Assessment Cycle 2020-2021

Mathematics – Core Competency #2. To apply mathematical and analytical reasoning skills.

Prepared by: Frank Serio **Date: 12 July 2021**

Approved by: Greg Handel **Date: 12 July 2021**

Northwestern Mission. Northwestern State University is a responsive, student-oriented institution committed to acquiring, creating, and disseminating knowledge through innovative teaching, research, and service. With its certificate, undergraduate, and graduate programs, Northwestern State University prepares its increasingly diverse student population to contribute to an inclusive global community with a steadfast dedication to improving our region, state, and nation.

Northwestern Core Curriculum. Northwestern has a broadly-based core curriculum that is central to the University's mission and consistent with the Louisiana Board of Regents' requirements for general education survey courses applicable to all students regardless of their major. The core encompasses the knowledge and abilities that Northwestern believes are essential to college graduates. Its requirements are designed to improve students' writing and speaking, to expand students' aptitude in mathematics and its applications, to strengthen students' understanding of biological, physical, social, and behavioral sciences, and to develop an appreciation and knowledge of the arts and humanities.

The goal of the core curriculum is for undergraduate students, depending on their respective degree program, to obtain appropriate learning outcomes for this general education competency.

Methodology: The assessment process includes:

(1) Students must complete one of the following Core sequences:

Course Name - Sequence	Methodology	Target	Term
Math 1020 & 1060	Quiz	70%	Fall and Spring
Math 1035 & 1060	Quiz	70%	Fall and Spring
Math 1020 & 1090	Quiz	70%	Fall and Spring
Math 1020 & 2010	Quiz	70%	Fall and Spring
Math 1810	Quiz	70%	Fall and Spring
Math 2100 & 2110	Quiz	70%	Fall and Spring

The first four sequences are offered online as well as face-to-face. The last two are only taught face-to-face at the Natchitoches campus.

We will administer a quiz near the end of each core class according to the schedule below. If the course is taught online, we will administer this quiz through Moodle or MyMathLab whether the class is an online section or not. Quizzes will be administered in-class to the students in courses that are only taught face-to-face.

Assessment Cycle 2020-2021

Course Name	Administration Semester
Math 1020	Fall
Math 1035	Fall
Math 1060	Spring
Math 1090	Spring
Math 2010	Spring
Math 1810	Fall and Spring
Math 2100	Fall and Spring
Math 2110	Fall and Spring

(2) Data from the assessment tools (direct & indirect and quantitative & qualitative) are collected and returned to the executive director at the end of each term indicated (see Student Learning Outcomes section, below, for details).

(3) The executive director will analyze the data to determine whether the applicable outcomes are met:

(4) Results from the assessment will be discussed with the appropriate staff members.

(5) The executive director, in consultation with the staff and senior leadership, will determine proposed changes to measurable outcomes, assessment tools for the next assessment period and, where needed, service changes.

Note. *During Assessment Cycle 2020-2021, the COVID-19 virus forced Northwestern State University to reevaluate how to execute its mission. Through deliberate planning, the (Department) substantially modified courses, programs, facilities, services, and resources to enhance learning while protecting the health and safety of students, faculty, and staff.*

Assignments and student learning assessments were modified to maximize the principles of equitable evaluation and assure the highest quality in-person classes, online delivery of courses, and hybrid face-to-face and virtual studies. Technological equipment and resources were updated and expanded to provide high academic quality and flexibility while using lower bandwidth.

Student learning outcomes guide the design and delivery of instruction to ensure student learning. While the assessment process continues, it would be naïve to assume this academic program assessment has not been affected – the degree of which is based on individual courses and student. However, because of the tireless efforts of the faculty and staff, we continue strive to provide extraordinary academic and experiential student learning opportunities despite these trying times.

Student Learning Outcomes (SLO):

SLO 1 Students will apply mathematics/analytical reasoning skills by translating a word problem into an appropriate mathematical model and translating the solution of a model into an answer to a practical problem.

Measure 1.1. *Methodology:* Direct Measure – Quiz administered in each class. Target: 70% of students will attain a score of 2 (Acceptable) on the questions that ask the student to pick an appropriate mathematical model for a problem.

