

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.

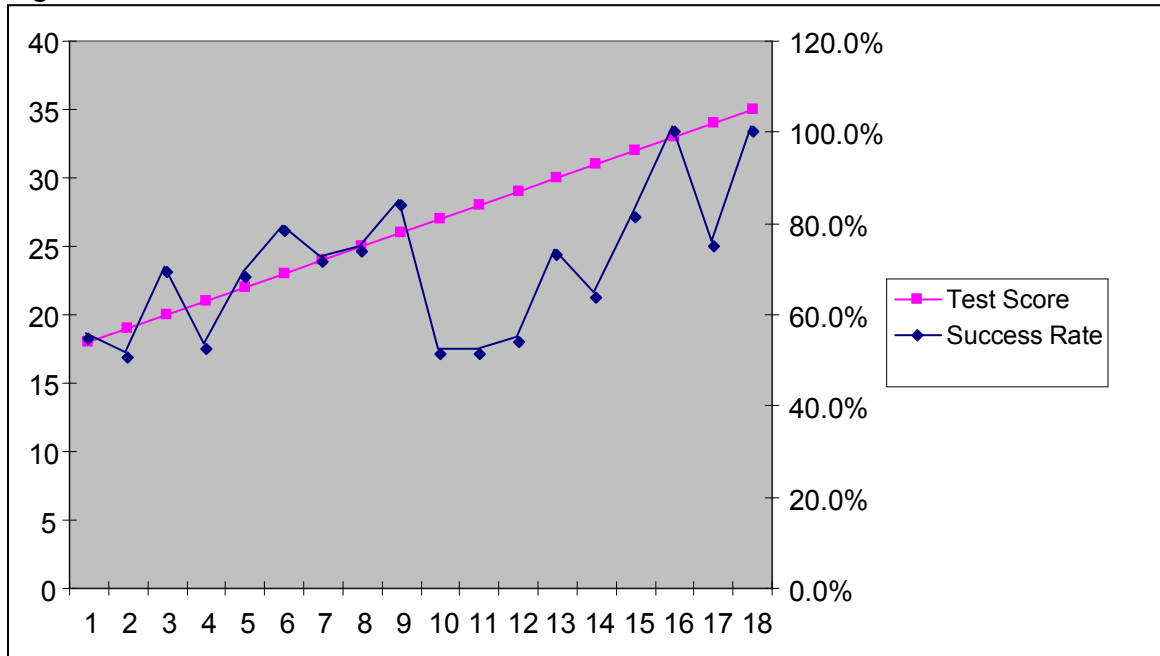
Table 2

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.