

CNM ANNUAL STUDENT LEARNING ASSESSMENT REPORT

Due to the Student Academic Assessment Committee by October 15



PART 1: REPORT INFORMATION

Report Year and Contact Information			
<u>2018-2019</u> Academic Year	<u>David Heddens</u> Contact Person	<u>dheddens@cnm.edu</u> CNM Email	<u>50267</u> CNM Office Extension

Subject of this Report
MSE--MATH_AS--Mathematics Degree

PART 2: CONTEXT IN WHICH THE ASSESSMENT TOOK PLACE

Program/Area Highlights and Successes
<p>(Wherever applicable, include course completion rates, job placement outcomes, and licensing examination pass rates. See the program information dashboard at https://livecnm.sharepoint.com/sites/Dashboards/SitePages/Program%20Information%20Dashboard.aspx (access restricted to CNM employees) and other reports at https://www.cnm.edu/depts/opie.)</p> <p>During AY2018/19 the start of a new six year assessment cycle plan began with the assessment of Program-Level SLO#1: Demonstrate competency in the core concepts of single-variable, differential calculus which includes limits, continuity, differentiation, and optimization. Our students performed well in two of the three targeted program-level assessment questions. Mathematics curriculum-wide (all courses and so not limited to program-level offerings) AY2018/19 course completion rate data indicated an average class size of 22 students, a retention rate of 84.8%, an enrollee success rate of 62.4%, and an average fill rate of 76.6%.</p>

Changes Implemented During the Past Year in Support of Student Learning
<p>While not unanimously agreed upon, the MATH 1710 Calculus I common final was retired due to a belief that many of the questions were not sufficiently challenging. With the return to targeted program-level assessment questions during AY2018/19, a likely weakness in students' ability to determine continuity was revealed.</p>

PART 3: REPORT ON ASSESSMENT OF STUDENT LEARNING

Assessment Method	Type of Assessment Tool	Population or Course(s) Assessed	Graduate Learning Outcome(s) Assessed	Mastery Level (E.g., "Minimum score of 3 on a rubric scaled 0-4" or "Minimum score of 75%")	Targeted % Achieving Mastery	Outcome
Standard Test Questions	Direct & Internal	MATH 1710	Demonstrate competency in the core concepts of single-variable, differential calculus which includes limits, continuity, differentiation, and optimization.	Mean Rubric Score of at least 2.00 on a scale {0, 1, 2, 3}	N/A	Target partially met
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Summary of Assessment Findings

Program-Level SLO#1 – MATH 1710 Calculus I – Standard Test Question 1

1. Find the values of a and b that make f continuous everywhere.

$$f(x) = \begin{cases} \frac{x^2 - 4}{x - 2} & \text{if } x < 2 \\ ax^2 - bx + 3 & \text{if } 2 \leq x < 3 \\ 2x - a + b & \text{if } x \geq 3 \end{cases}$$

Numerical Assessment Problem #1	0	1	2	3
Answer	Not answered or non-mathematical 'attempt'	Mathematical attempt but major conceptual or calculational error	Mathematical attempt with minor conceptual or calculational error	$a = \frac{1}{2}, b = \frac{1}{2}$

MATH 1710 Fall and Spring mean rubric scores were 1.39 and 1.91, respectively.

2. Use logarithmic differentiation to find the derivative of the function.

$$y = (\sin x)^{\ln x}$$

Numerical Assessment Problem #2	0	1	2	3
Answer	Not answered or non-mathematical 'attempt'	Mathematical attempt but major conceptual or calculational error	Mathematical attempt with minor conceptual or calculational error	See below

$$y' = \left[\frac{\ln \sin x}{x} + (\ln x) \cot x \right] (\sin x)^{\ln x}$$

MATH 1710 Fall and Spring rubric scores were 2.02 and 2.15, respectively.

3. Evaluate the limit.

$$\lim_{x \rightarrow 0} \frac{e^x - e^{-x} - 2x}{x - \sin x}$$

Numerical Assessment Problem #3	0	1	2	3

Answer	Not answered or non-mathematical 'attempt'	Mathematical attempt but major conceptual or calculational error	Mathematical attempt with minor conceptual or calculational error	2
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MATH 1710 Fall and Spring rubric scores were 2.33 and 2.32, respectively.

