

**George Mason University**  
**College of Education and Human Development**  
**Graduate School of Education**  
**Mathematics Education Leadership**

EDCI 646 DL5 – Mathematics Education Leadership for School Change

3 Credits, Fall 2018

Mondays, 7:20 PM - 10:00 PM synchronous online

**Faculty**

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**Prerequisites/Corequisites**

Admission to the Mathematics Education Leadership Master's Degree program or instructor permission.

**University Catalog Course Description**

Surveys current literature and large-scale studies in mathematics education. Engages students in research, study, and discussion of factors that affect teaching and learning of mathematics in school settings.

**Course Overview**

This course is designed for master's level students in the Mathematics Education Leadership program.

**Course Delivery Method**

This course will be delivered online (76% or more) using a synchronous format via Blackboard Learning Management system (LMS) housed in the MyMason portal. You will log in to the Blackboard (Bb) course site using your Mason email name (everything before @masonlive.gmu.edu) and email password. The course site will be available on Monday, August 27, 2018.

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

### *Technical Requirements*

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

- High-speed Internet access with standard up-to-date browsers. To get a list of Blackboard's supported browsers see:

<https://help.blackboard.com/Learn/Student/Getting Started/Browser Support#supported-browsers>

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

<https://help.blackboard.com/Learn/Student/Getting Started/Browser Support#tested-devices-and-operating-systems>

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

### *Expectations*

- **Course Week:**  
Our course week will begin on the day that our synchronous meetings take place as indicated on the Schedule of Classes.
- **Log-in Frequency:**  
Students must actively check the course Blackboard site and their GMU email for communications from the instructor, class discussions, and/or access to course materials at least 2 times per week. In addition, students must log-in for all scheduled online synchronous meetings.
- **Participation:**  
Students are expected to actively engage in all course activities throughout the semester, which includes viewing all course materials, completing course activities and assignments, and participating in course discussions and group interactions.

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

## Learner Outcomes or Objectives

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

1. Develop skillful and flexible use of different instructional formats – whole group, small group, partner, and individual – in support of learning goals.
2. Design, select, and/or adapt worthwhile mathematics tasks and sequence examples to support a particular learning goal.
3. Construct and evaluate multiple representations of mathematical ideas or processes, establish correspondences between representations, and understand the purposes of doing so.
4. Use questions to effectively probe mathematical understanding and make productive use of responses.
5. Develop learners' abilities to give clear and coherent public mathematical communications in a classroom setting.
6. Manage diversities of the classroom and school –cultural, disability, linguistic, gender socio-economic, developmental – and use appropriate strategies to support the mathematical learning of all students.

7. Analyze and evaluate student ideas and work, and design appropriate responses.
8. Use professional resources such as professional organization networks, journals, and discussion groups to be informed about critical issues related to mathematics teaching and learning, e.g., policy initiatives and curriculum trends.
9. Use leadership skills to improve mathematics programs at the school and district levels.
10. Read, interpret, and discuss methodologies for implementing school change in mathematics education and for coping with the emotional aspects of change.
11. Explore and discuss the various aspects of the work of a mathematics leader including: working with different populations (i.e., new and experienced teachers, administrators, parents, and school cultures); managing discussions; identifying and implementing structures for professional development (i.e., Lesson Study, Content-Focused Coaching, Professional Learning Communities); and transitioning into the role of a mathematics specialist.

(\*\*\*Outcomes 1-8 are quoted directly from page 6-7 of the 2010 AMTE *Standards for Elementary Mathematics Specialists: A Reference for Teaching Credentialing and Degree Programs*)

### **Professional Standards (Association of Mathematics Teacher Educators (AMTE))**

Upon completion of this course, students will have met the following professional standards: EDCI 646 is designed to enable mathematics education leaders to use strategies to implement and evaluate school change in mathematics teaching and learning. Students need knowledge of effective instruction in mathematics as well as vehicles for change so that they can be a catalyst for school improvement in mathematics. The course was developed according to the *Standards for Elementary Mathematics Specialists* of the Association of Mathematics Teacher Educators (AMTE, 2010).

### **Professional Standards (National Council of Teachers of Mathematics (NCTM))**

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

#### **A. Standard 3: Content Pedagogy**

Effective elementary mathematics specialists apply knowledge of curriculum standards for mathematics and their relationship to student learning within and across mathematical domains in teaching elementary students and coaching/mentoring elementary classroom teachers. They incorporate research-based mathematical experiences and include multiple instructional strategies and mathematics-specific technological tools in their teaching and coaching/mentoring to develop all students' mathematical understanding and proficiency. As teacher, lead teacher, and coach/mentor, they provide and assist teachers in providing 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 assist teachers in the incorporation of formative and summative assessments for monitoring student learning, measuring student mathematical understanding, and informing practice. In their role as teacher, lead teacher, and/or coach/mentor, elementary mathematics specialist candidates:

- a. Apply knowledge of curriculum standards for elementary mathematics and their relationship to student learning within and across mathematical domains in

- teaching elementary students and coaching/mentoring elementary classroom teachers.
- c. Plan and assist others in planning lessons and units that incorporate a variety of strategies, differentiated instruction for diverse populations, and mathematics-specific and instructional technologies in building all students' conceptual understanding and procedural proficiency.
  - e. Implement and promote techniques related to student engagement and communication including selecting high quality tasks, guiding mathematical discussions, identifying key mathematical ideas, identifying and addressing student misconceptions, and employing a range of questioning strategies.
  - f. Plan, select, implement, interpret, and assist teachers in using formative and summative assessments to inform instruction by reflecting on mathematical proficiencies essential for all students.

