**George Mason University**
**College of Education and Human Development**
**Mathematics Education Research**

EDCI 666.6M3 – Research in Mathematics Teaching
3 Credits, Spring 2018
Mondays/4:30-7:10 p.m.

**Faculty**


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|---|---|
| Name: | Dr. Courtney Baker |
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**Prerequisites/Corequisites**

Admission to the Mathematics Education Leadership Master's Degree Program or instructor permission. Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non-Degree or Senior Plus. Enrollment is limited to Graduate, Non-Degree or Undergraduate level students. Students in a Non-Degree Undergraduate degree may **not** enroll.

**University Catalog Course Description**

Explores curricula, current issues, and research literature in elementary school mathematics. Emphasizes development of different styles of teaching. Offered by Graduate School of Education. May not be repeated for credit.

**Course Overview**

EDCI 666 is designed to enable mathematics education leaders to evaluate, synthesize and apply mathematics research to school-based practices and professional development experiences. See also Learner Outcomes and Professional Standards.

**Course Delivery Method**

This course will be delivered online (76% or more) using 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 January 22.

**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 a standard up-to-date browser, either Internet Explorer or Mozilla Firefox is required (note: Opera and Safari are not compatible with Blackboard).
- Students must maintain consistent and reliable access to their GMU email and Blackboard, as these are the official methods of communication for this course.
- Students will need a headset microphone for use with the Blackboard Collaborate web conferencing tool.
- Students may be asked to create logins and passwords on supplemental websites and/or to download trial software to their computer or tablet as part of course requirements.
- The following software plug-ins for PCs and Macs, respectively, are available for free download:
    - Adobe Acrobat Reader: https://get.adobe.com/reader/
    - Windows Media Player:
    - https://support.microsoft.com/en-us/help/14209/get-windows-media-player
    - Apple Quick Time Player: www.apple.com/quicktime/download/

*Expectations*

- Course Week:
  Our course week will begin on the day that our synchronous meetings take place as indicated on the Schedule of Classes.
- Log-in Frequency:
  Students must actively check the course Blackboard site and their GMU email for communications from the instructor, class discussions, and/or access to course materials at least 3 times per week. In addition, students must log-in for all scheduled online synchronous meetings.
- Participation:
  Students are expected to actively engage in all course activities throughout the semester, which includes viewing all course materials, completing course activities and assignments, and participating in course discussions and group interactions.
- Technical Competence:
  Students are expected to demonstrate competence in the use of all course technology. Students who are struggling with technical components of the course are expected to seek assistance from the instructor and/or College or University technical services.
- Technical Issues:

Students should anticipate some technical difficulties during the semester and should, therefore, budget their time accordingly. Late work will not be accepted based on individual technical issues.

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

## Learner Outcomes or Objectives

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

1. Study the teaching of mathematics through reading, interpreting, critiquing, and synthesizing research.
2. Identify and locate scholarly articles about the teaching of mathematics.
3. Design and deliver a high-quality professional development presentation and evaluate professional development programs using research-based criteria.

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

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

**A. Standard 6: Professional Knowledge and Skills**

- **a.** Take an active role in their professional growth by participating in professional development experiences that directly relate to the learning and teaching of mathematics and to their development as a mathematics instructional leader.
- **c.** Plan, develop, implement, and evaluate mathematics-focused professional

development programs at the school and/or district level; use and assist teachers in using resources from professional mathematics education organizations such as teacher/leader discussion groups, teacher networks, and print, digital, and virtual resources/collections; and support teachers in systematically reflecting on and learning from their mathematical practice.

**d.** Demonstrate mathematics-focused instructional leadership through actions such as coaching/mentoring; building and navigating relationships with teachers, administrators, and the community; establishing and maintaining learning communities; analyzing and evaluating educational structures and policies that affect students' equitable access to high quality mathematics instruction; leading efforts to assure that all students have opportunities to learn important mathematics; evaluating the alignment of mathematics curriculum standards, textbooks, and required assessments and making recommendations for addressing learning and achievement gaps; developing appropriate classroom or school level learning environments; and collaborating with school-based professionals to develop evidence-based interventions for high and low-achieving students.

## Required Texts

Loucks-Horsley, S., Stiles, K., Mundry, S., Love, N., & Hewson, P. (2010). Designing professional development for teachers of science and mathematics. (3rd ed.). Thousand Oaks, CA: Corwin.

McMillan, J. & Wergin, J. (2010). Understanding and evaluating educational research. (4th ed.). Boston: Pearson.

**Additional readings will be posted on the course Blackboard site. You will need your GMU email login and password to access.**

## Recommended 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).

The assignments are intended to develop skills in mathematics research identification, analysis and evaluation. Students will apply current research to practice when they implement a mathematics professional development experience in their school settings. Discussions will be focused on the nature and development of research in schools and professional development settings. All assignments are to be completed on time so that class members might benefit from the expertise and contributions of their colleagues.

**Assignments**

1. **PARTICIPATION (10%)**
   A commitment to participation in class discussions and 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, leading discussions about selected mathematics problems, and sharing with the class the products of various writing, reflection, lesson planning, and field experience assignments. The expectations, demands and workload of this course are professional and high.

