

Assessment Cycle 2019-2020

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

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Date: 06/19/2020

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.

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

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taught face-to-face.

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.

Changes were made to our SLOs and Measures for AY 2019 – 2020. Faculty in the Department of Mathematics felt a realignment and reemphasis was needed. Previously SLO1 was about choosing a mathematical model and SLO2 was about solving and interpreting solutions of a mathematical model. More granular data was needed on the process of solving a mathematical mode. To this end, SLO1 was rewritten to cover both the choosing of a mathematical model and the interpretation of one. Measure 2.2 became the new Measure 1.2, and the old Measure 1.2 was discarded. SLO2 is now concerned only with solving a mathematical model, and it has two new measures that cover straightforward problems given in mathematical notation and word/story problems. Thus, the old Measure 2.1 has been expanded into two new Measures 2.1 and 2.2

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.

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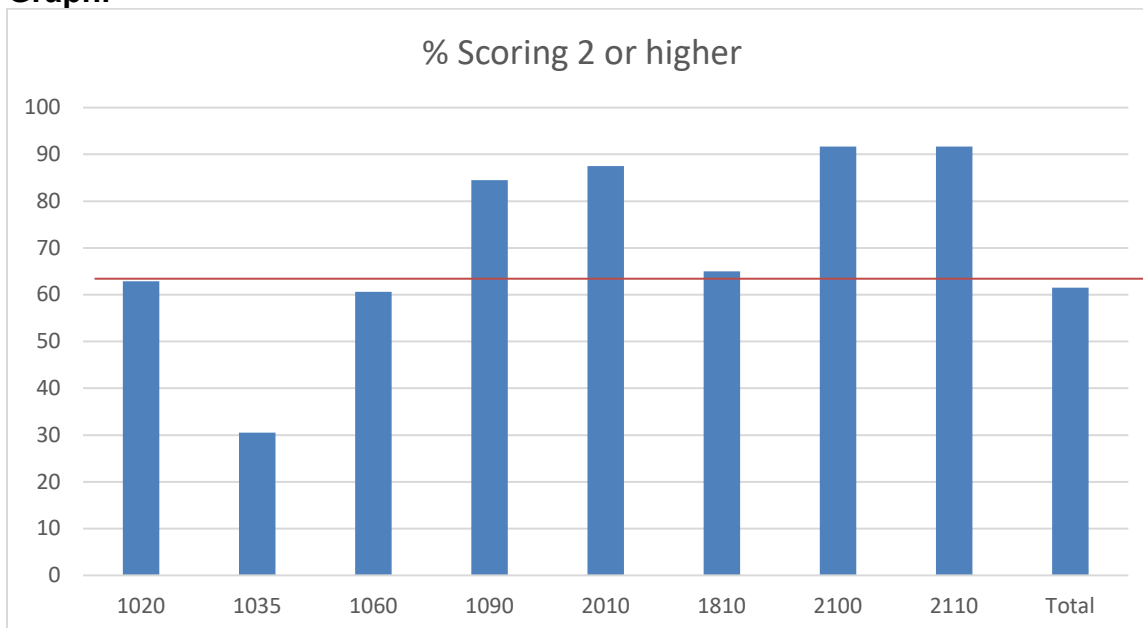
Measure 1.1. Methodology: Direct Measure – Quiz administered in each class. Target: 70% of students will attain a score of 2 (Acceptable) on the questions that ask the student to pick an appropriate mathematical model for a problem.

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. 1510 students were assessed 930 or 61.5% met the goal. Target 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

Graph.



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Analysis. The University modified its General Education Core Curriculum to include six competencies which help to fulfill its mission and are in accordance with the Louisiana Board of Regents requirements for general education. The competency relevant to the Department of Mathematics is the following: to expand students' aptitude in mathematics and its applications. This new competency has two student learning outcomes with two different measures. New quiz-based assessments were developed for each of eight core classes in mathematics. These were administered for the first time in AY2018-2019. Our target of 70% was not met with only 64.3% (965 of 1500) of responding students reaching a score of 2 or higher on the quizzes.

Based on the analysis of the 2018-2019 results, our plan of action this past academic year was to increase the amount of instructional time spent on choosing a mathematical model. As a result, only 61.5% achieved a score of 2 or higher. Looking at these results course by course MATH1020, 1035, and 1060 did notably worse this year. MATH1090, 2010, and 1810 showed modest improvement. MATH2100 and 2110 were roughly the same.

Decision or action to drive future improvement. Based on our analysis of the results from AY2019-2020, we will implement the following changes for AY2020-2021. Faculty will 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.