**B. Standard 4: Mathematical Learning Environment**

Effective elementary mathematics specialists exhibit knowledge of child, pre-adolescent, and adult learning, development, and behavior. They use this knowledge to plan, create, and assist teachers in planning and creating 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, promote, and assist teachers in demonstrating and promoting a positive disposition toward mathematical practices and learning and exhibit and support the equitable and ethical treatment of and high expectations for all students. They include and assist teachers in embracing culturally relevant perspectives in teaching, in recognizing individual student differences, and in using instructional tools such as manipulatives, digital tools, and virtual resources to enhance student learning, while recognizing the possible limitations of such tools. In their role as teacher, lead teacher, and/or coach/mentor, elementary mathematics specialist candidates:

- b. Plan, create, and coach/mentor teachers in creating developmentally appropriate, sequential, and challenging learning opportunities grounded in mathematics education research in which students are actively engaged in building new knowledge from prior knowledge and experiences.
- d. Demonstrate and encourage equitable and ethical treatment of and high expectations for all students.
- e. Apply mathematical content and pedagogical knowledge in the selection, use, and promotion of instructional tools such as manipulatives and physical models, drawings, virtual environments, presentation tools, and mathematics-specific technologies (e.g., graphing tools and interactive geometry software); and make and nurture sound decisions about when such tools enhance teaching and learning, recognizing both the insights to be gained and possible limitations of such tools.

**C. Standard 5: Impact on Student Learning**

Elementary mathematics specialists provide evidence that as a result of their instruction or coaching/mentoring of teachers, elementary students' conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and application of major mathematics concepts in varied contexts have increased.

Elementary mathematics specialists support the continual development of a positive

disposition toward mathematics. These mathematics specialists show that new student mathematical knowledge has been created as a consequence of their ability to engage students or coach/mentor teachers in mathematical experiences that are developmentally appropriate, require active engagement, and include mathematics-specific technology in building new knowledge. In their role as teacher, lead teacher, and/or coach/mentor, elementary mathematics specialist candidates:

- b. Engage students and coach/mentor teachers in using developmentally appropriate mathematical activities and investigations that require active engagement and include mathematics-specific technology in building new knowledge.
- c. Collect, organize, analyze, and reflect on diagnostic, formative, and summative assessment evidence and determine the extent to which students' mathematical proficiencies have increased as a result of their instruction or their efforts in coaching/mentoring teachers.

## Required Texts

Felux, C. & Snowdy, P. (2006). *The math coach field guide: Charting your course*. Sausalito, CA: Math Solutions.

Lewis, C. & Hurd, J. (2011). *Lesson study step-by-step: How teacher learning communities improve instruction*. Portsmouth, NH: Heinemann.

West, L. & Cameron, A. (2013). *Agents of change*. Portsmouth, NH: Heinemann.

## Suggested Texts

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

## 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).

- **Assignments and/or Examinations**

The assignments across the semesters are intended to develop skills in implementing, leading, and evaluating school change in mathematics teaching and learning. All assignments are to be completed on time so that class members might benefit from the expertise and contributions of their colleagues. Late assignments will be worth a lower grade. ***Additional details and rubrics for all assignments will be posted on Blackboard. Please review these materials.***

- a. Coaching Project—(40%)

For this assignment, participants will plan and **videotape or audiotape** a coaching cycle (one pre-conference and one post-conference) with a classroom teacher. Participants should **not** videotape the actual lesson that is taught by the classroom teacher. In addition to writing

a summary report, participants will choose one uninterrupted clip from each conference and present these clips to a small group of their classmates. After discussing the clips with the small group, participants will develop a written summary of the important ideas related to mathematical pedagogy and mathematical content that surfaced during their own pre- and post-conferences. Each small group will also choose a representative clip (one pre- or post-conference clip) to discuss with the entire class. This Performance-Based Assessment will be posted to TK20 for the final evaluation.

b. Lesson Study Project – (40%)

Students will work with a small group to conduct a lesson study. This will include selecting research goals for the lesson, planning the lesson, teaching the lesson (by at least one person in the team), and reviewing artifacts from the lesson. This Performance-Based Assessment will be posted to TK20 for the final evaluation.

c. Reading Discussion Questions & Participation (20%)

The quality of this course depends heavily and primarily on the regular attendance and participation of all involved. Participation will include taking part in discussions informed by critical reading and thinking, and sharing with the class the products of various reading/writing assignments and teacher leader experiences. As part of the reading, each student will be assigned to post discussion questions at least once during the semester connected to the reading for the week. In addition, students will need to post a comment responding to at least one of the discussion questions each week.

- **Other Requirements**

Attendance:

It is your responsibility to attend all class sessions. Please report your reasons for any absences to the instructor in writing.

Tardiness: It is your responsibility to be on time for each class session. Please report your reasons for any tardiness to the instructor in writing.

Class materials will be posted for each class session on Blackboard. Students are responsible for reviewing these materials and submitting required artifacts (where appropriate) to online class discussion boards.

- **Grading**

40% Coaching Project

40% Lesson Study Project

20% Reading Discussion Questions & Participation

**The evaluation criteria utilizes the graduate grading scale and is as follows:**

A      93%-100%

B+      87%-89%

C      70%-79%

A- 90%-92%

B 80%-86%

F Below 70%

### **TK20/Performance-Based Assessment(s) Submission Requirement:**

Every student registered for any Mathematics Education Leadership course with a required TK20 performance-based assessment (designated as such in the syllabus) must submit these assessments to Tk20 through '**Assessments**' in Blackboard. Failure to submit the assessment(s) to Tk20 (through Blackboard) will result in the course instructor reporting the course grade as Incomplete (IN). Unless this grade is changed upon completion of the required Tk20 submission, the IN will convert to an F nine weeks into the following semester.

