



Student Learning Assessment Report, Academic

Report Year

2022-2023

Program

Mathematics (BA/BS) Major

Department Head

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Submitted By

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Previously Submitted Reports

2021-2022 Mathematics (BA/BS) Major

Mission

The Department of Mathematics mission is to introduce the language, ideas, and active process of doing mathematics through its courses and programs. To achieve this mission we create a culture that promotes awareness of the great problems and applications of mathematics, the nature of mathematics research, and provide a solid grounding in contemporary mathematical ideas and techniques. Our courses are designed to provide students with the tools they need to succeed, whether majors are preparing for graduate school, the workforce, or non-majors seeking to understand the mathematical viewpoint.

Assessment

1. Major/Program Student Learning Outcomes

Student will be able to...

Know the language of mathematics and basics of mathematical deductive reasoning.

2. Phase

Check all that apply

- Planning/ determining procedure
- Planning/ Redesigning based on past assessment
- Collecting/ analyzing assessment data
- Discussing/ using result
- Determining if Changes had an Impact on Student Learning
- Objective not assessed this year

3. Assessment Procedures (Planning/ determining)

Method: (ex. tests, presentations, research paper, describe the assessment course and student sample when it is applicable, etc.)

Students in MATH 301 are required to write proofs as programs using Proof Designer (<https://djvellingman.people.amherst.edu/pd.html>). This requires knowing the basic valid steps of deductive reasoning well enough to implement these steps using this software, allowing students to have immediate feedback for any moves they attempt.

All 14 students in Math 301 Fall 2022 were assessed for this learning goal.

Students were assigned a set of 65 problems in Set Theory to complete over the semester. When the students finished these problems they submitted their completed code to a shared Google Drive Folder. (In addition, Dr. Bannon gave students oral exams doing this material by hand, but this is not necessary to include for the assessment.

When does assessment occur?

Throughout the entire Fall semester.

How often does assessment occur?

Weekly

Criteria (How do you know students are achieving learning outcome?)

Averages above 80% exceed standards, scores at 70% or above meet standards and scores below 70% did not meet standards.

To pass this part of the course assessment, students were required to do at least 25 problems (and could do more for more credit). Each problem is graded out of 1 point (1 point for a correct solution, 0 point for an incorrect solution).

4. Assessment Results (Collecting/ analyzing, please identify the sample size and course number when appropriate)

Here are the number of problems completed by students in increasing order. So 85.7% of students exceeded an 80% grade on this part of the assessment.

13, 18, 21, 27, 31, 39, 43, 47, 50, 59, 67, 69, 70, 72.

Learning Outcome Met? (Based on Criteria)

Yes

Assessment

1. Major/Program Student Learning Outcomes

Student will be able to...

Communicate mathematical ideas with clarity and coherence through writing and speaking.

2. Phase

Check all that apply

- Planning/ determining procedure
- Planning/ Redesigning based on past assessment
- Collecting/ analyzing assessment data
- Discussing/ using result
- Determining if Changes had an Impact on Student Learning
- Objective not assessed this year

3. Assessment Procedures (Planning/ determining)

Method: (ex. tests, presentations, research paper, describe the assessment course and student sample when it is applicable, etc.)

Eight written homework assignments in MATH 320 were used to assess students' mathematical writing skills.
Six Presentations in MATH 320 were used to assess students' mathematical speaking skills.

MATH 320, mathematical analysis, lays the rigorous foundations of Calculus. Students complete a set of weekly homework problems and write up their solutions. Each problem is graded for correctness and quality of writing out of 5 points. Moreover, each student presents from a selected set of problems throughout the semester. Presentations are graded out of 10 points for correctness and quality.

All 9 students in MATH 320 Spring 2023 were assessed for this learning goal.

When does assessment occur?

Throughout the Spring semester.

How often does assessment occur?

Weekly

Criteria (How do you know students are achieving learning outcome?)

Averages above 80% exceed standards, scores at 70% or above meet standards and scores below 70% did not meet standards.

4. Assessment Results (Collecting/ analyzing, please identify the sample size and course number when appropriate)

The attached tables of grades for HW and Presentations in MATH 320 show that 100% of students exceeded the criteria this year.

Learning Outcome Met? (Based on Criteria)

Yes

Assessment

1. Major/Program Student Learning Outcomes

Student will be able to...

Apply mathematical models to phenomena of the natural sciences.