Measure 1.2. Methodology: Direct measure – Quiz administered in each class. Target: 70% 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.

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

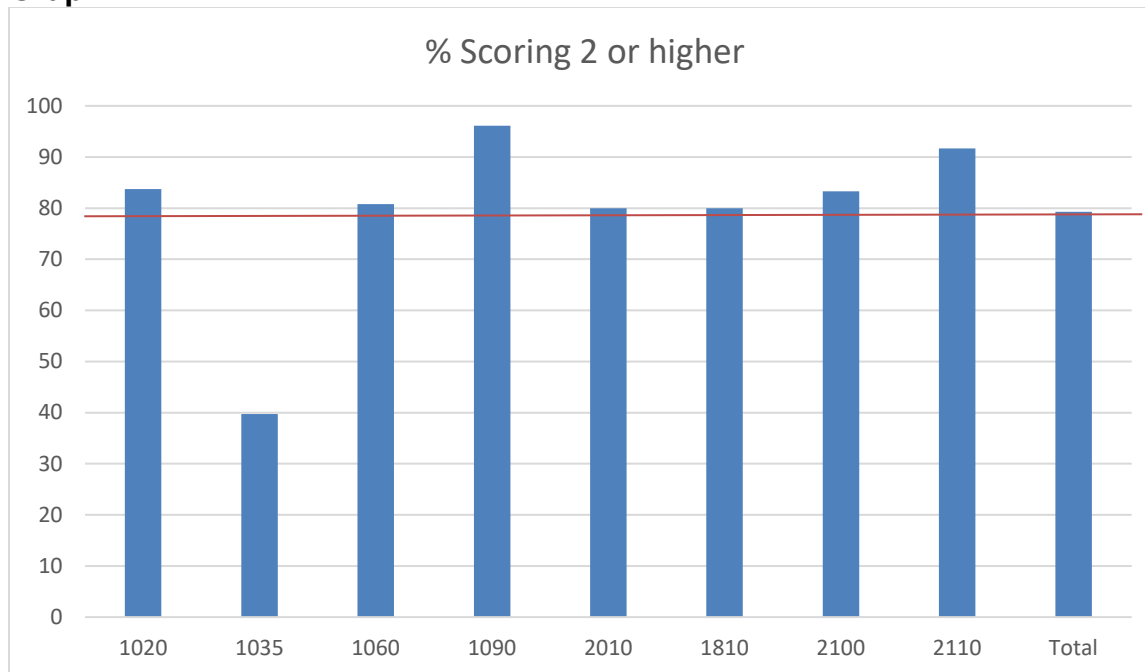
Finding. 1510 students were assessed. 1197 or 79.3% met the goal. Target met.

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

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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

Graph.



Analysis. The University modified its General Education Core Curriculum to include six competencies which help to fulfil its mission and are in accordance with the Louisiana Board of Regents requirements for general education. The competency relevant to the Department of Mathematics is the following: to expand students' aptitude in mathematics and its applications. This new competency has two student learning outcomes with two different measures. New quiz-based assessments were developed for each of eight core classes in mathematics. These were administered for the first time in AY2018-2019.

In AC 2018-2019 the target of 70% was met with 77.4% (1163 of 1503) of responding students reaching a score of 2 or higher on the quizzes. As this is our first year collecting data under the new paradigm, we have no comparable data from previous years to compare. We do feel this assessment gives us better detail than our previous approach and will enable us to better analyze and refine our instructional practices.

Based on the analysis of the AC 2018-2019 results, the plan action for AC 2019-2020 was to increase the amount of instructional time spent on choosing a mathematical model. As a result, this year's average was 79.3% achieving a score of 2 or higher, slightly better than last year. Looking at our results course by course MATH1020, 1090, and 2110 showed improvement with 1020 and 2110 showing drastic improvement.

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MATH1060, 2010, and 2100 did slightly worse but still met the goal; MATH1035 and 1810 went from meeting the goal to far below.

Decision or action to drive future improvement. Based on our analysis of the results from AY2019-2020, we will implement the following changes for AY2020-2021. Faculty will focus 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 new goal will be that each individual course 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.

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: 70% of students will attain a score of 2 (Acceptable) on the questions that ask a student to solve a problem stated in mathematical symbology.