   A commitment to reading reflectively and critically the assigned readings. The readings will be used to provide a framework and coherent theme to the course content. They have been selected to introduce themes in professional development as well as research and critical commentary on current issues in mathematics education.

2. **RESEARCH-BASED PD: TOPIC IDENTIFICATION & RATIONALE (10%)**
   (*NCTM NCATE 6d*)
   This is a Performance-Based Assessment (PBA). Professional development should be centered on relevant and specific mathematics topics. In this project, a rationale is provided that specifically explains the connection of the professional development to the following: the school or district's needs, the promotion of mathematics instruction, and local, state and/or national goals for mathematics instruction. Additional details for this assignment (project description & rubric) are provided at the end of the syllabus and in Blackboard/Assignments.

3. **RESEARCH-BASED PD: CONCEPTUAL FRAMEWORK (25%)**
   (*NCTM NCATE 7a*)
   This is a Performance-Based Assessment (PBA). Professional development for educators should be centered on research-based practices. In this project, you will research, analyze and incorporate literature on a specific mathematics practice. A minimum of 5 research articles will be used to identify themes and design your conceptual framework (or mapping of the "big ideas" and literature connections to your study). Additional details for this assignment (project description & rubric) are provided at the end of the syllabus and in Blackboard/Assignments.

4. **RESEARCH-BASED PD: THE DECISION-MAKING PROTOCOL FOR MATHEMATICS COACHING (15%)**

This is a Performance-Based Assessment (PBA). The Decision-Making Protocol for Mathematics Coaching (DMPMC) increases coaching effectiveness by considering content, practices and relationship building in tandem. Mathematics coaches use the DMPMC to negotiate obstacles and support their schools in realizing the *PtA* vision of mathematics. The DMPMC is for any leader whose goals are to move math instruction forward through enactment of *Principles to Actions* (NCTM, 2014) to create a cohesive vision for all school stakeholders. The DMPMC is comprised of four phases. The guiding questions from Phases I, II and III will be answered to connect the context and content of the professional development session. Responses to the Phase IV guiding questions will be provided prior to implementation, and as a result center on the anticipation of how the debrief *might* occur Additional details for this assignment (project description & rubric) are provided at the end of the syllabus and in Blackboard/Assignments.

5. **RESEARCH-BASED PD: IMPLEMENTATION PLAN (25%)**
(*NCTM NCATE 6c, 6d, 7a, 7b*)
This is a Performance-Based Assessment (PBA). Professional development for educators should be centered on research-based practices. The implementation plan should be clearly and comprehensively written so that another individual could pick up the plan with all materials and implement the professional development. The professional development implementation plan should emphasize collaboration and take into consideration the needs of both adult and student learners. An assessment should be included to determine the impact of the professional development and future needs of the stakeholders. Additionally, the plan should focus on making a mathematics-focused shift through one of several key coaching actions. Additional details for this assignment (project description & rubric) are provided at the end of the syllabus and in Blackboard/Assignments.

6. **RESEARCH-BASED PD: REFLECTION (15%)**
(*NCTM NCATE 6a*)
This is a Performance-Based Assessment (PBA). Professional development for educators should be centered on research-based practices. The candidate will reflect on the role of learning and teaching of mathematics, the role of mathematics instructional leaders, the improvement of student learning and continuing the implementation. Additional details for this assignment (project description & rubric) are provided at the end of the syllabus and in Blackboard/Assignments.

**Other Requirements**

- **Attendance:** It is your responsibility to attend all class sessions. 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.

- **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.

*Note: Faculty reserve the right to add, alter, or omit any assignment as necessary during the course of the semester. You will always receive advanced notice of any modifications.*

7. **Grading**

| ASSIGNMENT | PERCENT |
|---|---|
| Participation | 10% |
| Topic Identification & Rationale | 10% |
| Conceptual Framework | 25% |
| The Decision-Making Protocol for Mathematics Coaching | 15% |
| Implementation Plan | 25% |
| Reflection | 15% |

**GRADING POLICY (Graduate Grading Scale)**

All assignments are to be turned in to your instructor on time. **Late work will not be accepted for full credit.** If the student makes prior arrangements with the instructor, assignments turned in late will receive a 10% deduction from the grade per late day or any fraction thereof (including weekends and holidays).

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|---|---|---|
| A 93%-100% | B+ 87%-89% | C 70%-79% |
| A- 90%-92% | B 80%-86% | F Below 70% |

**For Master's Degrees**:
Candidates must have a minimum GPA of 3.00 in coursework presented on the degree application, which may include no more than 6 credits of C. (Grades of C+, C-, or D do not apply to graduate courses. The GPA calculation excludes all transfer courses and Mason non-degree studies credits not formally approved for the degree).

**For Endorsement Requirements**
Candidates must have a grade of B or higher for all licensure coursework (endorsement coursework).