Course Name	Methodology	Target	Term
Math 1020	Quiz	70%	Fall
Math 1035	Quiz	70%	Fall
Math 1060	Quiz	70%	Spring
Math 1090	Quiz	70%	Spring
Math 1810	Quiz	70%	Fall and Spring
Math 2010	Quiz	70%	Spring
Math 2100	Quiz	70%	Fall and Spring
Math2110	Quiz	70%	Fall and Spring

Finding. 1327 students (of whom 60 were Dual Enrollment) were assessed 872 met the goal (65.7%). Target not met.

Analysis. In AC 2019-2020 the target was not met.

MATH1020 – 603 responses – 379 or 62.9% met goal.
MATH1035 – 141 responses – 43 or 30.5% met goal.
MATH1060 – 579 responses – 351 or 72.8% met goal.
MATH1090 – 103 responses – 87 or 84.5% met goal.
MATH2010 – 40 responses – 35 or 87.5% met goal.
MATH1810 – 20 responses – 13 or 65.0%met goal.
MATH2100 – 12 responses – 11 or 91.7% met goal.
MATH2110 – 12 responses – 11 or 91.7% met goal.

Looking at last year's data course by course, we see five of the courses – 1060, 1090, 2010, 2100, and 2110 – performed well meeting our goal of 70%. Two courses – 1020 and 1810 – were close to this goal, and only 1035 fell well short of meeting the target. The three underperforming classes are all typically taken by first-time entering freshmen.

Based on our analysis of the results from AY2019-2020, we implemented the following changes for AY2020-2021. Faculty devoted more instructional time to choosing a correct mathematical model. In addition, faculty included exercises on the topic of choosing the correct model during all review session before exams as this is the most effective time to reinforce this skill.

As a result, in 2020-2021 the target was again not met.

MATH1020 – 594 responses – 316 or 53.2% met goal.
MATH1035 – 89 responses – 51 or 65.1% met goal.
MATH1060 – 455 responses – 333 or 73.2% met goal.
MATH1090 – 96 responses – 88 or 91.7% met goal.
MATH2010 – 56 responses – 50 or 89.3% met goal.
MATH1810 – 15 responses – 6 or 40.0%met goal.
MATH2100 – 15 responses – 14 or 93.3% met goal.
MATH2110 – 7 responses – 7 or 100% met goal.

The five courses that were already doing well have continued to do so. MATH1020 and 1810 showed some backsliding, and MATH1035 had remarkable improvement. It would seem there is some value to the changes we implemented, but additional actions are needed.

Decision or action to drive future improvement. In 2020-2021, the target was not met. Based on the analysis of the 2020-2021 results, the faculty will implement the following changes in 2021-2022 to drive the cycle of improvement:

- Questions like those used in the Assessment Quiz will be included on regular exams throughout the course. This will insure we are not asking a question on the Assessment Quiz unlike anything they have seen before.
- A committee will be appointed to review all Assessment Quizzes to ensure that the questions are of appropriate difficulty for the course and congruent with the material taught. Particular attention will be paid to 1035 and 1810 which are markedly underperforming.

Measure 1.2. *Methodology*: Direct measure – Quiz administered in each class. Target: 80% of students will attain a score of 2 (Acceptable) on questions that ask the student to interpret the solution to a mathematical model as an answer to a practical problem. Further in each course, at least 70% of students will attain a score of 2.

Course Name	Methodology	Target	Term
Math 1020	Quiz	70%	Fall
Math 1035	Quiz	70%	Fall
Math 1060	Quiz	70%	Spring
Math 1090	Quiz	70%	Spring
Math 1810	Quiz	70%	Fall and Spring
Math 2010	Quiz	70%	Spring
Math 2100	Quiz	70%	Fall and Spring
Math2110	Quiz	70%	Fall and Spring

Finding. 1327 students (of whom 60 were Dual Enrollment) were assessed 1095 met the goal (82.6%). Two of the eight courses did not meet the goal of 70%. Target not met.

