ANNUAL PROGRAM REPORT

College	College of Science
Department	Mathematics
Program	Bachelors and Masters
Reporting for Academic Year	2024-2025
Last 5-year Review	2022-23
Next 5-year Review	2027-28
Department Chair	Julia Olkin
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Date Submitted	October 1, 2025

1. **SELF-STUDY**
   (A) Five-Year Review Planning Goals
   (B) Progress Toward Five-Year Review Planning Goals
   (C) Program Changes and Needs
2. **SUMMARY OF ASSESSMENT:** Program Learning Outcomes (PLO)
   (A) BS Program Learning Outcomes
   - Summary of Assessment Process
   - Summary of Assessment Results
   - Assessment Plans for Next Year

   (B) MS Program Learning Outcomes
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3. **DISCUSSIONS OF PROGRAM DATA AND RESOURCE REQUESTS**
   (A) Discussions of Trends and Reflections
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4. **APPENDICES**
   - Appendix A: RVF Rubric
   - Appendix B: Mathematics 1 pager
   - Appendix C: Department Equity Action Plan

2 Summary of Assessment

Mathematics Bachelors of Science
Assessment Report 2024-25

(A) BS Program Learning Outcomes (PLO)

Sudents graduating with a BS degree in Mathematics will be able to:	
PLO 1	Apply the definitions, techniques and theorems of mathematics. (ILO Thinking and Reasoning, Quantitative Reasoning).
PLO 2	Use mathematics to understand, explain and/or solve problems beyond a particular course. (ILO Specialized Discipline).
PLO 3	Creatively conjecture and rigorously write, analyze and critique proofs.(ILO Thinking and Reasoning, Quantitative Reasoning).
PLO 4	Communicate mathematics effectively. (ILO Communication: Oral Communication).

(B) Program Learning Outcome Assessed.

PLO 3	Creatively conjecture and rigorously write, analyze and critique proofs.(ILO Thinking and Reasoning, Quantitative Reasoning).

(C) Summary of Assessment Process

Instrument(s): The department used a midterm (take-home exam 2). The rubric was used to score the responses in the areas of readability, validity and fluency.

Sampling Procedure: The course for this year's assessment was chosen by the department when we created our long-term assessment plan. An exam was identifies as appropriate to assess PLO 3.

Sample Characteristics: The course selected is part of the upper division list of core courses. This Exam was selected carefully to ensure it included essential course content.

Data Collection: Dr. Arauza Rivera scored all 13 exams for readability, validity and fluency using the rubric found in Appendix A.

Data Analysis: Course Assessed=*Math 330 Analysis 1*

Course Exam Problem:

Puzzle 4.2

1. Prove that $\mathbb{R}$ is open. Include a labeled image to illustrate your proof.
2. Prove that $\emptyset$ is open. Hint: this one is somewhat unsatisfying.
3. Let $a, b \in \mathbb{R}$ and $a < b$. Prove that the interval (a, b) is open in $\mathbb{R}$. Include a labeled image to illustrate your proof.

Summary of Results

Category	Missing (0)	Emerging (1)	Developing (2)	Mastering (3)
Readability	0	0	9 (69%)	4 (31%)
Validity	0	1 (8%)	5 (38%)	7 (54%)
Fluency	0	1 (8%)	9 (69%)	3 (23%)

These scores indicate that predominately, the students have developed or mastered the ability to write a readable and valid solution using essentially completely justifiable steps. Main Findings: As this course is taken before some of the other upper division math courses, these results are encouraging that the students are well on their way to developing and mastering their skills.

Next Step(s) for Closing the Loop: Our courses go through cycles of continuous review for revisions, discussions about assessments across sections in terms of equity and standards. This is important when multiple instructors teach the courses. No one faculty member "owns" a course and we believe in shared material, so there is constant review and revision.

