Assessment Plan

MSE – Mathematics Secondary Education

The MSE – Mathematics Secondary Education program at UW-River Falls contributes to the fulfillment of the University’s mission by forming and strengthening partnerships between our campus and area K-12 schools. This partnership is based, in part, on the commitment of UW-River Falls to furthering the professional growth of area secondary mathematics teachers. Currently the undergraduate and graduate mathematics education program has strong partnerships across the state of Wisconsin, working with K-12 math teachers. Fifteen different districts have partnered with us on the WEITQ grant entitled “Master Teacher Leaders of Secondary Mathematics”, related to this program.

We currently have students enrolled in our program that represent 19 different school districts in both WI and MN. Our partnerships run deeply, as sixteen of our current students have worked in other mathematical grants that have been conducted by the program director in the past. Four of the current graduate students have worked as cooperating teachers with our undergraduate mathematics education students. Eight of our current graduate students have given professional presentations on work they have completed while in our program over the last three years at various math conferences. Six presentations were given at the state level, two at the regional level, and four at the national level.

The MSE – Mathematics Secondary Education program models innovation in the field of mathematics education. Graduate students learn how to use emerging technologies in order to further the teaching and learning of their students. The program models for its students innovative best teaching practices recommended by the National Council of Teachers of Mathematics. Graduate students develop a strong connection between content knowledge and pedagogical content knowledge. They learn about innovative areas of mathematics education such as mathematical modeling and simulation-based inference in statistics. Two of our teachers have used what they have experienced to enroll student teams in the MathWorks Math Modeling Challenge for high school students the last two years.

The MSE – Mathematics Secondary Education program is distinctive as it is one of the only programs in the region to provide a strong mixture between content and pedagogy, and result in a Master’s Degree that allows graduates to teach college level math courses. Coursework completed in the program that is related to the WEITQ grant “Master Teacher Leaders of Secondary Mathematics” has the distinction of being highly rated both years by the external evaluator of the project. The program director has the distinction of being awarded the “Distinguished Mathematics Educator” award by the Wisconsin Mathematics Council in 2019 for his outstanding contributions and exceptional leadership and service to the Wisconsin mathematics education community.
I Program Learning Outcomes

These are the updated learning outcomes of the MSE – Mathematics Secondary Education program:

• (LO1) Students completing the MSE – Mathematics Secondary Education program will exhibit
  a. an increased knowledge and proficiency in six fundamental conceptual categories –
    calculus, algebra, functions, geometry, statistics, and probability.
  b. an understanding of mathematics through multiple lenses (procedural fluency, conceptual understanding, and application/mathematical reasoning).

• (LO2) Students completing the MSE – Mathematics Secondary Education program will exhibit
  a. an increase in pedagogical content knowledge.
  b. an increase in understanding of best teaching practices in mathematics courses.

• (LO3) Students completing the MSE – Mathematics Secondary Education program will be
  positioned to
  a. further infuse emerging technology into their classrooms
  b. include more active learning and inquiry-based teaching methods.

• (LO4) Students completing the MSE – Mathematics Secondary Education program will increase
  a. their expertise in the development and implementation of rich math tasks
  b. their incorporation of more rigor, coherence, and focus as defined in the Common
    Core Math Standards.

• (LO5) Students completing the MSE - Mathematics Secondary Education program will increase
  their understanding of mathematical habits of mind (CCSS - Mathematical Practice Standards)
  and their expertise in developing these habits with their students.

Learning Outcomes 1 and 2 are linked to making our program distinctive. Learning Outcomes 3, 4, and 5 are linked to making our program innovative. Each of our learning outcomes are linked to the needs of K-12 school districts in our region. By meeting these learning outcomes, graduates of this program will be able to assist school districts in meeting the needs of a diverse group of students trying to learn mathematics at a high level.
II Profile of where Learning Outcomes are being achieved

<table>
<thead>
<tr>
<th></th>
<th>LO1</th>
<th>LO2</th>
<th>LO3</th>
<th>LO4</th>
<th>LO5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 689</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Math 705</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 711</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 726</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 736</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 751</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 756</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 766</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 789</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Paper or Capstone Project</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Through the completion of the research paper or capstone project, students in the program will engage in out-of-classroom experiences that will meet learning outcomes of the project. During the completion of the paper or project, students will showcase an understanding of pedagogical content knowledge (LO2) that will be used in their own classes. Students will develop tasks and activities that they can implement (LO4) with their own students during the school year. Mathematical habits of mind (LO5) will be implemented with their own students during the school year.