Analysis. In 2019-2020 the target was met.

MATH1020 – 603 responses – 505 or 83.7% met goal.
MATH1035 – 141 responses – 56 or 39.7% met goal.
MATH1060 – 579 responses – 468 or 80.8% met goal.
MATH1090 – 103 responses – 99 or 96.1% met goal.
MATH2010 - 40 responses – 32 or 80.0% met goal.
MATH1810 – 20 responses – 16 or 80.0%met goal.
MATH2100 – 12 responses – 10 or 83.3% met goal.
MATH2110 – 12 responses – 11 or 91.7% met goal.

Looking at last year's data course by course, we see that every course except for MATH1035 met the 70% goal individually, and we did meet the goal overall. There were specific concerns with 1035 and the course syllabus had been redesigned. We decided to review the Assessment Quiz for this course to insure it matched the new list of topics.

Based on our analysis of the results from AY2019-2020, we implemented the following changes for AY2020-2021. Faculty focused more instructional time on using the solution of a mathematical model to answer questions from a word/story/practical problem. Since we met our overall goal, the goal was set that each individual course would meet the target of 70% of students scoring 2 or better on this component and that overall, we will have 80% of all students score 2 or higher.

As a result, in 2020-2021 the target was not met. The overall goal of 80% was achieved in the aggregate, but we did not meet the subsequent goal of 70% or higher in each course.

MATH1020 – 594 responses – 480 or 80.8% met goal.
MATH1035 – 89 responses – 51 or 60.6% met goal.
MATH1060 – 455 responses – 387 or 85.1% met goal.
MATH1090 – 96 responses – 96 or 100% met goal.
MATH2010 - 56 responses – 50 or 89.4% met goal.
MATH1810 – 15 responses – 6 or 40.0%met goal.
MATH2100 – 15 responses – 15 or 100% met goal.
MATH2110 – 7 responses – 7 or 100% met goal.

Six of the seven courses that met last year's goal, met the new goal for this year. MATH1035 showed dramatic improvement. Unfortunately, we had a big downturn for MATH1810. It would seem there is some value to the changes we implemented, but additional actions are needed.

Decision or action to drive future improvement. In 2020-2021, the target was not met. Based on the analysis of the 2020-2021 results, the faculty will implement the following changes in 2021-2022 to drive the cycle of improvement:

- Questions like those used in the Assessment Quiz will be included on regular exams throughout the course. This will insure we are not asking a question on the Assessment Quiz unlike anything they have seen before.

- A committee will be appointed to review all Assessment Quizzes to ensure that the questions are of appropriate difficulty for the course and congruent with the material taught. Particular attention will be paid to 1035 and 1810 which are markedly underperforming.

SLO 2. Students will demonstrate the ability to solve a mathematical problem through algebraic, graphical/geometrical, or numerical/statistical methods as appropriate.

Measure 2.1 *Methodology*: Direct measure – Quiz administered in each class. Target: 75% of students will attain a score of 2 (Acceptable) on the questions that ask a student to solve a problem stated in mathematical symbology. Further in each course, at least 70% of students will attain a score of 2.

Course Name	Methodology	Target	Term
Math 1020	Quiz	70%	Fall
Math 1035	Quiz	70%	Fall
Math 1060	Quiz	70%	Spring
Math 1090	Quiz	70%	Spring
Math 1810	Quiz	70%	Fall and Spring
Math 2010	Quiz	70%	Spring
Math 2100	Quiz	70%	Fall and Spring
Math2110	Quiz	70%	Fall and Spring

Finding. 1327 students (of whom 60 were Dual Enrollment) were assessed 1065 met the goal (80.3%). Three of the eight courses did not meet the goal of 70%. Target not met.

Analysis. In AC 2019-2020 the target was met.

MATH1020 – 603 responses – 532 or 96.5% met goal.
MATH1035 – 141 responses – 40 or 28.4% met goal.
MATH1060 – 579 responses – 353 or 61.0% met goal.
MATH1090 – 103 responses – 72 or 69.9% met goal.
MATH2010 – 40 responses – 34 or 85.0% met goal.
MATH1810 – 20 responses – 20 or 100%met goal.
MATH2100 – 12 responses – 11 or 91.7% met goal.
MATH2110 – 12 responses – 12 or 100% met goal.