### **Professional Dispositions**

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

This course will require students to audiotape, videotape, or use the audio/video conferencing feature. Students should dress professionally, speak professionally, and aware of their recording surroundings and backgrounds. Background noise (such as television, music, conversations, etc.) and inappropriate background video are distracting, unprofessional, and not allowed in this course.

### **Class Schedule**

| Key: Field Guide = Math Coach Field Guide; Change = Agents of Change; Lesson Study = Lesson Study Step-by-Step |                |  |  |
|--|----------------|--|--|
|  | Date           | Topics and Goals   | Assignments Due (before class begins)  |
| 0  | Mon 8/20       | Blackboard course available; log on to access the syllabus and create a Collaborate profile                              |  |
| 1  | Mon 8/27       | Introduction to the class<br>Principles and skills for being a math coach<br>What is the job like?<br>Team introductions | Create a Collaborate profile, including picture, by the start of first class   |
| 2  | <b>Mon 9/3</b> | <b>No Class; University closed in observance of Labor Day</b>  |  |
| 3  | Mon 9/10       | Interacting with teachers about students' work<br>Dealing with conflict, PLC, group norms                                | <b>Readings:</b> ( <i>Field Guide</i> )<br>1: Being a successful math coach<br>2: The math bulletin board<br>3: Coaching a middle school math team |
| 4  | Mon 9/17       | Basic introduction to lesson study with particular focus on planning and first teaching                                  | <b>Lesson Study Element 1 due.</b><br><br><b>Readings:</b> ( <i>Lesson Study</i> )<br>1: Why Lesson Study?   |

|    |                 |   |   |
|----|-----------------|---|---|
|    |                 |   | 2: Lesson Study in Action (Part 1), Clips 1 and 2<br>3: Build a Lesson Study Group  |
| 5  | Mon 9/24        | Building a PD group to conduct a research lesson, more detail about planning  | <b>Lesson Study Element 2 due.</b><br><br><b>Readings:</b> ( <i>Lesson Study</i> )<br>4: Focus the Group's Inquiry<br>5: Conduct and Discuss the Research Lesson      |
| 6  | Mon 10/1        | Walking through a research lesson. What happens in the classroom?   | <b>Lesson Study Element 3 due.</b><br><br><b>Readings:</b> ( <i>Lesson Study</i> )<br>6: What should you expect from Lesson Study?<br>7: Lesson Study's Diverse Forms |
| 7  | <b>Mon 10/8</b> | No Class; University closed. University calendar require all courses taught on 10/8 to meet on Tuesday 10/9. To ensure consistency with professional schedules, class is postponed until Monday, 12/10 during the designated "exam time".<br><b>No class meeting this week.</b> |   |
| 8  | Mon 10/15       | Challenges and opportunities for lesson study   | <b>Lesson Study Element 4 due.</b><br><br><b>Readings:</b> ( <i>Lesson Study</i> )<br>8: Misconceptions, Challenges, Next Steps<br>9: Next Steps                      |
| 9  | Mon 10/22       | Introduction to content coaching<br>Coaching Initiatives  | <b>Readings:</b> ( <i>Change</i> )<br>1: What is Content Coaching?<br>2: Designing and Refining Coaching Initiatives<br>3: Roles in a Coaching Initiative             |
| 10 | Mon 10/29       | Present Lesson Study Results to Class   | <b>Lesson Study Project Due</b>   |
| 11 | Mon 11/5        | Coaching Protocol<br>How do you decide what to coach?<br>Rehearsals   | <b>Readings:</b> ( <i>Change</i> )<br>4: Know Thyself<br>5: Communication is Key<br>6: Assessing Teacher Development: the Starting Place for Coaching Teachers        |
| 12 | Mon 11/12       | Modeling the imperfect lesson<br>Preconference rehearsals<br>Post conference rehearsals   | <b>Readings:</b> ( <i>Change</i> )<br>7: The Preconference<br>8: Co-Teaching the Lesson<br>9: The Postconference  |

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| 13 | Mon<br>11/19 | Tools for supporting teachers<br>(reluctant, math anxiety, and other barriers)                  | <b>Readings:</b> ( <i>Field Guide</i> )<br>4: Helping reluctant teachers<br>5: Making sense of arithmetic<br>7: Coteaching (skim for similarities and differences from Ch.8 of Change) |
| 14 | Mon<br>11/26 | Observation tools<br>Lesson design frameworks   | <b>Coaching Plan Due</b><br><br><b>Readings:</b> ( <i>Field Guide</i> )<br>6: Learning to look<br>9: Helping teachers take ownership   |
| 15 | Mon<br>12/3  | Implementing innovations, school-wide innovation  | <b>Readings:</b> ( <i>Field Guide</i> )<br>10: Adopting a new math program<br>11: From the trenches  |
| 16 | Mon<br>12/10 | (University catalog: Exam time)<br>Presentations of Coaching Project with feedback on coaching. | <b>Coaching Project Due</b>  |

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

### 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](mailto:tk20help@gmu.edu) or <https://cehd.gmu.edu/aero/tk20>. Questions or concerns regarding use of Blackboard should be directed to <http://coursesupport.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 <https://cehd.gmu.edu/students/>.**

