Mathematics Master's of Science

Assessment Report 2018-19

I. SUMMARY OF MS PLO ASSESSMENT

A. Program Learning Outcomes (PLO)

Students graduating with a MS 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 solutions to problems using techniques in graduate level mathematics.
PLO 3	Communicate Graduate Level Mathematics Effectively. (ILO Communication)

B. Program Learning Outcome(S) Assessed

Students graduating with a MS degree in Mathematics will be able to:	
PLO 3	Communicate Graduate Level Mathematics Effectively. (ILO Communication)

C. Summary of Assessment Process

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

Sampling Procedure: A comprehensive exam question was identified as a typical problem for the exam that demonstrates the PLO to be assessed. The problem was chosen by the department during one of our monthly department meetings. This discussion was interesting and useful in that we did not all immediately agree on what is a "typical" exam question the comprehensive exams.

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

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

Data Analysis:

Course Assessed:

MATH 692 Graduate Capstone

Math 692, PLO 3/Mastered

Problem: Find roots to a function using fixed point iterations.

	Missing	**Emerging**	**Developing**	**Mastering**
Readability	**0%**	**42%**	**42%**	**17%**
Validity	**0%**	**42%**	**25%**	**33%**
Fluency	**0%**	**42%**	**42%**	**17%**

These scores indicate that 33% of the students have mastered the ability to write a valid solution and only 17% have mastered writing a readable or fluent solutions. Most of the students are still developing or emerging these skills. The department should consider strategies to increase the percentage of students mastering these important communication skills.

D. **Summary of Assessment Results**

Main Findings: This year most students demonstrated that they have not yet mastered communicating mathematical solutions to problems.

Recommendations for Program Improvement: The department needs to work on ensuring that strong communication skills are developed within the coursework of the program. High expectations need to be set and communicated to the graduate students.

Next Step(s) for Closing the Loop: The department is creating new expanded syllabi for semester courses which will include more details regarding course topics, depth of study, grading guidelines, and assessment expectations at the introductory, developing or mastery level for readability, validity and fluency in student work. Professors will be encouraged to share the assessment rubrics with their students. Our assessment activity next year will include reassessing more than just one exam problem to increase the data we use to do our assessment.

Other Reflections: The work described above is a huge project. We have guidelines ready and did a revisit this past summer but we will need to continuously improve our course packets for instructors.

E. Assessment Plans for Next Year

1. Which PLO(s) to assess	PLO 1
2. Is it aligned to an ILO?	Yes
3. If yes, list ILO.	Thinking and Reasoning: Quantitative 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: **1.** Evaluation and creation of proofs using the fundamental definitions and theorems. **2.** Creation of solutions to problems using techniques in graduate level mathematics.
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
9. Responsible person(s)	Math Assessment Committee
10. Time (which semester(s))	Collect Data Fall 2018, re-score and analyze Spring 2019
11. Ways of closing the loop	Data will reported in Mathematics Department Annual Report and discussed in faculty meetings to continuously improve the program.

Appendix A - Rubric

PLO 3: Communicate Graduate Level Mathematics Effectively.

RVF Rubric – Readability, Validity, Fluency

	Missing (0)	Emerging (1)	Developing (2)	Mastering (3)
Readability	Informal or non-mathematical language is used. There is misuse of notation/symbols.	Some improper mathematical language or notation is used.	Mostly proper mathematical language and notation is used.	Proper mathematical language and notation is used.
Validity	Significantly inaccurate or irrelevant statements in definitions, techniques and/or theorems are present. Important information is missing.	Mostly accurate statements in definitions, techniques and/or theorems are present. May include some irrelevant or unjustified statements.	Statements in definitions, techniques and/or theorems are accurate and relevant.	Statements in definitions, techniques and/or theorems are accurate and relevant and connected/deduced correctly.
Fluency	No coherent flow of ideas Listing facts without a sense of how to link them to obtain or apply a valid definition, technique or proof of a theorem.	Partially coherent and organized, but inconsistent. Appeals to intuition. Some unjustified or improperly justified statements/ conclusions in definitions, techniques or proofs of theorems are present.	A correct and essentially complete definition, solution, or proof given. Logic and flow overall sound. Some small gaps in presentation may require "benefit of the doubt."	A correct and complete definition, solution, or proof given. Elegance or mathematical maturity present.