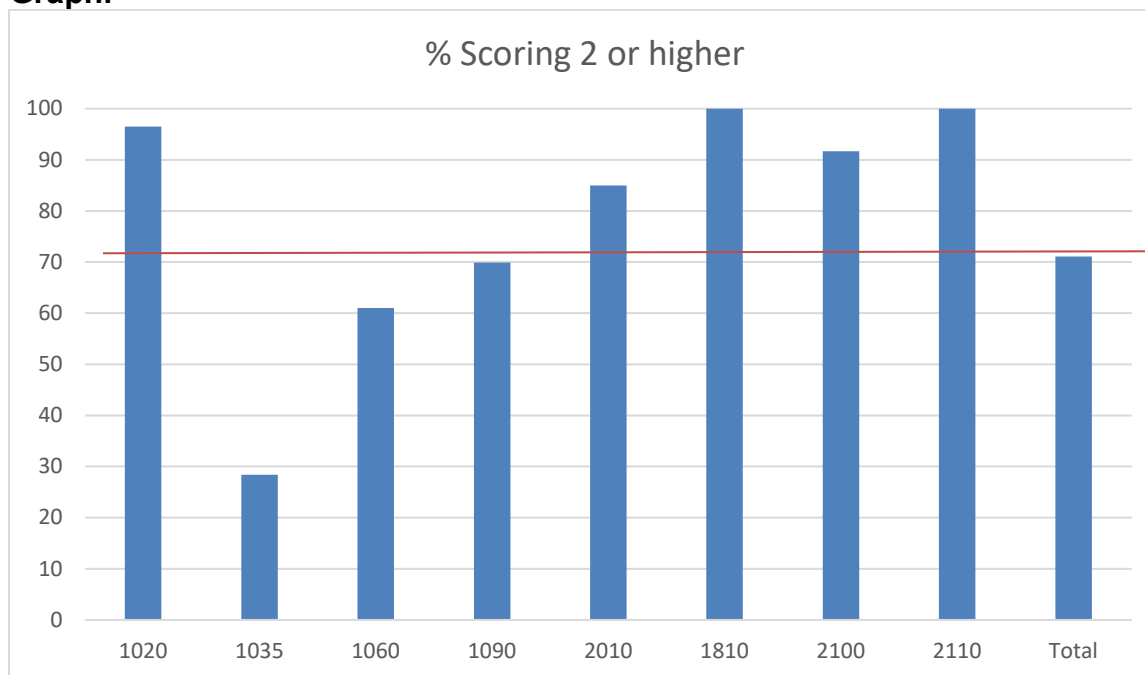
Course Name	Methodology	Target	Term
Math 1020	Quiz	70%	Fall
Math 1035	Quiz	70%	Fall
Math 1060	Quiz	70%	Spring
Math 1090	Quiz	70%	Spring
Math 1810	Quiz	70%	Fall and Spring
Math 2010	Quiz	70%	Spring
Math 2100	Quiz	70%	Fall and Spring
Math2110	Quiz	70%	Fall and Spring

Finding. 1510 students were assessed.1074 or 71.1% met the goal. Target 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

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Graph.



Analysis. The University modified its General Education Core Curriculum to include six competencies which help to fulfil its mission and are in accordance with the Louisiana Board of Regents requirements for general education. The competency relevant to the Department of Mathematics is the following: to expand students' aptitude in mathematics and its applications. This new competency has two student learning outcomes with two different measures. New quiz-based assessments were developed for each of eight core classes in mathematics. These were administered for the first time in AY2018-2019. Our target of 70% was not met with only 68.0% (1023 OF 1504) of responding students reaching a score of 2 or higher on the quizzes. [This is the previous data for old Measure 2.1. It includes the types of problems now covered in both new Measure 2.1 and 2.2]

Based on the analysis of the AC 2018-2019 results we increased the instruction on problems given in a straightforward manner. As a result, in AC 2019-2020 71.1% OF students achieved a score of 2 or higher. The improvement is due to this new measure 2.1 only including problems given in straightforward symbolic notation and not the more challenging word/story problems now covered in Measure 2.2. Looking at our results course by course, MATH1020, 1090, 2010, and 1810 all showed dramatic improvement. MATH2100 showed slight improvement, and MATH2110 held steady. Unfortunately, MATH1035 and 1060 showed dramatic downturns.

Decision or action to drive future improvement. Based on our analysis of the results from AY2019-2020, we will implement the following changes for AY2020-2021: Faculty will place more emphasis on standard techniques for straightforward problems. Since we met our overall goal, the new goal will be that each individual course meet the target of 70% of students scoring 2 or better on this component

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and that overall we will have 75% of all students score 2 or higher.

