Competency: To reason abstractly and think critically

Description: 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. Students are required to complete at least six (6) credit hours of mathematics selected from MATH1020 – College Algebra – 3 credit hours, MATH1035 – Contemporary Mathematics = 3 credit hours, MATH1060 – Finite Mathematics – 3 credit hours, MATH1090 – Trigonometry – 3 credit hours, MATH2010 – Survey of Calculus – 3 credit hours, MATH1100 – Precalculus – 6 credit hours, MATH1810 – Technical Mathematics – 6 credit hours, MATH2100 – Calculus I – 5 credit hours, MATH2110 – Calculus II – 5 credit hours. Students must complete one of these one or two-course sequences: 1020-1060, 1020-1090, 1020-2010, 1035-1060, 1100, 1810, and 2100-2110. We will measure mastery of this competency by assessing mathematics students.

Student Learning Outcome: Students completing MATH1020 and 1060 will be able reason abstractly and display evidence of critical thinking.

Measure (including methodology and target).
Students in MATH1020 and MATH1060 take a common, departmental final exam. This exam is given simultaneously to all students in each course. For each semester, the faculty chose questions from the Final Exams that require abstract reasoning and critical thinking. Data was collected on the number of students who correctly answered these questions.

These were the topics covered by the questions reviewed:
- Identify/verify that a proposed solution satisfies a mathematical model.
- Evaluate a function and interpret its meaning in the context of a word problem.
- Graph a function and interpret its features in the context of a word problem.
- Translate a word problem into an appropriate mathematical model and find its solution.

Acceptable target: A question will be considered successfully answered if 70% of students chose the correct answer. Our target is to have 70% of the chosen questions successfully answered.

Ideal target: A question will be considered successfully answered if 70% of students chose the correct answer. An ideal target would be to have 100% of the chosen questions successfully answered.
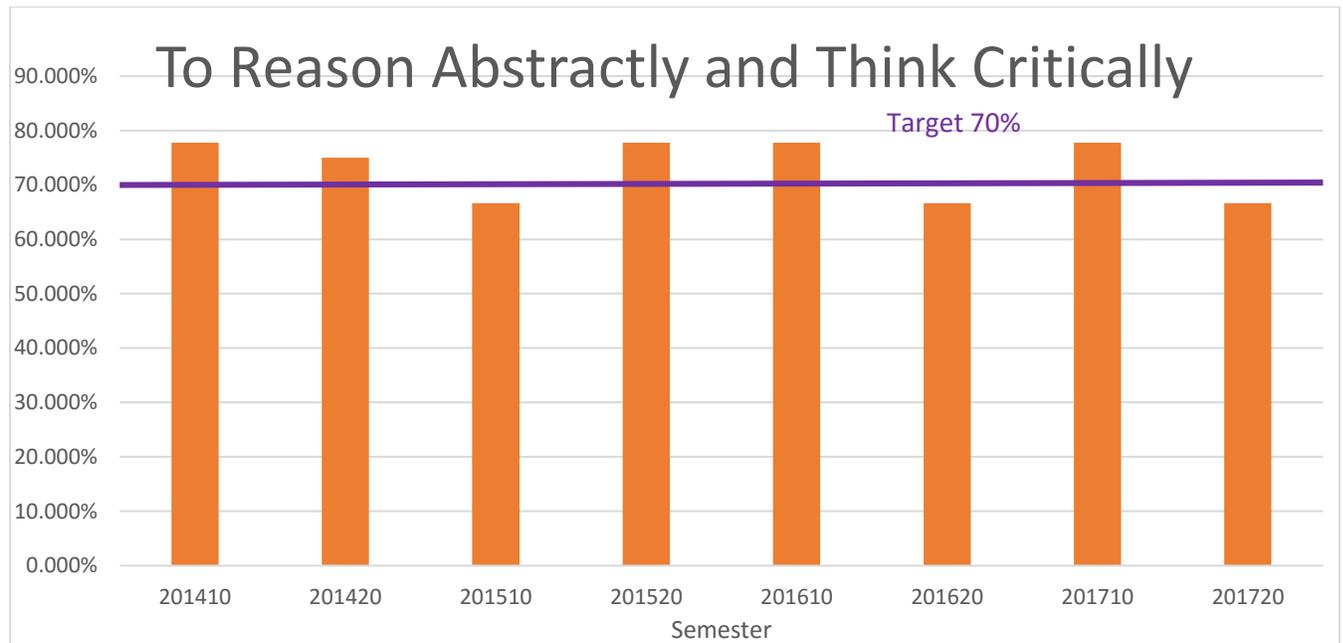
Based upon data derived from these assessments, students from 2014 to 2016 exceeded both the acceptable target and ideal targets.

