

PLACEMENT TEST SCORES and SUCCESS RATES in MATH COURSES

Research Question: Is there a relationship between the math placement test scores and the success in the placed math courses?

Study framework: Students who enrolled in MATH50, 51, 61, 71, 110, 120, 130, 140, 180 for the first time in Fall 2006 AND met prerequisite requirement through the placement test results only are included in this study.

The following table (Table 1) shows the number of students who enrolled in the target math courses for the first time in Fall 2006 by meeting the eligibility through placement test results only. The overall success rates of this cohort in target math courses by the type of placement test taken are also provided. The average success rates of students in MATH61 and 71 via MDT2 is 51.6%, the lowest among all math placement tests in this study.

Table 1

| Test Type | MATH 50 | MATH 51 | MATH 61 | MATH 71 | MATH 110 | MATH 120 | MATH 130 | MATH 140 | MATH 180 | Total Enrolled | No Pass | Pass | Success Rate |
|-------------|---------|---------|---------|---------|----------|----------|----------|----------|----------|----------------|---------|------|--------------|
| MATH | 729 | 176 | | | | | | | | 905 | 323 | 582 | 64.3% |
| MDT2 | | | 13 | 506 | | | | | | 519 | 251 | 268 | 51.6% |
| MDT3 | | | | | 221 | 10 | 160 | | | 391 | 151 | 240 | 61.4% |
| MDT4 | | | | | | | | 12 | 97 | 109 | 35 | 74 | 67.9% |
| Grand Total | 729 | 176 | 13 | 506 | 221 | 10 | 160 | 12 | 97 | 1924 | 760 | 1164 | 60.5% |

Results

Students who met eligibility through the MATH test scores and enrolled in MATH50 or MATH51 in Fall 2006 for the first time have an average of 64.3% success rate in the placed math courses. Table 2 shows the success rates of this group of students by their MATH test scores. Students who scored between 18 and 26 were placed in MATH50 while those scored above 26 were placed into MATH51.

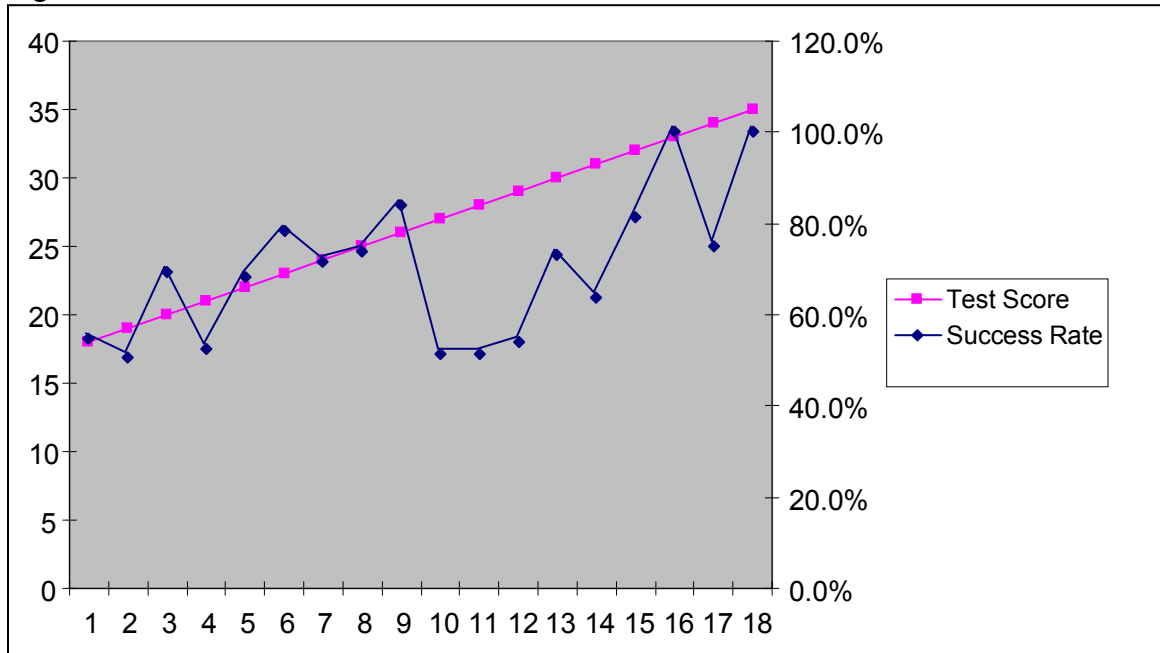
Table 2

| MATH Test Score | Total Enrolled | Pass in MATH50 | Pass in MATH51 | No Pass Total | Pass Total | Success Rate |
|-----------------|----------------|----------------|----------------|---------------|------------|--------------|
| 18 | 108 | 59 | | 49 | 59 | 54.6% |
| 19 | 93 | 47 | | 46 | 47 | 50.5% |
| 20 | 91 | 63 | | 28 | 63 | 69.2% |
| 21 | 84 | 44 | | 40 | 44 | 52.4% |
| 22 | 88 | 60 | | 28 | 60 | 68.2% |
| 23 | 69 | 54 | | 15 | 54 | 78.3% |