### Coaching Project Rubric

| Levels/Criteria   | 4   | 3  | 2  | 1  |
|---|---|--|--|--|
|   | Exceeds Expectations  | Meets Expectations   | Developing   | Does Not Meet Expectations   |
| a) COACHING PLAN - BACKGROUND   | <p>Plan includes a background of the teacher.</p> <p>Plan includes goals and challenges of coaching/assisting the teacher.</p>  | <p>Plan includes a background of the teacher.</p> <p>Plan includes goals OR challenges of coaching/assisting the teacher.</p>  | <p>Plan includes a background of the teacher.</p>  | <p>Plan does not include the background, goals, or challenges of coaching/assisting the teacher.</p> |
| b) COACHING PLAN - STRATEGIES & MISCONCEPTIONS<br><br>NCTM Indicator<br><br>3C Plan lessons and units that incorporate a variety of strategies. | <p>Plan contains several different strategies that show multiple opportunities and solution avenues for students to demonstrate conceptual understanding and procedural proficiency.</p> <p>Plan contains several different misconceptions.</p> | <p>Plan contains different strategies that show multiple opportunities and solution avenues for students to demonstrate conceptual understanding and procedural proficiency.</p> <p>Plan contains a misconception.</p> | <p>Plan contains different strategies or misconceptions that show multiple opportunities and solution avenues for students to demonstrate conceptual understanding and procedural proficiency.</p> | <p>Student strategies and misconceptions lack a complete listing and in-depth understanding.</p>     |
| 3C Build all students' conceptual understanding and procedural proficiency in planned lessons and units.  | <p>Plan describes the connections between the different strategies/misconceptions using descriptions such as similarities, differences, efficiency, visual clarity,</p>   | <p>Plan describes the connections between the different strategies/misconceptions to support students' conceptual understanding and procedural proficiency.</p>  |  |  |

|   |  |   |   |   |
|---|--|---|---|---|
|   | 3C Include in planned lessons and units multiple opportunities and solution avenues for students to demonstrate conceptual understanding and procedural proficiency.   | mathematical accuracy and/or precision to support students' conceptual understanding and procedural proficiency.  |   |   |
| c) COACHING PLAN - TECHNOLOGY<br><br>NCTM Indicator<br><br>3C Include mathematics-specific and instructional technologies in planned lessons and units.   | Your choice of technology is explained regarding how it is math-specific and supports the task.<br><br>The tool is specific to the task (ie: the geoboard on NLVM, and not simply "iPads").<br><br>Links to the web or appstore are provided and screen captures of the tool are included. | Your choice of technology is explained regarding how it is math-specific and supports the task.<br><br>The tool is specific to the task (ie: the geoboard on NLVM, and not simply "iPads"). | Your choice of technology is not explained regarding how it is math-specific and supports the task or the tool is not specific. | Your choice of technology is not explained regarding how it is math-specific and does not support the task or the tool is not specific. |
| d) COACHING PLAN - DIVERSE POPULATIONS<br><br>3C Plan lessons and units addressing student differences and diverse populations and how these differences influence student learning of mathematics. | Modifications to the lesson are given for diverse populations to meet all student needs.<br><br>Explanation of how student differences may influence their learning of mathematics.  | Modifications are given for diverse populations but may lack clarity or completeness.   | Modifications are given for diverse populations but may lack clarity and completeness.  | Plan modifications are very minimal.  |

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|---|---|---|--|--|
| <p><b>d) PRE-CONFERENCE SUMMARY</b></p>   | <p>Includes pre-conference summary.</p> <p>Includes questions about the mathematics and the teaching of the lesson.</p> <p>Includes thoughts, concerns, challenges, and expectations of the pre-conference.</p>   | <p>Includes pre-conference summary.</p> <p>Includes questions about the mathematics and the teaching of the lesson.</p>   | <p>Includes pre-conference summary.</p>  | <p>Does not include a pre-conference summary.</p>  |
| <p><b>d) ASSESSMENT</b></p> <p><b>NCTM Indicator</b></p> <p><b>3F Plan, select, implement, interpret, and use formative and summative assessments to inform instruction by reflecting on mathematical proficiencies essential for all students.</b></p> | <p>Plan a formative and summative assessment to inform instruction by reflecting on mathematical proficiencies essential for all students.</p> <p>Assist teachers in using formative and summative assessments addressing essential mathematical proficiencies.</p> | <p>Plan a formative and summative assessment to inform instruction by reflecting on mathematical proficiencies essential for all students.</p> <p>Assist teachers in using formative and summative assessments.</p> | <p>Plan a formative and summative assessment to inform instruction by reflecting on mathematical proficiencies essential for all students.</p> <p>Assist teachers in using formative OR summative assessments.</p> | <p>Plan a formative and summative assessment to inform instruction by reflecting on mathematical proficiencies essential for all students.</p> |
| <p><b>3F Assist teachers in using formative and summative assessments addressing essential mathematical proficiencies.</b></p>  | <p>Select, implement, interpret, and use formative and summative assessments to inform instruction by reflecting on</p>   | <p>Select, implement, interpret, and use formative and summative assessments to inform instruction by reflecting on mathematical</p>  | <p>Select, implement, interpret, or use formative and summative assessments to inform instruction by reflecting on</p>   | <p>Does not assist teachers in using formative or summative assessments.</p>   |

