BA/BS Mathematics

Annual Program Report Template

Year:	2022-2023
Program:	BA/BS in Mathematics
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Summary of Continuous Improvement Efforts since Last Report

Provide a brief description of how assessment results have been used for program improvement. Point to a specific example of how an assessment provided the program with data it could use for improvement and what that improvement was, if possible, also show evidence of the improvement. You may look at data from the two previous academic years to support this case.

Respond here:

We realized based on 2021-2022 information that we were missing substantial amounts of data due to lack of submission. We revisited efforts at department meetings in Fall 2022 to increase faculty participation and submission of work samples. Getting the correct data is the first step in our continuous improvement process so that can have enough data to analyze and create an action plan. Submissions of work samples from Fall 2022 were significantly higher than in past years, and we have implemented a data storage method to make sure that we can find that information easily for future reporting.

Starting in Fall 2022, samples collected from the exam in courses (Math 326, Math 322, Math 335, Math 372, Math 319) were graded for the

Table 1. Assessment Results and Analyses for Current Cycle.

STAGE 1: PLAN				STAGE 2: DO		STAGE 3: STUDY
Departmental Student Learning Goal	Program Student Learning Outcome	Assessment	Assessment Method/Location	Benchmark Expectations	Data Results	Actions/Goals Based on Data Results* What do the data tell you? How will you use this data? How were data from the last cycle used to make changes during this cycle, and What were the results of those changes?
Written Communication	Students should demonstrate growth and self-sufficiency in the proof-writing process.	Two work samples from each of Math 3322, Math 3350/3351, and Math 4325 will be gathered and scored on a rubric measuring

to restate the problem, the correctness of the proof, and growth between first and second submissions. | Updated: these samples are graded by the assessment committee, with at least two scores per problem collected. We have also increased outreach to faculty teaching these courses to ensure samples are submitted. The rubric used in Fall 2022 is attached in Appendix A. | At least 80% of mathematics majors should be deemed successful, have at least 50% of mathematics majors be deemed successful with an average score of 7.25 or higher | | |

					got a C or better.	Universities (AAC&U) at https://www.aacu.org/initiatives/value-initiative/value-rubrics) and will use information from this course to assess the program.
Content Proficiency Exam	Mathematics majors seeking teacher certification must take and pass the Content Proficiency Exam	Percentage of students seeking teacher certification must take the assessment and earn at least 75%.	Number of students taking this assessment and their scores on the LU Content Proficiency Test.	(80%) of the students seeking teacher certification must take and pass the LU Content Proficiency Test with a score of at least 75%.	As a result of these exams in AY 2022-2023, there are 5 students who are working on remediation plans during Summer 2023 with Dr. Couch. In 2020, 66% of students passed the LU CPT. In 2021, 0% of students passed the LU CPT exam.	We are working with Teacher Education to have better data about which students are taking this exam. We also spent Fall 2022 realigning our content in courses for teacher certification to make sure students are well-prepared for the LU CPT. Additionally, the mathematics department has created a new remediation plan for students who do not pass the exam on their first attempt after taking the required courses, relying on free materials developed in the previous year by our department.

Table 2. Continuous Improvement Results Since Last Report

Stage 4: ACT		
Actions/Goals Based on Data Results	**Status**	**Discussion of Status**
Copy last cycle's actions/goals and report on progress toward continuous improvement on those here.	*C=Complete* *P=Progressing* *N=No Action Taken*	*If C, describe efforts that led to accomplishment of*

		An updated remediation plan has been established, with students meeting in a study group with Dr. Couch during summer 2023 before their next attempt at the exam.

1: Written Communications

Means of Assessment for Outcome 1: Each mathematics major will have a portfolio that will contain, from <u>each</u> of the core courses MATH 3322, MATH 3350, and MATH 4325, a minimum of two graded work samples with written feedback and one proof of reasonable difficulty from the final exam. The department chair will assist in the maintenance of student portfolios.   After the graduating senior's portfolio is complete, the department chair will ask the appropriate faculty members to review the student portfolio, using standard rubrics, to ascertain whether growth in this area has been sufficient.

Rationale: A student completing an undergraduate degree in mathematics should demonstrate growth over time in mathematical maturity and self-sufficiency in the proof process.

Decision rule to be used to determine successful performance for Outcome 1: The appropriate faculty members will determine if the candidate has passed or failed. If the candidate achieves an average of 70% on the assessment rubrics, the candidate passes.