(D) **Assessment Plans for Next Year: 2025-26**

2025-2026	
Which PLO(s) to assess	PLO 4
Is it aligned to an ILO?	Yes
If yes, list ILO.	Communication: Oral Communication
Course name and number	Math 493 Senior Seminar
SLO from course	Upon completion of MATH 493 students will be able to communicate mathematics from a variety of areas effectively.
Assessment activity	A sampling of videos of student presentations will be viewed by the mathematics assessment committee and scored using a rubric.
Assessment Instrument	Communicating Mathematics Rubric
How data will be reported	Quantitative
Responsible person(s)	Math Assessment Committee
10. Time (which semester(s))	Spring 2026
11. Ways of closing the loop	Data will be reported in Mathematics Department Annual Report and discussed in faculty meetings to continuously improve the program.

Mathematics Masters of Science
Assessment Report 2024-25

(A) **MS Program Learning Outcomes (PLO)**

Sudents graduating with a BS degree in Mathematics will be able to:	
PLO 1	Evaluate and create proofs in graduate level mathematics using the fundamental definitions and theorems (ILO Thinking and Reasoning: Quantitative Reasoning).
PLO 2	Create solutiosn to problems using techniques in graduate level mathematics (ILO Specialized Discipline).
PLO 3	Communicate graduate level mathematics effectively. (ILO Communication).

(B) **Program Learning Outcome Assessed.**

PLO 1	Evaluate and create proofs in graduate level mathematics using the fundamental definitions and theorems (ILO Thinking and Reasoning: Quantitative Reasoning).

(C) **Summary of Assessment Process**

Instrument(s): The department used a comprehensive exam question and a rubric. The rubric was used to score the responses in the areas of readability, validity and fluency.

Sampling Procedure: : Two comprehensive exam questions were identified as typical problems for the exam that demonstrates the PLO to be assessed. The problems were chosen by the assessment team.

Sample Characteristics: The course selected is a course required for all math master's students. The exam questions were selected carefully to ensure it included essential program content. This selection was done during one of the assessment team meetings.

Data Collection: Comprehensive exams were collected by the department assessment coordinator. The problem was scored by the Graduate Coordinator for readability, validity and fluency using the rubric found in Appendix A.

Data Analysis: Course Assessed=*Math 692 Graduate Capstone*

Course Exam Problem:

8. (a) Explain how to solve the equation $A\mathbf{x} = \mathbf{b}$ using an LU decomposition.
   (b) Write the matrix form you would use to numerically solve the following partial differential equation using backward-difference in time and central-difference in space.

$$\frac{\partial u}{\partial t} - \frac{1}{16}\frac{\partial^2 u}{\partial x^2} = 0, \qquad 0 < x < 1, 0 < t;$$
$$u(0,t) = u(1,t) = 0, \qquad u(x,0) = 2\sin(2\pi x)$$

Summary of Results

Category	Missing (0)	Emerging (1)	Developing (2)	Mastering (3)
Readability	0	1 (11%)	5 (56%)	3 (33%)
Validity	0	2 (22%)	3 (33%)	4 (44%)
Fluency	0	2 (22%)	4 (44%)	3 (33%)

These scores indicate that we still have a few students in the Emerging stage, which is something to work on.

Next Step(s) for Closing the Loop: Our courses go through cycles of continuous review for revisions, discussions about assessments across sections in terms of equity and standards. This is important when multiple instructors teach the courses. No one faculty member "owns" a course and we believe in shared material, so there is constant review and revision.

(D) Assessment Plans for Next Year: 2025-26

2025-2026	
1. *Which PLO(s) to assess*	PLO 1
2. *Is it aligned to an ILO?*	Yes
3. *If yes, list ILO.*	Thinking and Reasoning
4. *Course name and number*	MATH 692 Graduate Mathematics Capstone
5. *SLO from course*	692: Students who successfully complete MATH 692 will have mastered the following in at least four areas of graduate level mathematics from the four core required courses. 1. Apply the fundamental definitions and theorems of graduate level mathematics. 2. Apply the techniques of graduate level mathematics to solve problems.
6. *Assessment activity*	Comprehensive Exams
7. *Assessment Instrument*	Re-score comprehensive exam questions using the Readability, Validity and Fluency Rubric
8. *How data will be reported*	Quantitative