|   |  |   |   |  |  |
|---|--|---|---|--|--|
|   | 3F Use assessment results for subsequent instructional planning.   | mathematical proficiencies essential for all students.  | proficiencies essential for all students.   | mathematical proficiencies essential for all students.   |  |
| e) POST-CONFERENCE SUMMARY  | <p>Includes post-conference summary.</p> <p>Describes the lesson the teacher taught and what mathematics was part of the lesson (intended or unintended).</p> <p>Describes what kinds of questions were discussed related to the teaching of the lesson</p> <p>Describes your thoughts and concerns about what happened during the lesson.</p> | <p>Includes post-conference summary.</p> <p>Describes the lesson the teacher taught and what mathematics was part of the lesson (intended or unintended).</p> <p>Describes what kinds of questions were discussed related to the teaching of the lesson</p> | <p>Includes post-conference summary.</p> <p>Describes the lesson the teacher taught and what mathematics was part of the lesson (intended or unintended).</p> | <p>Includes post-conference summary.</p>   |  |
| f) DATA ANALYSIS<br>NCTM Indicator<br>5C Collect, organize, analyze, and reflect on diagnostic, formative, and summative assessment data. | <p>Collect, organize, analyze, and reflect on diagnostic, formative, and summative assessment data.</p> <p>Determine the extent to which students' mathematical proficiencies have increased as a result</p>   | <p>Collect, organize, analyze, and reflect on diagnostic, formative, and summative assessment data.</p> <p>Determine the extent to which students' mathematical proficiencies have increased as a result</p>  | <p>Collect, organize, analyze, and reflect on diagnostic, formative, and summative assessment data.</p>   | <p>Collect, organize, analyze, and reflect on diagnostic, formative, OR summative assessment data.</p> | <p>Collect, organize, analyze, and reflect on diagnostic, formative, OR summative assessment data.</p> |

|  |   |  |   |  |
|--|---|--|---|--|
| <p><b>5C Determine the extent to which students' mathematical proficiencies have increased as a result of their instruction or their efforts in coaching/mentoring teachers.</b></p>   | <p>of their instruction or their efforts in coaching/mentoring teachers.</p> <p>Use assessment results as a basis for designing and modifying their instruction as a means to meet group and individual needs and increase student performance.</p>   | <p>of their instruction or their efforts in coaching/mentoring teachers.</p> <p>Use assessment results as a basis for designing and modifying their instruction as a means to meet group and individual needs and increase student performance.</p>                | <p>Determine the extent to which students' mathematical proficiencies have increased as a result of their instruction or their efforts in coaching/mentoring teachers.</p>  |  |
| <p><b>5C Use assessment results as a basis for designing and modifying their instruction as a means to meet group and individual needs and increase student performance.</b></p>   |   |  |   |  |
| <p><b>g) VIDEO EVIDENCE</b></p> <p><b>3C Assist others in planning lessons and units that incorporate multiple strategies, differentiated instruction for diverse populations, and mathematics-specific and instructional technologies to build all students' conceptual understanding and procedural proficiency.</b></p> | <p>Assisted a teacher in developing multiple strategies to build all students' conceptual understanding and procedural proficiency.</p> <p>Assisted a teacher in identifying diverse populations and modifying the task to build all students' conceptual understanding and procedural proficiency.</p> <p>Assisted a teacher in aligning mathematics-specific and instructional technologies to build all students' conceptual</p> | <p>Assisted a teacher in developing multiple strategies and identifying diverse populations and modifying the task or aligning mathematics-specific and instructional technologies to build all students' conceptual understanding and procedural proficiency.</p> | <p>Assisted a teacher in developing a strategy or identifying diverse populations or modifying the task or aligning mathematics-specific and instructional technologies to build all students' conceptual understanding and procedural proficiency.</p> | <p>Does not collaborate with peers on lesson plan.</p> |

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|  | understanding and procedural proficiency. |  |  |  |
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## **Lesson Study Project**

In order to provide experience in lesson study, students will work in small groups and complete the lesson study process. Time will be given in class for small groups to meet, to establish their goal, and review their progress toward their goal.

Groups will provide evidence or documentation that supports their progress as artifacts of 1) lesson development, 2) implementation, and 3) reflection. Each group will have a space within Blackboard for discussion boards, file sharing and other tools that only the group and the instructor will be able to access.

### **Lesson Study Final Project Rubrics**

| Levels/Criteria  | 4  | 3  | 2   | 1   |
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|  | Exceeds Expectations   | Meets Expectations   | Developing  | Does Not Meet Expectations  |
| <b>Group Final Paper</b>   |  |  |   |   |
| Pre-planning assignments   |  |  |   |   |
| Pre-planning documents:<br>1) Meeting Notes (Appendix A) and<br>2) Introductory Interview (Appendix B) | There is exemplary evidence of group collaboration and task sharing.<br>There is ample documentation that all members of the group engaged in thoughtful discourse during decision-making processes. | There is sufficient evidence of group collaboration and task sharing.<br>There is some documentation of academic discourse during the decision-making process. | There is some evidence of group collaboration and task sharing. | There is little to no evidence of group collaboration and task sharing. |
| s) GOAL SETTING Action Plan (Appendix C)   | Goals include roles for group members and tasks that need to be completed.<br><br>Goals include the research goals the team identified.  | Goals include the research goals the team identified.  | Goals are vague or not researched.                              | Does not include goals.   |

