

Mathematics
Tracking Study of MTH080 Students
Spring 2008

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Introduction

As a part of its program review efforts, the Mathematics Department at Harper College was interested in investigating the academic success of students who took MTH080. The department requested information regarding how many other developmental math courses these students completed before MTH080, how successful students were in MTH080, and how successful they were in their next math class compared to other students who had not taken developmental math courses.

Harper's Regent system was used to identify students who had taken MTH080 during FY06 and then to collect information regarding the developmental math classes they took before MTH080 and college math classes they took after MTH080. We selected FY06 as a starting cohort to give students time to enroll in other math classes. We then used the Regent system to obtain information on students who had taken these same classes along with the MTH080 students in order to draw the comparison.

This report is organized into an Introduction, a Results and Discussion section that presents information in tabular format, and a Summary section that highlights notable results. The Appendix presents additional detail on course-level grades and success.

Results and Discussion

A total of 1,608 students took MTH080 during FY06 (Summer semester 2005 through Spring semester 2006). Most of them (87%) had taken MTH080 a single time during FY06. A very small proportion of students (0.5%) took MTH080 once in each semester (i.e., three times during FY06). If we examine the total number of times that these students took MTH080 (including attempts before and after FY06), a large minority (41%) took MTH080 more than once. Table 1, below, shows additional detail on the number of times students took MTH080.

Table 1: Attempts at MTH080

Number of attempts	Number of students	% of students
1	949	59.0%
2	383	23.8%
3	176	10.9%
4	61	3.8%
5	24	1.5%
6	11	0.7%
7	2	0.1%
8	0	0.0%
9	0	0.0%
10	1	0.1%
11	1	0.1%

As we can see in Table 1, while the majority of students (59%) made a single attempt, a relatively large proportion (41%) attempted MTH080 more than once. Dwindling proportions attempted MTH080 more than three times.

Of the 1,608 students who took MTH080 during FY06, 1,112 (69%) were eventually successful (earning a grade of C or better). The majority of these successful students (65%) were able to earn a grade of C or better in a single attempt. While the maximum was 10 attempts, on average these successful students needed 1.6 attempts to earn a grade of C or better. A total of 496 students were not yet successful in MTH080 as of Fall 2007. On average, these non-successful students made 1.9 attempts. Among the FY06 students, 232 students (14% of the total) made a single non-successful attempt and have not yet tried again.

Table 2 shows the distribution of the first grade earned in MTH080 as well as the best grade earned. These are grades earned by the students who took MTH080 during FY06, but the grades themselves could have been earned in a different fiscal year. As shown in Table 2, 45 percent of students were successful in their first attempt, while 69 percent were eventually successful through Fall 2007.

Table 2: First and Best Grades Earned in MTH080

Grade	Grade Earned in		Best Grade Earned	
	n	%	n	%
A	158	9.8%	212	13.2%
B	270	16.8%	414	25.7%
C	292	18.2%	486	30.2%
D	180	11.2%	118	7.3%
F	295	18.3%	226	14.1%
W	413	25.7%	152	9.5%

We next examined the relationship between student success in MTH080 and their history in developmental math coursework. The two main questions were:

- Is student success related to the number of times they attempted MTH080?
- Is student success related to the number of prerequisites students had to satisfy?

Table 3 shows students' grades as a function of how many times they had attempted MTH080 (grades shown are the best grades earned). Table 4 shows student success (defined as earning a grade of C or better) as a function of attempts. As shown in Table 3, students making a single attempt earned the highest proportion of A grades (17%). The proportion of A grades declined rather dramatically for students making two or more attempts. The proportion of B and C grades remained relatively stable based on number of attempts, but the proportion of D and F grades tended to increase for students making multiple attempts.

Table 3: Grade in MTH080 by Number of Attempts

Number of Attempts	Best Grade Earned in MTH080 ^a											
	A		B		C		D		F		W	
	n	%	n	%	n	%	n	%	n	%	n	%
1	158	17%	270	28%	289	30%	33	3%	98	10%	101	11%
2	34	9%	84	22%	120	31%	43	11%	65	17%	37	10%
3	12	7%	40	23%	50	28%	20	11%	42	24%	12	7%
4	5	8%	12	20%	16	26%	13	21%	13	21%	2	3%
5	1	4%	5	21%	7	29%	7	29%	4	17%	0	0%
6	1	9%	2	18%	3	27%	1	9%	4	36%	0	0%
7	1	50%	1	50%	0	0%	0	0%	0	0%	0	0%
10	0	0%	0	0%	1	100%	0	0%	0	0%	0	0%
11	0	0%	0	0%	0	0%	1	100%	0	0%	0	0%

^a Best grade was significantly related to number of attempts ($\chi^2=149.90$, $df=40$, $p<.01$).

