

NECC College Math Tutoring Center Results Fall 2010

Office of Institutional Research & Planning

The College Math Tutoring Center at Northern Essex Community College opened its doors to students in the Spring 2009 semester. In Fall 2010, 1,064 grades were distributed to 1,047 students enrolled in college level math courses¹ during the term, 249 of which sought math tutoring services through the Center.

As displayed in Table 1 below, the 249 students who participated in math tutoring in Fall 2010 averaged 5 total contacts with the Center and 496 contact minutes (slightly over 8 contact hours). Fall 2010 saw an increase in the number of students enrolled in college math courses who sought tutoring services from previous terms, but averages for the number of contacts, minutes and hours decreased between the terms.

Table 1

Tutoring Activity

		Spring '09	Fall '09	Spring '10	Fall '10	Fall '09 -Fall '10% Change
# of Contacts	N	128 ²	152 ³	241	249	63.8%
	Mean	8	7	5.5	5.2	-25.7%
	Median	5	4	3.0	3.0	-25.0%
	Mode	1	1	1.0	1.0	0.0%
	Sum	1,040	1,034	1,317.0	1,285.0	24.3%
Contact Minutes	N	103	150	241	249	66.0%
	Mean	771	718	554.7	496.4	-30.9%
	Median	390	329	256.0	214.0	-35.0%
	Mode	60	59	91.0	32.0	-45.8%
	Sum	79,455	107,773	133,673.0	123,590.0	14.7%
Contact Hours	N	103	150	241	249	66.0%
	Mean	13	12	9.0	8.3	-30.8%
	Median	7	5	4.1	3.6	-28.0%
	Mode	1	1	1.3	0.5	-50.0%
	Sum	1,324	1,796	2,228.3	2,059.8	14.7%

¹ College level math courses include the following: Advanced Algebra & Trigonometry, Applied Technical Mathematics, Calculus for Business/Social/Life Sciences, Calculus I, II, & III, College Algebra & Trigonometry, College Algebra, Contemporary Math I & II, Differential Equations, Mathematical Ideas I & II, Mini-Trigonometry, and Statistics.

² Of the 128 students enrolled in college level math in Spring 2009 who participated in math tutoring, 25 had zero contact minutes recorded.

³ Of the 152 students enrolled in college level math in Fall 2009 who participated in math tutoring, 2 had zero contact minutes recorded.

College Math Student Profile

In Fall 2010 more males enrolled in college level math courses and more males than females sought tutoring. These differences were not statically significantly⁴.

Table 2

Tutoring Status by Gender						
Gender	No Tutoring		Tutoring		Total	
	N	%	N	%	N	%
Female	350	43.9%	118	47.4%	468	44.7%
Male	448	56.1%	131	52.6%	579	55.3%
Total	798	100.0%	249	100.0%	1,047	100.0%

Table 3 depicts the race/ethnicity distributions for those who received tutoring services and those that did not. There was a significant difference between the distribution and tutoring participation⁵ and as seen below, there were significantly more minority students that participated in tutoring than those that did not.

Table 3

Tutoring Status by Race/Ethnicity						
Race/Ethnicity	No Tutoring		Tutoring		Total	
	N	%	N	%	N	%
African-American/Black	16	2.0%	12	4.8%	28	2.7%
American Indian/Alaskan Native	2	0.3%	2	0.8%	4	0.4%
Asian	14	1.8%	2	0.8%	16	1.5%
Hispanic	157	19.7%	66	26.5%	223	21.3%
Multi-Racial	7	0.9%	2	0.8%	9	0.9%
Native Hawaiian/Pacific Islander	8	1.0%	3	1.2%	11	1.1%
Non-Resident Alien	2	0.3%	5	2.0%	7	0.7%
Unknown	24	3.0%	10	4.0%	34	3.2%
White/Caucasian	568	71.2%	147	59.0%	715	68.3%
Total	798	100.0%	249	100.0%	1,047	100.0%

⁴ Chi square tests were used to determine levels of significance and had an Alpha of .01.

