Assessment Cycle Academic Year 2016 – 2017

Mathematics Bachelor of Science Program

College: Arts and Sciences

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Northwestern Mission. Northwestern State University is a responsive, Student-oriented institution that is committed to the creation, dissemination, and acquisition of knowledge through teaching, research, and service. The University maintains as its highest priority excellence in teaching in graduate and undergraduate programs. Northwestern State University prepares its Students to become productive members of society and promotes economic development and improvements in the quality of life of the citizens in its region.

College of Arts and Sciences' Mission. College of Arts and Sciences' Mission. The College of Arts & Sciences, the largest college at Northwestern State University, is a diverse community of scholars, teachers, and students, working collaboratively to acquire, create, and disseminate knowledge through transformational, high-impact experiential learning practices, research, and service. The College strives to produce graduates who are productive members of society equipped with the capability to promote economic and social development and improve the overall quality of life in the region. The College provides an unequaled undergraduate education in the social and behavioral sciences, English, communication, journalism, media arts, biological and physical sciences, and the creative and performing arts, and at the graduate level in the creative and performing arts, English, TESOL, and Homeland Security. Uniquely, the College houses the Louisiana Scholars' College (the State's designated Honors College), the Louisiana Folklife Center, and the Creole Center, demonstrating its commitment to community service, research, and preservation of Louisiana's precious resources.

Department of Mathematics. The Department of Mathematics is dedicated to the development of students for roles in academic, professional, and research careers in the various areas of the field of mathematics. The department also fosters the mathematical development of all students through our offerings in general education and support courses for other degree programs. We are committed to providing a modern, effective education to all students using traditional practices and current technology throughout our course offerings. The department delivers Bachelor of Science degrees in Mathematics with available concentrations in Healthcare Informatics and Actuarial Mathematics. A minor in Mathematics is also available.

Mathematics Program Mission Statement: The Department of Mathematics offers a Bachelor of Science in Mathematics. The coursework includes a foundation in the classic coursework in mathematics covering Calculus, Foundations, and Algebra which is enhanced with a strong student research component. All coursework is delivered

using appropriate, modern technology. Mathematics coursework is supplemented with a strong selection of courses in the Biological, Physical, and Computer Sciences. Choice of upper-level electives allows for customization of the degree emphasizing preparation for graduate school or a professional career or a mixture of both. The concentrations in Healthcare Informatics and Actuarial Mathematics also require an Internship experience further preparing the student for a professional career.

Methodology: The assessment process for the BS program is as follows:

(1) Data from assessment tools (both direct – indirect, quantitative and qualitative) are collected and returned to the department head;

(2) The department head will analyze the data to determine whether students have met measurable outcomes;

(3) Results from the assessment will be discussed with the faculty;

(4) The Department Head, in consultation with the Advisory Committee, will propose changes to measurable outcomes, assessment tools for the next assessment period and, where needed, curricula and program changes.

Student Learning Outcomes:

SLO 1. Students will gain a strong understanding of the fundamental ideas, concepts, and applications of mathematics

Course Map: Tied to course syllabus objectives.

MATH2110: Analytic Geometry and Calculus II
MATH3100: Modern Algebra I
MATH4950: Mathematics – A Capstone Course

Measure 1.1. (Direct – other)

MATH2110 is taken at the end of the freshman year. MATH3100 is the last explicitly required course before the student begins taking upper-level electives in mathematics. MATH4950 is the senior research project course taken shortly before graduation. By looking at the pass rate in each of these courses, we get a sense of whether our majors are making progress. Our targets are 75% of Mathematics majors earn a Grade of C or higher in 2110. 90% of Mathematics majors earn a Grade of C or higher in 3100 and 4950.

Finding:

- MATH2110 – 5 of 5 math majors met the goal
  (3 of 3 in Fall 2016, 2 of 2 in Spring 2017)
- MATH3100 – 3 of 4 math majors met the goal

(3 of 4 in Fall 2016, not taught in Spring 2017)
- MATH4950 – 6 of 6 math majors met the goal
(4 of 4 in Fall 2016, 2 of 2 in Spring 2017)

Analysis: We met our goal in 2 of 3 courses. This is a marked improvement in MATH2110 and consistent mastery in MATH4950. We may need to asses our goal in MATH3100; for two of the last three years we have missed the goal of 90% success because our numbers are so small that only one student making less than a C causes us to fall short. On the other hand, it was the very same student in fall 2015 and fall 2016 who failed to earn a C in MATH3100. This may be more of a statistical anomaly than a trend.

Action - Decision or Recommendation: Our added attention towards the calculus sequence seems to have produced better results in MATH2110. Senior faculty will discuss whether changes need to be made in MATH3100.

Measure 1.2. (Indirect – Attitude)

Students make a self-assessment of their preparation in the Graduating Senior Survey. We examine responses to questions on the ability to “reason abstractly” and “Use numerical data and statistics.” Our targets are 75% or more of Mathematics majors will report "Satisfied" or "Very Satisfied" to the questions regarding how their education has helped them in these areas.