Rationale: The experts most able to assess student achievement are those who teach the courses involved.

Proof Rubric
Statement of the problem (5 points is the maximum - 0-2 Unacceptable, 2-

Goals

	MATHEMATICS SCORING RUBRIC: A GUIDE TO SCORING EXTENDED-RESPONSE ITEMS Mimimum passing score is 10 points, including at least 3 points for each column	
Score	MATHEMATICAL KNOWLEDGEKnowledge of mathematical principles and concepts which result in a correct solution of a problem.	STRATEGIC KNOWLEDGEIdentification and use of important

terminology and notationsØ may contain major algorithmic or computational errors

evidence of a strategy for solving the problem

Means of Assessment for Outcome 3: No less than one-third of the questions of the final examination for the course, MATH 3370 - Introduction to the Theory of Statistical Inference, will include applications of the Central Limit Theorem. At least half of the problems involved will be common problems, developed by the faculty who teach the course.

Decision rule to be used to determine successful performance for Outcome 3: The instructor of record will score the problems for correctness of the final answers.

Target: To be considered proficient in the use of the Central Limit Theorem, each mathematics major who completes this course with a grade of "C" or better, must earn at least 70% of the points available for CLT problems on the final exam for MATH 3370.

Rationale: The Central Limit Theorem is fundamental in both the study of and the applications of statistics. A student completing an undergraduate degree in mathematics
she should be able to demonstrate proficiency in solving problems involving this theorem.

Largest changes are highlighted in yellow.

Outcome 1   Written Communications

Means of Assessment for Outcome 1

Each mathematics major will have a portfolio that will contain from <u>each</u> of the core courses (MATH 3322, MATH 3350, MATH 3351, and MATH 4325) a minimum of two graded proofs of reasonable difficulty from exams. There should be a minimum of one month between when the submitted proofs were collected in order to access if the student has shown growth during the semester in their written communications skills and mathematical knowledge.

If a problem submitted has multiple parts please indicate which part is to be scored.

The proofs collected for the portfolio need to be the same proofs for each student in a particular class (they can vary from semester to semester of course) in order for the scoring to be consistent for all students in the class.

The WEAVE committee chair will oversee the collection of the proofs for the student portfolios. In the semester following the collection of the proofs the WEAVE committee chair will call together a working group consisting of instructors who have recent taught the course or recently taught courses with complementary topics to score each proof using the Correctness of Proof rubric (see next page). It is assumed that, in general, there will be a working group for each course in which proofs were collected.

In addition, once proofs from each of the three courses have been collected and scored using the Correctness of Proof rubric the working groups will convene a joint meeting to score each student using the Indication of Growth rubric (see next page).

Rule to be used to determine successful performance for Outcome 1

In order for a student to be deemed have successful performance for Outcome 1 a student should meet the following criteria.
1. An average of 6.5 or higher on all the Correctness of Proof scores with no more than two scores at 4 or below.
2. A minimum score of 2 on the Indication of Growth rubric.

Goal

At least

9 Excellent	A correct and complete proof is given.

Some irrelevant information may be included since the time limit precludes polishing up the presentation. |
| 7 8 Acceptable | A correct approach to proving the theorem is attempted.

Some statements may be unjustified or improperly justified, but errors are minor and could be fixed given time to polish the proof. |
| 5 6 Marginally Acceptable | Statements linked into a reasonable (though perhaps misguided) attempt to prove the theorem.

The proof may be left incomplete or may depend upon a major unjustified leap. |
| ⬛le | Unconnected, mostly true statements properly deduced from the given.

Listing facts without sense of how to link them to get a correct proof.

May just jump to the conclusion without justification. |

7 8	A correct approach to proving the theorem is attempted.
Acceptable	

rtfolio. Included should be cover sheet giving the scores for each of the problems that include applications of the Central Limit Theorem as well as the percentage of the total possible points from the Central Limit Theorem problems that the student achieved.

Rule to be used to determine successful performance for Outcome 3
The instructor of record will score the problems for correctness of the final answers.

Goal
At least 80%   70% of the total possible points from the Central Limit problems on the Math 3370 final exam.

Rationale
The Central Limit Theorem is fundamental in both the study of and the applications of statistics. A student completing an undergraduate degree in mathematics   should be able to demonstrate proficiency in solving problems involving this theorem.