

## STUDENT LEARNING ASSESSMENT PROGRAM SUMMARY FORM

Program Name: MA – Mathematics (Mathematics Education)

Dept: Mathematics and Computer Science

College: Liberal Arts and Sciences

Submitted by: Peter Wiles

### Part 1:

<p>CGS Learning Goal #1 A depth of content knowledge</p>	<p>Program Learning Goal(s): Students will demonstrate an understanding of advanced mathematical content knowledge in areas as identified by AMATYC<sup>1</sup> and NCTM<sup>2</sup> standards.</p>
<p>How are learners assessed?</p>	<ol style="list-style-type: none"> <li>1) Summative grades from required mathematics coursework.</li> <li>2) Course instructor will complete the Assessment Rubric for Mathematics Content Courses (MAT 4810/5810, MAT 5635, MAT 5335, or other allowable mathematics content elective).</li> <li>3) Course instructor will complete the Assessment Rubric for Mathematics Education Courses (MAT 5300, 5700).</li> <li>4) Completion of a literature review (in course MAT 5410) assessed by the MAT 5410 instructor</li> <li>5) Upon graduation, graduate candidates will complete an exit survey.</li> </ol>
<p>What are the expectations for the students?</p>	<ol style="list-style-type: none"> <li>1) Coursework will be completed with a grade of at least a B</li> <li>2) Rubric Item associated with this learning goal:             <ol style="list-style-type: none"> <li>a) The graduate candidate demonstrates a depth of content knowledge in the discipline.</li> </ol> </li> <li>3) Rubric Items associated with this learning goal:             <ol style="list-style-type: none"> <li>a) The graduate candidate demonstrates knowledge of pedagogical techniques related to student engagement, communication, and problem solving.</li> <li>b) The graduate candidate demonstrates a facility with technological tools as a means to solve problems and enhance mathematical thinking.</li> </ol> </li> <li>4) All graduate candidates will complete a literature review in preparation of their development of an action research project. Candidates are evaluated on their</li> </ol>

	<p>depth of understanding of the research base and relevance of the resources to the proposed work of study.</p> <p>5) The exit survey will ask students to indicate the degree to which the program has meet their needs as a professional educator. Areas associated with this learning goal:</p> <ul style="list-style-type: none"> <li>a) Developed my content knowledge in the discipline</li> <li>b) Developed strategies to effectively use technology in mathematics instruction.</li> <li>c) Use rich and varied pedagogical approaches to enhance conceptual understanding</li> </ul>
<p>What are the expectations for the program?</p>	<ul style="list-style-type: none"> <li>1) Coursework will be completed with a grade of at least a B</li> <li>2) All students will meet or exceed expectations</li> <li>3) All students will meet or exceed expectations</li> <li>4) All students will meet or exceed expectations for the literature review</li> <li>5) 80% of student responses indicate that the program met their expectations, 50% of the responses indicate that the program exceeded their expectations.</li> </ul>
<p>What were the results?</p>	<ul style="list-style-type: none"> <li>1) Five courses were offered in the assessment period: <ul style="list-style-type: none"> <li>MAT 5330 (2 students): 1 A, 1C</li> <li>MAT 5335 Ellipic Curves (1 student): 1 A</li> <li>MAT 5152 (5 students): 5 A</li> <li>MAT 5300: (5 students): 5 A</li> <li>MAT 5335 Knot Theory (5 students): 4 A, 1C</li> </ul> </li> <li>2) Four math content courses were offered in the assessment period: <ul style="list-style-type: none"> <li>a) The graduate candidate demonstrates a depth of content knowledge in the discipline. <ul style="list-style-type: none"> <li>MAT 5330 (4 students): 3 students met or exceeded expectations, 1 student approached expectations</li> <li>MAT 5335 Ellipic Curves (1 student): 1 students exceeded expectations</li> <li>MAT 5152 (5 students): 5 students met or exceeded expectations</li> <li>MAT 5335 Knot Theory (5 students): 4 students met or exceeded expectations, 1 student approached expectations</li> </ul> </li> </ul> </li> <li>3) One math education course was offered in the assessment period:</li> </ul>

