

# Office of Academic Assessment

## **Analysis of the SAT-Quantitative Scores and Mathematics Placement Test Scores For USM Proficiency Requirements**

### **MAT 105 Pilot Study**

**Fall 2003**

**Office of Academic Assessment  
University of Southern Maine  
Portland Campus**

## **Introduction**

This study was conducted based upon the results of an earlier study on the SAT-Quantitative (SAT-Q) scores and the Mathematics Placement Test (MPT) scores regarding the minimum mathematics proficiency policy at USM. The previous study (“A Profile of Students with SAT-Q Scores Between 480 and 550”, Office of Academic Assessment, USM, January 2003) indicated that a large percentage of students who initially met the mathematics proficiency by their test scores had difficulty passing their college mathematics course (i.e. fulfilling the D-requirement of the Core Curriculum). Hence, due to gradual changes in the mathematics curriculum and the recent major revisions of the Math Placement Test, it is time to re-examine USM’s current mathematics proficiency requirement.

This pilot study involved examining the academic profiles of a sample of students (N=128) who had enrolled in the MAT 105D course (Math for Quantitative Decision-Making) for the fall 2003 semester. At the beginning of the semester, students were strongly encouraged by their instructors to take the newly developed Mathematics Placement Test (developed by USM mathematics instructors and computer-administered by The Office of Academic Assessment in the summer 2003). According to the current mathematics proficiency policy, students who had SAT-Q scores of 480 or above could enroll in the MAT 105 course without taking the placement test. Therefore, special testing sessions were given so students could take the mathematics placement test at the beginning of the course. By policy, some of the students, i.e. those with no SAT-Q scores or those with SAT-Q test scores below the 480 cut-off, were to take the mathematics placement test prior to enrollment in a MAT 100 level course. The purpose of this study was to examine the minimum mathematics proficiency requirement by examining the SAT-Q and the mathematics placement test scores, as well as the mathematics final course grades.

### **Overall Profile of MAT 105 Students: Table 1**

The demographic profile showed that there were a similar number of males and females in the sample and most students averaged around 19 years old. Table 1 shows the percentage of males (52%) and females (48%). In addition, the chart shows the percentages of students in each age group; that is, the majority of the students (65%) were between the ages of 17 to 19 years and approximately one-third (34%) were between the ages of 20 to 30 years. (See Table 1, page 7)

Also noted on Table 1 are the overall breakdowns of the test scores and the mathematics course grades. Regarding the SAT-Q scores, students had an average score of 510 which is above the proficiency cut-off score. However, the full range of test scores went as low as 370 to 610 being the highest; yet 45% of the students had scores between

480 and 540. In regards to the mathematics placement test, the three subtests cover the contents of the three developmental courses (MAT 009, 050, 051). Consequently, a particular combination of subtest scores will indicate whether a student has met proficiency. As indicated on the table, the 86 students who were tested received an average score of 8.5 on Subtest 1, 7.3 on Subtest 2, and 5.2 on Subtest 3 (out of 13 possible points per subtest). Overall, there were a total of 67 students in the MAT 105 course who were recommended for a developmental course and only 19 students were recommended for a 100-level mathematics course. There were 42 students who did not take the placement test.

Regarding the overall profile of MAT 105 course grades, 41% (N=53) had successful grades (i.e. a grade of C or above). Conversely, 59% (N=75) had unsuccessful grades (i.e. D, F, I, L, or W). (See Table 1, page 7)