2. Phase

Check all that apply

- Planning/ determining procedure
-

- Planning/ Redesigning based on past assessment
- Collecting/ analyzing assessment data
- Discussing/ using result
- Determining if Changes had an Impact on Student Learning
- Objective not assessed this year

3. Assessment Procedures (Planning/ determining)

Method: (ex. tests, presentations, research paper, describe the assessment course and student sample when it is applicable, etc.)

Projects from MATH 314, Modeling in Biology, were used as a measure of mathematical modeling training. This course requires a substantive and meaningful engagement with the mathematical modeling process, and as such will provide robust data for assessing this standard, moving forward. The assessment centers around students designing, implementing, and analyzing their own mathematical model.

All 16 students in MATH 314 Fall 2022 were assessed for this learning goal.

When does assessment occur?

Over the entire fall 2022 semester.

How often does assessment occur?

It's a single project with multiple stages.

Criteria (How do you know students are achieving learning outcome?)

Averages above 80% exceed standards, scores at 70% or above meet standards and scores below 70% did not meet standards.

4. Assessment Results (Collecting/ analyzing, please identify the sample size and course number when appropriate)

See attached assessment report for details:

Exceeds 31.25% (5 students)

Meets 31.25% (5 students)

Does not meet 37.5 (6 students)

According to the results, 62.5% of the 16 students in MATH 314 met or exceeded the standards which is short of our 80% mark.

Learning Outcome Met? (Based on Criteria)

No

Assessment

1. Major/Program Student Learning Outcomes

Student will be able to...

Make conjectures and prove propositions within the axiomatic structures of mathematics.

2. Phase

Check all that apply

- Planning/ determining procedure
- Planning/ Redesigning based on past assessment
- Collecting/ analyzing assessment data
- Discussing/ using result
- Determining if Changes had an Impact on Student Learning
- Objective not assessed this year

3. Assessment Procedures (Planning/ determining)

Method: (ex. tests, presentations, research paper, describe the assessment course and student sample when it is applicable, etc.)

Each student got 8 presentation grades (throughout the entire semester). Each presentation grade consists of two grades out of 5, one for correctness and one for quality. MATH 360 is a proof and presentation based course. Students take turns to solve and present a sequence of problems and theorems in Euclidean and Non-Euclidean Geometry. This requires making conjectures and trying different ideas using Hilbert Axioms and previously established theorems. Students meet regularly with the instructor to polish their proofs.

There were only five students enrolled in MATH 360 in the fall 2022. All students were assessed for this learning goal.

When does assessment occur?

Throughout the Fall semester.

How often does assessment occur?

Weekly

Criteria (How do you know students are achieving learning outcome?)

Averages above 80% exceed standards, scores at 70% or above meet standards and scores below 70% did not meet standards.

4. Assessment Results (Collecting/ analyzing, please identify the sample size and course number when appropriate)

According to the attached table of grades for presentations in MATH360, 100% of students exceeded the standards.

Learning Outcome Met? (Based on Criteria)

Yes

Assessment

1. Major/Program Student Learning Outcomes

Student will be able to...

Use technology to enhance mathematical learning.

2. Phase

Check all that apply

- Planning/ determining procedure
- Planning/ Redesigning based on past assessment
- Collecting/ analyzing assessment data
- Discussing/ using result
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3. Assessment Procedures (Planning/ determining)

Method: (ex. tests, presentations, research paper, describe the assessment course and student sample when it is applicable, etc.)

Assessment computer lab where students had to answer questions independently using Wolfram's Mathematica.

When does assessment occur?

One of the last lab periods (end of the term).

How often does assessment occur?

Once in the fall 2022 MATH 210.

Criteria (How do you know students are achieving learning outcome?)

Averages above 80% exceed standards, scores at 70% or above meet standards and scores below 70% did not meet standards.

4. Assessment Results (Collecting/ analyzing, please identify the sample size and course number when appropriate)

There were 21 students in Fall 2022. The attached data shows that all standards were met.

Learning Outcome Met? (Based on Criteria)

Yes

Package History

Date	User	Action
7/4/2023 12:39:21 PM	Mohammad Javaheri	Submitted 'Student Learning Assessment Report'
7/4/2023 12:39:57 PM	Thomas Giarla	Received
7/4/2023 12:39:57 PM	Provost and Senior Vice President	Received
7/4/2023 12:39:57 PM	Institutional Effectiveness	Received
7/4/2023 12:39:57 PM	School of Science - Asst. Dean	Received
7/4/2023 12:39:57 PM	School of Science - Dean	Received
7/4/2023 12:39:57 PM	Mohammad Javaheri	Received
7/5/2023 1:29:40 PM	Margaret Madden	Decision Approved