	<p>a) The graduate candidate demonstrates knowledge of pedagogical techniques related to student engagement, communication, and problem solving. MAT 5300 (5 students): all students met or exceeded expectations</p> <p>b) The graduate candidate demonstrates a facility with technological tools as a means to solve problems and enhance mathematical thinking. MAT 5300 (5 students): all students met or exceeded expectations</p> <p>4) MAT 5410 was not offered in this assessment period</p> <p>5) No students graduated during this assessment period</p>
<p>How are the results shared? How will these results be used?</p>	<p>Results disseminated to Mathematics Education Graduate Committee. Students who are not meeting expectations will meet with the graduate coordinator to determine what courses of action need to be taken. In the one case above, this meeting determined that the primary problems may have been due to time management and stress due to the global pandemic. The student has been placed on academic warning.</p> <p>If assessment data determine that students are consistently not meeting expectations in this area for certain courses, then an agenda item will be added to a department meeting to determine if modifications need to be made to the courses, or if a prerequisite course may be needed to better prepare students for this course.</p> <p>If exit survey data determine that students do not feel the program is meeting their needs in these areas, then an agenda item will be added to a department meeting to discuss steps that can be taken to better meet those needs.</p>
<p>CGS Learning Goal #2: Critical thinking and problem-solving skills</p>	<p>Program Learning Goal(s): Students will demonstrate critical thinking and problem-solving skills, and adopt reflective pedagogical practices.</p>
<p>How are learners assessed?</p>	<p>1) Course instructor will complete the Assessment Rubric for Mathematics Content Course (MAT 4810/5810, MAT 5635, MAT 5335, or other allowable mathematics content elective).</p>

	<ul style="list-style-type: none"> <li>2) Course instructor will complete the Assessment Rubric for Mathematics Education Coursework (MAT 5300, 5700).</li> <li>3) Upon graduation, graduate candidates will complete an exit survey.</li> </ul>
What are the expectations for the students?	<ul style="list-style-type: none"> <li>1) Rubric Item associated with this learning goal: <ul style="list-style-type: none"> <li>a) The graduate candidate demonstrates evidence of critical thinking and effective mathematics problem solving.</li> </ul> </li> <li>2) Rubric Item associated with this learning goal: <ul style="list-style-type: none"> <li>a) The graduate candidate demonstrates critical reflection on research and its impact on practice.</li> </ul> </li> <li>3) The exit survey will ask students to indicate the degree to which the program has meet their needs as a professional educator. Areas associated with this learning goal: <ul style="list-style-type: none"> <li>a) Provided opportunities to apply my content knowledge to practice</li> <li>b) Developed my critical thinking and problem solving abilities</li> <li>c) Prepared me to engage in reflective practice</li> </ul> </li> </ul>
What are the expectations for the program?	<ul style="list-style-type: none"> <li>1) All students will meet or exceed expectations.</li> <li>2) All students will meet or exceed expectations</li> <li>3) 80% of student responses indicate that the program met their expectations, 50% of the responses indicate that the program exceeded their expectations.</li> </ul>
What were the results?	<ul style="list-style-type: none"> <li>1) Four math content courses were offered in the assessment period: <ul style="list-style-type: none"> <li>a) The graduate candidate demonstrates evidence of critical thinking and effective mathematics problem solving.  MAT 5330 (4 students): 3 students met or exceeded expectations, 1 student approached expectations  MAT 5335 Ellipic Curves (1 student): 1 students exceeded expectations  MAT 5152 (5 students): 5 students met or exceeded expectations  MAT 5335 Knot Theory (5 students): 4 students met or exceeded expectations, 1 student approached expectations</li> </ul> </li> <li>2) One math education course was offered in the assessment period: <ul style="list-style-type: none"> <li>a) The graduate candidate demonstrates knowledge of pedagogical techniques related to student engagement, communication, and problem solving.</li> </ul> </li> </ul>

	<p>MAT 5300 (5 students): 5 students met or exceeded expectations.  3) No students graduated in this assessment period</p>
<p>How are the results shared? How will these results be used?</p>	<p>Results disseminated to Mathematics Education Graduate Committee. Students who are not meeting expectations will meet with the graduate coordinator to determine what courses of action need to be taken. In the one case above, this meeting determined that the primary problems may have been due to time management and stress due to the global pandemic. The student has been placed on academic warning.</p> <p>If assessment data determine that students are consistently not meeting expectations in this area for certain courses, then an agenda item will be added to a department meeting to determine if modifications need to be made to the courses, or if a prerequisite course may be needed to better prepare students for this course.</p> <p>If exit survey data determine that students do not feel the program is meeting their needs in these areas, then an agenda item will be added to a department meeting to discuss steps that can be taken to better meet those needs.</p>
<p>CGS Learning Goal #3: Effective oral and written communication skills</p>	<p>Program Learning Goal(s):  Students will demonstrate effective oral and writing skills through investigation of mathematical ideas, and reviewing and conducting research in the field of mathematics education</p>
<p>How are learners assessed?</p>	<ol style="list-style-type: none"> <li>1) Course instructor will complete the Assessment Rubric for Mathematics Content Course (MAT 4810/5810, MAT 5635, MAT 5335, or other allowable mathematics content elective).</li> <li>2) Course instructor will complete the Assessment Rubric for Mathematics Education Coursework (MAT 5300, 5700).</li> <li>3) Completion of a written report of action research project for the independent study/thesis program requirement. This written report is assessed by the independent study advisor.</li> </ol>