Our external stakeholders seek secondary mathematics teachers that are knowledgeable with their mathematical content (LO1), as well as their pedagogical content knowledge (LO2), in order to meet the wide array of students they will teach. Many districts have integrated various forms of emerging technologies in their districts. Secondary mathematics teachers need opportunities to learn about these technologies (LO3), as well as how to develop meaningful lessons that incorporate the technology to support their students’ learning. In order to meet district performance needs, secondary mathematics teachers need opportunities to develop and implement rich mathematical tasks (LO4) in order to give their students opportunities to engage in meaningful mathematics learning. They also need the opportunity to develop an awareness and appreciation of mathematical habits of mind (LO5), so they are able to have their students interpret and engage with them as they solve mathematically rich problems.

III Venues for Assessing Learning Outcomes

These are the venues in which the achievement of learning outcomes will be assessed, with the corresponding artifacts used in parentheses.

- (T1) Mathematical Content Knowledge (Final Exams from courses)
• (T2) Mathematical Pedagogical Content Knowledge (Tasks, Activities, or lesson plans developed in the courses)

• (T3) Knowledge for using Emerging Technologies in the Classroom (Projects involving technology developed in the courses)

• (T4) Classroom Practices (Research Paper or Capstone Project)

An annual student survey will be given to the students in order to measure learning outcomes through indirect measures. Data gathered from the survey will assist the program to make appropriate modifications, where needed, in order to meet the learning outcomes of the program.

At the completion of the program, the program director will collect data from students in order to make modifications to the program which meet the needs of secondary mathematics teachers in our region.

IV Process for Assessment

The administration of the program assessment tools will occur both cyclically and episodically:

<table>
<thead>
<tr>
<th>Venue</th>
<th>Time Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T1) Mathematical Content Knowledge</td>
<td>Artifacts will be collected at the end of each of the two summer courses. Each graduate will complete six of these courses, so the assessment will be completed six times over a three-year period for each graduate.</td>
</tr>
<tr>
<td>(T2) Mathematical Pedagogical Content Knowledge</td>
<td>Artifacts will be collected throughout various mathematics courses that each graduate completes. This includes courses taught during the spring and the summer.</td>
</tr>
<tr>
<td>(T3) Knowledge for using Emerging Technologies in the Classroom</td>
<td>An artifact will be collected during Math 705, as well as in other courses that emphasize the use of technology (such as Math 711, 726, 766, etc.). That means an artifact will be collected on average once every year as the student completes the program.</td>
</tr>
<tr>
<td>(T4) Classroom Practices</td>
<td>An artifact will be collected as the student completes the program. This is in the form of either their Independent Research Capstone project, or their Research Paper.</td>
</tr>
<tr>
<td>Annual Student Survey</td>
<td>A survey will be given once per year, typically at the end of the summer. A graduate of the program will complete at least three of these surveys.</td>
</tr>
<tr>
<td>Alumni Data Collection</td>
<td>A survey will be given to those students that complete the program. The program director will conduct an interview with recent alumni of the program to assess whether or not needs are being met.</td>
</tr>
</tbody>
</table>
The Director of the MSE-Mathematics program will oversee the administration of its assessment plan, and will coordinate the collection, aggregation, and review of data throughout each year of the program. The director will share this information once a year with the members of the Mathematics Department involved in teaching courses in the program. Once this information is shared with them, there will be an opportunity for discussion on whether or not changes need to be implemented in order to assist the program at meeting the stated learning outcomes for each graduate student. Ideas and suggestions will be documented by the director and action will be taken when appropriate.

Internal and external stakeholders may inquire about assessment plans and results through contacting the coordinator of the MSE-Mathematics program. Information will also be provided on the official website for the program.

**Mathematical Content Knowledge**

The MSE-Mathematics Director will meet with instructors of the summer courses to review student performance, specifically with regard to content specific learning outcomes associated with the course. Exam performance will serve as the artifact that is collected in this venue. The director and the instructor will identify areas of concern and avenues for improvement.

**Mathematical Pedagogical Content Knowledge**

The MSE-Mathematics Director will meet with the instructor of each course upon its completion to review student performance, specifically with regard to pedagogical content knowledge developed by each student in the course. They will discuss artifacts that were collected, such as tasks, activities, or lesson plans, that the student developed in order to showcase this knowledge. The director and the instructor will identify areas of concern and avenues for improvement.