Interpretation of Assessment Findings

During AY2018/19, 168 students were assessed in MATH 1710 Calculus I with 48 and 120 students in the Fall and Spring semesters, respectively. All of the students were assessed without the use of notes of any kind, with the use of a calculator, and during the final exam. There is some evidence that students struggled with determining continuity as the Fall semester students performed markedly below the benchmark of 2.00 with a mean rubric score of 1.39 while the Spring semester students performed better yet still did not make the benchmark with a mean rubric score of 1.91. In contrast, all rubric scores across both the Fall and Spring semesters exceeded 2.00 for logarithmic differentiation and the use of L'Hopital's Rule. Table 1 below summarizes the results.

Table 1. MATH 1710 Calculus I mean rubric scores of assessment questions AY2018/19.

PROGRAM-LEVEL SLO#1: Demonstrate competency in the core concepts of single-variable, differential calculus which includes limits, continuity, differentiation, and optimization.

	Fall	Spring
Course-Level SLO#1 – Component 6: Determine where a function is continuous	1.39	1.91
Course-Level SLO#2 – Component 9: Compute derivatives using logarithmic differentiation	2.02	2.15
Course-Level SLO#2 – Component 6: Determine if a limit is indeterminate and compute using L'Hopital's Rule	2.33	2.32

Action Plan in Support of Student Learning (Describe changes to be made that are based at least in part on the assessment interpretation. If the assessment did not yield useful information, describe changes to be made in the assessment methodology and/or criteria.)

With the abandonment of the common final for MATH 1710 and the return to targeted Program-Level SLO#1 questions for AY2018/19, the apparent weakness in Calculus I students in determining continuity will be addressed during AY2019/20. Faculty will discuss potential changes to teaching approach and assignment revision, and make revisions as departmentally agreed upon.

Please select all of the following that characterize the types of changes described in the above action plan:

- | | | |
|---|---|---|
| <input type="checkbox"/> Assessment criteria revision | <input type="checkbox"/> Assessment methodology revision | <input checked="" type="checkbox"/> Assignment revision |
| <input type="checkbox"/> Budgetary reallocation | <input checked="" type="checkbox"/> Change in teaching approach | <input type="checkbox"/> Course content revision |
| <input type="checkbox"/> Curricular Revision | <input type="checkbox"/> Faculty training/development | <input type="checkbox"/> Process revision |

Recommendations, Proposals, and/or Funding Requests	Budget Needed
None.	Click or tap here to enter text.

PART 4: REMAINING YEARS IN CURRENT ASSESSMENT CYCLE PLAN (including any revisions) – **OR -- UPCOMING ASSESSMENT CYCLE PLAN** (if this was the final year)

Years of Full Cycle	Next Year's Assessment Focus (Describe how the next planned assessment is expected to provide information that can be used toward improving student learning.)
AY2018/19 through AY2023/24	This six-year cycle plan continues to focus on the five graduate learning outcomes (GLOs) of the math degree. While there will be some overlap with assessed course-level student learning outcomes (SLOs) with the last assessment cycle plan, there will also be new as of yet never assessed course-level SLOs. These new SLOs will facilitate exploring new facets of the GLOs and ideally will help the math department discover new areas in need of increased student achievement as well as potentially provide confirmatory evidence of improvements in GLOs during the last cycle.

Graduate Learning Outcomes to Be Assessed	Years in which Assessment Is Planned	Population/Courses to Be Assessed	Planned Assessment Approach
1) Demonstrate competency in the core concepts of single-variable, differential calculus which includes limits, continuity, differentiation, and optimization.	AY2018/19	MATH 1710	Standard Test Questions
2) Demonstrate competency in the core concepts of single-variable integral calculus which includes various integration techniques, separable differential equations, and series.	AY2019/20	MATH 1520	Standard Test Questions
3) Demonstrate Competency in the core concepts of multivariable and vector calculus which includes level curves and surfaces, partial derivatives, gradients, tangent planes, directional derivatives, multiple integrals, and cylindrical and spherical coordinates.	AY2020/21 AY2023/24	MATH 2530	Standard Test Questions
4) Construct mathematical strategies using calculus techniques to solve applied problems from a variety of disciplines utilizing appropriate terminology and symbols.	AY2021/22	MATH 1510	Standard Test Questions
5) Develop proficiency in using various technological tools including graphing calculators and mathematical programming software (MATLAB).	AY2022/23	MATH 1520	Standard Test Questions
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