### **Breakdown by SAT-Quantitative Scores: Table 2**

- The SAT-Q scores were broken down into three categories: SAT-Q scores below 480 (those who did not meet the minimum proficiency), SAT-Q scores between 480-540, and those with SAT-Q scores of 550 or above (both of these latter groups of student would have met the minimum mathematics proficiency). As we would expect, only a small percentage (16%) of students with SAT-Q scores below 480 were recommended for a MAT 100-level course based upon the MPT (i.e. Math Placement Test) scores. Yet, even in the “SAT-Q 480-540” group, only 9% of students would have been recommended for a college-level math course, and approximately 21% of those in the “SAT-Q 550 or above” group.
- Students with SAT-Q scores below 480 and students with SAT-Q scores between 480 and 540 had similar MPT scores. The students with SAT-Q scores of 550 or above had significantly higher MPT scores than other students; however, for 38% of these students, the MPT scores were not high enough scores to place them in a MAT 100-level course.
- The analyses of the MAT 105 course grades show that students with the highest SAT-Q scores (550 or above) were more likely to get successful grades (C or above) than students with SAT-Q scores below 480 and students with SAT-Q scores between 480 and 540. Over 60% of students of the students in these two groups (all of those with SAT-Q scores below 550) had unsuccessful grades (D, F, I, L, W) in their MAT 105 course. (See Table 2, page 8)

### **Breakdown by Recommended Course Placement: Table 3**

- The recommended course placements based upon the MPT scores were broken down into three groups: those who were recommended for a 009, 050, or 051 developmental course (those who did not meet the minimum proficiency), those who were recommended for a math course below MAT 150 or any MAT 100-level course (those who met the minimum mathematics proficiency level), and those who did not take the placement test. As we would expect, the students recommended for a college-level math course had significantly higher MPT scores (on the average) than those recommended for a developmental course.
- Out of the 19 students who were recommended for a 100-level math course, 37% had SAT-Q scores of 550 or above, and 52% had SAT-Q scores below 550. Conversely, out of the 67 students who were recommended for a developmental course, 18% had SAT-Q scores of 550 or above and 76% had SAT-Q scores below 550.
- The students who were recommended for a 100-level math course had the highest success rates (74%) in regard to MAT 105 course grades compared to the success rates of students who were recommended for a developmental course (42%) or those who did not take the MPT (26%). (See Table 3, page 9)

### **Breakdown by SAT-Q Score and Recommended Course Placement: Tables 4 and 5**

- Students who had SAT-Q scores below 480 and were recommended for a developmental course had low success rates in MAT 105; that is, 62% had unsuccessful grades of D,F,I, L, or W. A similar profile was also found with students who had SAT-Q scores between 480 and 540; that is, 59% had unsuccessful grades in MAT 105. With respect to the students who had SAT-Q scores of 550 or above and who were recommended for a developmental course, 42 % had unsuccessful grades in MAT 105. (See Table 4, page 10)
- Students who were recommended for a 100-level math course and had an SAT-Q of 550 or above (N=7) had the highest MPT scores and a high rate of success (71%) in the MAT 105 course compared to other students. (See Table 5, page 11)

### **Breakdown by SAT-Q Score of Students with No Placement Test Scores: Table 6**

- Students who had SAT-Q scores of 550 or above but did not take the MPT had an average SAT-Q score of 580. However, less than half of these students had MAT 105 grades of C or above. Approximately, 84% of students with SAT-Q scores below 550 had unsuccessful final course grades. (See Table 6, page 12)

## **Summary of the Findings**

This pilot study was primarily conducted to determine if the current mathematics proficiency requirement is a valid assessment of the basic mathematics skills of incoming students. The current policy states that students with a SAT-Q score of 480 or above have met the basic (minimum) mathematics proficiency and can be counseled into a college-level mathematics course. Conversely, students with scores below the 480 cut-off must demonstrate their skills by passing the Math Placement Test (MPT) in order to enroll in a college level mathematics course.

Based upon the results of this study, students who have initially met the basic mathematics proficiency requirements by the SAT-Q cut-off score (480 or above) do not place in a 100-level mathematics course according to the newly developed Mathematics Placement Test (MPT). Since the MPT has been designed by the mathematics faculty and based upon the revised curriculum, the assumption is made that the new MPT is a better placement tool than the old test. If this is the case, then the current mathematics proficiency requirement is no longer a valid academic policy when assessing incoming students.

Overall, the findings have indicated that students with SAT-Q scores between 480 and 550 have similar profiles of students with SAT-Q scores below 480. That is, these students demonstrate that they do not have enough of the basic skills necessary to succeed in a college level mathematics course (i.e. low placement test scores). This study shows that at least 60% of the students (those with SAT-Q scores below 550) received unsuccessful grades in their first college level math course (MAT 105D).