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|  | the team identified.  |  |   |  |
| Lesson Plan (Appendix E)   |   |  |   |  |
| a) TASK<br>NCTM Indicator 3E<br>Implement and promote techniques for actively engaging students in learning and doing mathematics.                         | The task implements and promotes techniques for actively engaging students in learning and doing mathematics.<br><br>Complete a second round of Lesson Study using a revised task.  | The task has a cognitive demand of “Procedures with Connections”   | The task has a cognitive demand of “Procedures without Connections”   | The task has a cognitive demand of “Memorization”                              |
| b) CURRICULUM STANDARDS<br>NCTM Indicator<br>3A Apply knowledge of mathematics curriculum standards for elementary within and across mathematical domains. | Includes the grade level, major concept, objective/goals, VA SOL's, NCTM process standards, mathematical practice CCSS, and prerequisite knowledge.<br><br>Assemble resources that your group can use to support the lesson. These could include books, websites, articles or other materials that could be shared with teachers or math specialists. | Includes the grade level, major concept, objective/goals, VA SOL's, NCTM process standards, mathematical practice CCSS, and prerequisite knowledge.<br><br>Lesson is based on research and it cited correctly. | Includes the grade level, major concept, objective/goals, VA SOL's, NCTM process standards, mathematical practice CCSS, and prerequisite knowledge. | Lesson plan is not based on research.<br>Many aspects of the plan are missing. |
| 3A Relate mathematics curriculum standards to student learning.  |   |  |   |  |

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| c) QUESTIONS<br>NCTM Indicator<br>3E Provide instruction that incorporates high quality tasks and a range of questioning strategies. | Plan contains key questions and student expectations to aid teacher when implementing the task to maintain rigor.   | Plan contains key questions and student expectations to aid teacher when implementing the task to maintain rigor but lacks some clarity. | Plan contains questions low in cognitive demand.<br><br>Student expectations are also low in rigor. | Plan does not contain key questions.<br><br>Student expectations are missing. |
| 3E Guide productive mathematical discussions in classrooms centered on key mathematical ideas.                                       | Plan contains questions and expected student expectations to address misconceptions.<br><br>Plan contains questioning strategies to guide productive mathematical discussions in classrooms centered on key mathematical ideas. | Plan contains questions and expected student expectations to address misconceptions.   | Questions engage students and teachers in communicating about mathematics.                          |   |
| 3E Select and apply instructional techniques that assist in identifying and addressing student misconceptions.                       | Questions engage students and teachers in communicating about mathematics.  |  |   |   |
| 3E Engage students and teachers in communicating about mathematics.  | Plan describes how student misconceptions will be used as opportunities for learning.   |  |   |   |
| 3E Use students' misconceptions as opportunities for learning.   | Complete a second round of Lesson Study using targeted questions that were identified through data analysis.  |  |   |   |

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| <p>d) MATHEMATICAL TOOLS</p> <p>NCTM Indicator</p> <p>4E Apply mathematical content and pedagogical knowledge to select and use instructional tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies.</p> | <p>Apply mathematical content and pedagogical knowledge to select and use 2 or more instructional tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies.</p>     | <p>Apply mathematical content and pedagogical knowledge to select and use instructional tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies.</p> | <p>Apply mathematical content and pedagogical knowledge to select and use instructional tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies.</p>   | <p>Does not use tools and/or does not make sound decisions about when to use the tool.</p>   |
| <p>4E Make and nurture sound decisions about when instructional tools enhance teaching and learning and recognize both the insights to be gained and possible limitations of such tools.</p>  | <p>Make and nurture sound decisions about when instructional tools enhance teaching and learning and recognize both the insights to be gained and possible limitations of such tools.</p> <p>*Different tools can be used in additional rounds of lesson study.</p> | <p>Make and nurture sound decisions about when instructional tools enhance teaching and learning and recognize both the insights to be gained and possible limitations of such tools.</p>   | <p>Make and nurture sound decisions about when instructional tools enhance teaching and learning and recognize both the insights to be gained OR possible limitations of such tools.</p>  |  |
| <p>e) Developmental TECHNOLOGY</p> <p>NCTM Indicator</p> <p>5B Engage students in developmentally appropriate mathematical activities and investigations that include mathematics-specific technology in building new knowledge.</p>  | <p>Your choice of technology is explained regarding how it will enhance learning.</p> <p>Tool engages students in developmentally appropriate mathematical activities and investigations that include mathematics-specific technology in</p>                        | <p>Your choice of technology is explained regarding how it will enhance learning.</p> <p>Tool engages students in developmentally appropriate mathematical activities and investigations that include mathematics-specific technology in</p>          | <p>Your choice of technology is not explained regarding how it will enhance learning or the tool does not engage students in developmentally appropriate mathematical activities and investigations that include mathematics-specific technology in</p> | <p>Your choice of technology is not explained regarding how it will enhance learning and the tool does not engage students in developmentally appropriate mathematical activities and investigations that include mathematics-specific technology in</p> |

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|  | <p>building new knowledge.</p> <p>Plan contains a detailed explanation of how the students will interact with the tool.</p>  | <p>building new knowledge.</p>   | <p>building new knowledge.</p>   | <p>building new knowledge.</p>   |
| f) DIFFERENTIATION<br>NCTM Indicator<br>3A Demonstrate how mathematics curriculum standards and learning progressions impact the teaching of elementary students at different developmental levels and coaching/mentoring elementary classroom teachers. | <p>Plan identifies the grade level standard (VA SOL &amp; CCSS) and at least two other grade levels and describes the progression and vertical alignment.</p> <p>Modifications to the lesson are given for different developmental levels to meet all student needs.</p> <p>Collaborated with peers to coach and give feedback on the differentiation of others' task.</p> | <p>Plan includes how to modify the lesson to gear down and gear up to meet all student needs but is lacking clarity or completeness.</p> <p>Modifications are given that are appropriate for the given level but may lack clarity or completeness.</p> <p>Collaborated with peers to coach and give feedback on the differentiation of others' task.</p> | <p>Plan includes how to modify the lesson to gear down and gear up to meet all student needs but is lacking clarity and completeness.</p> <p>Grade modifications are given that are appropriate for the given level but may lack clarity and completeness.</p> | <p>Plan differentiation and modifications are very minimal.</p>  |
| h) LEARNING SEQUENCE<br>NCTM Indicator<br>4B Plan and create sequential learning opportunities in which students connect new learning to prior knowledge and experiences.  | <p>Plan and create sequential learning opportunities in which students connect new learning to prior knowledge and experiences.</p> <p>Create a sequence of</p>  | <p>Plan and create sequential learning opportunities in which students connect new learning to prior knowledge and experiences.</p> <p>Describe a sequence of</p>  | <p>Plan and create sequential learning opportunities in which students connect new learning to prior knowledge or experiences.</p> <p>Describe the sequence of</p>   | <p>Plan and create sequential learning opportunities in which students connect new learning to prior knowledge or experiences.</p> |