**Professional Dispositions**
Students are expected to exhibit professional behaviors and dispositions at all times. Education professionals are held to high standards, both inside and outside of the classroom. Educators are evaluated on their behaviors and interactions with students, parents, other professionals, and the community at large. At the College of Education and Human Development, dispositions may play a part in the discussions and assignments of any/all courses in a student's program (and thus, as part or all of the grade for those assignments). For additional information visit: https://cehd.gmu.edu/students/polices-procedures/

## Class Schedule

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

| Date | Topic(s) | Readings | Due |
|---|---|---|---|
| **Week 1**<br>1/22<br><br>**Format**<br>Synchronous | Collaborate Ultra Orientation<br><br>Syllabus Overview<br><br>Introduction to the Mathematics Teaching Practices (NCTM, 2014)<br><br>Connecting to the TRU Framework | | Profile picture and information posted in Collaborate. |
| **Week 2**<br>1/29<br><br>**Format**<br>Synchronous | Mathematics Teaching Practices (NCTM, 2014)<br><br>Library Orientation & Question Session | **Articles**<br>EMS Joint Position Statement<br><br>PTA: Math Teaching Practices (p. 7-56) | **Research-Based PD: Topic Identification & Rationale Due**<br><br>Blackboard Discussion Post: DMPMC Reflection Questions |
| **Week 3**<br>2/5<br><br>**Format**<br>Synchronous | Knowledge and Beliefs Supporting Effective Professional Development<br><br>The Decision-Making Protocol for Mathematics Coaching | DPD: Chapter 2 | Blackboard Discussion Post: DMPMC Reflection Questions |
| **Week 4**<br>2/12<br><br>**Format**<br>Synchronous | Context Factors Influencing Professional Development | DPD: Chapter 3<br><br>**Articles**<br>Gibbons, Kazemi, & Lewis (2017) | Blackboard Discussion Post: DMPMC Reflection Questions |
| **Week 5**<br>2/19<br><br>**Format**<br>Synchronous | Strategies for Professional Learning<br><br>Examining Student Work<br><br>Lesson Study | DPD: Examining Student Work (p. 186-194)<br><br>DPD: Lesson Study (p. 201-208) | Blackboard Discussion Post: DMPMC Reflection Questions |
| **Week 6**<br>2/26<br><br>**Format**<br>Synchronous | Strategies for Professional Learning<br><br>Cases and Rehearsals<br><br>Video Analysis | DPD: Cases (p. 216-223)<br><br>**Articles**<br>Video Analysis Article<br>Rehearsals | **Research-Based PD: Conceptual Framework Due**<br><br>Blackboard Discussion Post: DMPMC Reflection Questions |
| **Week 7**<br>3/5<br><br>**Format**<br>Synchronous | Strategies for Professional Learning<br><br>Demonstration Lessons and Modeling<br><br>Co-teaching, Coaching and Mentoring | DPD: Demonstration Lessons (p. 195-200)<br><br>DPD: Coaching and Mentoring (p. 224-235) | Blackboard Discussion Post: DMPMC Reflection Questions |

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| **Week 8**<br>3/12<br><br>**Format**<br>Asynchronous<br><br>GMU Spring Break | Critical Issues to Consider in Designing Professional Development<br>TRU Conversation Guide | DPD: Chapter 4<br><br>**Articles**<br>TRU Conversation Guide | Research-Based PD: DMPMC & Implementation Plan Due to Critical Fiend |
| **Week 9**<br>3/19<br><br>**Format**<br>Synchronous | Knowledge Required for Mathematics Coaching | UEER: Ch. 1, p. 1-13 (Intro to Ed Research)<br><br>**Articles**<br>Burroughs, Yopp, Sutton, & Greenwood (2017)<br><br>Bitto (2015) | **Research-Based PD: DMPMC Due**<br><br>**Research-Based PD: Implementation Due**<br>**Review and incorporate instructor feedback before implementing* |
| 3/26 | **Spring Break: No Class Meeting** | | |
| **Week 10**<br>4/2<br><br>**Format**<br>Synchronous | State of Elementary Mathematics Specialists<br><br>Quantitative Design | UEER: Ch. 2, p. 14-17; Ch. 3, p. 60-62<br><br>**Articles**<br>Fennell (2017)<br><br>Campbell & Malkus (2011) | *Research-Based PD Project: Finalize, Deliver & Reflect* |
| **Week 11**<br>4/9<br><br>**Format**<br>Synchronous | Enacting Leadership<br><br>Qualitative Design | UEER: Ch. 4, p. 89-93<br><br>**Articles**<br>Knapp (2017) | *Research-Based PD Project: Finalize, Deliver & Reflect* |
| **Week 12**<br>4/16<br><br>**Format**<br>Synchronous | Models for Elementary Mathematics Specialists<br><br>Mixed Methods | UEER: Ch. 5, p. 134-135<br><br>**Articles**<br>Markworth et al (2017) | *Research-Based PD Project: Finalize, Deliver & Reflect* |
| **Week 13**<br>4/23<br><br>**Format**<br>Asynchronous | Professional Development Writer's Workshop<br><br>Critical Friend Feedback | | *Research-Based PD Project: Finalize, Deliver & Reflect* |
| **Week 14**<br>4/30<br><br>**Format**<br>Synchronous | High-Leverage Coaching Activities | **Articles**<br>McGatha, Davis, & Stokes (2015)<br><br>Baker, Bailey, Larsen, & Galanti (2017) | *Research-Based PD Project: Finalize, Deliver & Reflect* |

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| **Week 15**<br>5/7<br><br>**Format**<br>Synchronous | Synthesis of Professional Development Projects Reflection | | **Compiled Research-Based PD Project Due & Uploaded to Tk20**<br><br>(Topic & Rationale, Conceptual Framework, DMPMC, Implementation Plan w/ All Materials, and Reflection) |

**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*

8. Students must adhere to the guidelines of the Mason Honor Code (see https://catalog.gmu.edu/policies/honor-code-system/ ).

