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**Fall Semester 2012 Math 110 (Introduction to Statistics)**

**Summary of Key Findings**

**Kimberly J. O’Shields, Mathematics Specialist**

***Introduction***

The Fall 2012 outcomes assessment report is a quick overview of key findings. It does not contain the level of detail provided in the spring reports. The data is used as a signal of methodologies “best practices” that are working and can be used in the spring semester. Conversely, it will show any signs of downward trends that need to be addressed and reversed. Many strategies could include collaborative efforts with other specialists prior to students enrolling in Math 110 (Introductory Statistics).

The goal of this course has always been to sharpen students’ critical thinking and analysis skills to the point where they can effectively use statistical methodologies to analyze data. As future decision makers in fields such as nursing, criminal justice, business and psychology, it is critical to their success that they know how to interpret statistics.

***Approach***

The course objectives for Math 110 remain the same. Also, the primary course grade components such as exams, quizzes, homework, project and final exam were unchanged. MyStatlab continues to be an integral part of this course; however, there were some changes made to the application of this tool. Based upon prior outcome assessments, it was documented that the online components of this course (homeworks and quizzes) tend to have higher averages. The concern was whether students were relying too heavily on the help aids (help me solve, view an example or multiple attempts). As the result of recommendations made in the spring, the following changes were made to the course:

* The help me solve functionality was disabled
* The students were only given 2 attempts on homework
* At the start of class, students were asked to identify concepts in the chapter that would be discussed that day
* Unannounced quizzes were given
* Students were required to present key statistics or polls for the presidential election concerning issues in their majors or future professions.

These changes were implemented to help with retention of the concepts and possibly improve in-class exam grades. Reading the text (ebook) was an area that needed to be improved. Many students have admitted that they rely solely on the power point sides and in-class notes. This is evident in their grades. Some aren’t grasping the theory.

Since 2012 was a presidential election year, the students (in groups) provided brief presentations of polls/statistics. This allowed them to really investigate the issues that will affect them as well as understand some of the statistics being used in the election. This was a very important part of the course and students were very engaged. Some issues were complex and at times their understanding of what was being presented was inaccurate. However, the discussion was very meaningful. It made statistics more relevant to their future professions and personal lives. Most of the discussion was centered on the effect proposed policies would have on student loans.

***Findings***

The analysis of outcomes will consist of a summary of grades for the five (5) Math 110 sections taught this semester and also a comparison to outcomes from three (3) taught by the math specialist in Fall 2011. The key components of the grade summary include the following:

1. Completion rates (took final exam)
2. Percentage of students earning a C or better as well as D or better
3. Number of students earning each letter grade
4. Percentage of students who earned each letter grade

Table 1 provides a brief summary of completion rates with the average being a high 91%. The rates for each section ranged from 88%-97%. The detailed breakdown includes numbers of students who withdrew and those who abandoned. This course tends to have a very low withdrawal or abandon rate. However, section 4 had a combined withdrawal/abandon rate of 25% which is the highest documented in these reports. In general, these rates are beginning to increase. The level of frustration is more evident.

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| **Table 1. Summary of Student Completion** |  |  |
|  | Registered | Grades Submitted | Withdrew | Abandoned (Didn’t take final) | Percent Completed (Took Final) |
| Math 110.1 | 29 | 28 | 1 | 0 | 97% |
| Math 110.2  | 26 | 24 | 2 | 1 | 92% |
| Math 110.3 | 29 | 26 | 3 | 2 | 90% |
| Math 110.4 | 24 | 21 | 3 | 3 | 88% |
| Math 110.5 | 19 | 18 | 1 | 0 | 95% |
| **Total 5 sec.** | **127** | **117** | **10** | **6** | **92%** |

The second part of the grade analysis was the percentage of students who earned a D or better and C or better. Some majors require mastery grading (C or above). So, this metric is important to gauging course mastery and how many students may have to repeat the course. Table 2 provides a summary. Overall, there is a downward trend where more students are not earning C or better as compared to prior semesters. The following table shows that only 33% of one section earned a C or better. The average percentage for all sections is 48% and without the grades of those who abandoned it moves up slightly to 50%.