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| <p><b>4B</b> Create a sequence of developmentally appropriate and challenging learning opportunities grounded in mathematics education research in which students are actively engaged in building new knowledge.</p>                       | <p>developmentally appropriate and challenging learning opportunities grounded in mathematics education research in which students are actively engaged in building new knowledge.</p>                              | <p>developmentally appropriate and challenging learning opportunities grounded in mathematics education research in which students are actively engaged in building new knowledge.</p>                              | <p>instruction for all students that shows a progression of learning over time toward proficiency and understanding.</p>   |  |
| <p><b>4B</b> Create a developmentally appropriate and challenging sequence of instruction for all students that shows a progression of learning over time toward proficiency and understanding.</p>   | <p>Create a developmentally appropriate and challenging sequence of instruction for all students that shows a progression of learning over time toward proficiency and understanding.</p>                           | <p>Describe the sequence of instruction for all students that shows a progression of learning over time toward proficiency and understanding.</p>   |  |  |
| <p><b>i) ASSESSMENTS</b><br/>NCTM Indicator<br/><b>3F</b> Plan, select, implement, interpret, and use formative and summative assessments to inform instruction by reflecting on mathematical proficiencies essential for all students.</p> | <p>Plan a formative and summative assessment to inform instruction by reflecting on mathematical proficiencies essential for all students.</p> <p>Select, implement, interpret, and use formative and summative</p> | <p>Plan a formative and summative assessment to inform instruction by reflecting on mathematical proficiencies essential for all students.</p> <p>Select, implement, interpret, and use formative and summative</p> | <p>Plan a formative and summative assessment to inform instruction by reflecting on mathematical proficiencies essential for all students.</p> <p>Select, implement, interpret, or use formative and summative</p> | <p>Plan a formative and summative assessment to inform instruction by reflecting on mathematical proficiencies essential for all students.</p> |

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| 3F Use assessment results for subsequent instructional planning. | assessments to inform instruction by reflecting on mathematical proficiencies essential for all students.<br><br>Complete a second round of Lesson Study using assessment results for subsequent instructional planning | assessments to inform instruction by reflecting on mathematical proficiencies essential for all students. | assessments to inform instruction by reflecting on mathematical proficiencies essential for all students. |  |
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#### Group Final Paper Reflections (Main text of paper)

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| r) REFLECTION - LESSON STUDY | Reflection describes the role of each person, aspects of lesson study that were attempted, and the results.<br><br>Reflection describes what the group learned and how it will transfer to a math specialist position.<br><br>Reflection summarizes the research themes for your group and explains the rationale for those goals.<br><br>Reflection summarizes the lesson your group implemented and how it meets the research goals.<br><br>In describing each of the above categories, the paper includes insightful, thoughtful reflections that indicate group | Reflection describes the role of each person, aspects of lesson study that were attempted, and the results.<br><br>Reflection describes what the group learned and how it will transfer to a math specialist position.<br><br>Reflection summarizes the research themes for your group and explains the rationale for those goals.<br><br>Reflection summarizes the lesson your group implemented and how it meets the research goals. | One or more of the following components are incomplete:<br><br>Reflection describes the role of each person, aspects of lesson study that were attempted, and the results.<br><br>Reflection describes what the group learned and how it will transfer to a math specialist position.<br><br>Reflection summarizes the research themes for your group and explains the rationale for those goals.<br><br>Reflection summarizes the lesson your group implemented and how it meets the research goals. | One or more of the following components are missing:<br><br>Reflection describes the role of each person, aspects of lesson study that were attempted, and the results.<br><br>Reflection describes what the group learned and how it will transfer to a math specialist position.<br><br>Reflection summarizes the research themes for your group and explains the rationale for those goals. |
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|   | learning and growth.  |   |   | meets the research goals.   |
| g) EQUITABLE TEACHING<br>NCTM Indicator<br>4D Demonstrate and encourage equitable and ethical treatment of all students.              | The video shows evidence of equitable and ethical treatment of all students, high expectations for all students and persist in helping each student reach his/her full potential and respect for and responsiveness to the cultural backgrounds and differing perspectives students bring to the classroom. | The video shows evidence of equitable and ethical treatment of all students, high expectations for all students and persist in helping each student reach his/her full potential and respect for and responsiveness to the cultural backgrounds and differing perspectives students bring to the classroom. | The candidate is developing equitable and ethical treatment of all students, high expectations for all students and persist in helping each student reach his/her full potential and respect for and responsiveness to the cultural backgrounds and differing perspectives students bring to the classroom. | The candidate does not show evidence that they are developing equitable and ethical treatment of all students, high expectations for all students and persist in helping each student reach his/her full potential and respect for and responsiveness to the cultural backgrounds and differing perspectives students bring to the classroom. |
| 4D Have high expectations for all students and persist in helping each student reach his/her full potential.                          |   |   |   |   |
| 4D Demonstrate respect for and responsiveness to the cultural backgrounds and differing perspectives students bring to the classroom. | The lesson was modified for the second round of lesson study to address equity and high expectations of all students.   |   |   |   |