9. Students must follow the university policy for Responsible Use of Computing (see http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/).

10. 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.

11. 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 http://ods.gmu.edu/).

12. Students must follow the university policy stating that all sound emitting devices shall be silenced during class unless otherwise authorized by the instructor.

*Campus Resources*

- Support for submission of assignments to Tk20 should be directed to tk20help@gmu.edu or https://cehd.gmu.edu/aero/tk20. Questions or concerns regarding use of Blackboard should be directed to http://coursessupport.gmu.edu/.

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

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

# Research-Based Professional Development Project Description

Course Performance Based Assessment

This is a Performance Based Assessment. The student will design, develop, implement and refine a professional development experience (approximately 60 minutes) for teachers, administrators or other educational professionals. The final product should include the following: 1) topic identification and rationale; 2) a research-based conceptual framework; 3) the Decision-Making Protocol for Mathematics Coaching; 4) an implementation plan; and 5) a written reflection paper about the professional development experience. The final report will be submitted on Blackboard in Tk20. For a complete rubric and grading criteria please see the rubric at the end of the syllabus.

## PART I: TOPIC IDENTIFICATION & RATIONALE

Professional development should be centered on relevant and specific mathematics topics. In this project, a rationale is provided that specifically explains the connection of the professional development to the following: the school or district's needs, the promotion of mathematics instruction within the targeted audience, local, state and/or national goals for mathematics instruction. Things to consider are:

- **A Clearly Defined Focus and Purpose:** What is the topic you will base your professional development on?
- **A Rationale for Why This Topic Matters:** What is going on in your classroom which brings your attention to this topic? Why are you interested in this topic and why does it matter to you, other teachers/administrators, your district, and the field?

## PART II: RESEARCH-BASED CONCEPTUAL FRAMEWORK

Professional development for educators should be centered on research-based practices. In this project, you will research, analyze and incorporate literature on a specific mathematics practice. A minimum of 5 research articles will be used to identify themes and design your conceptual framework (or mapping of the "big ideas" and literature connections to your study). Things to consider are:

- What does the literature review add to your understanding of your research topic?
- What common topics and themes have you found in the literature?
- What ideas for pedagogical strategies can you adapt from the literature?

## PART III: THE DECISION-MAKING PROTOCOL FOR MATHEMATICS COACHING

The Decision-Making Protocol for Mathematics Coaching (DMPMC) increases coaching effectiveness by considering content, practices and relationship building in tandem. Mathematics coaches use the DMPMC to negotiate obstacles and support their schools in realizing the *PtA* vision of mathematics. The DMPMC is for any leader whose goals are to move math instruction forward through enactment of *Principles to Actions* (NCTM, 2014) to create a cohesive vision for all school stakeholders.

The DMPMC is comprised of four phases. The guiding questions from Phases I, II and III will be answered to connect the context and content of the professional development session. Responses to the Phase IV guiding questions will be provided prior to implementation, and as a result center on the anticipation of how the debrief *might* occur.

## PART IV: IMPLEMENTATION PLAN

The implementation plan should be clearly and comprehensively written so that another individual could pick up the plan with all materials and implement the professional development. This includes:

- Timing
- Materials
- Electronic downloads of materials (not weblinks)
- Anticipated responses of participants
- A focus on mathematics
- Objectives
- Detailed activities and actions
- Planned opportunities for discussion
- Questions to ask the audience
- Anticipated teacher questions
- Anticipated responses to teacher questions,

The professional development implementation plan should emphasize collaboration and take into consideration the needs of both adult and student learners. An assessment should be included to determine the impact of the professional development and future needs of the stakeholders.

Additionally, the plan should focus on making a mathematics-focused shift through one of several actions: coaching /mentoring; building and navigating relationships with teachers, administrators, and the community; establishing and maintaining learning communities; analyzing and evaluating educational structures and policies that affect students' equitable access to high quality mathematics instruction; leading efforts to assure that all students have opportunities to learn important mathematics; evaluating the alignment of mathematics curriculum standards, textbooks, and required assessments and making recommendations for addressing learning and achievement gaps; developing appropriate classroom or school-level learning environments; and collaborating with school-based professionals to develop evidence-based interventions for high- and low-achieving students.

## PART V: REFLECTION

The candidate will reflect on the role of learning and teaching of mathematics, the role of mathematics instructional leaders, the improvement of student learning and continuing the implementation.