Another important finding of this study shows that students who were recommended to take a MAT 100-level course based upon their placement test scores had the best success in the MAT 105D course. Nearly 74% of these students had successful grades of C or above in their math course compared to those who were recommended for one of the developmental courses (success rate = 42%) or those who did not take the placement test (success rate = 26%). This finding shows that the new placement test may have some predictive value. However, due to the small number of students who fall into this category, more follow-up studies are necessary in order to determine the reliability of the placement test.

## **Recommendations**

It is proposed by the mathematics faculty (those on the mathematics proficiency committee) that the current SAT-Q cut-off score for meeting proficiency be raised from 480 to 550. As shown in this study, a large percentage of students (those with SATQ scores between 480 and 550) do not have successful MAT 105 course grades, which supports the view that the proficiency cut-off needs to be higher. One of the concerns of raising the SAT-Q score is that a larger number of incoming degree students would not

be considered proficient upon entry to USM and would need to take the Math Placement Test (an estimated 600 more students per academic year). Consequently, there may be considerably more students being placed into one of the three developmental courses.

This study confirms that the SAT-Q score (alone) is not a good predictor of success in college-level mathematics. In other words, there are students who received unsuccessful grades in mathematics regardless of the SAT-Q score; therefore, raising the SAT-Q score does not necessarily solve the issue of students not being able to meet the D-requirement of the Core Curriculum. However, the findings did indicate that the higher the Math Placement Test score, the better the success rate in the MAT 105D course. This result tells us that the Math Placement Test is a more valid measurement for placement than the SAT-Q. Therefore, testing a larger number of students upon entry to the university will help us identify at-risk students early in their degree program by eliminating many students from enrolling in a MAT 100-level course without better preparation and eventually eliminating high rates of failure from students trying to complete the mathematics competency level (fulfilling the D-requirement).

**Table 1**

**Overall Profile of MAT 105 Students**

| <b><u>Demographic Information</u></b>                      |   |                  |                     |
|--|---|------------------|---------------------|
| Gender:  | 66 Males (52%)  | 62 Females (48%) |                     |
| Age:   | 83 students were 17-19 years (65%)<br>44 students were 20-30 years (34%)<br>1 student was over 31 years (1%)                          |                  |                     |
| <hr/>  |   |                  |                     |
| <b><u>Test Scores</u></b>                                  |   |                  |                     |
| SAT-Q Scores:  | N   | Mean Score       | SD                  |
|  | 119   | 510.8            | 59.9                |
| Breakdown of Scores:                                       | 470 or below = 30 students (23%)<br>480 to 540 = 57 students (45%)<br>550 or above = 32 students (25%)<br>No scores = 9 students (7%) |                  |                     |
| Math Placement Test Scores:                                | N   | Mean Score       | SD                  |
| Subtest 1 score  | 86  | 8.5              | 2.1                 |
| Subtest 2 score  | 86  | 7.3              | 2.6                 |
| Subtest 3 score  | 86  | 5.2              | 2.8                 |
| Recommended Courses Based Upon Math Placement Test Scores: |   |                  |                     |
|  | N   | %                |                     |
| MAT 009  | 20  | 16%              |                     |
| MAT 050  | 27  | 21%              |                     |
| MAT 051  | 20  | 16%              |                     |
| MAT 100-level below 150                                    | 12  | 9%               |                     |
| Any MAT 100-level course                                   | 7   | 5%               |                     |
| Did not take test  | 42  | 33%              |                     |
| <hr/>  |   |                  |                     |
| <b><u>MAT 105 Course Grades</u></b>                        | Successful Grades   |                  | Unsuccessful Grades |
|  | N   | N                |                     |
|  | A's 11  | D's 19           |                     |
|  | B's 13  | F's 23           |                     |
|  | C's 29  | I, L's 10        |                     |
|  |   | W's 23           |                     |
| Totals   | 53 (41%)  |                  | 75 (59%)            |