| MATH Test Score | Total Enrolled | Pass in MATH50 | Pass in MATH51 | No Pass Total | Pass Total | Success Rate |
|-----------------|----------------|----------------|----------------|---------------|------------|--------------|
| 24 | 71 | 51 | | 20 | 51 | 71.8% |
| 25 | 69 | 51 | | 18 | 51 | 73.9% |
| 26 | 56 | 47 | | 9 | 47 | 83.9% |
| 27 | 39 | | 20 | 19 | 20 | 51.3% |
| 28 | 37 | | 19 | 18 | 19 | 51.4% |
| 29 | 37 | | 20 | 17 | 20 | 54.1% |
| 30 | 15 | | 11 | 4 | 11 | 73.3% |
| 31 | 22 | | 14 | 8 | 14 | 63.6% |
| 32 | 16 | | 13 | 3 | 13 | 81.3% |
| 33 | 4 | | 4 | | 4 | 100.0% |
| 34 | 4 | | 3 | 1 | 3 | 75.0% |
| 35 | 2 | | 2 | | 2 | 100.0% |
| MATH Total | 905 | 476 | 106 | 323 | 582 | 64.3% |

An upward trend seems to appear with the success rates in MATH50 and MATH51 when MATH test scores increased. Figure 1 shows the trend in two segments: between test score 18 and 26 for MATH50 and between 27 and 35 for MATH51. A Chi-Squared test on the MATH test scores and the placed math course success yields a significant association between the two with MATH50 ($X^2=38.786$, $df=8$, $p<0.001$) but not with MATH51 ($X^2=11.569$, $df=8$, $p=0.171$). With MATH51, many cell frequencies are less than 5 which limits the precision that the corresponding success rates can be estimated; therefore, one needs to be cautious in making inferences on these rates.

Figure 1



Students who met eligibility through the MDT2 test scores and enrolled in MATH61 or MATH71 in Fall 2006 for the first time have an average of 51.6% success rate in the placed math courses. Table 2 shows the success rates of this group of students by their MDT2 test scores. With only 13 students enrolled for MATH61 in Fall 2006, the observed data is too small for study. For MATH71, although a Chi-Squared test yields a significant association ($\chi^2=53.977$, $df=25$, $p=0.001$) between test scores and the course success, with close to 39% of cells have frequency less than 5, the validity of such association is questionable. The standard rule of thumb is no more than 20% of the cells should have an expected frequency of less than 5. More data are needed to identify if a true relationship exists between test scores and course success.

Table 2

| MDT2 Test Score | Total Enrolled | Pass in MATH 61 | Pass in MATH 71 | No Pass Total | Pass Total | Success Rate |
|------------------------|-----------------------|------------------------|------------------------|----------------------|-------------------|---------------------|
| 24 | 2 | | | 2 | | 0.0% |
| 25 | 55 | 1 | 19 | 35 | 20 | 36.4% |
| 26 | 33 | | 16 | 17 | 16 | 48.5% |
| 27 | 48 | 1 | 14 | 33 | 15 | 31.3% |
| 28 | 45 | 1 | 20 | 24 | 21 | 46.7% |
| 29 | 44 | 1 | 14 | 29 | 15 | 34.1% |
| 30 | 32 | 1 | 15 | 16 | 16 | 50.0% |
| 31 | 32 | | 15 | 17 | 15 | 46.9% |
| 32 | 24 | 1 | 13 | 10 | 14 | 58.3% |
| 33 | 33 | | 20 | 13 | 20 | 60.6% |
| 34 | 22 | | 12 | 10 | 12 | 54.5% |
| 35 | 25 | | 15 | 10 | 15 | 60.0% |
| 36 | 20 | 1 | 12 | 7 | 13 | 65.0% |
| 37 | 22 | 1 | 12 | 9 | 13 | 59.1% |
| 38 | 19 | | 11 | 8 | 11 | 57.9% |
| 39 | 10 | | 9 | 1 | 9 | 90.0% |
| 40 | 10 | | 6 | 4 | 6 | 60.0% |
| 41 | 11 | | 8 | 3 | 8 | 72.7% |
| 42 | 8 | | 7 | 1 | 7 | 87.5% |
| 43 | 7 | | 6 | 1 | 6 | 85.7% |
| 44 | 4 | | 4 | | 4 | 100.0% |
| 45 | 5 | 1 | 3 | 1 | 4 | 80.0% |
| 46 | 2 | | 2 | | 2 | 100.0% |
| 47 | 3 | | 3 | | 3 | 100.0% |
| 48 | 2 | | 2 | | 2 | 100.0% |
| 50 | 1 | | 1 | | 1 | 100.0% |
| MDT2 Total | 519 | 9 | 259 | 251 | 268 | 51.6% |