Looking at last year's data course by course, we see that five courses met the goal of 70% - 1020, 2010, 1810, 2100, and 2110. MATH1060 and 1090 were close to meeting the goal; only MATH1035 fell far short. We did, however, meet the goal overall. There were specific concerns with 1035 and the course syllabus had been redesigned. We decided to review the Assessment Quiz for this course to insure it matched the new list of topics.

Assessment Cycle 2020-2021

Based on our analysis of the results from AY2019-2020, we implemented the following changes for AY2020-2021: Faculty placed more emphasis on standard techniques for straightforward problems. Since we met our overall goal, the new goal was set that each individual course meets the target of 70% of students scoring 2 or better on this component and that overall, we will have 75% of all students score 2 or higher.

As a result, in 2020-2021 the target was not met. The overall goal of 75% was achieved in the aggregate, but we did not meet the subsequent goal of 70% or higher in each course.

MATH1020 – 594 responses – 571 or 96.1% met goal.
MATH1035 – 89 responses – 61 or 68.5% met goal.
MATH1060 – 455 responses – 272 or 59.8% met goal.
MATH1090 – 96 responses – 82 or 85.4% met goal.
MATH2010 - 56 responses – 52 or 92.9% met goal.
MATH1810 – 15 responses – 6 or 40.0%met goal.
MATH2100 – 15 responses – 14 or 93.3% met goal.
MATH2110 – 7 responses – 7 or 100% met goal.

Four of the five courses that previous met the goal – 1020, 2010, 2100, and 2110 – continued to do well. MATH1090 which had previous not met goal did so easily this year. MATH1035 made a dramatic improvement but still did not quite make the goal. MATH1060 and 1810 showed mild and dramatic downturns, respectively. It would seem there is some value to the changes we implemented, but additional actions are needed.

Decision or action to drive future improvement. In 2020-2021, the target was not met. Based on the analysis of the 2020-2021 results, the faculty will implement the following changes in 2021-2022 to drive the cycle of improvement:

- Questions like those used in the Assessment Quiz will be included on regular exams throughout the course. This will insure we are not asking a question on the Assessment Quiz unlike anything they have seen before.
- A committee will be appointed to review all Assessment Quizzes to ensure that the questions are of appropriate difficulty for the course and congruent with the material taught. Particular attention will be paid to 1035 and 1810 which are markedly underperforming.

Measure 2.2. *Methodology*: Direct measure – Quiz administered in each class. Target: 70% of students will attain a score of 2 (Acceptable) on the questions that ask a student to solve a word problem.

Course Name	Methodology	Target	Term
Math 1020	Quiz	70%	Fall
Math 1035	Quiz	70%	Fall
Math 1060	Quiz	70%	Spring
Math 1090	Quiz	70%	Spring

Math 1810	Quiz	70%	Fall and Spring
Math 2010	Quiz	70%	Spring
Math 2100	Quiz	70%	Fall and Spring
Math2110	Quiz	70%	Fall and Spring

Finding. 1327 students (of whom 60 were Dual Enrollment) were assessed. 911 met the goal (68.7%). Target not met.

Analysis. In AC 2019-2020 the target was not meet.

MATH1020 – 603 responses – 412 or 68.3% met goal.
MATH1035 – 141 responses – 56 or 39.7% met goal.
MATH1060 – 579 responses – 325 or 56.1% met goal.
MATH1090 – 103 responses – 88 or 85.4% met goal.
MATH2010 – 40 responses – 36 or 90.0%met goal.
MATH1810 – 20 responses – 13 or 65.0%met goal.
MATH2100 – 12 responses – 12 or 100% met goal.
MATH2110 – 12 responses – 10 or 83.3% met goal.

Looking at last year's data course by course, we see that four courses met the goal of 70% - 1090, 2010, 2100, and 2110. MATH1020 and 1810 were close to meeting the goal; MATH1035 and 1060 fell far short. All this contributed to our not meeting the overall goal.