**Table 2**

**Profile of MAT 105 Students: Breakdown by SAT-Quantitative Score**

|   | Did <u>Not</u> Meet Proficiency |      | Met Proficiency                   |      | Met Proficiency              |      |
|---|---------------------------------|------|-----------------------------------|------|------------------------------|------|
|   | SATQ Below<br>480<br>(N=30)     |      | SATQ Between<br>480-540<br>(N=57) |      | SATQ Above<br>550+<br>(N=32) |      |
| -----   |                                 |      |                                   |      |                              |      |
| <b>Test Scores</b>  | Mean                            | SD   | Mean                              | SD   | Mean                         | SD   |
| SAT-Q Scores:   | 438.7                           | 26.5 | 505.9                             | 18.9 | 586.9                        | 36.6 |
| Math Placement<br>Test Scores:                                    | Mean                            | SD   | Mean                              | SD   | Mean                         | SD   |
| Subtest 1 score   | 8.1                             | 1.2  | 8.2                               | 2.4  | 10.0                         | 1.9  |
| Subtest 2 score   | 6.7                             | 2.5  | 6.7                               | 2.3  | 9.2                          | 2.2  |
| Subtest 3 score   | 4.5                             | 2.8  | 5.0                               | 2.3  | 6.4                          | 2.9  |
| <b>Recommended Courses</b> Based Upon Math Placement Test Scores: | N                               | %    | N                                 | %    | N                            | %    |
| MAT 009   | 8                               | 27%  | 11                                | 19%  | 1                            | 3%   |
| MAT 050   | 8                               | 27%  | 11                                | 19%  | 5                            | 16%  |
| MAT 051   | 8                               | 27%  | 5                                 | 9%   | 6                            | 19%  |
| *MAT 150<br>or below  | 4                               | 13%  | 4                                 | 7%   | 3                            | 9%   |
| *Any MAT<br>100 course  | 1                               | 3%   | 1                                 | 2%   | 4                            | 12%  |
| Did not take test   | 1                               | 3%   | 25                                | 44%  | 13                           | 41%  |
| <b><u>MAT 105 Course Grades</u></b>                               |                                 |      |                                   |      |                              |      |
| Successful Grades   | N                               |      | N                                 |      | N                            |      |
| A's   | 1                               |      | 2                                 |      | 7                            |      |
| B's   | 3                               |      | 5                                 |      | 4                            |      |
| C's   | 8                               |      | 13                                |      | 7                            |      |
| Totals  | 12 (40%)                        |      | 20 (35%)                          |      | 18 (56%)                     |      |
| Unsuccessful Grades   |                                 |      |                                   |      |                              |      |
| D's   | 3                               |      | 11                                |      | 5                            |      |
| F's   | 5                               |      | 12                                |      | 5                            |      |
| I, L's  | 2                               |      | 4                                 |      | 2                            |      |
| W's   | 8                               |      | 10                                |      | 2                            |      |
| Totals  | 18 (60%)                        |      | 37 (65%)                          |      | 14 (43%)                     |      |