Students who met eligibility through the MDT3 test score and enrolled in MATH110, MATH120 or MATH130 in Fall 2006 for the first time have an average of 61.4% success rate in the placed math

courses. Table 3 shows the success rates of this group of students by their MDT3 test scores. With only 10 students enrolled for MATH120 in Fall 2006, the total observed data is too small for study. A Chi-squared test yields a significant association between MDT3 test scores and success in MATH110, but not in MATH130. Again, with more than 60% of cells in MATH110 that have small frequencies, it limits the precision of such association.

Table 3

| MDT3 Test Score | Total Enrolled | Pass in MATH110 | Pass in MATH120 | Pass in MATH130 | No Pass Total | Pass Total | Success Rate |
|----------------------------|---------------------------|----------------------------|----------------------------|----------------------------|--------------------------|-----------------------|-------------------------|
| 21 | 32 | 10 | | 3 | 19 | 13 | 40.6% |
| 22 | 39 | 12 | 1 | 4 | 22 | 17 | 43.6% |
| 23 | 27 | 7 | | 7 | 13 | 14 | 51.9% |
| 24 | 21 | 3 | 1 | 3 | 14 | 7 | 33.3% |
| 25 | 35 | 12 | | 7 | 16 | 19 | 54.3% |
| 26 | 23 | 6 | | 6 | 11 | 12 | 52.2% |
| 27 | 31 | 11 | | 8 | 12 | 19 | 61.3% |
| 28 | 19 | 8 | | 2 | 9 | 10 | 52.6% |
| 29 | 20 | 11 | | 6 | 3 | 17 | 85.0% |
| 30 | 16 | 6 | | 3 | 7 | 9 | 56.3% |
| 31 | 16 | 8 | | 3 | 5 | 11 | 68.8% |
| 32 | 13 | 3 | 2 | 6 | 2 | 11 | 84.6% |
| 33 | 16 | 8 | | 5 | 3 | 13 | 81.3% |
| 34 | 11 | 6 | | 5 | | 11 | 100.0% |
| 35 | 6 | 2 | | 2 | 2 | 4 | 66.7% |
| 36 | 5 | 3 | | 2 | | 5 | 100.0% |
| 37 | 8 | 3 | | 3 | 2 | 6 | 75.0% |
| 38 | 5 | 3 | | | 2 | 3 | 60.0% |
| 39 | 8 | 5 | 1 | 2 | | 8 | 100.0% |
| 40 | 8 | 2 | 1 | 4 | 1 | 7 | 87.5% |
| 41 | 9 | 6 | | | 3 | 6 | 66.7% |
| 42 | 6 | 1 | 1 | 1 | 3 | 3 | 50.0% |
| 43 | 5 | 3 | | 1 | 1 | 4 | 80.0% |
| 44 | 6 | 3 | | 3 | | 6 | 100.0% |
| 45 | 6 | 2 | 1 | 2 | 1 | 5 | 83.3% |
| MDT3 Total | 391 | 144 | 8 | 88 | 151 | 240 | 61.4% |

Students who met eligibility through the MDT4 test scores and enrolled in MATH140 or MATH180 in Fall 2006 for the first time have an average of 67.9% success rate in the placed math courses. Table 4 shows the success rates of this group of students by their MDT4 test scores. With only 12 students enrolled for MATH140 in Fall 2006, the observed data is too small for study. For MATH180, a Chi-Squared test yields a significant association between test scores and course success at .05 level. However, due to the small frequencies (less than 5) in most crosstab cells and

small total observed cases for all MDT4 test scores in this study, the valid of such association is questionable.