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| **Table 2. Summary of Percent of Students Earning D and C or better** |
|  | D or better | C or better (72 or better) | D or better (without abandoned group) | C or better (without abandoned group) |  |
| Math 110.1 | 96% | 68% | 96% | 68% |  |
| Math 110.2  | 75% | 42% | 78% | 43% |  |
| Math 110.3 | 81% | 35% | 88% | 38% |  |
| Math 110.4 | 52% | 33% | 61% | 39% |  |
| Math 110.5 | 89% | 61% | 89% | 61% |  |
| **Average** | **79%** | **48%** | **82%** | **50%** |  |

The third and fourth parts of the grade analysis show a detailed count by letter grade and the percentages for each. The most important part was percentage of students who failed (F or NP) which was as high as 48% for one section. In one section it was as low as 4% which had the highest percentage of Cs or better of 68%. The detail is provided in tables 3 and 4 below.

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| **Table 3. Summary of Letter Grade Count** |  |  |  |
|  | Count of Letter Grades by Section |  |
| Letter Grade | Math 110.1 | Math 110.2 | Math 110.3 | Math 110.4 | Math 110.5 | Total 5 secs. |
| A | 2 |  | 2 |  | 1 | 5 |
| A- | 3 | 1 |  |  | 2 | 6 |
| B+ |  | 2 | 1 |  |  | 3 |
| B | 5 | 3 |  | 1 | 2 | 11 |
| B- | 1 | 2 | 1 | 2 | 2 | 8 |
| C+ | 3 | 2 |  | 2 | 1 | 8 |
| C | 5 |  | 5 | 2 | 3 | 15 |
| C- | 2 | 4 | 1 | 1 | 2 | 10 |
| D+ | 1 |  | 4 |  | 2 | 7 |
| D | 5 | 3 | 6 | 3 | 1 | 18 |
| F |  | 6 | 4 | 9 | 2 | 21 |
| P |  | 1 | 1 |  |  | 2 |
| NP | 1 |  | 1 | 1 |  | 3 |
| Total Count | 28 | 24 | 26 | 21 | 18 | 117 |

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| **Table 4. Summary of Percentage of Letter Grade Count** |  |  |
|  | Percentage of Total Grades |  |
| Letter Grade | Math 110.1 | Math 110.2 | Math 110.3 | Math 110.4 | Math 110.5 | Total 5 secs. |
| A | 7% | 0% | 8% | 0% | 6% | 4% |
| A- | 11% | 4% | 0% | 0% | 11% | 5% |
| B+ | 0% | 8% | 4% | 0% | 0% | 3% |
| B | 18% | 13% | 0% | 5% | 11% | 9% |
| B- | 4% | 8% | 4% | 10% | 11% | 7% |
| C+ | 11% | 8% | 0% | 10% | 6% | 7% |
| C | 18% | 0% | 19% | 10% | 17% | 13% |
| C- | 7% | 17% | 4% | 5% | 11% | 9% |
| D+ | 4% | 0% | 15% | 0% | 11% | 6% |
| D | 18% | 13% | 23% | 14% | 6% | 15% |
| F | 0% | 25% | 15% | 43% | 11% | 18% |
| P | 0% | 4% | 4% | 0% | 0% | 2% |
| NP | 4% | 0% | 4% | 5% | 0% | 3% |
|  | 100% | 100% | 100% | 100% | 100% | 100% |

In order to determine if this shows a positive trend of improvement or one that shows concern, a comparison was made with the outcomes of Fall 2011. Table 5 shows that the outcomes aren’t improving. The most significant finding is the percent of students earning a C or better is 48% compared to 69% a year ago.