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|  | proficiencies have increased as a result of their instruction or their efforts in coaching/mentoring teachers.   | proficiencies have increased as a result of their instruction or their efforts in coaching/mentoring teachers.  | proficiencies have increased as a result of their instruction or their efforts in coaching/mentoring teachers. |   |
| 5C Use assessment results as a basis for designing and modifying their instruction as a means to meet group and individual needs and increase student performance.   | Use assessment results as a basis for designing and modifying their instruction as a means to meet group and individual needs and increase student performance.<br><br>Complete a second round of Lesson Study using the same lesson and data results. | Use assessment results as a basis for designing and modifying their instruction as a means to meet group and individual needs and increase student performance. |  |   |
| k) LESSON REFLECTION - JUSTIFICATION<br>NCTM Indicator<br>5B Engage students in developmentally appropriate mathematical activities and investigations that require active engagement in building new knowledge. | Reflection shows evidence that students were engaged in developmentally appropriate mathematical activities and investigations that require active engagement in building new knowledge.   | Reflection shows evidence that students were engaged in investigations that require active engagement in building new knowledge.                                | Reflection shows evidence that students were engaged in investigations that require active engagement.         | Reflection of lesson implementation is missing.                                     |
| l) LESSON REFLECTION - PROBLEM SOLVING<br>NCTM Indicator<br>5B Facilitate students' ability to develop future inquiries based on current analyses.   | Reflection shows evidence that you facilitated students' ability to develop future inquiries based on current analyses.  | Reflection shows evidence that you facilitated students' ability to develop inquiries about the task.   | Reflection shows evidence that you facilitated students' ability to solve the task.                            | There is no expectation of students communicating their problem solving strategies. |
| <b>Individual Reflection Paper</b>   |  |   |  |   |
| Coach is a reflective practitioner   | Kept a detailed journal of coaching actions with insightful reflections  | Kept a detailed journal of coaching actions<br><br>Communicated evidence of   | Kept a journal of individual contributions to the group but coaching actions and/or reflections                | Journal is incomplete or lacks focus and clarity                                    |

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|   | Clearly communicated effective evidence of coaching actions throughout individual final report   | coaching actions throughout individual final report  | were missing from the journal  |   |
| m)<br>COACHING/ASSISTING - ASSESSMENT<br>NCTM Indicator<br>3F Assist teachers in using formative and summative assessments addressing essential mathematical proficiencies.   | Assist teachers in using formative and summative assessments addressing essential mathematical proficiencies.  | Assist teachers in using formative and summative assessments.  | Assist teachers in using formative OR summative assessments.   | Does not assist teachers in using formative or summative assessments.   |
| n)<br>COACHING/ASSISTING - SEQUENCING<br>NCTM Indicator<br>4B Coach/mentor teachers in creating developmentally appropriate, sequential, and challenging learning opportunities in which students connect new learning to prior knowledge and experiences.  | Coach/mentor teachers in creating developmentally appropriate, sequential, and challenging learning opportunities in which students connect new learning to prior knowledge and experiences.   | Coach/mentor teachers in analyzing developmentally appropriate, sequential, and challenging learning opportunities in which students connect new learning to prior knowledge and experiences.  | Coach/mentor teachers in describing developmentally appropriate, sequential, and challenging learning opportunities in which students connect new learning to prior knowledge and experiences.   | Does not coach/mentor teachers in developmentally appropriate, sequential, and challenging learning opportunities in which students connect new learning to prior knowledge and experiences.  |
| o)<br>COACHING/ASSISTING - TOOLS<br>NCTM Indicator<br>4E Coach/mentor teachers in applying mathematical content and pedagogical knowledge to select and use tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies. | Coach/mentor teachers in applying mathematical content and pedagogical knowledge to select and use 3 or more tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies. | Coach/mentor teachers in applying mathematical content and pedagogical knowledge to select and use 2 tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies. | Coach/mentor teachers in applying mathematical content and pedagogical knowledge to select and use 1 tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies. | Does not coach/mentor teachers in applying mathematical content and pedagogical knowledge to select and use tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies. |

|   | specific technologies.  |   |   | mathematics-specific technologies.  |
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| p)<br>COACHING/ASSISTING - TECHNOLOGY<br>NCTM Indicator<br>4E Participate in learning opportunities that address current and emerging technologies in support of mathematics learning and teaching.                                       | The candidate participates in learning opportunities that address current and emerging technologies in support of mathematics learning and teaching and gives feedback to all of the group members. | The candidate participates in learning opportunities that address current and emerging technologies in support of mathematics learning and teaching and gives feedback to 2 of the group members. | The candidate participates in learning opportunities that address current and emerging technologies in support of mathematics learning and teaching and gives feedback to 1 of the group members. | The candidate does not participate in learning opportunities that address current and emerging technologies in support of mathematics learning. |
| q)<br>COACHING/ASSISTING - INVESTIGATIONS<br>NCTM Indicator<br>5B Coach/mentor teachers in using developmentally appropriate mathematical activities and investigations that require active student engagement in building new knowledge. | Assist peers in designing a task that uses developmentally appropriate mathematical activities and investigations that require active student engagement in building new knowledge.                 | Assist peers in designing a task that is developmentally appropriate and uses investigations.   | Assist peers in thinking about their task.  | Does not collaborate with peers during task creation.   |

(84 Total Points)