Analysis:

Academic Year 2014-2015: What happened – why did it happen – what are we did we do about it.

In the fall of 2014, 9 questions were elected for analysis. 6 of those questions were successful. This gave us a 6/9 = 66.7% success rate.

In the spring of 2015, 9 questions were again selected for analysis. 7 of those questions were successful. This gave us a 7/9 = 77.7% success rate.

We were closer to meeting the target than the summary might suggest. If 5 more students had answered Question 7 correctly, then we would have met our goal in the fall. Our results from the spring are slightly better on all questions except one. That was sufficient to move Question 7 into a success.

Acceptable Target: We narrowly missed our goal in the fall and exceeded our goal in the spring. As noted above, we only missed the goal by a handful of students in the fall.

Ideal Target: Our improvement from fall to spring would indicated we are making progress to the goal.

Analysis: Data shows we were close to meeting our target in the fall and did meet the target in spring. During the regular faculty meeting at the beginning of the academic year, this data will be reviewed. We believe focusing the attention of the faculty on the importance of these topics will allow us to meet our goals.

Academic Year 2015-2016: What happened – why did it happen – what are we did we do about it.

In the fall of 2015, 9 questions were elected for analysis. 7 of those questions were successful. This gave us a 7/9 = 77.7% success rate.

In the spring of 2016, 9 questions were again selected for analysis. 6 of those questions were successful. This gave us a 6/9 = 66.7% success rate.

The data from fall 2015 was slightly better on most questions than last fall. The spring results were lower than either of the last two semesters.

Acceptable Target: We achieved our goal in the fall for the second semester in a row. Unfortunately, the spring semester results were worse than the previous two, and we did not meet our goal.

Ideal Target: We sustained our success from the spring to the fall, but unfortunately lost some progress in the spring.

Analysis: Our results were still close to our goals despite the setbacks in spring 2016. We decided to conduct a more intensive faculty in-service to discuss the actual question that students had struggles with.

Academic Year 2016-2017: What happened – why did it happen – what are we did we do about it.

In the fall of 2016, 9 questions were elected for analysis. 7 of those questions were successful. This gave us a 7/9 = 77.7% success rate.

In the spring of 2017, 9 questions were again selected for analysis. 6 of those questions were successful. This gave us a 6/9 = 66.7% success rate.

The data is very consistent with data from the past year. We met the goal in the fall but not the spring. This is despite a focus on these areas for the academic year.

Acceptable Target: Our results for AY1617 were almost identical to AY1516. We met the goal in the fall but then did not in the spring.

<u>Ideal Target:</u> We seem to be moving away.

Analysis: Our lack of progress seems to indicate a need for a different approach. We met at the conclusion of the spring semester to discuss this.

Decision / Recommendation.

In May 2017, we held a faculty meeting to discuss this data. We identified these concerns with our approach to measuring the two outcomes:

- The data we collect is aggregated in a way that makes it difficult to tease out what our problems are. It is impossible to tell whether our problems are with a few individuals or if different students are struggling with different concepts.

- We are not assessing several important groups of students:
    - Online students
    - Students at the Leesville and Shreveport campuses
    - Students who take other core sequences – Biology, Engineering Technology, Mathematics Education, and Mathematics majors

To address these concerns, we are proposing a new approach. A committee is currently working on a new assessment tool. This will be a separate assignment for each outcome which will be available through Moodle. It will be administered to all students in their last core mathematics course (MATH1060, 1090, 1100, 1810, 2010, or 2110). The plan is to pilot this approach in classes during Summer 2017.

The above data is from Taskstream TK20, the University's assessment management system.