Finding: 100% of respondents reported “Very Satisfied” in both areas.
- (2 of 2 responses in Fall 2016, 2 of 7 responses in Spring 2017)

Analysis: We seems to be doing very well in this area although it is regrettable that only 2 of our 7 spring graduates responded to the survey.

Action - Decision or Recommendation: We will make an effort to remind students in senior-level classes of the importance of completing this instrument.

SLO 2. Students will demonstrate a college-level proficiency in oral communication of mathematical concepts.

Course Map: Tied to course syllabus below.

MATH1010: Introduction to Mathematics
MATH2080: Fundamentals of Proof
MATH4950: Mathematics

Measure: 2.1. (Direct – Skill/Activity)

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All mathematics majors take MATH1010 the first fall semester they are a major. Since MATH1010 is a pass-fail graded course, we only have successful/unsuccessful grades on their assignments. Their final project is to make a presentation on a career in mathematics which they have researched. Our target is for 75% of mathematics majors to give a successful final presentation.

Finding: This course is only taught in the fall semesters. This fall, we had 5 mathematics majors. Of these, all 5 made a passing grade on the final presentation for a 100% success rate.

Analysis: This is our 2nd year in a row for 100% success and our 3rd above 90%.

Action - Decision or Recommendation: The data suggests our current approach in MATH1010 is effective.

Measure: 2.2. (Direct – Skill/Activity)

Mathematics majors take MATH2080 the fall of their sophomore year. In this course, students are required to present solutions of proofs on the board. Students only receive credit for the presentation if it is correct and complete. At least 75% of mathematics majors in MATH2080 will complete the required quota of presentations (this quota varies from year to year based on the size of the class).

Finding: This course is only taught in the fall semesters. This fall, we had 2 mathematics majors enrolled in the class. Of these, both met the quota for a 100% success rate.

Analysis: We are back over our target this year after narrowly missing it the year before. Putting a greater emphasis on the presentations component of the course seems to have worked.

Action - Decision or Recommendation: We will continue with the same approach for the next academic year and reassess after another set of data.

Measure: 2.3. (Direct – Skill/Activity)

All mathematics majors take MATH4950 either the last or next to last semester before graduation. This class involves an independent research project which culminates in a paper and a public presentation. At least 75% of mathematics majors in MATH4950 will score 7 out of 10 or better on the presentation rubric on their final presentation.

Finding: Fall 2016 – There were 4 mathematics majors enrolled in the course. Of these, 3 scored 7/10 or better (the remaining one scored 6/10). Spring 2017 – There

were 2 mathematics majors enrolled in the course. Of these, 2 scored 7/10 or better. For the academic year 5 or 6 met the goal for a 83% success rate.

Analysis: We have met our target, but it would be desirable to have a higher rate.

Action - Decision or Recommendation: We will continue to stress the importance of the Final Presentation in MATH4950.

SLO 3. The students will demonstrate proficiency in written communication of mathematical concepts.

Course Map: Tied to course syllabus below.

MATH3100: Modern Algebra I
MATH4950: Mathematics – A Capstone Course

Measure 3.1. (Direct – Skill/Activity)

MATH3100 is the last required course before majors begin their upper-level elective courses in mathematics. Responses to questions on the final exam will be analyzed to determine if students are writing about mathematics at the appropriate level. At least 75% of students will display the ability to write cogently and logically.

Finding: This course is only taught in the fall semester. There were 5 mathematics majors in the course in the fall 2016. Of these, 4 displayed written skills at an acceptable level in this course. This is a success rate of 80%.

Analysis: We have achieved our goal in this course. Ideally, all students would meet this standard.

Action - Decision or Recommendation: Our approach in this class seems to be working well. We will implement an early warning program whereby students who are not displaying competency on the 3 unit test will be offered additional assistance in improving their writing.

Measure: 3.2. (Direct – Skill/Activity)

All mathematics majors take MATH4950 either the last or next to last semester before graduation. This class involves an independent research project which culminates in a paper and a public presentation. At least 75% of mathematics majors in MATH4950 will score 10 out of 14 or better on the rubric for their final paper.

Finding: Fall 2016 – There were 4 mathematics majors enrolled in the course. Of these, 3 scored 10/14 or better. Spring 2017 – There were 2 mathematics majors

enrolled in the course. Of these, 2 scored 10/14 or better. For the academic year 5 or 6 met the goal for a 83% success rate.

Analysis: We have met our target, but it would be desirable to have a higher rate

Action - Decision or Recommendation: We will continue to stress the importance of the Final Paper in MATH4950.

SLO 4. Students will demonstrate proficiency in use of technology for problem solving and communication

Course Map: Tied to course syllabus below.

MATH2110: Analytic Geometry and Calculus II
MATH4950: Mathematics – A Capstone Course

Measure 4.1. (Direct – Skill/Activity)

MATH2110 is the second semester of Calculus. The use of technology is integrated into this course. A survey of questions on the final exam which require technology to answer will allow us to assess whether mathematics majors have mastered the appropriate skills. Our target is 75% of students will display competency with technology.