⁵ $\chi^2=25.96$, $p = .001$

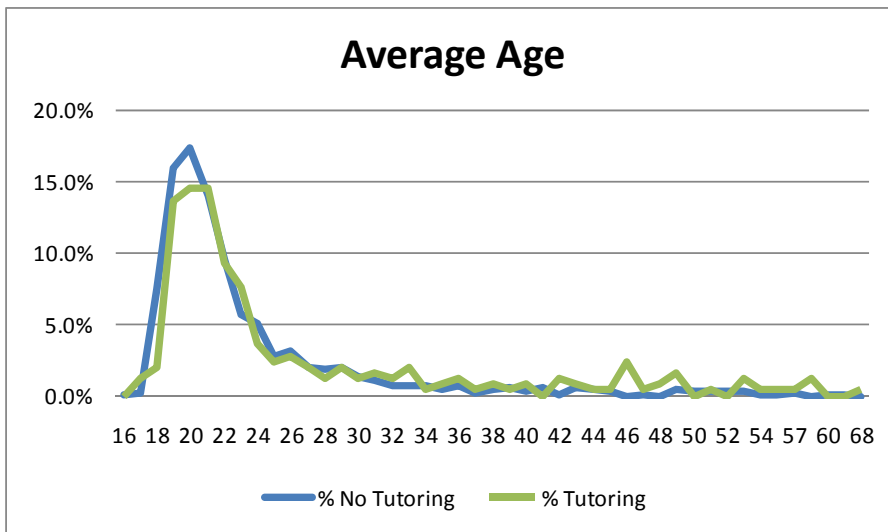
The vast majority of students accessing math tutoring services were continuing students, which was significantly⁶ higher than the overall composition of students enrolled in college math courses (see Table 4).

Table 4

Tutoring Status by Student Status						
Student Status	No Tutoring		Tutoring		Total	
	N	%	N	%	N	%
Continuing	491	61.5%	203	81.5%	694	66.3%
New	177	22.2%	19	7.6%	196	18.7%
Readmit	92	11.5%	22	8.8%	114	10.9%
Transfer	35	4.4%	4	1.6%	39	3.7%
Unknown	3	0.4%	1	0.4%	4	0.4%
Total	798	100.0%	249	100.0%	1,047	100.0%

As displayed in the chart below, students seeking math tutoring services had a significantly⁷ higher average age than those who did not.

Chart 1



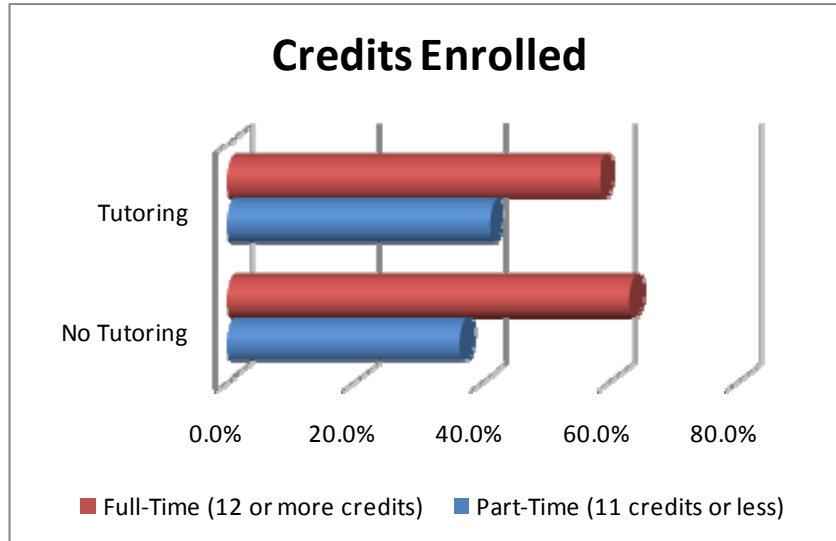
Age in Years	No Tutoring	Tutoring	Total
N	798	249	1,047
Mean	23.7	26.4	24.4
Median	21.0	21.8	21.3
Mode	19.4	19.5	19.5

⁶ $\chi^2=38.11, p = .000$

⁷ $t = -4.63, p = .000$

The majority of both college math students who received tutoring and those that did not were enrolled in 12 or more credits. On average (median) students were enrolled in 12 credits (see Chart 2). The differences were not statistically significant.

Chart 2



Credits Enrolled	No Tutoring	Tutoring	Total
N	795	248	1,043 ⁸
Mean	11.3	11.1	11.3
Median	12.0	12.0	12.0
Mode	13.0	12.0	12.0

Students who participated in math tutoring had earned, on average, more credit hours than those who did not seek tutoring (see Table 5). This difference was statistically significant⁹.

Table 5

Tutoring Status by Earned Credit Hours			
	No Tutoring	Tutoring	Total
N	608	232	840 ¹⁰
Mean	33.0	38.0	34.4
Median	28.0	31.0	30.0
Mode	25.0	22.0	12.0

⁸ Four students did not have credit enrollment data.

⁹ $t = -2.86, p = .004$

¹⁰ 207 students did have earned credit data.

Prior to Fall 2010, the majority of students had taken two prior math courses. Those who received tutoring had a slightly higher average of 2.4 courses compared to those who did not receive tutoring (2.2 average prior math courses).