| MDT4 Test Score | Total Enrolled | Pass in MATH 140 | Pass in MATH 180 | No Pass Total | Pass Total | Success Rate |
|----------------------------|---------------------------|-----------------------------|-----------------------------|--------------------------|-----------------------|---------------------|
| 25 | 2 | | | 2 | | 0.0% |
| 26 | 2 | 2 | | | 2 | 100.0% |
| 27 | 2 | 1 | | 1 | 1 | 50.0% |
| 28 | 4 | 2 | | 2 | 2 | 50.0% |
| 29 | 2 | 1 | | 1 | 1 | 50.0% |
| 30 | 2 | | | 2 | | 0.0% |
| 31 | 1 | | | 1 | | 0.0% |
| 32 | 3 | | | 3 | | 0.0% |
| 33 | 3 | | 1 | 2 | 1 | 33.3% |
| 35 | 1 | | | 1 | | 0.0% |
| 36 | 4 | | 3 | 1 | 3 | 75.0% |
| 37 | 3 | | 2 | 1 | 2 | 66.7% |
| 38 | 1 | | 1 | | 1 | 100.0% |
| 39 | 1 | | 1 | | 1 | 100.0% |
| 40 | 3 | | 1 | 2 | 1 | 33.3% |
| 41 | 4 | | 1 | 3 | 1 | 25.0% |
| 42 | 4 | | 3 | 1 | 3 | 75.0% |
| 43 | 4 | | 3 | 1 | 3 | 75.0% |
| 44 | 2 | | 2 | | 2 | 100.0% |
| 45 | 5 | | 4 | 1 | 4 | 80.0% |
| 46 | 5 | | 5 | | 5 | 100.0% |
| 47 | 2 | | 1 | 1 | 1 | 50.0% |
| 48 | 4 | | 4 | | 4 | 100.0% |
| 49 | 3 | | 2 | 1 | 2 | 66.7% |
| 50 | 5 | | 2 | 3 | 2 | 40.0% |
| 51 | 7 | | 4 | 3 | 4 | 57.1% |
| 52 | 6 | | 5 | 1 | 5 | 83.3% |
| 53 | 6 | | 6 | | 6 | 100.0% |
| 54 | 7 | | 6 | 1 | 6 | 85.7% |
| 55 | 4 | | 4 | | 4 | 100.0% |
| 56 | 2 | | 2 | | 2 | 100.0% |
| 58 | 1 | | 1 | | 1 | 100.0% |
| 59 | 3 | | 3 | | 3 | 100.0% |
| 60 | 1 | | 1 | | 1 | 100.0% |
| MDT4 Total | 109 | 6 | 68 | 35 | 74 | 67.9% |

Chi-Square Tests

| Test Type | FALL06 Target Course | | Value | df | Asymp. Sig. (2-sided) |
|-----------|----------------------|--------------------|-----------|----|-----------------------|
| MATH | MATH50 | Pearson Chi-Square | 38.786(a) | 8 | .000 |
| | | N of Valid Cases | 729 | | |
| | MATH51 | Pearson Chi-Square | 11.569(b) | 8 | .171 |
| | | N of Valid Cases | 176 | | |
| MDT2 | MATH61 | Pearson Chi-Square | 8.306(c) | 10 | .599 |
| | | N of Valid Cases | 13 | | |
| | MATH71 | Pearson Chi-Square | 53.977(d) | 25 | .001 |
| | | N of Valid Cases | 506 | | |
| MDT3 | MATH110 | Pearson Chi-Square | 43.317(e) | 24 | .009 |
| | | N of Valid Cases | 221 | | |
| | MATH120 | Pearson Chi-Square | 10.000(f) | 8 | .265 |
| | | N of Valid Cases | 10 | | |
| | MATH130 | Pearson Chi-Square | 32.823(g) | 23 | .084 |
| | | N of Valid Cases | 160 | | |
| MDT4 | MATH140 | Pearson Chi-Square | 4.000(h) | 4 | .406 |
| | | N of Valid Cases | 12 | | |
| | MATH180 | Pearson Chi-Square | 41.789(i) | 28 | .045 |
| | | N of Valid Cases | 97 | | |

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 19.43.

b 6 cells (33.3%) have expected count less than 5. The minimum expected count is .80.

c 22 cells (100.0%) have expected count less than 5. The minimum expected count is .31.

d 20 cells (38.5%) have expected count less than 5. The minimum expected count is .49.

e 32 cells (64.0%) have expected count less than 5. The minimum expected count is .70.

f 18 cells (100.0%) have expected count less than 5. The minimum expected count is .20.

g 36 cells (75.0%) have expected count less than 5. The minimum expected count is .90.

h 10 cells (100.0%) have expected count less than 5. The minimum expected count is 1.00.

i 58 cells (100.0%) have expected count less than 5. The minimum expected count is .30.

Conclusion

There is some evidence of an association between placement test scores and the success of placed math courses in Fall 2006. However, when breaking down to the individual course level, many cells have very small frequencies in the contingency tables where the use of Chi-squared test may not be reliable. More data are needed to determine the independence/dependence of placement test scores and placed course success.