# Research-Based Professional Development Project Rubric

Course Performance Based Assessment

| Level/Criteria | 4<br>Exceeds Expectations | 3<br>Meets Expectations | 2<br>Developing | 1<br>Does Not Meet Expectations |
|---|---|---|---|---|
| **PART I: TOPIC IDENTIFICATION & RATIONALE** | | | | |
| **PROFESSIONAL DEVELOPMENT TOPIC IDENTIFICATION** | A topic is identified. Information is provided on all of the following:<br>• Specific topic relevant to mathematics education<br>• Identification of one Mathematics Teaching Practice<br>• A clear connection is described between the identified topic and one Mathematics Teaching Practice (NCTM, 2014) | A topic is identified. Information is provided on two of the following:<br>• Specific topic relevant to mathematics education<br>• Identification of one Mathematics Teaching Practice<br>• A clear connection is described between the identified topic and one Mathematics Teaching Practice (NCTM, 2014) | A topic is identified. Information is provided on one of the following:<br>• Specific topic relevant to mathematics education<br>• Identification of one Mathematics Teaching Practice<br>• A clear connection is described between the identified topic and one Mathematics Teaching Practice (NCTM, 2014) | A topic is identified. Information is provided on none of the following:<br>• Specific topic relevant to mathematics education<br>• Identification of one Mathematics Teaching Practice<br>• A clear connection is described between the identified topic and one Mathematics Teaching Practice (NCTM, 2014) |
| **PROFESSIONAL DEVELOPMENT TOPIC RATIONALE**<br>**NCTM Element 6d.2**<br>Promote and facilitate the improvement of mathematics programs at the school and district levels. | A rationale is provided and includes descriptions of all of the following elements:<br>• How the professional development will meet the school or district level's needs<br>• How the professional development will promote the improvement of mathematics within the school or district<br>• How the facilitation of the professional development builds upon local/ state/national goals | A rationale is provided and includes two of the following elements:<br>• How the professional development will meet the school or district level's needs<br>• How the professional development will promote the improvement of mathematics within the school or district<br>• How the facilitation of the professional development builds upon local/ state/national goals | A rationale is provided and includes one of the following elements:<br>• How the professional development will meet the school or district level's needs<br>• How the professional development will promote the improvement of mathematics within the school or district<br>• How the facilitation of the professional development builds upon local/ state/national goals | A rationale is not provided or does not include any of following elements:<br>• How the professional development will meet the school or district level's needs<br>• How the professional development will promote the improvement of mathematics within the school or district<br>• How the facilitation of the professional development builds upon local/ state/national goals |
| **PART II: RESEARCH-BASED CONCEPTUAL FRAMEWORK** | | | | |
| **CONCEPTUAL FRAMEWORK: REVIEW OF THE LITERATURE**<br>**NCTM Element 7a.2**<br>Demonstrate a broad experiential base of knowledge and skills working with a range of student and adult learners in varied school and professional development settings. | A review of the literature is provided and includes all of the following elements:<br>• It is connected to the topic of the professional development.<br>• A minimum of 5 research articles.<br>• The description of each article is adequate, coherent and analytical. | A review of the literature is provided and includes three of the following elements:<br>• It is connected to the topic of the professional development.<br>• A minimum of 5 research articles.<br>• The description of each article is adequate, coherent and analytical. | A review of the literature is provided and includes two of the following elements:<br>• It is connected to the topic of the professional development.<br>• A minimum of 5 research articles.<br>• The description of each article is adequate, coherent and analytical. | A review of the literature is provided and includes one or fewer of the following elements:<br>• It is connected to the topic of the professional development.<br>• A minimum of 5 research articles.<br>• The description of each article is adequate, coherent and analytical. |