Finding: Fall 2016 – There were 3 mathematics majors enrolled in the course. Of these, 3 displayed proficiency. Spring 2017 – There were 2 mathematics majors enrolled in the course. Of these, 2 displayed proficiency. For the academic year 5 of 5 displayed proficiency for a 100% success rate.

Analysis: For the first time in 3 years, we have met this goal.

Action - Decision or Recommendation: We will maintain the focus on the usage of technology which has led to improvements in this area.

Measure 4.2. (Direct – Skill/Activity)

All mathematics majors take MATH4950 either the last or next to last semester before graduation. This class involves an independent research project which culminates in a paper and a public presentation using presentation software. The “organization” portion of the presentation rubric evaluates the ability to integrate equations, mathematical symbols, graphs, and other illustrations into an electronic presentation. Our target is 75% of mathematics majors will earn a score of 2 out of 3 or better on Organization on their final presentation.

Finding: There were 4 mathematics majors enrolled in the course. Of these, 4 scored 2/3 or better on Organization. Spring 2017 – There were 2 mathematics majors enrolled in the course. Of these, 2 scored 2/3 or better on Organization. For the academic year 6 or 6 met the goal for a 100% success rate.

Analysis: This continues to be an area of strength in our program.

Action - Decision or Recommendation: There seems to be no need to change what we are doing in this area. We will discuss whether a more granular measure would be appropriate.

Measure 4.3. (Direct – Student Artifact)

All mathematics majors take MATH4950 either the last or next to last semester before graduation. This class involves an independent research project which culminates in a paper and a public presentation. A rating of Satisfactory or better on the Conventions and Clarity portions of the paper rubric displays the ability to integrate equations, mathematical symbols, graphs, and other illustrations into text. Our target is 75% of mathematics majors will score Satisfactory or better on the Conventions and Clarity portion of the paper rubric.

Finding: There were 4 mathematics majors enrolled in the course. Of these, 3 scored Satisfactory or better on Clarity, and all did so on Conventions. Spring 2017 – There were 2 mathematics majors enrolled in the course. Of these, both scored Satisfactory or better in both areas. For the academic year, 5 of 6 met the goal for Clarity (83% success rate) and 6 of 6 met the goal for Conventions (100% success rate)

Analysis: This continues to be an area of strength in our program.

Action - Decision or Recommendation: There seems to be no need to change what we are doing in this area. We are reevaluating the rubric we use for the paper to better measure this outcome.

SLO 5. Students will develop the ability to think in an analytical fashion.

Course Map: Tied to course syllabus below.

MATH2080: Fundamentals of Proof
MATH4950: Mathematics – A Capstone Course

Measure 5.1. (Direct - Skill)

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MATH2080 is the first course in the mathematics major where students are expected to write at length about mathematics. Responses to questions on the final exam in this course will be evaluated with regard to whether or not the student can write about mathematics in a clear and logically rigorous manner. Our target is for 75% or higher of mathematics majors to show proficiency on this measure.

Finding: This course is only taught in the fall semester. In fall 2016, there were 2 mathematics majors enrolled in the course. Of these 2 demonstrated appropriate levels of skill in critical thinking and analysis on their Final Exam for a success rate of 100%.

Analysis: This is an improvement over last year's results. Additional emphasis on this area seems to have helped.

Action - Decision or Recommendation: We need to collect data for another academic year before making additional pedagogical adjustments to MATH2080.

Measure 5.2. (Direct - Knowledge)

All mathematics majors take MATH4950 either the last or next to last semester before graduation. This class involves an independent research project which culminates in a paper and a public presentation. A rating of Satisfactory or better on the Organization and Depth portions of the paper rubric displays the think analytically. Our target is 75% of mathematics majors will score Satisfactory or better on the Organization and Depth portion of the paper rubric.

Finding: There were 4 mathematics majors enrolled in the course. Of these, 3 scored Satisfactory or better on Depth, and all did so on Organization. Spring 2017 – There were 2 mathematics majors enrolled in the course. Of these, both scored Satisfactory or better in both areas. For the academic year, 5 of 6 met the goal for Depth (83% success rate) and 6 of 6 met the goal for Organization (100% success rate)

Analysis: Analysis: This continues to be an area of strength in our program.

Action - Decision or Recommendation: There seems to be no need to change what we are doing in this area. We are reevaluating the rubric we use for the paper to better measure this outcome.

Summary of key findings and or decisions.

We have met our targets in all but one of the measures, and we have partial success there. There are a few areas where we need to continue to make progress which were noted above. All in all we are satisfied with our performance.

We do have some concerns about the rubrics we use to evaluate papers and presentations in MATH4950. We are using a slightly modified format that we found a number of years past through search the literature. Over the summer, we will have

discussions about designing a rubric that more directly addresses our outcomes and measures.

Once we are satisfied with these rubrics, we will modify and simplify them for use in assessing the written work and presentation from MATH1010, 2080, and 3100. This should give our assessments a more accurate longitudinal view of our students' progress.