Table 4: Success in MTH080 by Number of Attempts

Number of Attempts	Success in MTH080 ^{a,b}			
	Not Successful		Successful	
	n	%	n	%
1	232	24%	717	76%
2	145	38%	238	62%
3	74	42%	102	58%
4	28	46%	33	54%
5	11	46%	13	54%
6	5	45%	6	55%
7	0	0%	2	100%
10	0	0%	1	100%
11	1	100%	0	0%

^a Success is defined as a student earning a grade of C or better as the best grade awarded in the course.

^b Success was significantly related to number of attempts ($\chi^2=51.09$, $df=8$, $p<.01$).

As shown in Table 4, student success in MTH080 tended to decline with number of attempts. The rate of student success was highest for students making their first attempt. Success rate declined for students making their second and third attempts but appeared to level out for students making their fourth and subsequent attempts. Relatively few students (100 of 1,608, or 6%) made four or more attempts.

Some students enrolling in MTH080 arrived in that course after taking one or more other developmental math courses. Table 5 shows the placement levels of students enrolled in MTH080 during FY06.¹

Table 5: Initial Placement Levels of MTH080 Students

Initial Placement Level	n	%
MTH050 (includes MTH050, 051, 052, 053, or 055)	211	13.1%
MTH060 (includes MTH060, 061, 062, or 063)	587	36.5%
MTH080 (first course taken was MTH080)	810	50.4%

¹ Placement levels were inferred from the first MTH course taken by each student.

Half of the MTH080 students took MTH080 as their first math course. Most of the remainder (587, or 37% of total) initially placed into MTH060-level classes. A minority (211, or 13% of total) initially placed into MTH050-level classes.

Students were more successful in their first attempt at MTH080 if they had initially placed into MTH080. Students who had initially placed into MTH050- or MTH060-level classes had equivalent success rates in their first MTH080 attempt. Table 6 shows students' grades in their first attempt in MTH080 based on their initial placement level. Table 7 shows student success (grade of C or better) in MTH080 as a function of their initial placement level.

Table 6: First Grades in MTH080 Based on Initial Placement Level

First Grade in MTH080	Initial Placement Level ^a					
	MTH050 Level		MTH060 Level		MTH080 Level	
	n	%	n	%	n	%
A	11	5.2%	54	9.2%	93	11.5%
B	28	13.3%	79	13.5%	163	20.1%
C	44	20.9%	98	16.7%	150	18.5%
D	30	14.2%	64	10.9%	86	10.6%
F	37	17.5%	105	17.9%	153	18.9%
W	61	28.9%	187	31.9%	165	20.4%

^a Grades were significantly related to initial placement level ($\chi^2=40.20$, $df=10$, $p<.01$).

Table 6: Success in First MTH080 Based on Initial Placement Level

Success in First MTH080	Initial Placement Level ^a					
	MTH050 Level		MTH060 Level		MTH080 Level	
	n	%	n	%	n	%
Not successful	128	60.7%	356	60.6%	404	49.9%
Successful	83	39.3%	231	39.4%	406	50.1%

^a Success was significantly related to initial placement level ($\chi^2=18.87$, $df=2$, $p<.01$).

Although students' first grades were related to their initial placement level, students' best grades earned in MTH080 were *not* significantly related to their initial placement level. This is important because it suggests that students were able to achieve a level playing field given time despite varying levels of initial skill. However, as noted above, the overall success rate was 69 percent—31 percent were *not* successful in MTH080, despite multiple attempts in some cases.

We next examined students' success in their next math class following MTH080. Harper's Regent system was used to identify the next math class taken by the FY06 MTH080 students. We then extracted all other students that were in these classes with the FY06 MTH080 students. We checked the transcripts of these students to identify those who had taken MTH080 but not in FY06. Finally, we selected students' first attempt in each course for the purposes of comparison.

A total of 851 of the FY06 MTH080 students (53%) went on to take a college-level math course. The courses chosen by the MTH080 students are shown in Table 7.