	<ul style="list-style-type: none"> <li>4) Oral presentation of action research project presented to the department and assessed by the graduate committee using the Action Research Oral Presentation rubric.</li> <li>5) The exit survey will ask students to indicate the degree to which the program has meet their needs as a professional educator. Areas associated with this learning goal: <ul style="list-style-type: none"> <li>a) Provided opportunities to collaborate with other professionals</li> <li>b) Developed my oral communication skills</li> <li>c) Developed my written communication skills</li> </ul> </li> </ul>
<p>What are the expectations for the students?</p>	<ul style="list-style-type: none"> <li>1) Rubric items associated with this learning goal: <ul style="list-style-type: none"> <li>a) The graduate candidate demonstrates the ability to develop convincing arguments and critique the reasoning of others.</li> <li>b) The graduate candidate demonstrates effective written communication skills</li> </ul> </li> <li>2) Rubric items associated with this learning goal: <ul style="list-style-type: none"> <li>a) The graduate candidate demonstrates the ability to develop convincing arguments and critique the reasoning of others.</li> <li>b) The graduate candidate demonstrates effective written communication skills.</li> </ul> </li> <li>3) All students will complete a written report of their action research project. This report will be evaluated on its coherence, significance, analytic approach, depth of conclusions, and impact on practice.</li> <li>4) All students will present their action research projects to the department. It will be evaluated on its clarity, significance, analytic approach, depth of conclusions, and impact on practice.</li> <li>5) The exit survey will ask students to indicate the degree to which the program has meet their needs as a professional educator. Areas associated with this learning goal:</li> </ul>
<p>What are the expectations for the program?</p>	<ul style="list-style-type: none"> <li>1) All students will meet or exceed expectations.</li> <li>2) All students will meet or exceed expectations</li> <li>3) The independent study advisor will determine that all students meet or exceed expectations for the areas outlined in the previous section.</li> </ul>

	<p>4) 80% of students will meet or exceed expectations on the Oral Presentation rubric. In the case that a student does not meet expectations, the independent study advisor will work with any student to make required edits as suggested by the committee.</p> <p>5) 80% of student responses indicate that the program met their expectations, 50% of the responses indicate that the program exceeded their expectations.</p>
<p>What were the results?</p>	<p>1) Four math content courses were offered in the assessment period:</p> <p>a) The graduate candidate demonstrates the ability to develop convincing arguments and critique the reasoning of others.</p> <p>MAT 5330 (4 students): 3 students met or exceeded expectations, 1 student approached expectations  MAT 5335 Ellipic Curves (1 student): 1 students exceeded expectations  MAT 5152 (5 students): 5 students met or exceeded expectations  MAT 5335 Knot Theory (5 students): 4 students met or exceeded expectations, 1 student approached expectations</p> <p>b) The graduate candidate demonstrates effective written communication skills.</p> <p>MAT 5330 (4 students): 3 students met or exceeded expectations, 1 student approached expectations  MAT 5335 Ellipic Curves (1 student): 1 students exceeded expectations  MAT 5152 (5 students): 5 students met or exceeded expectations  MAT 5335 Knot Theory (5 students): 4 students met or exceeded expectations, 1 student approached expectations</p> <p>2) One math education course was offered in the assessment period:</p> <p>a) The graduate candidate demonstrates knowledge of pedagogical techniques related to student engagement, communication, and problem solving.</p> <p>MAT 5300 (5 students): all students met or exceeded expectations</p> <p>b) The graduate candidate demonstrates a facility with technological tools as a means to solve problems and enhance mathematical thinking.</p> <p>MAT 5300 (5 students): all students met or exceeded expectations</p>