**Table 3**

**Profile of MAT 105 Students: Breakdown by Recommended Course Placement**

|                                     | Did Not Meet Proficiency             |          | Met Proficiency                        |          | Do Not Know                           |          |
|-------------------------------------|--------------------------------------|----------|--|----------|---------------------------------------|----------|
|                                     | Dev. Course<br>009/050/051<br>(N=67) |          | Math Course<br>Below 150/Any<br>(N=19) |          | No Rec.Course<br>Not Tested<br>(N=42) |          |
| -----                               |                                      |          |  |          |                                       |          |
| <b>Test Scores</b>                  | Mean                                 | SD       | Mean                                   | SD       | Mean                                  | SD       |
| SAT-Q Scores:                       | 495.2                                | 58.3     | 528.2                                  | 76.7     | 530.2                                 | 47.8     |
| Breakdown of Scores:                | N                                    | %        | N                                      | %        | N                                     | %        |
| 470 or below                        | 24                                   | 36%      | 5                                      | 26%      | 1                                     | 2%       |
| 480 to 540                          | 27                                   | 40%      | 5                                      | 26%      | 25                                    | 60%      |
| 550 or above                        | 12                                   | 18%      | 7                                      | 37%      | 13                                    | 31%      |
| No scores                           | 4                                    | 6%       | 2                                      | 11%      | 3                                     | 7%       |
| <b>Math Placement</b>               |                                      |          |  |          |                                       |          |
| Test Scores:                        | Mean                                 | SD       | Mean                                   | SD       | Mean                                  | SD       |
| Subtest 1 score                     | 7.9                                  | 1.9      | 10.5                                   | 1.6      | ---                                   | ---      |
| Subtest 2 score                     | 6.6                                  | 2.4      | 9.7                                    | 1.6      | ---                                   | ---      |
| Subtest 3 score                     | 4.1                                  | 2.1      | 8.8                                    | 1.5      | ---                                   | ---      |
| <b><u>MAT 105 Course Grades</u></b> |                                      |          |  |          |                                       |          |
| Successful Grades                   |                                      | N        |  | N        |                                       | N        |
| A's                                 |                                      | 1        |  | 5        |                                       | 5        |
| B's                                 |                                      | 11       |  | 1        |                                       | 1        |
| C's                                 |                                      | 16       |  | 8        |                                       | 5        |
| Totals                              |                                      | 28 (42%) |  | 14 (74%) |                                       | 11 (26%) |
| Unsuccessful Grades                 |                                      |          |  |          |                                       |          |
| D's                                 |                                      | 11       |  | 1        |                                       | 7        |
| F's                                 |                                      | 13       |  | 3        |                                       | 7        |
| I, L's                              |                                      | 3        |  | 0        |                                       | 7        |
| W's                                 |                                      | 12       |  | 1        |                                       | 10       |
| Totals                              |                                      | 39 (58%) |  | 5 (26%)  |                                       | 31 (74%) |

**Table 4**

**Breakdown by SAT-Q Score and Recommended Courses (009,050,051)**

|   | SATQ Below<br>480<br>(N=24) |      | SATQ Between<br>480-540<br>(N=27) |      | SATQ Above<br>550+<br>(N=12) |      |
|---|-----------------------------|------|-----------------------------------|------|------------------------------|------|
| <b>Test Scores</b>  | Mean                        | SD   | Mean                              | SD   | Mean                         | SD   |
| SAT-Q Scores:   | 439.2                       | 28.1 | 507.0                             | 19.2 | 580.8                        | 38.5 |
| <b>Math Placement Test Scores:</b>                                | Mean                        | SD   | Mean                              | SD   | Mean                         | SD   |
| Subtest 1 score   | 7.9                         | 1.2  | 7.1                               | 2.2  | 9.1                          | 1.7  |
| Subtest 2 score   | 6.1                         | 2.3  | 6.3                               | 2.2  | 8.6                          | 2.1  |
| Subtest 3 score   | 3.7                         | 2.1  | 4.4                               | 1.9  | 4.7                          | 2.1  |
| <b>Recommended Courses</b> Based Upon Math Placement Test Scores: |                             |      |                                   |      |                              |      |
|   | N                           | %    | N                                 | %    | N                            | %    |
| MAT 009   | 8                           | 33%  | 11                                | 41%  | 1                            | 8%   |
| MAT 050   | 8                           | 33%  | 11                                | 41%  | 5                            | 42%  |
| MAT 051   | 8                           | 33%  | 5                                 | 18%  | 6                            | 50%  |
| <b><u>MAT 105 Course Grades</u></b>                               |                             |      |                                   |      |                              |      |
| Successful Grades   | N                           |      | N                                 |      | N                            |      |
| A's   | 0                           |      | 0                                 |      | 1                            |      |
| B's   | 3                           |      | 4                                 |      | 3                            |      |
| C's   | 6                           |      | 7                                 |      | 3                            |      |
| Totals  | 9 (38%)                     |      | 11 (41%)                          |      | 7 (58%)                      |      |
| Unsuccessful Grades   |                             |      |                                   |      |                              |      |
| D's   | 3                           |      | 6                                 |      | 2                            |      |
| F's   | 3                           |      | 6                                 |      | 3                            |      |
| I, L's  | 2                           |      | 1                                 |      | 0                            |      |
| W's   | 7                           |      | 3                                 |      | 0                            |      |
| Totals  | 15 (62%)                    |      | 16 (59%)                          |      | 5 (42%)                      |      |