Table 7: First College-Level Math Courses Taken by FY06 MTH080 Students

Course	n	%
MTH101	334	39.2%
MTH103	327	38.4%
MTH124	3	0.4%
MTH130	65	7.6%
MTH134	2	0.2%
MTH140	2	0.2%
MTH165	118	13.9%

A total of 4,965 students were in these math classes. A large minority (2,023, or 41%) had taken MTH080 at some point. That is, 851 of these students took MTH080 during FY06 and an additional 1,172 had taken MTH080 in a different academic year. Now we focus on students' success in their first attempt in a college-level math course, and how their chances of success were related to their prior enrollment in MTH080 (regardless of the year in which they took MTH080).

Table 8 shows the grade earned in students' first attempt at a college-level math course. These courses represent the first college-level courses taken by MTH080 students and the first attempt at these courses by students who had not taken MTH080. Students who had taken MTH080 were less likely to earn As and more likely to earn Cs and Ws than students who had not taken MTH080. The difference in grade distribution was statistically significant ($\chi^2=174.45$, $df=5$, $p<.01$). The Appendix contains a breakdown of grades earned by specific courses. Compared to students who did not take MTH080, the MTH080 students tended to earn lower grades in MTH101, MTH103, MTH130, and MTH165.

Table 8: Grades Earned in First College-Level Math Course

Grade ^a	Prior Enrollment in MTH080			
	Did not take MTH080		Took MTH080	
	n	%	n	%
A	756	23%	283	12%
B	729	22%	469	20%
C	614	19%	591	26%
D	219	7%	240	10%
F	398	12%	217	9%
W	531	16%	512	22%

^a Grades were significantly related to students' prior enrollment in MTH080 ($\chi^2=174.45$, $df=5$, $p<.01$).

Table 9 compares success rates in students' first attempts in college-level math courses. As in the prior discussion, a successful grade is defined as a grade of C or better. Grades of D, F, and W were considered not successful. Although the majority (58%) of MTH080 students were successful in their first college-level math class, their success rate

was lower than that of students who had not taken MTH080. The difference in success rates was statistically significant ($\chi^2=24.62$, $df=1$, $p<.01$).

Table 9: Success in First College-Level Math Course

Success ^a	Prior Enrollment in MTH080			
	Did not take MTH080		Took MTH080	
	n	%	n	%
Not successful	1,148	35%	969	42%
Successful	2,099	65%	1,343	58%

^a Success was significantly related to students' prior enrollment in MTH080 ($\chi^2=24.62$, $df=1$, $p<.01$).

Table 10: Success in First College-Level Math Course, by Course

Course	Success	Prior Enrollment in MTH080			
		Did not take MTH080		Took MTH080	
		n	%	n	%
MTH101	Not successful	240	31%	266	30%
	Successful	540	69%	615	70%
MTH103 ^a	Not successful	501	43%	437	52%
	Successful	674	57%	406	48%
MTH124 ^b	Not successful	13	27%	5	63%
	Successful	35	73%	3	38%
MTH130 ^c	Not successful	53	28%	72	50%
	Successful	134	72%	72	50%
MTH134	Not successful	8	17%	4	44%
	Successful	40	83%	5	56%
MTH140	Not successful	21	43%	2	18%
	Successful	28	57%	9	82%
MTH165 ^d	Not successful	312	33%	183	44%
	Successful	648	68%	233	56%

^a Success was significantly related to students' prior enrollment in MTH080 ($\chi^2=16.70$, $df=1$, $p<.01$).

^b Success was significantly related to students' prior enrollment in MTH080 ($\chi^2=3.94$, $df=1$, $p<.01$).

^c Success was significantly related to students' prior enrollment in MTH080 ($\chi^2=16.24$, $df=1$, $p<.01$).

^d Success was significantly related to students' prior enrollment in MTH080 ($\chi^2=16.64$, $df=1$, $p<.01$).

Table 10 shows students' success in their first college-level math course broken out by course. Success rates between MTH080 students and those who had not taken MTH080 were equivalent for MTH101, MTH134, and MTH140. MTH080 students had lower success rates in MTH103, MTH124, MTH130, and MTH165, compared to students who had not taken MTH080. Sample sizes for MTH124, MTH134, and MTH140 were low, and as a consequence the results for these classes might not be reliable.

We also examined the success of MTH080 students in their first college-level math class based on how long they waited to take this next class. Length of time was measured in terms of the number of semesters elapsed between their last attempt at MTH080 and the semester in which they took their first college-level math class. There

was no statistically significant difference in student success based on the lag between MTH080 and the first college-level math class. While many MTH080 students had not yet attempted a college-level math class,² the majority of those that had (64%) enrolled in a college-level math class the semester immediately following MTH080.

