BA/BS Mathematics

Annual Program Report Template

Year:	2022-2023
Program:	BA/BS in Mathematics
Contact Person (include email & phone#)	Jacqueline Jensen-Vallin, jjensenvalli@lamar.edu, 409-880-7859

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 examined courses (Math 4325, Math 3322, Math 3350/3351) were graded by the assessment committee instead of the individual instructors. We took the average of two scores for each paper based on the same rubric to better examine the samples gathered. Return rates were higher than in previous years, and so we have a more robust sample to use for comparisons and improvements going forward.

Program Highlights Since Last Report

Identify and briefly discuss any programmatic curriculum changes made since the last report (e.g. new courses, course changes, SLO changes, course deletions).

Respond here:

In Summer 2021 and Fall 2022, all courses were examined and student learning outcomes and course objectives were updated for all courses in response to SACSCOC feedback. These changes are through the college curriculum council and waiting for final approval from the university curriculum council.

During Fall 2022, we reexamined the curriculum being taken by students seeking certification to teach mathematics and have realigned curriculum for courses to make sure that all topics that they should know are being covered in courses required by their major. We are reactivating Math 3300 *Math History* (being offered for the first time in several years in Fall 2023) to cover missing topics from that list. Further, we are extending this course to be an elective for all math majors instead of being only for those students seeking certification.

For the 2022-2023 academic year, we are maintaining the same goals, but rewriting the rubrics for materials being gathered in Spring 2023. These updated rubrics have been approved by the assessment committee and are being used starting with Spring 2023 samples.

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 students' ability 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 in the Correctness of Proof rubric and to have at least 25% of mathematics majors be deemed successful with an average score of 8.25 or higher in the Correctness of Proof rubric.	December 2022, five students completed bachelor's degree. We had submissions for four students. Two were rated Accomplished overall and two were rated Acceptable. Rubric details are in Appendix A.	During the 2022-2023 academic year, the department implemented updated techniques for collecting data, including multiple reminders about submissions to instructors. To alleviate instructor bias, the submissions are being scored by committee. The committee is rewriting the rubric with updated rubric being to be used to score Spring 2023 samples. During the Fall 2022 scoring, we realized that the rubric is cumbersome and difficult to apply. We also received many work samples that were not proof based, which did not meet the standards of the rubric. Because of this, we have adjusted our communication with faculty to make sure we are getting proof-based samples, and have adjusted the rubrics so that they are more consistent with standardized rubrics. These will be reevaluated again after a

						couple of implementations, and we will compare them with standardized rubrics available from the AACU. Updated rubrics are in Appendix B.
Oral Communication	Students should demonstrate self-sufficiency in producing expository material and in presenting that material orally.	The student will give oral presentations in Math 3350/3351 and Math 4325 defending their solution to a problem. Students who are seeking teacher certification will also complete oral presentations in Math 4307.	Students are scored on a rubric for oral presentations by their instructors. This rubric measures the students' use of logic, their use of visual aids, their style and word choice, and their response to questions.	80% of the graduating students earn the minimum average score of 15 points on the presentation based on whether the fail to meet, meet, or exceed expectations in the items measured by the rubric.	Three graduating majors successfully completed this. Of the samples collected, all met our standard.	Since the sample size is small, little can be concluded. During the 2022-2023 academic year, the department implemented updated techniques for collecting data, including multiple reminders about submissions to instructors. The committee is rewriting the rubric with updated rubric being used starting in Spring 2023. As above, we realized that the application of the rubrics was cumbersome and not in line with the rubric for written submissions. We have rewritten these to be more consistent. Old rubrics are in Appendix A, and revisions are in Appendix B.
Central Limit Theorem	Mathematics majors will demonstrate proficiency in solving problems using the Central Limit Theorem.	At least 1/3 of the final exam in Math 3370 will contain problems relating to the Central Limit Theorem.	Points earned by students on the Central Limit Theorem problems on the final exam.	Each mathematics major who completes Math 3370 with a C or better must earn at least 70% of the points available for Central Limit Theorem problems on the final exam.	As indicated in students' folders, each of the students earned at least 70% of the points available. Out of 238 students who enrolled in MATH 3370 during the cycle Summer 2022, Fall 2022, and Spring 2023, 208	We have continued to meet this goal. During Fall 2022, the mathematics department began to re-evaluate its programmatic goals to be less course-specific. These updated goals will be more programmatic. The department has agreed (dept meeting on 25 Oct 2022) to convert one of our upper level courses (Math 4307) into a capstone course assessed using a value rubric adapted from the American Association of Colleges and

