**MTH 086 SLOAT Assessment Study Report (Spring 2011)**

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# Introduction

Two full-time faculty members that were invited to participate in the College’s Student Learning Outcomes Assessment Team (SLOAT) conducted a study of the MTH 086 course (Introductory Algebra) in the Spring 2011 semester. The faculty members that conducted the study were Shohreh Andresky and Ines Figueiras, Instructors in the Math and Physics Division.

MTH 086 is the most commonly offered course at Essex County College. Statistics provided by the Office of Planning, Research and Assessment over three Fall semesters (Fall 2006, Fall 2007 and Fall 2008) shows that, on average, 82% of new students to Essex County College place into MTH 086. In the 2011 Mathematics Program Assessment Report, an analysis of success rates in an eight-semester time period (Spring 2006 through Fall 2009) revealed a success rate of 46%. During that time period, of the 14,400 students who took the course only 6,617 passed. The course description is as follows: “*This beginning mathematics course is designed to take students from concrete arithmetic ideas to the more abstract algebraic forms of these ideas. Throughout the course, emphasis is placed on the development of arithmetic and algebraic skills and the application of these skills and concepts to the solution of practical problems. Topics covered include simplifying arithmetic and algebraic expressions, signed numbers, fractions, decimals, percents, estimations and geometric applications.”* Basically, MTH 086 is a course that covers material that students should master in the elementary and middle school years (typically third grade through eighth grade). Therefore, most students taking MTH 086 need to spend a considerable amount of time studying and doing homework to master the material in this course traditionally taught in a sixteen-week time period at ECC.

# Purpose

The study had the following two purposes: to analyze course-level Measurable Performance Objectives (MPOs); and to determine the impact on success rates of variables such as class size, day classes versus evening classes, full-time versus part-time instructors, and the main campus versus the West Essex campus. The MPOs that were analyzed all pertain to course goal #1. This course goal and its corresponding MPOs are listed below.

**Course Goal #1:** Demonstrate knowledge of the fundamental concepts and theories from arithmetic, algebra and geometry.

* 1. *perform arithmetic operations on signed numbers;*

1.2 *perform arithmetic operations on fractions;*

1.3 *perform arithmetic operations on decimals;*

1.4 *perform arithmetic operations on percents;*

1.5 *determine the perimeter and area for simple geometric figures;*

1.6 *determine whether a ratio is a proportion;*

1.7 *convert from one unit of measure to another;*

1.8 *simplify basic algebraic operations;* and

1.9 *solve simple linear equations involving one operation.*

# Methodology

Based on Linda Suskie’s book, **Assessing Student Learning: A Common Sense Guide**, 2nd edition, 14 sections of MTH 086 were selected to participate in the study to ensure a maximum 5% margin of error. This would result in a total sample size of 368, but in reality only 11 instructors chose to participate in the study resulting in a total sample size of 271.

## Sample

Sections were chosen to represent students taught by full-time or part-time faculty, during the day or evening, and on either the main campus or the West Essex campus. Information regarding the sections that participated in the study is detailed in the following table:

| **Section** | **# of Students** | **Instructor** | **Full-time (F) Adjunct (A)** | **Day (D) Evening (E)** | **Main (M) West Essex (W)** |
| --- | --- | --- | --- | --- | --- |
| 002 | 25 | Matthew Turner  mzmatt@hotmail.com | A | D | M |
| 005 | 28 | James Freeman  jfree23\_15@hotmail.com | A | D | M |
| 008 | 24 | Ines Figueiras  ifigueir@essex.edu | F | D | M |
| 017 | 24 | Ming McCall  mccall@essex.edu | F | D | M |
| 018 | 20 | Abraham Shaban  abeshaban@aol.com | A | D | M |
| 019 | 25 | John Bottger  bottgeru@aol.com | A | D | M |
| 025 | 14 | Anthony Bevilacqua  a.m.bevilacqua@earthlink.  net | A | D | M |
| B01 | 24 | Douglas Platt  douglasmplatt@optonline.  net | A | D | M |
| CW3 | 30 | Taran Alexander  alextaran@optonline.net | A | D | W |
| CW4 | 35 | Nataliya Chentsova  nchentsova@yahoo.com | A | D | W |
| CWC | 22 | Anthony Pompeii  antajp@aol.com | A | E | W |
| **Total:** | **271** |  |  |  |  |

Some general information regarding the sections that participated in the study is summarized in the following table:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **% Taught by Full-Time Faculty** | **% Taught by Part-Time Faculty** | **% of Day Students** | **% of Evening Students** | **% of Main Campus Students** | **% of West Essex Campus Students** |
| 18% | 82% | 92% | 8% | 68% | 32% |

Thus, the typical student participating in this study is taught by an adjunct instructor at the Main Campus, during the day.

