

# Mathematics Master's Program

## I. SUMMARY OF ASSESSMENT

### A. Program Learning Outcomes (PLO)

Students graduating with a Masters of Science in Mathematics will be able to:

1. Evaluate and create proofs in graduate level mathematics using the fundamental definitions and theorems.
2. Create solutions to problems using techniques in graduate level mathematics.
3. Communicate Graduate Level Mathematics Effectively.

### B. Program Learning Outcome(S) Assessed

2. Create solutions to problems using techniques in graduate level mathematics.

This is the first year that we are assessing our new PLOs.

### C. Summary of Assessment Process

**Instrument(s):** The department used a final exam question and a rubric. The rubric was used to score the exam question 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 five-year assessment plan. A final exam question was identified as a typical problem for the course that demonstrates the PLO to be assessed. The problem was chosen by the department during one of our monthly department meetings.

**Sample Characteristics:** The course selected is a typical elective course for both the Applied and Pure options in the master's degree. The exam question was selected carefully to ensure that it included essential course content.

**Data Collection:** Final exams were collected by the department assessment coordinator. Each

problem was scored by regular faculty for readability, validity and fluency using the rubric found in appendix A.

### **Data Analysis:**

#### **Math 6331 Partial Differential Equations SLO 2/Mastered (10 Students)**

#### **Problem: Using Fourier Theory to solve a PDE**

	Missing	Emerging	Developing	Mastering
Readability	0%	10%	10%	80%
Validity	0%	30%	30%	40%
Fluency	0%	20%	20%	60%

These scores indicate 80% of the students have mastered the ability to write a readable solution, 40% provided valid solutions and 60% mastered the ability to write a fluent solutions. These percentages are similar to those from last year.

### **D. Summary of Assessment Results**

**Main Findings:** Students in this applied course performed well at the readability and fluency levels and less so in the validity level. In general, the departments needs to find ways to work on agreeing on expectations and scoring at each level and on communicating this to the graduate students. This might be due to the alignment of “validity” with the “grade” on the problem as was originally given by the instructor for the course. It is of note that a solution can “read” well and “flow” even if the final answer is imperfect. The 3 dimensions in the rubric are, to some degree, independent.

**Recommendations for Program Improvement:** The department needs to work on agreeing to the level and standards for its graduate courses and on how to score the assessments using the program assessment rubric. Additional work should probably be done on “norming” prior to the scoring process.

**Next Step(s) for Closing the Loop:** The department is creating new expanding syllabi for the semester courses which will include more in depth 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.

**Other Reflections:** The work described above is a huge project. We will have guidelines ready once semesters begin but will need to continuously improve our course packets for instructors.

#### **E. Assessment Plans for Next Year**

The Department of Mathematics will assess MS degree PLO #1 and PLO #3 in even years and PLO #2 in odd years for mastery in the required capstone course (Math 692). Student artifacts will be collected by the instructor who will identify specific elements/problems in which the students are able to demonstrate each PLO to be assessed. Items will be saved and assessed annually for PLO attainment by members of the Graduate Curriculum Committee using a department approved rubric. Each rubric includes the following dimensions: Readability, Validity, and Fluency (RVF). The assessment process will include a norming by the committee followed by assessment of, at a minimum, 10 student artifacts. If enrollment in Math 692 falls below 10 students in any year, the assessment of the corresponding PLO will occur in the following year.

## Appendix A - Rubric

### CSU East Bay Mathematics, MS AY 2017\_18

SLO 2: Create solutions to problems using techniques in graduate level mathematics

#### SLO 2 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.