					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 **Copy last cycle's actions/goals and report on progress toward continuous improvement on those here.*	**Status** *C=Complete* *P=Progressing* *N=No Action Taken*	**Discussion of Status** *If C, describe efforts that led to accomplishment of actions/goals.* *If P, provide update on progress made toward accomplishing actions/goals and what tasks remain* *If N, discuss why action toward accomplishing actions/goals has been delayed and what work will be initiated toward accomplishment.*
Written communication: Implemented Marketing Plan Faculty were reminded via email three times during the semester to collect and submit samples.	P	Instructors are receiving reminders to submit this data for each student. The rubric was rewritten in spring of 2023, and will be used for data in that semester. This has not been thoroughly effective in terms of receiving samples. We are reorganizing our assessment team to better support these efforts, with the chair of the department now being the chair of the assessment committee.
Oral Communication: Implemented Marketing Plan Faculty were reminded at two department meetings to collect and submit samples.	P	Instructors are receiving reminders to submit this data for each student. The former rubric was found to be inconsistent with our goals. The rubric was rewritten in spring of 2023, and will be used for data in the AY 2023-2024.
Central Limit Theorem: Accomplished for second year. This goal will be replaced by assessing student performance in a new capstone course, which will first be offered in the 2023-2024 academic year.	C	In Fall 2022, the department began discussing updating our programmatic goals. This goal has been met for several years and so will be replaced an assessment of a new capstone class that will be offered in 2023-2024.
Content Proficiency Exam We did not have 100% of the students taking this exam pass. Therefore, we are conducting a curriculum audit and continuing to improve our remediation plan for students who do not pass on their first attempt.	P	In Fall 2022, the department conducted an audit of courses taken by Teaching Certification Math Majors to ensure all topics on the LU CPT are covered in at least one of the courses taken by those students. Those curriculum adjustments are still being implemented, though have been rolled out in Math 1350 and Math 3313 in spring 2023.

		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.

APPENDIX A: Fall 2022 Rubric

1: Written Communications

Means of Assessment for Outcome 1: Each mathematics major will have a portfolio that will contain, from each 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, 2-4 Marginally Acceptable, 5 Acceptable)

0-2	3-4	5
Incorrect statement of problem. May miss half of an "if and only if" or misinterpret what is given or what is to be shown. Might just recopy problem rather than give a precise restatement.	Correct but incomplete statement of the problem. Doesn't include a statement of either the given or the "to show" or fails to connect them to the diagram.	Correct statement with a labeled diagram and the given and to show stated in terms of the diagram.

Note that an improperly drawn diagram may fall into either the first or second category, depending upon the extent of the error.

Correctness of the proof (15 points is the maximum - 0-5 Unacceptable, 6-9 Marginally Acceptable, 10-14 Acceptable, 15 Excellent)

0-1	2-5	6-9	10-14	15
Mainly incorrect consequences improperly deduced from the given. Little or no sense of how to prove the result.	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.	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.	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.	A correct and complete proof is given. Some irrelevant information may be included since the time limit precludes polishing up the presentation.

If a proof should have two parts, you should assess each part separately, scaling down the scores above by half (but please make your final answer an integer). If the problem is misstated in a way to significantly change the proof, then reduce the score as appropriate (typically cutting it in half).

Note: A student who receives 6-9 points will be given the opportunity to correct the proof and a student who receives 10-14 points may be given the opportuntity to correct the proof with no additional points awarded.

Work Sample Rubric

Minimum Acceptable Score -- Growth 6 plus Correctness 6

A holist approach is required to complete this rubric. A comparison of "old" and "recent" work should indicate growth and recent work should be of high quality.