	<ul style="list-style-type: none"> <li>3) No action research projects were completed during this assessment period</li> <li>4) No action research projects were presented during this assessment period</li> <li>5) No students graduated during this assessment period</li> </ul>
<p>How are the results shared? How will these results be used?</p>	<p>Results disseminated to Mathematics Education Graduate Committee. Students who are not meeting expectations will meet with the graduate coordinator to determine what courses of action need to be taken. In the one case above, this meeting determined that the primary problems may have been due to time management and stress due to the global pandemic. The student has been placed on academic warning.</p> <p>If assessment data determine that students are consistently not meeting expectations in this area for certain courses, then an agenda item will be added to a department meeting to determine if modifications need to be made to the courses, or if a prerequisite course may be needed to better prepare students for this course.</p> <p>If exit survey data determine that students do not feel the program is meeting their needs in these areas, then an agenda item will be added to a department meeting to discuss steps that can be taken to better meet those needs.</p> <p>If students are not meeting expectations for the oral presentations, then a meeting of the graduate committee will determine if modifications need to be made to MAT 5410, where students plan their action research projects, to prepare them better for writing up and presenting their work.</p>
<p>CGS Learning Goal #4: Evidence of advanced scholarship through research and/or creative activity.</p>	<p>Program Learning Goal(s): The graduate candidate will demonstrate their ability to synthesize research in the field and apply research to instructional practice.</p>
<p>How are learners assessed?</p>	<ul style="list-style-type: none"> <li>1) All graduate candidates are required to develop, propose, implement and summarize the results of an action research project</li> <li>2) All graduate candidates are required to develop and implement and reflect on a unit lesson plan based on their graduate coursework. This is assessed by the independent study advisor.</li> </ul>



	3) Upon graduation, graduate candidates will complete an exit survey.
What are the expectations for the students?	<ol style="list-style-type: none"> <li>1) All graduate candidates are expected produce a written and oral proposal of research, as well as a written and oral report of the completed project. Together, the instructor of MAT 5410, the independent study advisor, and the committee assessing the final presentation will provide continued feedback at each stage of the process.</li> <li>2) Graduate candidates' unit lesson plan will be evaluated according to (1) the depth of connection to mathematical ideas, (2) the use of sound pedagogical approaches to focus on conceptual understanding, (3) the use of appropriate assessments, and (4) the reflectiveness of the summary of implementation.</li> <li>3) The exit survey will ask students to indicate the degree to which the program has meet their needs as a professional educator. Areas associated with this learning goal: <ol style="list-style-type: none"> <li>a) Understand the role of research in the discipline</li> <li>b) Conduct research an apply it to practice</li> </ol> </li> </ol>
What are the expectations for the program?	<ol style="list-style-type: none"> <li>1) All graduate candidates must meet or exceed expectations at each stage of the process (literature review, proposal, implementation, analysis, and presentation) before they can move on to the next stage.</li> <li>2) All graduate candidates will meet or exceed the expectations in the required areas for the unit lesson plan.</li> <li>3) 80% of student responses indicate that the program met their expectations, 50% of the responses indicate that the program exceeded their expectations.</li> </ol>
What were the results?	<ol style="list-style-type: none"> <li>1) 5 students have been assigned to independent student advisors and are currently successfully collecting and/or analyzing data.</li> <li>2) No students completed a unit lesson plan during this assessment period</li> <li>3) No students graduated during this assessment period</li> </ol>
How are the results shared? How will these results be used?	If students are not meeting expectations for the written or oral portions of the action research project, then a meeting of the graduate committee will determine if modifications need to be made to MAT 5410, where students plan their action research projects, to prepare them better for writing up and presenting their work.