## MPO Results

MPO results were generated from student performance on the multiple-choice section of the final exam. Each multiple-choice question on the final exam was blueprinted to an MPO listed previously in this report. A total of 171 students took the final exam, that is, 63% of the original sample. A total of 100 students or 37% withdrew, received a grade of Incomplete, or stopped attending. The instructors were asked to count the number of students that answered each multiple choice correctly. Those results were submitted through an online survey, which also requested answers to other questions needed for this study. An MPO is considered ‘achieved’ in this study if 70% or more of the students answered the question successfully. All 9 of the MPOs analyzed were achieved comfortably as summarized in the table below.

|  |  |
| --- | --- |
| **MPO** | **% Achieved** |
| 1.1 *perform arithmetic operations on signed numbers* | 90.1% |
| 1.2 *perform arithmetic operations on fractions* | 79.5% |
| 1.3 *perform arithmetic operations on decimals* | 85.1% |
| 1.4 *perform arithmetic operations on percents* | 79.8% |
| 1.5 *determine the perimeter and area for simple geometric figures* | 91.2% |
| 1.6 *determine whether a ratio is a proportion* | 78.9% |
| 1.7 *convert from one unit of measure to another* | 84.8% |
| 1.8 *simplify basic algebraic operations* | 82.6% |
| 1.9 *solve simple linear equations involving one operation* | 95.0% |

## Other Variables Impacting Student Success

The success rate for this sample is only 38%, considerably lower than the success rate calculated for the 2011 Mathematics Program Assessment Report of 46%. Success rate is calculated by adding all of the students with a passing grade and dividing that sum by the total of all students enrolled in the cohort (including Withdraw and Incomplete grades). Success rates among the sections for this study range from 14% to 91%. The biggest impact on the calculation of success rate are the students who either withdrew or simply stopped attending, thus defaulting to a grade of ‘F’. Exactly 100 out of the 271 students in the sample did not complete the course. Seventy students (26% of the sample) did not show up to take the final exam, and therefore earned a grade of ‘F’. Twenty-nine students (11% of the sample) withdrew, and therefore earned a grade of ‘W’. Only one student (0.4%) received an “I” (Incomplete) grade. In fact, only 25% (67 out of 271) of the students in the sample failed the final exam.

As was mentioned above, there is a large disparity in success rate among the 11 sections that participated in the study ranging from a low of 14% to a high of 91%. The average success rate for the 11 sections is 38% and the median success rate is 36%. The chart below depicts the success rate for each section that participated in the study by full-time and part-time faculty.

MPO results are significantly higher than the success rates previously discussed. All 9 of the MPOs analyzed were achieved, but the success rate for this sample is only 38%. Since the success rate calculation includes all students enrolled, students that do not take the final exam significantly lower the success rate calculation. Omitting students that did not take the final exam, either because they withdrew, received an Incomplete grade or stopped attending, returns a much higher success rate of 61% (number of students that passed the final exam divided by number of students that took the final exam). In addition, the multiple-choice section of the final exam is typically easier than the rest of the exam. Therefore, it is reasonable that the MPOs analyzed on the final exam were all achieved despite the very low success rate for this sample.

Several factors were compared to do further analysis of success rates including day versus evening sections, being taught by full-time versus part-time faculty, class size, and being taught at the main campus versus the West Essex campus. The following findings are noteworthy:

* Although 3 evening sections were selected to participate in the study, only 1 of the instructors completed the survey. Therefore, there is not enough data to compare day and evening sections.