Indication of growth (15 points)

0-5 Unacceptable	6-12 Acceptable	13-15 Accomplished
Little evidence that the student has grown in mathematical ability. Work has remained marginal, even with feedback for growth.	Some evidence that the student has accepted feedback for marginal work and made changes/improvements.	The student's work was acceptable throughout OR The student accepted feedback for marginal work and improved significantly.

Note that an improperly drawn diagram may fall into either the first or second category, depending upon the extend of the error.

Correctness of most recent work (15 points)

0-1 Unacceptable	2-5 Unacceptable	6-9 Marginally Acceptable	10-14 Acceptable	15 Accomplished
Mainly incorrect consequences improperly deduced from the given. Little or no sense of how to obtain a valid result.	Unconnected, mostly valid work properly deduced from the given. Listing facts without sense of how to link them to get a valid result. May just jump to the conclusion without justification.	Work linked into a reasonable (though perhaps misguided) attempt to complete the work. Conclusions may be left incomplete or may depend upon major unjustified leaps.	Correct approaches are attempted. Some work may be unjustified or improperly justified, but errors are minor and the work could be polished.	Most recent work is correct and complete. Little irrelevant information may be included. No recent marginal work.

2: Oral Communications

	Improvement Needed	Acceptable	Accomplished
Logic	Presentation followed a somewhat logical progression. Introduction was appropriate. Some preparation was evident.	Presentation followed smooth, logical progression, was well organized and reasoned. Introduction was pertinent and conclusion reinforced main points.	Presentation provided succinct overview of the study elements, which was organized to create a logical argument. Compelling introduction and convincing conclusion.
Visual Aids	Visual aids were either inadequate or inappropriate.	Visual aids enhanced the verbal message.	Visual aids enriched the verbal message.
Delivery	Delivery was minimally effective.	Delivery was strong; communication was clear and could be heard.	Delivery was excellent; communication was compelling and convincing.
Style	Some eye contact. Appropriate dress.	Maintained good eye contact and used appropriate gestures. Professional dress.	Actively engaged audience though effective eye contact and gestures. Professional appearance and style.
Word Choice	Language was either inadequate or inappropriate for the setting.	Language was appropriate and technical.	Advanced technical language for a professional audience.
Timing	Some effort to adhere to time limitations.	Adhered to time limitations and provided time for questions.	Accomplished use of time limitations and answered all questions.
Response to Questions	Some substantive questions were not adequately answered.	Substantive questions were answered concisely and correctly. Answers illustrated in-depth knowledge	Questions were answered confidently, accurately, and reflected deep knowledge of the research topics.

Goals	1. Knowledge, skills, values2. Creative, analytical, critical thinking3. Oral and written communication, research from myriad sources4. Design and conduct research5. New and/or various methods and/or technology6. Global perspectives Circle goals met at "Minimal" level	1. Knowledge, skills, values2. Creative, analytical, critical thinking3. Oral and written communication, research from myriad sources4. Design and conduct research5. New and/or various methods and/or technology6. Global perspectives Circle goals met at "Acceptable" level	1. Knowledge, skills, values2. Creative, analytical, critical thinking3. Oral and written communication, research from myriad sources4. Design and conduct research5. New and/or various methods and/or technology6. Global perspectives Circle goals met at "Accomplished" level

Means of Assessment for Outcome 2: 1) The student will give oral presentations in MATH 3350 and MATH 4325 defending his or her solution to a problem. A written copy of the report will be added to the student's portfolio. 2) Each mathematics major taking MATH 4307 will give an oral presentation defending some problem solving strategy including a problem showing how that strategy is used. A written copy of the report will be added to the student's portfolio.

Rationale: 1) A student completing an undergraduate degree in mathematics should demonstrate a high level of mathematical maturity and self-sufficiency in producing expository material, and in presenting the material both orally and in written form. 2) Students seeking certification to teach mathematics to high school students should demonstrate proficiency, not only in providing accurate solutions for problems, but also in explaining the mathematics required for solving problems.