	<p>If exit survey data determine that students do not feel the program is meeting their needs in these areas, then an agenda item will be added to a department meeting to discuss steps that can be taken to better meet those needs.</p>
<p>CGS Learning Goal #5: Ethics and Professional Responsibility</p>	<p>Program Learning Goal(s): Students will practice, apply, and reflect on ethics, technology use, new pedagogical ideas, techniques and practices related to mathematics education as identified by the NCTM professional development standards</p>
<p>How are learners assessed?</p>	<ol style="list-style-type: none"> <li>1) Course instructor will complete the Assessment Rubric for Mathematics Content Courses (MAT 4810/5810, MAT 5635, MAT 5335, or other allowable mathematics content elective).</li> <li>2) Course instructor will complete the Assessment Rubric for Mathematics Education Courses (MAT 5300, 5700).</li> <li>3) Present a research proposal to the department at the conclusion of MAT 5410.</li> <li>4) Complete CITI training and earn certificate.</li> <li>5) Submit a research request to the Institutional Review Board.</li> <li>6) Upon graduation, graduate candidates will complete an exit survey.</li> </ol>
<p>What are the expectations for the students?</p>	<ol style="list-style-type: none"> <li>1) Rubric Item associated with this learning goal: <ol style="list-style-type: none"> <li>a) The graduate candidate demonstrates the respect for the professional environment through their honesty, integrity, and professionalism.</li> </ol> </li> <li>2) Rubric Item associated with this learning goal: <ol style="list-style-type: none"> <li>a) The graduate candidate demonstrates knowledge of the diversity of student thinking and development.</li> </ol> </li> <li>3) Graduate candidates will be assessed using the Oral Presentation of Research Proposal Rubric. Candidates are evaluated on their readiness to engage in research at a level consistent with ethical and professional practices.</li> <li>4) Complete CITI training and earn certificate.</li> <li>5) Submit a research request to the Institutional Review Board.</li> <li>6) The exit survey will ask students to indicate the degree to which the program has meet their needs as a professional educator. Areas associated with this learning goal:</li> </ol>

	<ul style="list-style-type: none"> <li>a) Developed my ability to employ student centered instruction and meet the diverse needs of students.</li> </ul>
What are the expectations for the program?	<ul style="list-style-type: none"> <li>1) 100% of students earn the CITI certificate</li> <li>2) 80% meet or exceed expectations</li> <li>3) 100% of students' projects are approved by IRB</li> </ul>
What were the results?	<ul style="list-style-type: none"> <li>1) Four math content courses were offered in the assessment period: <ul style="list-style-type: none"> <li>a) The graduate candidate demonstrates the respect for the professional environment through their honesty, integrity, and professionalism.</li> </ul> <ul style="list-style-type: none"> <li>MAT 5330 (4 students): 4 students met or exceeded expectations.</li> <li>MAT 5335 Ellipic Curves (1 student): 1 students exceeded expectations</li> <li>MAT 5152 (5 students): 5 students met or exceeded expectations</li> <li>MAT 5335 Knot Theory (5 students): 5 students met or exceeded expectations</li> </ul> </li> <li>2) One math education course was offered in the assessment period: <ul style="list-style-type: none"> <li>a) The graduate candidate demonstrates knowledge of the diversity of student thinking and development.</li> </ul> <ul style="list-style-type: none"> <li>MAT 5300 (5 students): all students met or exceeded expectations</li> </ul> </li> <li>3) Since MAT 5410 is only offered every other summer, we did not have any students propose a research project during this assessment period.</li> <li>4) No students completed CITI training during this assessment period (all students currently conducting research have already been trained).</li> <li>5) No students submitted a research request to the IRB (all students currently conducting research have already had their proposals approved by the IRB)</li> <li>6) No students graduate during this assessment period.</li> </ul>
How are the results shared? How will these results be used?	<p>Results disseminated to Mathematics Education Graduate Committee. Students who are not meeting expectations will meet with the graduate coordinator to determine what courses of action need to be taken.</p> <p>If assessment data determine that students are consistently not meeting expectations in this area for certain courses, then an agenda item will be added to a department meeting to determine if a learning experience devoted to ethics and professional activity needs to be implemented.</p>

	If exit survey data determine that students do not feel the program is meeting their needs in these areas, then an agenda item will be added to a department meeting to discuss steps that can be taken to better meet those needs.
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<sup>1</sup>AMATYC stands for American Mathematics Association of Two Year Colleges.

<sup>2</sup>NCTM stands for National Council of Teachers of Mathematics

## Part 2

It was suggested that we implement an exit survey for graduates of the program. While we have not implemented it yet (since we have not had any graduating students), it has been developed. We will continue to refine this in anticipation of using it in the coming year (we expect a few students to graduate). It was also suggested that we expand the assessment of the action research project to a committee rather than just the independent study advisor. Going forward, we will implement this at two stages in the action research project. A committee will assess the research proposal presentation, as well as the final presentation of the completed research. Finally, while we have always had CITI training and IRB approval as part of the action research planning stage, we have included it now as an item in the assessment report.

## Part 3

The primary changes and improvements to the program have been focused on the continued transition of the program to become online. We have adapted several new courses to be run online (MAT 5152, MAT 5300, MAT 5330, and MAT 5335). As we move forward in the endeavor, we want to create a survey that will be distributed to the graduate candidates to evaluate how well the transition to online coursework has been. We intend to use this data to help us refine the courses to better meet the needs of the students, while still maintaining a high level of rigor in the courses.