

**Assurance of Student Learning Report
2022-2023**

Ogden College of Science & Engineering

Department of Mathematics

730 Middle Grades Mathematics

Patrick Brown, Program Coordinator

Is this an online program? ☐ Yes ☒ No

Please make sure the Program Learning Outcomes listed match those in CourseLeaf . Indicate verification here
☒ Yes, they match! (If they don't match, explain on this page under **Assessment Cycle**)

Use this page to list learning outcomes, measurements, and summarize results for your program. Detailed information must be completed in the subsequent pages. Add more Outcomes as needed.

Program Student Learning Outcome 1: Effectively communicate mathematical ideas in verbal and written forms.

Instrument 1 **Capstone Project in MATH 490 – Seminar in Middle Grades Mathematics**

Based on your results, check whether the program met the goal Student Learning Outcome 1.

☒ **Met**

☐ **Not Met**

Program Student Learning Outcome 2: Successfully solve a variety of problems using appropriate mathematical tools.

Instrument 1 **Final Exam in MATH 411 – Problem Solving for Elementary & Middle School Teachers**

Based on your results, check whether the program met the goal Student Learning Outcome 2.

☒ **Met**

☐ **Not Met**

Program Student Learning Outcome 3: Propose and formally prove mathematical conjectures.

Instrument 1 **Final Exam in MATH 403 – Geometry for Middle School Teachers**

Based on your results, check whether the program met the goal Student Learning Outcome 3.

☒ **Met**

☐ **Not Met**

Assessment Cycle Plan:

All outcomes were assessed in this cycle. We expect the next cycle to be no different.

Program Student Learning Outcome 1			
Program Student Learning Outcome	Effectively communicate mathematical ideas in verbal and written forms.		
Measurement Instrument 1	Capstone Project in MATH 490 – Seminar in Middle Grades Mathematics Students work independently with a faculty member on a mathematics research project, culminating in both a final paper and final presentation, in which they are assessed on their ability to effectively communicate mathematics in both verbal and written forms.		
Criteria for Student Success	<i>Students will exhibit the ability to effectively communicate mathematics in verbal and written forms via their final oral presentation and written paper in their senior seminar class. Students will average a “sufficient” or higher across all assessment domains: Writing of Paper, Delivery of Presentation, Quality of Mathematics, Quantity of Mathematics, Mathematical Accuracy, and Mathematical Understanding.</i>		
Program Success Target for this Measurement	70% of students will average “sufficient” or higher across all domains on the project rubric.	Percent of Program Achieving Target	100% of students averaged “sufficient” or higher across all domains on the project rubric.
Methods	All students enrolled in the senior capstone course, MATH 490, during the 2023/2024 academic year were assessed.		
Based on your results, highlight whether the program met the goal Student Learning Outcome 1.			<input checked="" type="checkbox"/> Met <input type="checkbox"/> Not Met

Program Student Learning Outcome 2			
Program Student Learning Outcome	Successfully solve a variety of problems using appropriate mathematical tools.		
Measurement Instrument 1	Final Exam in MATH 411 – Problem Solving for Middle Grades Teachers Students in this class learn formal and informal problem solving strategies, and apply these strategies, along with mathematical understanding gained in previous coursework, to solve a wide variety of problems. Much like the senior seminar course, this course requires students to draw upon skills and concepts from across the program and apply them in new and creative ways.		
Criteria for Student Success	<i>Students will demonstrate their ability to successfully solve a variety of problems using appropriate mathematical tools on the final exam for this problem solving class. The final exam contains problems requiring a wide range of problem-solving strategies and a diverse set mathematical tools. Students will be evaluated on each problem using a 10 point rubric that assesses their ability to understand the problem, choose and implement an appropriate strategy, obtain the correct answer, and explain their thinking.</i>		
Program Success Target for this Measurement	70% of students will average 7.5/10 or higher on the problem-solving rubric across all problems.	Percent of Program Achieving Target	100% of students averaged 7.5/10 or higher on the problem-solving rubric across all problems.
Methods	All students enrolled in the problem solving course, MATH 411, during the 2023/2024 academic year were assessed.		
Based on your results, highlight whether the program met the goal Student Learning Outcome 2.			<input checked="" type="checkbox"/> Met <input type="checkbox"/> Not Met