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| | • References from a variety of peer-reviewed sources. | • References from a variety of peer-reviewed sources. | • References from a variety of peer-reviewed sources. | • References from a variety of peer-reviewed sources. |
| **CONCEPTUAL FRAMEWORK: CONNECTING RESEARCH TO PRACTICE**<br>**NCTM Element 7a.2**<br>Demonstrate a broad experiential base of knowledge and skills working with a range of student and adult learners in varied school and professional development settings. | The candidate connects and explains theories, literature, and phenomena in a way that informs the professional development AND integrates the literature review into the conceptual framework. | The candidate connects and explains theories, literature, and phenomena in a way that informs the professional development OR integrates the literature review into the conceptual framework. | The candidate does not explains theories, literature, and phenomena in a way that informs the professional development and does not integrate the literature review into the conceptual framework. | No conceptual framework is included. |
| **REFERENCES** | References are included and meet all of the following requirements:<br>• All print and non-print (internet) references are listed.<br>• References and citations meet APA formatting guidelines.<br>• References are current.<br>• References are from varied high quality sources.<br>• All references cited are included in the list of references. | References are included and meet 4-5 of the following requirements:<br>• All print and non-print (internet) references are listed.<br>• References and citations meet APA formatting guidelines.<br>• References are current.<br>• References are from varied high quality sources.<br>• All references cited are included in the list of references. | References are included and meet three of the following requirements:<br>• All print and non-print (internet) references are listed.<br>• References and citations meet APA formatting guidelines.<br>• References are current.<br>• References are from varied high quality sources.<br>• All references cited are included in the list of references. | References are included and meet two or fewer of the following requirements:<br>• All print and non-print (internet) references are listed.<br>• References and citations meet APA formatting guidelines.<br>• References are current.<br>• References are from varied high quality sources.<br>• All references cited are included in the list of references. |
| **PART III: DECISION-MAKING PROTOCOL FOR MATHEMATICS COACHING** | | | | |
| **THE DECISION-MAKING PROTOCOL FOR MATHEMATICS COACHING** | The paper includes all of the following:<br>• Each of the guiding questions in Phases I-III is answered<br>• The guiding questions in Phase IV are answered by anticipating the implementation of the professional development.<br>• The responses to each of the guiding questions are clearly and concisely stated.<br>• One Mathematics Teaching Practice is clearly identified<br>• One Mathematics Coaching Practice is clearly identified | The paper includes four of the following:<br>• Each of the guiding questions in Phases I-III is answered<br>• The guiding questions in Phase IV are answered by anticipating the implementation of the professional development.<br>• The responses to each of the guiding questions are clearly and concisely stated.<br>• One Mathematics Teaching Practice is clearly identified<br>• One Mathematics Coaching Practice is clearly identified | The paper includes 2-3 of the following:<br>• Each of the guiding questions in Phases I-III is answered<br>• The guiding questions in Phase IV are answered by anticipating the implementation of the professional development.<br>• The responses to each of the guiding questions are clearly and concisely stated.<br>• One Mathematics Teaching Practice is clearly identified<br>• One Mathematics Coaching Practice is clearly identified | The paper includes fewer than two of the following:<br>• Each of the guiding questions in Phases I-III is answered<br>• The guiding questions in Phase IV are answered by anticipating the implementation of the professional development.<br>• The responses to each of the guiding questions are clearly and concisely stated.<br>• One Mathematics Teaching Practice is clearly identified<br>• One Mathematics Coaching Practice is clearly identified |
| **PART IV: IMPLEMENTATION PLAN** | | | | |

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| **PARTICIPANT INVOLVEMENT**<br><br>**NCTM Element 7b.2**<br><br>Participate and encourage teachers to participate in innovative or transformative initiatives, partnerships, or research projects related to the teaching of elementary mathematics. | Teachers and leaders at the school or district level are participants in the professional development experience.<br><br>Teachers and leaders at the school or district level are encouraged to try a new practice that enhances the current mathematical teaching practices. | Teachers and leaders at the school or district level are participants in the professional development experience.<br><br>Teachers and leaders at the school or district level are encouraged to try a new mathematical teaching practice. | Teachers and leaders at the school or district level are participants in the professional development experience.<br><br>Teachers and leaders at the school or district level are not encouraged to try a new mathematical teaching practice. | Teachers and leaders at the school or district level are not involved as participants in the professional development experience. |

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| **SESSION PLAN**<br><br>**NCTM Element 7b.1**<br><br>Develop and use leadership skills to improve mathematics programs at the school and/or district level, e.g., coaching/mentoring new and experienced teachers to better serve students; sharing critical issues, policy initiatives, and curriculum trends related to mathematics teaching; keeping abreast of local, state, or national policy decisions related to mathematics education; communicating to educational constituents about students, curriculum, instruction, and assessment; collaborating to create a shared vision and to develop an action plan for school improvement; and partnering with school-based professionals to improve each student's achievement. | Plan is written with enough detail that someone else could implement the session.<br><br>The organization of the plan is both logical and clear. | Plan is written with enough detail that someone else could implement the session.<br><br>Some components of the plan may be difficult to follow or lack logical and/or clear organization. | Some details necessary for implementation of the plan are missing.<br><br>Some components may be difficult to follow or lack logical and/or clear organization. | No details are given.<br><br>It would be very difficult for someone else to implement the session due to a lack of logical and/or clear organization. |
| **COACHING ACTIONS**<br><br>**NCTM Element 6d.1**<br><br>Demonstrate mathematics-focused instructional leadership through actions such as coaching /mentoring; building and navigating relationships with teachers, administrators, and the community; establishing and maintaining learning communities; analyzing and evaluating educational structures and policies that affect students' equitable access to high quality mathematics instruction; leading efforts to assure that all students have opportunities to learn important mathematics; evaluating the alignment | The professional development provides mathematics-focused instructional leadership through one of the following actions:<br><br>• coaching /mentoring<br>• building and navigating relationships with teachers, administrators, and the community<br>• establishing and maintaining learning communities<br>• analyzing and evaluating educational structures and policies that affect students' equitable access to high quality mathematics instruction<br>• leading efforts to assure that all students have opportunities to learn important mathematics<br>• evaluating the alignment of mathematics curriculum standards, textbooks, and required assessments and making recommendations for | The professional development provides mathematics-focused instructional leadership through one of the following actions:<br><br>• coaching /mentoring<br>• building and navigating relationships with teachers, administrators, and the community<br>• establishing and maintaining learning communities<br>• analyzing and evaluating educational structures and policies that affect students' equitable access to high quality mathematics instruction<br>• leading efforts to assure that all students have opportunities to learn important mathematics<br>• evaluating the alignment of mathematics curriculum standards, textbooks, and required assessments and making recommendations for | The professional development provides mathematics-focused instructional leadership through one of the following actions:<br><br>• coaching /mentoring<br>• building and navigating relationships with teachers, administrators, and the community<br>• establishing and maintaining learning communities<br>• analyzing and evaluating educational structures and policies that affect students' equitable access to high quality mathematics instruction<br>• leading efforts to assure that all students have opportunities to learn important mathematics<br>• evaluating the alignment of mathematics curriculum | The professional development does not focus on one of the following actions:<br><br>• coaching /mentoring<br>• building and navigating relationships with teachers, administrators, and the community<br>• establishing and maintaining learning communities<br>• analyzing and evaluating educational structures and policies that affect students' equitable access to high quality mathematics instruction<br>• leading efforts to assure that all students have opportunities to learn important mathematics<br>• evaluating the alignment of mathematics curriculum standards, textbooks, and required |