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| **Table 5. Comparison of Fall 2011 and Fall 2012** |
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| Evaluation Criteria | Fall 2011 | Fall 2012 |
| Percent completed Ccourse | 91% | 91% |
| D or better | 85% | 79% |
| **C or better (72 or better)** | **69%** | **48%** |
| D or better (without abandoned group) | 89% | 82% |
| C or better (without abandoned group) | 72% | 50% |
| Percent Earning Letter Grades: |  |  |
| A | 9% | 4% |
| A- | 11% | 5% |
| B+ | 7% | 3% |
| B | 9% | 9% |
| B- | 14% | 7% |
| C+ | 3% | 7% |
| C | 17% | 13% |
| C- | 7% | 9% |
| D+ | 8% | 5% |
| D | 1% | 16% |
| F | 12% | 18% |
| P | 1% | 2% |
| NP | 1% | 3% |

***Observations/Recommendations***

There were many changes made to improve the effectiveness of the course. These changes listed in the approach were designed to improve critical thinking skills and support comprehension. Even with these tools, the students’ outcomes declined. There needs to be more research to determine the causes. However, here are some recommendations to include some from Shakil Shrestha who taught section 5.

* ***Introducing current events such as the election inspired the students***. Getting the students interested in the practical application of statistics, data interpretation and analysis is key. The election was a great opportunity for them to interpret and analyze poll data. They did this given each candidate’s view on topics affecting their future professions. Nursing and the affordable health care act, criminal justice and gun control were just a couple of the connections the groups made. The discussion was very lively and also informative. Current events will continue to be used in this course.
* ***Limiting homework attempts to 2 and also disabling “help me solve” required the students to put a bit more effort into their homework***. The help functionality designed into the software was adjusted to encourage the students to grasp a better understanding of the concepts. The homework averages fell slightly; however, the view the example was still in place. Students indicated they copied the steps without reading the text. So, that function will be disabled. Unfortunately, the exam scores were still low.
* ***The instructors for Math 101, Math 108 and Math 109 should be consulted to help with pre-foundational skills.*** Students are still struggling with pre-foundational skills covered in prior math courses. Also, reading comprehension and critical thinking and analysis isn’t being properly developed due to the amount of review needed in prior skills. Algebraic problem solving skills was mentioned as needing more work. There are other examples like this that need to be addressed prior to students taking Math 110. More emphasis can then be placed on interpretation and statistical analysis.
* ***Pop quizzes were given; however, peer grading will be considered to support student feedback.*** The instructor needs to be able to assess the students’ retention of course material prior to the exam. Two pop quizzes were given this semester, but the volume of students didn’t allow for much feedback on those few questions. Peer grading will be explored for pop quizzes. If students expect unannounced quizzes, then they may have a more detailed homework notebook and study their problems.
* ***Inspiration of independent learning is needed.*** Many students are relying heavily on in-class instruction and aren’t very proactive in reading the text and searching for answers. This is detrimental to their critical analysis skills. They’ve made comments such as, “I don’t read, but I understand it when you do it in class.” Students are shocked that they can’t make the leap to demonstrate their mastery of course objectives tested on in-class exams. Some students are still expecting support that isn’t effective in this type of course. In the fall semesters, there are juniors or even seniors taking this course and they have few opportunities to learn the type of independent critical analysis required for their professions. The end of the semester survey projects showed evidence of not being able to effectively assess data and provide insightful recommendations using statistics.
* ***Consistent communication of classroom etiquette and responsibility will be communicated.*** This semester, there was an unusual expression of frustration that hadn’t been seen in prior semesters. Students were rudely interrupting when they were confused about concepts they hadn’t studied or mastered from prior courses. Knowing how to prepare for exams is still not second nature and the conduct reflects the disconnect. It is routinely announced in class to see the instructor for supplemental help, but a small percentage take advantage of the resources. However, this type of conduct had to be addressed immediately to keep the course on track. Also, the adjunct professor observed extreme tardiness and cellphone use in class. A high standard of classroom conduct will continue to be set.

Correcting this trend will be a collaborative effort. Key observations are being shared with other math specialists and faculty in an effort to find solutions.