Program Student Learning Outcome 3			
Program Student Learning Outcome	Propose and formally prove mathematical conjectures.		
Measurement Instrument 1	Final Exam in MATH 403 – Geometry for Middle Grades Teachers As the second geometry course students in the Middle Grades Mathematics program take, MATH 403 is a proof-based course. Students make conjectures and prove theorems throughout the course, culminating in the final exam. This exam assesses students' ability to propose and formally prove mathematical conjectures from across the geometry curriculum, making it an especially appropriate instrument for this learning outcome.		
Criteria for Student Success	<i>Students will demonstrate their ability to propose and formally prove mathematical conjectures on the final exam for this proof-based geometry course. Students will be evaluated on each proof-based problem using a 10 point value-rubric that assesses that ability.</i>		
Program Success Target for this Measurement	70% of students will average 70% of students will average 7.5/10 or higher on the rubric across all proof-based problems.	Percent of Program Achieving Target	100% of students averaged 7.5/10 or higher on the proof-based rubric across all problems.
Methods	All students enrolled in the geometry course, MATH 403, during the 2022/2023 academic year were assessed.		
Based on your results, highlight whether the program met the goal Student Learning Outcome 2.			<input checked="" type="checkbox"/> Met <input type="checkbox"/> Not Met

Results, Conclusion, and Plans for Next Assessment Cycle (Describe what worked, what didn't, and plan going forward) <u>Results:</u> While we always believe that our goals are attainable, we had a small cohort of students this year, meaning that a small number of students underperforming could skew the results. While this cohort was small, they were also a strong and hard-working group, which showed in the assessment results. <u>Conclusions:</u> As Mathematics Education professionals, we are continuously working to improve our curriculum both within and across courses in our programs, using both formative and summative assessment data, along with the expertise of our faculty. Over the past several years, we have made some significant changes to the Middle Grades Math program, improving the quality of the courses, the program, and in turn the students & graduates. We are very pleased to see the effects of these changes showing up in our assessments, but we know we can always find ways to innovate and improve and will continue to do so. <u>Plans for Next Assessment Cycle:</u> This is our first full year working with and assessing the new Student Learning Outcomes. We continue to believe the goals are relevant and appropriate, and that the assessment metrics are sound. However, as both are new, we will continue to monitor closely over the next assessment cycle with the next group of students.

CURRICULUM MAP					
Program name:	Middle Grades Mathematics				
Department:	Mathematics				
College:	Science & Engineering				
Contact person:	Patrick Brown				
Email:	patrick.brown@wku.edu				
KEY:					
I = Introduced					
R = Reinforced/Developed					
M = Mastered					
A = Assessed					
			Learning Outcomes		
			LO1:	LO2:	LO3:
			Effectively communicate mathematical ideas in verbal and written forms.	Successfully solve a variety of problems using appropriate mathematical tools.	Propose and formally prove mathematical conjectures.
Course Subject	Number	Course Title			
MATH	136	Calculus I		I	
MATH	183	Introductory Statistics	I	I	
MATH	205	Number Systems and Number Theory for Teachers	I	I	
MATH	206	Fundamentals of Geometry for Teachers	R	R	
MATH	308	Rational Numbers and Data Analysis for Teachers	R	R	
MATH	302	Introduction to Advanced Mathematics for Middle Grades Teachers	R	R	I
MATH	304	Functions, Applications and Explorations	R	R	R
MATH	403	Geometry for Elementary and Middle School Teachers	M	M	M / A
MATH	411	Problem Solving for Elementary and Middle School Teachers	M	M / A	M
MATH	413	Algebra and Technology for Middle Grades Teachers	M	M	M
MATH	490	Seminar in Middle Grades Mathematics	M / A	M	M

Rubric for Learning Outcome 1:

Seminar in Middle Grades Mathematics

Student Name: _____

Final Paper & Presentation Rubric

Committee Member: _____

The student's final paper and presentation will be evaluated by a committee of mathematics faculty members, including the student's supervising faculty member. The committee shall use the departmental rubric for grading the final products.