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| of mathematics curriculum standards, textbooks, and required assessments and making recommendations for addressing learning and achievement gaps; developing appropriate classroom or school-level learning environments; and collaborating with school-based professionals to develop evidence-based interventions for high- and low-achieving students. | addressing learning and achievement gaps<br>• developing appropriate classroom or school-level learning environments<br>• collaborating with school-based professionals to develop evidence -based interventions for high- and low-achieving students<br><br>The identified action is well-developed AND thoroughly described. | addressing learning and achievement gaps<br>• developing appropriate classroom or school-level learning environments<br>• collaborating with school-based professionals to develop evidence -based interventions for high- and low-achieving students<br><br>The identified action is well-developed OR thoroughly described. | standards, textbooks, and required assessments and making recommendations for addressing learning and achievement gaps<br>• developing appropriate classroom or school-level learning environments<br>• collaborating with school-based professionals to develop evidence -based interventions for high- and low-achieving students<br><br>The identified action is not well developed and is not thoroughly described. | assessments and making recommendations for addressing learning and achievement gaps<br>• developing appropriate classroom or school-level learning environments<br>• collaborating with school-based professionals to develop evidence -based interventions for high- and low achieving students |
| **OBJECTIVES & ACTIVITIES**<br><br>**NCTM Element 6c.1**<br><br>Plan, develop, implement, and evaluate mathematics-focused professional development programs at the school and/or district level. | Professional development is mathematics-focused.<br><br>The plan clearly outlines objectives for the session AND describes detailed activities the teachers will engage in during the session.<br><br>The plan provides substantive opportunities for interaction and discussion of the topics. | Professional development is mathematics-focused.<br><br>The plan outlines objectives for the session AND lists activities the teachers will engage in during the session.<br><br>The plan provides opportunities for interaction and discussion of the topics. | Professional development is mathematics-focused.<br><br>The plan outlines objectives for the session OR lists activities the teachers will engage in during the session. | Professional development is not mathematics-focused.<br><br>The objectives for the session and the opportunities for interaction are missing. |
| **RESOURCES & SUPPLEMENTARY MATERIALS**<br><br>**NCTM Element 6c.2**<br><br>Use and assist teachers in using resources from professional mathematics education organizations such as teacher/leader discussion groups, teacher networks, and print, digital, and virtual resources/ collections | Professional development resources for teachers come from professional mathematics education organizations.<br><br>Professional development handouts and other documents (i.e. articles) meet all of the following requirements:<br>• easy to follow/read<br>• error-free<br>included or linked within the plan | Professional development resources for teachers come from professional mathematics education organizations.<br><br>Professional development handouts and other documents (i.e. articles) meet two of the following requirements:<br>• easy to follow/read<br>• error-free<br>included or linked within the plan | Professional development resources for teachers come from professional mathematics education organizations.<br><br>Professional development handouts and other documents (i.e. articles) meet one of the following requirements:<br>• easy to follow/read<br>• error-free<br>included or linked within the plan | Professional development resources for teachers do not come from professional mathematics education organizations.<br><br>Professional development handouts and other documents (i.e. articles) do not meet the following requirements:<br>• easy to follow/read<br>• error-free<br>• included or linked within the plan |
| **MEETING LEARNERS' NEEDS**<br><br>**NCTM Element 7a.2**<br><br>Demonstrate a broad experiential base of knowledge and skills working with a range of student and adult learners in varied school and professional development settings. | Specific considerations for adult learners are articulated in the professional development plan.<br><br>Specific considerations for student learners are clearly articulated in the professional development plan. | Specific considerations for either adult learners OR student learners are clearly articulated in the professional development plan. | Specific considerations for adult learners and student learners are not clearly articulated in the professional development plan. | The professional development implementation plan does not take into consideration adult and student learners. |
| **QUESTIONS FOR TEACHERS**<br><br>**NCTM Element 6c.3**<br><br>Support teachers in systematically reflecting on and learning from their mathematical practice. | The professional development implementation plan includes questions **for** teachers with all of the following characteristics:<br>• high cognitive demand (requiring higher-order thinking)<br>• alignment with objectives/plan for the session<br>• conducive to group/partner discussion | The professional development implementation plan includes questions **for** teachers with two of the following characteristics:<br>• high cognitive demand (requiring higher-order thinking)<br>• alignment with objectives/plan for the session<br>• conducive to group/partner discussion | The professional development implementation plan includes questions **for** teachers with one of the following characteristics:<br>• high cognitive demand (requiring higher-order thinking)<br>• alignment with objectives/plan for the session | The professional development implementation plan includes does not include questions **for** teachers or includes questions without the following characteristics:<br>• high cognitive demand (requiring higher-order thinking) |