Table 6

Tutoring Status by Prior MAT Courses						
	No Tutoring		Tutoring		Total	
Prior MAT Courses	N	%	N	%	N	%
No Prior MAT courses	295	37.0%	41	16.5%	336	32.1%
1	179	22.4%	60	24.1%	239	22.8%
2	177	22.2%	74	29.7%	251	24.0%
3	79	9.9%	37	14.9%	116	11.1%
4	38	4.8%	16	6.4%	54	5.2%
5	15	1.9%	14	5.6%	29	2.8%
6	8	1.0%	4	1.6%	12	1.1%
7	4	0.5%	0	0.0%	4	0.4%
8	1	0.1%	2	0.8%	3	0.3%
9	0	0.0%	1	0.4%	1	0.1%
10	0	0.0%	0	0.0%	0	0.0%
11	1	0.1%	0	0.0%	1	0.1%
12	0	0.0%	0	0.0%	0	0.0%
13	1	0.1%	0	0.0%	1	0.1%
Total	798	100.0%	249	100.0%	1,047	100.0%

Of the college math students who sought tutoring in Fall 2010, 61.% had assessed into developmental math. This proportion is approximately 11% higher than those who did not seek tutoring, and this difference is statically significant¹¹.

Table 7

Tutoring Status by Math Placement¹²						
	No Tutoring		Tutoring		Total	
Math Placement	N	%	N	%	N	%
Assessed into Developmental Math	397	49.7%	152	61.0%	549	52.4%
Assessed into College Math	275	34.5%	71	28.5%	346	33.0%
Unknown	126	15.8%	26	10.4%	152	14.5%
Total	798	100.0%	249	100.0%	1,047	100.0%

¹¹ $\chi^2=10.39$, $p = .006$

¹² For students with multiple assessment scores, only the most recent test data was used.

Table 8

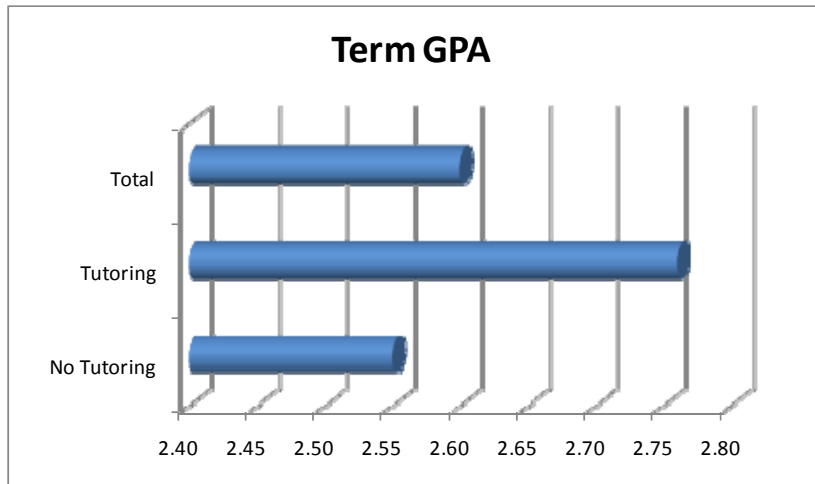
Tutoring Status by Testing Scores				
		Arithmetic Score	Elementary Algebra Score	College Level Math Score
No Tutoring	Valid	663	666	661
	Missing	135	132	137
	Mean	77.7	65.7	24.1
	Median	81.6	63.9	22.5
	Mode	77.0	72.0	0.0
Tutoring	Valid	214	214	212
	Missing	35	35	37
	Mean	70.7	59.2	20.8
	Median	74.5	54.9	20.2
	Mode	36.1	21.0	0.0

Students who participated in math tutoring received a lower average Arithmetic, Elementary Algebra, and College Level test scores than those who did not seek tutoring. The differences for Arithmetic and Elementary Algebra scores were statistically significant¹³.

College Math Outcomes

The final GPA for the Fall 2010 term was, on average, significantly¹⁴ higher for college math students who accessed tutoring services than those who did not (see Chart 3).

Chart 3



Term GPA	No Tutoring	Tutoring	Total
N	798	249	1,047
Mean	2.55	2.76	2.60
Median	2.85	3.00	2.92
Mode	0.00	4.00	0.00

¹³ $t = 2.95, p = .003, t = 3.13, p = .002$ respectively

¹⁴ $t = -2.43, p = .015$

A total of 1,064 college math grades were distributed among 1,047 individual students during the Fall 2010 semester. Students who sought tutoring services achieved notably higher A – C and A – D completion rates in college math than those who did not seek tutoring. This difference was statistically significant¹⁵ for both A – C and A – D completion rates.