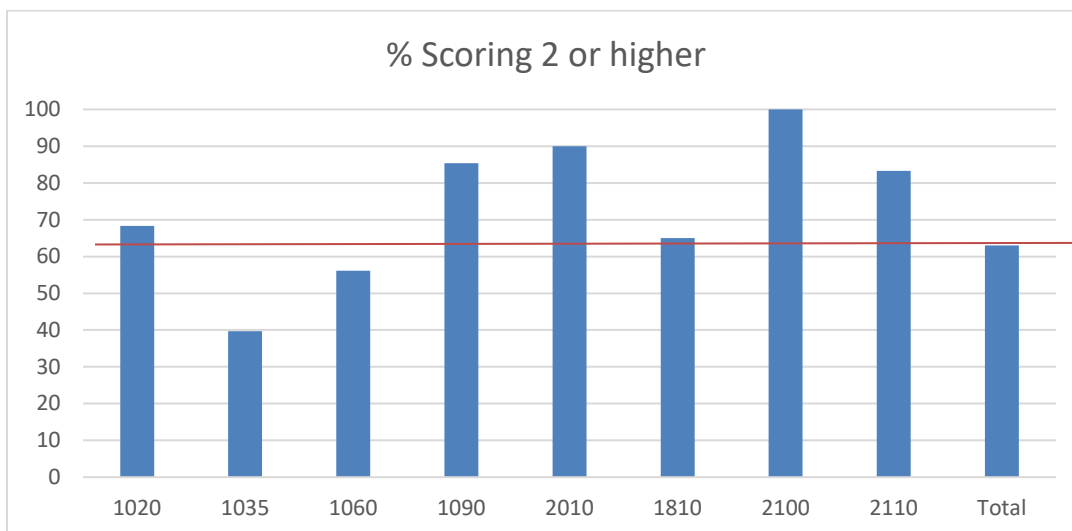
Measure 2.2. Methodology: Direct measure – Quiz administered in each class. Target: 70% of students will attain a score of 2 (Acceptable) on the questions that ask a student to solve a word problem.

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. 1510 students were assessed.952 or 63.0% met the goal. Target not met.

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

Graph.



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Analysis. The University modified its General Education Core Curriculum to include six competencies which help to fulfil its mission and are in accordance with the Louisiana Board of Regents requirements for general education. The competency relevant to the Department of Mathematics is the following: to expand students' aptitude in mathematics and its applications. This new competency has two student learning outcomes with two different measures. New quiz-based assessments were developed for each of eight core classes in mathematics. These were administered for the first time in AY2018-2019. Our target of 70% was not met with only 68.0% (1023 OF 1504) of responding students reaching a score of 2 or higher on the quizzes.

Based on the analysis of the 2018-2019 results, faculty targeted instruction to the common trouble areas of the students. As a result, 70% was not met with only 63.0% of responding students reaching a score of 2 or higher on the quizzes. This would seem to indicate that word/story problems are an area which needs more attention as separating these harder problems into their own measure resulted in lower success rates. Looking at our results course by course, MATH1090 and 2010 showed marked improvement. MATH2100 showed improvement, and MATH2110 held steady. MATH1020 and 1810 showed modest downturns, and MATH1035 and 1060 showed dramatic downturns.

Decision or action to drive future improvement. Based on our analysis of the results from AY2019-2020, we will implement 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.

Comprehensive Summary of Key Evidence of improvement based on the analysis of results. *Provided are all the things implemented in 2019-2020 to seek improvement based on the analysis of AC 2018-2019 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. The faculty feel the realignment of SLOs, and Measures has been helpful for analyzing the performance of our core courses. There was good progress in some areas. The lack of progress in other can at least partially be explained by the concerns below. The strategies we are adopting should show improvements in the next academic year.

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Areas to be addressed in specific courses:

- MATH1020. There were some difficulties with collecting data from some of our adjunct instructors.
- MATH1035. Results from this course took a dramatic downturn this year. Both the syllabus for this course and the instrument used to collect data for this report were updated. Faculty who teach this course feel they need to reevaluate these changes to ensure that the material covered in the course and the assessment instrument are congruous. This will be addressed before the fall semester.
- MATH1810. Results for this class were also dramatically different. Faculty will reassess the assessment instrument before it is administered again.
- MATH1060. There was also a consistent 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 2018 -2019 we assessed 718 students in MATH1060. In AY 2019-2020, we assessed only 579. Clearly a great number of students in MATH1060 took advantage of the options to drop this class after the regular drop date that were extended to students because of the impact of the pandemic.

One of the big concerns for the upcoming year involve beginning to assess students in Dual-Enrollment classes. Since there was some breakdown in the compliance with adjunct instructors this past Academic Year, work will need to be done to streamline and improve these procedures before we roll out the assessment to a population who has even less contact with departmental administration.