**Knowledge for using Emerging Technologies in the Classroom**

The MSE-Mathematics Director will meet with instructors of Math 705 and other courses that infuse the use of emerging technologies (ex. 711, 726, and 766) into their classes. They will discuss artifacts that were collected during the course(s) that showcased a student’s ability to use emerging technologies to learn mathematical content and develop that understanding with their students. The rubric in Appendix A was used internally to evaluate technology-infused artifacts.

**Classroom Practices**

Faculty members on the Final Oral Exam Committee for a graduate student in the program provide assessment feedback on the capstone project or research paper based on the assessment rubric given in Appendix B. The exam committee members and the program director discuss the strengths and weaknesses of the project or paper with regard to the justification of the topic, the review of literature,
its appropriateness, and the implementation of the knowledge gained from the project; as well as the overall quality of the student’s presentation (written and/or oral). Committee members also ask examinees to reflect on the connections between their graduate coursework and their final presentation.

**Annual Student Survey**

Appendix C provides open-ended questions that we use to assess whether graduate students are learning about rigor, coherence, and focus; and are able to take what they learn from their courses back to their own classrooms. We want them to increase their ability to take what they learn from their courses, and package them into rich tasks they will use with their students.

**Alumni Data Collection**

In addition to collecting data from graduate students each year, information is gathered from graduate students at the end of the program. Appendix D provides the end of program survey. Graduate students are also interviewed by the program director in order to provide feedback about the program and their experience.
## Appendix A

<table>
<thead>
<tr>
<th>Slightly Agree (1)</th>
<th>Moderately Agree (2)</th>
<th>Strongly Agree (3)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>The project showcased an appropriate and correct use of the technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The use of the technology helped to contribute to better understanding of the mathematical content</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The project could be adapted so the technological activity could be used within a K-12 classroom.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

<table>
<thead>
<tr>
<th></th>
<th>Slightly Agree (1)</th>
<th>Moderately Agree (2)</th>
<th>Strongly Agree (3)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>The need for the project was clearly communicated and how it connects to current themes in secondary mathematics.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The graduate student clearly communicated why they have an interest in the theme of the project.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The project is supported with a review of the literature appropriate to the theme of the project.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The graduate student clearly communicated how the research was used or will be used in their profession.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The project relates to current best practices in the area of mathematics education chosen.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The graduate student was able to clearly and appropriately convey their ideas and thoughts during the oral presentation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The graduate student was able to appropriately respond to questions of the committee members.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The presentation includes an appropriate showcase of references used in the graduate student’s research of the theme.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Provide us some detail of how you used the professional development experiences from the graduate course(s) you took last summer and spring and implemented them in your classroom during this past school year.

2. Provide us some detail of how you expect to use the professional development experiences from the graduate course(s) you took this summer in your classroom this coming school year.

*In addition to these two focus questions, we have also asked graduate students for self-reporting about changes in teaching and knowledge specific to content and pedagogical areas addressed in specific courses.*
The scale for all responses is “strongly disagree”, “disagree”, “slightly disagree”, “slightly agree”, “agree”, and “strongly agree”

**Teaching & Learning**

1. The courses offered in the program focus on rich mathematical thinking
2. The courses offered in the program helped increase my mathematical knowledge and proficiency
3. The courses in the program helped me think about mathematics through multiple lenses (procedural fluency, conceptual understanding, and application/mathematical reasoning)
4. The courses in the program helped me increase my mathematical pedagogical content knowledge
5. The courses in the program helped me increase my understanding of best teaching practices in mathematics courses
6. The program has helped increase my ability to infuse emerging technologies into my own teaching
7. The program has helped me include more active learning and inquiry-based teaching methods in my teaching
8. The program has helped me develop and find rich math tasks and activities that I can use with my students
9. The program has helped me incorporate more rigor, coherence, and focus into my teaching
10. The courses assisted me in developing my own mathematical habits of mind

**Advising**

1. The academic advising I have received has been appropriate
2. I am able to speak or meet with the program director and/or paper/project advisor when I had questions
3. The requirements for completing the program are clear to me
4. I understood what was expected of when completing the research paper or capstone project
5. I understood what was expected of me when during my Final Oral Exam
**Logistics of the program**

1. The program offers courses that I desire to make me a better mathematics teacher
2. The program is offered in a way that allowed me to complete it in a timely manner
3. The program is a good value for the money

*In addition to each of these likert scale questions, three open response questions are included for each section in order to gather further data from the graduate students.*