For each category, the student will receive a grade of 0 – 4 from each committee member, with half-points allowed.

0 – Inadequate

1 – Deficient

2 – Sufficient

3 – Accomplished

4 – Exemplary

Category	Score
Writing of Paper Readability, Structure, Formatting, Style, Grammar, Spelling, Citations, References, Writing Conventions, Length (12-20 pgs.), etc.	
Delivery of Presentation Style, Comfort, Audience Engagement, Flexibility, Tone, etc.	
Quality of Mathematics Appropriateness of Topic/Problem, Level of Difficulty, Originality	
Quantity of Mathematics Student exhibits a body of mathematical work appropriate for a 3 credit, 400-level class in the Middle Grades Mathematics Major	
Mathematical Accuracy Appropriate use of mathematical tools, Lack of errors, etc.	
Mathematical Understanding Evidence that student deeply and thoroughly understands the project, and that the project is student's own work	
Comments:	

The final grade will be the average of all of the scores from all graders, less any deductions*. Letter grades will be assigned as follows:

F – [0, 0.5)

D – [0.5, 1.5)

C – [1.5, 2.5)

B – [2.5, 3.5)

A – [3.5, 4.0]

Rubric for Learning Outcome 2:

MATH 411 – Problem Solving

Each problem will be graded using the following rubric for a total of 10 points per problem.

- A. Understand the problem
 - 0- Completely misinterprets the problem.
 - 1- Misinterprets part of the problem.
 - 2- Shows complete understanding of the problem.
- B. Choosing a solution strategy
 - 0- Does not give evidence of using a strategy or uses a totally inappropriate strategy.
 - 1- Chooses a strategy that could possibly lead to a correct solution or chooses a strategy that will get him or her a partway through the problem but fails to change strategies when appropriate.
 - 2- Chooses a correct strategy that could lead to a correct solution if used without error.
- C. Implementing the strategy
 - 0- Makes no attempt to solve, uses a totally inappropriate strategy, or uses a correct strategy totally incorrectly.
 - 1- Implements a partly correct strategy based on interpreting part of the problem correctly or chooses a correct strategy and implements it poorly.
 - 2- Implements a correct strategy with minor errors or no errors.
- D. Getting the Answer
 - 0- Gets no answer, fails to state the answer, or gets a wrong answer based on an inappropriate solution strategy
 - 1- Makes copying error or computation error, gets partial answer to a problem with multiple answers, or labels answer incorrectly.
 - 2- Gets correct answer, states it, and labels it properly.
- E. Giving an explanation of your thinking
 - 0- Makes no explanation or incoherent explanation,
 - 1- Gives an incomplete explanation, or the explanation is hard to follow.
 - 2- Gives a clear, coherent, complete explanation.

Rubric for Learning Outcome 3:

MATH 403: Geometry for Elem/Middle Grades Teachers 10-Point Rubric

Rubric for proof-based problems:

10	8	5	2	0
Surpasses Standard (Mastery plus Connections)	Meets Standard (Mastery)	Approaching Standard	Not Yet Approaching Standard	No Attempt
Demonstrates complete understanding. A correct and complete proof is given. Some irrelevant information may be included but does not affect the intended proof.	Demonstrates complete understanding. A correct approach to proving the theorem is attempted. Some statements may be unjustified or improperly justified, but errors are minor and could be fixed given time to polish the proof.	Demonstrates understanding of theorem to be proved, but proof is incomplete or does not prove the intended result. Statements linked into a reasonable (though perhaps misguided) attempt to prove the theorem. The proof may be left incomplete or may depend upon a major unjustified leap.	Attempts the proof but demonstrates little or no understanding.	Product does not address the assignment, is off topic, or was not submitted.