Decision rule to be used to determine successful performance for Outcome 2: 1) The faculty members of record for MATH 3350 and MATH 4325 will evaluate each presentation, using a standard rubric. To be considered successful, each student must earn at least 15 points, including at least 3 points in the area of Content Knowledge. 2) At least two mathematics faculty members will determine individually if the candidate successfully demonstrated proficiency in the writing assignment, including at least 3 points in Mathematical Knowledge. These scores will be averaged and this average will be included as part of the candidates final exam score. The instructor for MATH 4307 will determine whether the score earned is sufficient for the course grade.

	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 elements of a problem that represent and integrate concepts which yield the solution (e.g., models, diagrams, symbols, algorithms).	EXPLANATIONWritten explanation of the rationales and steps of the solution process. A justification of each step is provided.
4	➢ shows complete understanding of the problem's mathematical concepts and principles➢ uses appropriate mathematical terminology and notations including labeling answer if appropriate➢ executes algorithms and computations completely and correctly	➢ identifies all important elements of the problem and shows complete understanding of the relationships among elements➢ shows complete evidence of an appropriate strategy that would correctly solve the problem	➢ gives a complete written explanation of the solution process; clearly explains what was done and why it was done➢ may include a diagram with a complete explanation of all its elements➢ good grammar usage is evident throughout
3	➢ shows nearly complete understanding of the problem's mathematical concepts and principles➢ uses mostly correct mathematical terminology and notations➢ executes algorithms completely; computations are generally correct but may contain minor errors	➢ identifies most of the important elements of the problem and shows a general understanding of the relationships among them➢ shows nearly complete evidence of an appropriate strategy for solving the problem	➢ gives a nearly complete written explanation of the solution process; clearly explains what was done and begins to address why it was done➢ may include a diagram with most of its elements explained➢ acceptable grammar usage is evident throughout
2	➢ shows some understanding of the problem's mathematical concepts and principles➢ uses some correct mathematical	➢ identifies some important elements of the problem but shows only limited understanding of the relationships among them➢ shows some	➢ gives some written explanation of the solution process; either explains what was done or addresses why it was done➢ explanation is

	terminology and notations➢ may contain major algorithmic or computational errors	evidence of a strategy for solving the problem	vague, difficult to interpret, or does not completely match the solution process➢ may include a diagram with some of its elements explained➢ marginal grammar usage is evident
1	➢ shows limited to no understanding of the problem's mathematical concepts and principles➢ may misuse or fail to use mathematical terminology and notation➢ attempts an answer➢	➢ fails to identify important elements or places too much emphasis on unrelated elements➢ reflects an inappropriate strategy for solving the problem; strategy may be difficult to identify	➢ gives minimal written explanation of the solution process; may fail to explain what was done and why it was done➢ explanation does not match presented solution process➢ may include minimal discussion of the elements in a diagram; explanation of significant elements is unclear➢ poor grammar usage is evident
0	➢ no answer attempted	➢ no apparent strategy	➢ no written explanation of the solution process is provided

Achievement Target: 1) 80% of students will earn the minimum average score of 15 points on the presentation and 10 points on the paper. 2) Each student enrolled in Math 4307 is expected to earn a minimum average of 10 points, with required scores of at least 3 in Mathematical Knowledge, Strategic Knowledge, and Explanation.

Rationale: 1) Students nearing completion of a degree in mathematics should communicate mathematics orally and in writing. 2) Students who will soon be teachers should demonstrate communications abilities in mathematical knowledge, strategic knowledge, and explanation.

3. Central Limit Theorem

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 is required to earn a “C” or better in each required mathematics course, therefore he or she should be able to demonstrate proficiency in solving problems involving this theorem.

APPENDIX B – Updated Rubric

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 each 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 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 in the Correctness of Proof rubric and to have at least 25% of mathematics majors be deemed successful with an average score of 8.25 or higher in the Correctness of Proof rubric.