Summary

The Mathematics Department of Harper College was interested in examining student success in MTH080, as well as the success that MTH080 students experience in their first college-level math class.

First, we identified students who had taken MTH080 during FY06 (Summer semester 2005 through Spring semester 2006). There were a total of 1,608 students who took MTH080 during FY06, most of whom (87%) enrolled in the course a single time during that year. Considering the total number of times that students took MTH080 (including attempts made before and after FY06), 59 percent took MTH080 a single time; 24 percent took MTH080 twice; 11 percent took MTH080 three times; 6 percent took MTH080 more than three times. Fewer than half of the students (45%) earned a grade of C or better in their first attempt at MTH080. The majority of these students (69%) eventually earned a grade of C or better in MTH080, but 496 students (31%) had not yet earned a successful grade despite multiple attempts in some cases.

The rate of success was highest for students making their first attempt and declined for students making their second, third, and fourth attempts. On average, students required 1.6 attempts to be successful in MTH080. Students were more likely to be successful in their first attempt at MTH080 if they had initially placed into that course; students who took lower-level developmental courses (e.g., MTH060, MTH055) were less likely to be successful in their first attempt at MTH080. However, students who had initially placed at a lower level were eventually able to succeed in MTH080 at rates equivalent to those who had placed into the course.

Just over half (53%) of the FY06 MTH080 students went on to take college-level math classes by Fall semester 2007. Most of these students (544, or 64%) took their first college-level math class the semester immediately following their MTH080 class. In examining the courses they had taken, we found that MTH080 students were in general less likely to be successful compared to students who had not taken MTH080. MTH080 students were less likely to be successful in MTH103, MTH124, MTH130, and MTH165.

Based on these findings, we offer the following recommendations:

- Investigate the possibility of modifying instructional methods to increase student success in MTH080.

² For many career programs, MTH080 is the highest level math required.

- Focusing on the courses identified as likely “destinations” for MTH080 students (see Table 7), investigate potential ways to modify courses to improve students’ chance of success.
 - It may be especially useful to focus on MTH101 and MTH103: these are the most common destinations for MTH080 students and require the same level of math proficiency for placement, but these two courses show very different success rates for MTH080 students (70% for MTH101 and 48% for MTH103).

Appendix
Course-Level Grades for
MTH080 Students and Non-MTH080 Students

Table A1: Grades in First College-Level Math Course, by Course

Course	Grade	Prior Enrollment in MTH080			
		Did not take MTH080		Took MTH080	
		n	%	n	%
MTH101 ^a	A	216	28%	156	18%
	B	169	22%	202	23%
	C	155	20%	257	29%
	D	42	5%	85	10%
	F	97	12%	66	7%
	W	101	13%	115	13%
MTH103 ^b	A	218	19%	69	8%
	B	246	21%	129	15%
	C	210	18%	208	25%
	D	88	7%	90	11%
	F	170	14%	109	13%
	W	243	21%	238	28%
MTH124	A	15	31%	0	0%
	B	12	25%	3	38%
	C	8	17%	0	0%
	D	6	13%	3	38%
	F	1	2%	1	13%
	W	6	13%	1	13%
MTH130 ^c	A	45	24%	8	6%
	B	65	35%	34	24%
	C	24	13%	30	21%
	D	17	9%	27	19%
	F	12	6%	9	6%
	W	24	13%	36	25%
MTH134	A	9	19%	0	0%
	B	13	27%	4	44%
	C	18	38%	1	11%
	D	3	6%	2	22%
	F	1	2%	0	0%
	W	4	8%	2	22%
MTH140	A	8	16%	1	9%
	B	5	10%	2	18%
	C	15	31%	6	55%
	D	2	4%	0	0%
	F	13	27%	0	0%
	W	6	12%	2	18%
MTH165 ^d	A	245	26%	49	12%
	B	219	23%	95	23%
	C	184	19%	89	21%
	D	61	6%	33	8%
	F	104	11%	32	8%
	W	147	15%	118	28%

^a Success was significantly related to students' prior enrollment in MTH080 ($\chi^2=53.28$, $df=5$, $p<.01$).

^b Success was significantly related to students' prior enrollment in MTH080 ($\chi^2=74.68$, $df=5$, $p<.01$).

^c Success was significantly related to students' prior enrollment in MTH080 ($\chi^2=36.33$, $df=5$, $p<.01$).

^d Success was significantly related to students' prior enrollment in MTH080 ($\chi^2=56.01$, $df=5$, $p<.01$).