Table 9

Tutoring Status by Final College Math Grade						
Final Grade	No Tutoring		Tutoring		Total	
	N	%	N	%	N	%
A	159	19.7%	60	23.4%	219	20.6%
A-	67	8.3%	37	14.5%	104	9.8%
B+	49	6.1%	10	3.9%	59	5.5%
B	78	9.7%	24	9.4%	102	9.6%
B-	39	4.8%	12	4.7%	51	4.8%
C+	29	3.6%	10	3.9%	39	3.7%
C	49	6.1%	17	6.6%	66	6.2%
C-	27	3.3%	8	3.1%	35	3.3%
D+	24	3.0%	6	2.3%	30	2.8%
D	25	3.1%	11	4.3%	36	3.4%
F	53	6.6%	19	7.4%	72	6.8%
FW	0	0.0%	0	0.0%	0	0.0%
I	23	2.8%	11	4.3%	34	3.2%
NW	83	10.3%	11	4.3%	94	8.8%
W	103	12.7%	20	7.8%	123	11.6%
Total	808	100.0%	256	100.0%	1,064	100.0%
A - C Completion	470	58.2%	170	66.4%	640	60.2%
A - D Completion	546	67.6%	195	76.2%	741	69.6%

¹⁵ $\chi^2=5.50$, $p = .019$ and $\chi^2=6.79$, $p = .009$, respectively

As displayed previously in Table 7, there were significant differences in the distribution of math placement results between those who sought tutoring and those who did not. When the math placement groups were combined with completion rates, those who sought tutoring services had greater A – C completion rates in all placement groups except for those that tested three levels below college level. In terms of A – D completion rates, those who sought tutoring services had greater rates in all placement groups except for those that tested two and three levels below college level.

Table 10

		Tutoring Status by Math Placement Groups & Completion Rates			A-C	A-D
		A - C Grades	A - D Grades	Total Grades	Completion Rates	Completion Rates
No Tutoring	Missing	50	52	115	43.5%	45.2%
	Did Not Take	4	4	15	26.7%	26.7%
	Waiver	40	47	62	64.5%	75.8%
	Tested at College Level	132	159	217	60.8%	73.3%
	Tested 1 Level Below College Level	227	259	367	61.9%	70.6%
	Tested 2 Levels Below College Level	12	18	25	48.0%	72.0%
	Tested 3 Levels Below College Level	5	7	7	71.4%	100.0%
	Total	470	546	808	58.2%	67.6%
Tutoring	Missing	16	16	22	72.7%	72.7%
	Did Not Take	5	5	5	100.0%	100.0%
	Waiver	9	11	12	75.0%	91.7%
	Tested at College Level	39	47	62	62.9%	75.8%
	Tested 1 Level Below College Level	91	103	134	67.9%	76.9%
	Tested 2 Levels Below College Level	8	9	16	50.0%	56.3%
	Tested 3 Levels Below College Level	2	4	5	40.0%	80.0%
	Total	170	195	256	66.4%	76.2%

Correlations

A correlation exists when two variables are linked closely enough that knowing the values for one variable lets us predict with some accuracy the values of a second variable. Correlation does not prove causation, only that there is a relationship. While a correlation coefficient with an absolute value of 1 (-1 or +1) indicates a perfect association, an absolute value of .2 or higher is typically worth noting.

For students who sought tutoring, there was no significant relationship found between the total minutes spent in tutoring and A – C or A – D completion rates.

Controlling for gender, results showed that tutoring had a stronger impact on females than males. Females who participated in tutoring had a moderate relationship ($G = .306$) with A – C completion rates whereas males had a virtually non-existent relationship ($G = .066$).

The relationship between age and college math grades was much more pronounced for A – C completion rates. Students who participated in tutoring that were over 25 years of age had a positive relationship ($G = .410$) with A – C completion rates. Students who did not participate in tutoring also demonstrated a moderately weak relationship ($G = .237$), however this relationship was stronger for those who participated in tutoring.

When controlling for race (excluding students who had an unknown race/ethnicity), minorities (American Indian/Alaskan Native, Asian, Black non-Hispanic, and Hispanic, multi-racial, and Native Hawaiian/Pacific Islander) demonstrated a stronger relationship between tutoring and final college math grades than the majority (White non-Hispanic) ($G = .252$ for A – C and $G = .356$ for A – D).

Summary

College math students who accessed tutoring services were significantly different from those who did not seek tutoring in terms of race/ethnicity, student status, age, earned credit hours, math placements, arithmetic scores, elementary algebra scores, final grades, and end of term GPA. A higher proportion of those who participated in tutoring were minority, older, continuing students that had more earned credit hours, had higher A – C and A – D completion rates, and had higher end of term GPAs.

An association between math tutoring and successful course completion was revealed through correlation analysis; the relationship between these two variables increased for female students, minority students, and students over age 25.

Tests for significance also determined a remarkable difference in the distribution of math placement results between those who sought tutoring and those who did not. Results showed higher completion rates for several categories of placement groups for those who received tutoring in comparison to their counterparts in the same placement groups. These results are indicative of tutoring increasing the likelihood of successful completion of college math courses for students who test at college level, one level below and two levels below college level.