Rationale

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

Score	Correctness of Proof

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.
3 – 4 Unacceptable	• 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.
1 – 2 Unacceptable	• Mainly incorrect consequences improperly deduced from the given. • Little or no sense of how to prove the result.
0	• Nothing turned in

If the problem is misstated in a way to significantly change the proof, then reduce the score as appropriate (typically cutting it in half).

Score	Indication of Growth
3 Accomplished	• The student's work was acceptable throughout. • The student accepted feedback for marginal work and improved significantly.
2 Acceptable	• Evidence that the student has accepted feedback for marginal work and made changes and/or improvements but still room from improvement.
1 Marginally Acceptable	• Minimal evidence that the student has accepted feedback for marginal work and made some changes and/or improvements but still needs significant improvement.
0 Unacceptable	• Work has remained marginal, even with feedback for growth.

A holist approach is required to complete this rubric. A comparison of "old" and "recent" work should indicate growth and recent work should be of high quality.

Outcome 2 – Oral Communications

Means of Assessment for Outcome 2

Each mathematics major will give an oral presentation in MATH 3350, MATH 3351 and MATH 4325 defending his or her solution to a problem. Each mathematics major taking MATH 4307 will give an oral presentation defending a problem solving strategy including a problem showing how that strategy is used. The presentation should be no longer than 15 minutes.

The oral presentations can be done in class (which should be recorded) or a via a self-recorded video that the student provides the instructor. The instructor of the classes will, in turn, upload the videos to an online folder designated by the WEAVE committee chair. A written copy of the report will be provided to the WEAVE committee chair to be added to the student's portfolio.

In the semester following the collection of the videos 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 video using the **Oral Presentation** rubric (see next page). It is assumed that, in general, there will be a working group for each course in which videos were collected.

The Content Knowledge portion of the rubric will be used to score the students knowledge of the content in the video. The Communication Skills portion will be used to score the students ability to effectively communicate their solution to an audience. Understanding should be given to students clearly showing signs of nervousness.

Rule to be used to determine successful performance for Outcome 2

In order for a student to be deemed have successful performance for Outcome 2 a student should have an average score of 6.5 from the Content Knowledge and Communication Skills portions of the rubric with a minimum score of 6 in each area.

Goal

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 and to have at least 25% of mathematics majors be deemed successful with an average score of 8.25 or higher.

Rationale

1) A student completing an undergraduate degree in mathematics should demonstrate a high level of mathematical maturity and self-sufficiency in producing expository material, and in presenting the material orally. 2) Students seeking certification to teach mathematics to high school students should demonstrate proficiency, not only in providing accurate solutions for problems, but also in explaining the mathematics required for solving problems.

Oral Presentation

Score	CONTENT KNOWLEDGE	COMMUNICATION SKILLS
9 Excellent	• A correct and complete proof is given. • Some irrelevant information may be included since the time limit precludes polishing up the presentation.	• Clear, concise and understandable presentation. • A few minor issues in presentation due to time constraints and nerves.

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.	• Generally understandable presentation. • Minor instances of getting sidetracked and/or irrelevant information. • Minor pauses, mumbling or other distracting issues due to nerves.
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.	• Presentation that can be followed but only with effort. • Significant instances of getting sidetracked and/or irrelevant information. • Significant pauses, mumbling or other distracting issues due to nerves. • Went a few minutes past time limit.
3 – 4 Unacceptable	• 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.	• Unable to follow large portions of presentation. • Large portions of presentation were not necessary for explanation of solution. • Did not finish presentation and/or went significantly past time limit.
1 – 2 Unacceptable	• Mainly incorrect consequences improperly deduced from the given. • Little or no sense of how to prove the result.	• No real attempt to explain solution. • Most of the presentation did not address the solution to the problem.
0	• Nothing turned in	• No presentation

Outcome 3 – Central Limit Theorem

Means of Assessment for Outcome 3

No less than one fourth 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.

For each mathematics major in the class the final exam will be included in the student's portfolio. 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% of the mathematics majors should pass the class with a grade of "C" or better and must earn at least 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 is required to earn a "C" or better in each required mathematics course, therefore he or she should be able to demonstrate proficiency in solving problems involving this theorem.