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| | The plan includes anticipated questions **from** teachers. | The plan includes anticipated questions **from** teachers. | • conducive to group/partner discussion<br><br>The plan does not include anticipated questions **from** teachers. | • alignment with objectives/plan for the session<br>• conducive to group/partner discussion<br><br>The plan does not include anticipated questions **from** teachers. |
| **COLLABORATION**<br><br>**NCTM Element 7a.3**<br><br>Demonstrate interpersonal skills critical for mentoring other teachers and working with school-based personnel, district administrators, and others. | The professional development implementation plan includes potential responses to the anticipated teacher questions.<br><br>Potential responses are framed positively and highlight the important mathematical ideas/message of the professional development. | The professional development implementation plan includes potential responses to the anticipated teacher questions.<br><br>Potential responses are framed positively but do not further discussion of the important mathematical ideas/message of the professional development. | The professional development implementation plan includes potential responses to the anticipated teacher questions.<br><br>Potential responses are not framed positively and do not include the important mathematical ideas/message of the professional development. | The professional development implementation plan does not include potential responses to the anticipated teacher questions. |
| **ASSESSMENT OF PARTICIPANT KNOWLEDGE AND NEED**<br><br>**NCTM Element 6c.4**<br><br>Assist teachers in the implementation of newly acquired knowledge and professional practices in their mathematics teaching. | The professional development includes an assessment (i.e. exit ticket, follow-up email, survey, interview).<br><br>The assessment identifies teachers' perceptions of newly acquired knowledge and professional practices in their mathematics teaching AND allows teachers to indicate their needs and support required for implementation. | The professional development includes an assessment (i.e. exit ticket, follow-up email, survey, interview).<br><br>The assessment identifies teachers' perceptions of newly acquired knowledge and professional practices in their mathematics teaching OR allows teachers to indicate their needs and support required for implementation. | The professional development includes an assessment (i.e. exit ticket, follow-up email, survey, interview).<br><br>The assessment does not identify teachers' perceptions of newly acquired knowledge and professional practices in their mathematics teaching AND does not allow teachers to indicate their needs and support required for implementation. | The professional development does not include an assessment (i.e. exit ticket, follow-up email, survey, interview). |
| **PART V: REFLECTION** | | | | |
| **THE ROLE OF LEARNING & TEACHING OF MATHEMATICS**<br><br>**NCTM Element 6a.1**<br><br>Take an active role in their professional growth by participating in professional development experiences that directly relate to the learning and teaching of mathematics | The reflection clearly identifies how the professional development experience directly related to and impacted the candidate's learning and teaching of mathematics. | The reflection clearly identifies either how the professional development experience directly related to or how the professional development experience impacted the candidate's learning and teaching of mathematics. | The reflection does not clearly identify how the professional development experience directly related to and impacted the candidate's learning and teaching of mathematics. | The reflection does not mention how the professional development experience directly related to and impacted the candidate's learning and teaching of mathematics. |
| **THE ROLE OF MATHEMATICS INSTRUCTIONAL LEADER**<br><br>**NCTM Element 6a.2**<br><br>Take an active role in their professional growth by participating in professional development experiences that directly relate to their development as a mathematics instructional leader. | The reflection clearly identifies how the professional development experience directly related to the candidate's development as a mathematics instructional leader.<br><br>. | The reflection identifies that the professional development experience directly related to the candidate's development as a mathematics instructional leader. | The reflection does not clearly identify that the professional development experience is directly related to the candidate's development as a mathematics instructional leader. | The reflection does not mention the candidate's development as a mathematics instructional leader |

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| **CONTINUING IMPLEMENTATION**<br><br>**NCTM Element 6a.3**<br><br>Assist their colleagues in developing a plan for implementing new learning from professional development or other experiences in their classrooms. | The reflection describes the next steps that the candidate would take as a mathematics instructional leader implementing the identified action.<br><br>The next steps of implementation clearly articulate a plan to meet colleagues' needs and a timeline. | The reflection describes the next steps that the candidate would take as a mathematics instructional leader implementing the identified action.<br><br>The next steps of implementation include either a plan to meet colleagues' needs or a timeline. | The reflection describes the next steps that the candidate would take as a mathematics instructional leader implementing the identified action.<br><br>The next steps of implementation do not include a plan to meet colleagues' needs and do not include a timeline. | The reflection does not describe the next steps that the candidate would take as a mathematics instructional leader implementing the identified action. |