* Full-time faculty members taught two MTH 086 sections, and part-time faculty taught 9 sections. Although the sample size is small for full-time faculty, the success rate for full-time faculty is only 29% and the success rate for part-time faculty is significantly higher at 57%. As discussed earlier, large disparities in the success rate of the 11 sections that participated in the study contribute to the difference in success rate among full-time and part-time faculty members. In particular, one part-time faculty member had an unusually high success rate of 91%.
* Class size appears to have an impact on student success. Of the 11 sections that participated in the study, 6 had class sizes of 24 students or less. The remaining 5 sections had class sizes of 25 or more. The sections with class sizes of 24 or less had a success rate of 43%, whereas the larger sections with class sizes of 25 or more had a lower success rate of 34%.

* Finally, success rates were compared between the main campus and the West Essex campus. For this study, 8 sections from the main campus and 3 sections from the West Essex campus participated. The sections at the main campus had a success rate of 29%, and the sections taught at the West Essex campus had a significantly higher success rate of 58%. This indicates greater success at the West Essex campus, but it is important to note that at the main campus only 57% of the students that enrolled in the class took the final exam and at the West Essex campus 76% took the final exam. The higher percentage of students at the West Essex campus that took the final exam could attribute to the greater success rate at West Essex.

## Learning Strategies

All instructors in this study use lecturing as the primary means of teaching with many examples provided throughout the lecture, but other methods are also utilized such as board-work where all students participate in the resolution of the problem, small group work where students work in groups of two or three, and individual work where the instructor can provide personalized feedback. The latter is usually only feasible in smaller class sizes. In addition, this study revealed that 82% of the instructors grade homework and count the homework scores in the final course grade. As the use of technology increases in the MAP Division, this study also revealed that 36% of the participants in the study use online homework systems (WebAssign or MyMathLab). The instructors that grade homework, but do not use online homework systems, collect the homework on paper. The average homework grade for the students that took the final exam was 72%. It is not surprising that the average homework grade is more inline with the MPO achievement results. The importance of doing all homework assignments in a timely manner is crucial to student success, regardless of whether the instructor grades the homework or not. The MAP Division provides each instructor a course outline with a complete list of recommended homework problems.

In addition, the textbook selected by the MAP Division for the MTH 086 course at the College is custom packaged with a workbook and DVDs containing lectures when purchased at the ECC Bookstore. These DVD lectures provide a valuable resource for students that miss class or simply need to revisit a lecture.

# Conclusion and Recommendations

In conclusion, the success rate for MTH 086 is very low. MTH 086 is the course that most students place into, and it is typically a problematic course for students to pass. This study revealed a success rate of only 38%, although students in this sample achieved all 9 of the MPOs analyzed. As discussed earlier, a high attributor to the low success rate is the number of students who withdraw, receive a grade of Incomplete or stop attending. For this sample, only 63% of the students enrolled actually took the final exam. The success rate is a much higher 61% when students who did not take the final exam are omitted from the success-rate-calculation cohort. Factors such as class sizes of 24 or less and being taught at the West Essex campus appear to have a positive impact on success rates, but further studies are needed.

It is recommended that a similar study be done with a larger sample size. More evening sections are needed to do a proper comparison between day and evening sections, but it is noted that the current process of data collection relies primarily on the cooperation of the instructor. Therefore, it is also recommended that the College invest in equipment, software and personnel to do proper and consistent assessment. If more resources are made available, then MPO assessment can be expanded to include all course-level MPOs. Finally, student attrition is highly problematic. Poor math and reading backgrounds certainly contribute to the low success rate of this course, but other factors such as poor attendance, poor study habits, poor note taking and lack of homework completion are also contributors. The CSS 101 (College Success Seminar) course offered at the College addresses many of these issues and should certainly emphasize how significantly student behavior and attitude influence the possibility of success in courses.

Finally and most importantly, longitudinal studies are strongly recommended. Success rates and MPO assessment are meaningless unless students can retain and apply their knowledge to successfully complete the next course. At a minimum, students should be tracked from MTH 086 or AFM 083 through the completion of their first college-level math course. One such time-consuming study was conducted several years ago by Math Department faculty. Future, more efficient longitudinal studies should be fully supported by College administration, who must allocate and/or purchase required resources and personnel to and prioritize course-sequence cohort tracking.