Based on our analysis of the results from AY2019-2020, we implemented the following changes for AY2020-2021: since we have now separated the issues with solving word/story problems from those of straightforward problems, we see our issues with Measure 1.1 are related to these. The same strategies should be effective. Faculty plan to devote more instructional time to choosing a correct mathematical model. In addition, faculty will include exercises on the topic of choosing the correct model during all review session before exams as this is the most effective time to reinforce this skill.

As a result, in 2020-2021 the target was not met.

MATH1020 – 594 responses – 420 or 70.7% met goal.
MATH1035 – 89 responses – 51 or 57.3% met goal.
MATH1060 – 455 responses – 273 or 60.0% met goal.
MATH1090 – 96 responses – 88 or 91.7% met goal.
MATH2010 - 56 responses – 52 or 92.9% met goal.
MATH1810 – 15 responses – 6 or 40.0%met goal.
MATH2100 – 15 responses – 14 or 93.3% met goal.
MATH2110 – 7 responses – 7 or 100% met goal.

All four of the courses that previous met the goal – 1090, 2010, 2100, and 2110 – continued to do well. MATH1020 which had previous almost met goal did so this year. MATH1035 made a dramatic improvement but still did not quite make the goal. MATH1060 made a modest improvement, but still did not meet the

goal. Lastly, 1810 showed a dramatic downturn. It would seem there is some value to the changes we implemented, but additional actions are needed.

Decision or action to drive future improvement. In 2020-2021, the target was not met. Based on the analysis of the 2020-2021 results, the faculty will implement the following changes in 2021-2022 to drive the cycle of improvement:

- Questions like those used in the Assessment Quiz will be included on regular exams throughout the course. This will insure we are not asking a question on the Assessment Quiz unlike anything they have seen before.
- A committee will be appointed to review all Assessment Quizzes to ensure that the questions are of appropriate difficulty for the course and congruent with the material taught. Particular attention will be paid to 1035 and 1810 which are markedly underperforming.

Comprehensive Summary of Key Evidence of improvement based on the analysis of results. *Provided are all the things implemented in 2020-2021 to seek improvement based on the analysis of AC 2019-2020 assessment results.*

- Increased instruction in the process of mathematical modeling, guidelines for choosing the correct mathematical model, and interpreting the solution of a mathematical model.

- Change the type of exam given in all classes. The faculty felt the questions on critiquing a model were no longer helpful. Questions were included to help distinguish between the skills of solving a straightforward symbolic problem and the more advanced word/story problems.

Plan of Action moving forward. We have concerns about students who are doing well in the courses are doing markedly less well on the Assessment Quiz. To address these concerns, we will adopt the following policies:

- Questions like those used in the Assessment Quiz will be included on regular exams throughout the course. This will insure we are not asking a question on the Assessment Quiz unlike anything they have seen before.
- A committee will be appointed to review all Assessment Quizzes to ensure that the questions are of appropriate difficulty for the course and congruent with the material taught and that the Assessment Quizzes for all courses are of the same challenge level.

Areas to be addressed in specific courses:

- MATH1020. The results were better for Measure 2.2 than for Measure 1.1 even though all the skills involved in 1.1 are also needed for 2.2. The assessment instrument needs to be reviewed.

- MATH1035. Results from this course made a marked improvement this year. Particular attention will be devoted to instrument for this course to insure it is congruent with the material taught.

- MATH1810. Results for this class were also dramatically different. Faculty will reassess the assessment instrument before it is administered again.

- MATH1060. There was some downturn in results for this class. The disruption caused by the Covid19 pandemic had the greatest effect on this course. The other courses assessed in the spring semester all meet in relatively small sections, and the students in these other courses are all STEM majors.

- MATH1060 is the terminal mathematics course for many students in the humanities; not being able to receive face-to-face instruction could be reasonably expected to have more of an impact on this population. in AY 2019 -2020 we assessed 579 students in MATH1060. In AY 2020-2021, we assessed only 455. Clearly a greater number of students in MATH1060 failed to complete this class.