**Table 5**

**Breakdown by SAT-Q Score and Recommended Courses (MAT 100-level)**

|   | SATQ Below<br>480<br>(N=5) |      | SATQ Between<br>480-540<br>(N=5) |     | SATQ Above<br>550+<br>(N=7) |      |
|---|----------------------------|------|----------------------------------|-----|-----------------------------|------|
| <hr/>   |                            |      |                                  |     |                             |      |
| <b>Test Scores</b>  | Mean                       | SD   | Mean                             | SD  | Mean                        | SD   |
| SAT-Q Scores:   | 444.0                      | 11.4 | 498.0                            | 8.4 | 610.0                       | 32.7 |
| Math Placement<br>Test Scores:                                    | Mean                       | SD   | Mean                             | SD  | Mean                        | SD   |
| Subtest 1 score   | 9.2                        | 0.8  | 10.2                             | 1.8 | 11.6                        | 1.3  |
| Subtest 2 score   | 9.4                        | 1.1  | 9.0                              | 1.6 | 10.3                        | 2.1  |
| Subtest 3 score   | 8.6                        | 1.9  | 8.4                              | 0.5 | 9.3                         | 1.5  |
| <br>  |                            |      |                                  |     |                             |      |
| <b>Recommended Courses</b> Based Upon Math Placement Test Scores: |                            |      |                                  |     |                             |      |
|   | N                          | %    | N                                | %   | N                           | %    |
| MAT below 150   | 4                          | 80%  | 4                                | 80% | 3                           | 43%  |
| MAT any 100 level   | 1                          | 20%  | 1                                | 20% | 4                           | 57%  |
| <br>  |                            |      |                                  |     |                             |      |
| <b><u>MAT 105 Course Grades</u></b>                               |                            |      |                                  |     |                             |      |
| Successful Grades   | N                          |      | N                                |     | N                           |      |
| A's   | 0                          |      | 1                                |     | 3                           |      |
| B's   | 0                          |      | 0                                |     | 1                           |      |
| C's   | 2                          |      | 4                                |     | 1                           |      |
| Totals  | 2(40%)                     |      | 5 (100%)                         |     | 5 (71%)                     |      |
| Unsuccessful Grades   |                            |      |                                  |     |                             |      |
| D's   | 0                          |      | 0                                |     | 1                           |      |
| F's   | 2                          |      | 0                                |     | 1                           |      |
| I, L's  | 0                          |      | 0                                |     | 0                           |      |
| W's   | 1                          |      | 0                                |     | 0                           |      |
| Totals  | 3 (60%)                    |      | 0 (0%)                           |     | 2 (29%)                     |      |

**Table 6**

**Breakdown by SAT-Q Score and Those with no Math Placement Scores**

|                                     | SATQ Between<br>480-540<br>(N=25) |      | SATQ Above<br>550+<br>(N=13) |      |
|-------------------------------------|-----------------------------------|------|------------------------------|------|
| <b>Test Scores</b>                  | Mean                              | SD   | Mean                         | SD   |
| SAT-Q Scores:                       | 506.4                             | 20.2 | 580.0                        | 34.2 |
| <b><u>MAT 105 Course Grades</u></b> |                                   |      |                              |      |
| Successful Grades                   | N                                 |      | N                            |      |
| A's                                 | 1                                 |      | 3                            |      |
| B's                                 | 1                                 |      | 0                            |      |
| C's                                 | 2                                 |      | 3                            |      |
| Totals                              | 5 (20%)                           |      | 6 (46%)                      |      |
| Unsuccessful Grades                 |                                   |      |                              |      |
| D's                                 | 5                                 |      | 2                            |      |
| F's                                 | 6                                 |      | 1                            |      |
| I, L's                              | 3                                 |      | 2                            |      |
| W's                                 | 7                                 |      | 2                            |      |
| Totals                              | 21 (84%)                          |      | 7 (54%)                      |      |

