Mt. San Jacinto MSJC College

From the MSJC Research Office…

Assessment of the Multiple Measures used to Place MSJC Students into Reading, English, and Math Courses

What we looked at:

The following study was conducted to evaluate the multiple measures used by Mt. San Jacinto College to place students into various Reading, English, and Math courses. This study was designed to answer the following research questions: Do the measures selected for use in the placement decision process correlate with student performance? Do students whose placement decisions were influenced by the additional measures do better in the course they were recommended to enroll in?

For this investigation all students who took one or more of the ACCUPLACER assessment tests between Spring 2002 and Summer 2006 (the first semester the ACCUPLACER assessment tests were administered at MSJC through the last semester end-of-course grades were available for), and then enrolled at MSJC in the course their placement test recommended them to enroll in within two semesters of taking the test were included in the analysis. Listed in the table below are the number of students included from each course.

Course	Course description	Sample size (n)
Reading 063	Reading Fundamentals	386
Reading 064	Intermediate Reading	803
English 061	Basic Grammar and Usage	1,471
English 062	Basic Writing Skills	2,212
English 098	English Fundamentals	3,107
English 101	Freshman Composition	1,554
Math 050	Mind over Math	2,940
Math 051	Foundations of Mathematics	1,482
Math 090	Elementary Algebra	2,143
Math 096	Intermediate Algebra	2,100
Math 102	Finite Mathematics	59
Math 105	College Algebra	442
Math 110	Pre-Calculus	57
Math 140	Introduction to Statistics	53
Math 211	Calculus I and Analytic Geometry	7

What we found:

Part I: Descriptive Analysis

Course placement decisions at MSJC are based on student's scores on one or more standardized ACCUPLACER assessment tests and their responses to additional measures designed to assess students' prior education and general behavior (see the Table below for a list of the additional questions and response scales; see Appendix A for frequency distributions of student responses to each question by department).

Table 1. Additional measures used by MSJC to aid course placement decisions.

Question	Name	Value	Value Label
Please select from the list below the highest level of math you have completed with a grade of "C" or better.	Highest Math	1	Basic arithmetic or lower
		2	Pre-algebra
		3	Elementary Algebra (Algebra 1)
		4	Geometry
		5	Intermediate Algebra (Algebra 2)
		6	Trigonometry
		7	Pre-calculus
		8	Calculus
Please select from the list below the highest level of English you have completed with a grade of "C" or better.	Highest English	1	Sophomore or less
		2	Junior
		3	Senior
		4	Advanced literature or writing course
		5	Honors studies or advanced placement (AP)
Find the letter that corresponds to the number of classes you plan to enroll in this semester and the number of hours you will work during the school year.	Matrix	A	I will work 10 hours or less/wk and enroll in 2 or fewer classes
		B	I will work 10 hours or less/wk and enroll in 3 classes
		C	I will work 10 hours or less/wk and enroll in 4 classes
		D	I will work 10 hours or less/wk and enroll in 5 or more classes
		E	I will work 11-20 hours/wk and enroll in 2 or fewer classes
		F	I will work 11-20 hours/wk and enroll in 3 classes
		G	I will work 11-20 hours/wk and enroll in 4 classes
		H	I will work 11-20 hours/wk and enroll in 5 or more classes
		I	I will work 21+ hours/wk and enroll in 2 or fewer classes
		J	I will work 21+ hours/wk and enroll in 3 classes
		K	I will work 21+ hours/wk and enroll in 4 classes
		L	I will work 21+ hours/wk and enroll in 5 or more classes
How many hours per week do you spend reading materials other than newspapers and textbooks?	Reading Hours	1	1 or less hours/wk
		2	2-3 hours/wk
		3	4-5 hours/wk
		4	6 or more hours/wk
On average, how much time per day do you intend to spend on your homework and out-of-class study for each class for which you enroll?	Study Hours	1	1/2 hour or less
		2	1-1 1/2 hrs
		3	1-1/2-2 hrs
		4	More than 2 hours

To better understand how many students' placement decisions are influenced by the additional measures used during the assessment process, several descriptive analyses were performed. To determine how many students' placement decisions were influenced by the additional measures, it first had to be determined whether a student's assessment score fell within the cut-score range for the course they were recommended to enroll in. If a student's assessment score falls within the cut-score range for the course they were

recommended to enroll in, then the additional measures likely had little effect on the placement decision. If however, a student's assessment score falls outside of the cut-score range for the course they were recommended to enroll in, it may be inferred that the placement decision was influenced by the additional measures.

Analysis of all of the courses combined revealed that the majority (94.3%, *n* = 17,678) of students placed in a particular course scored within the cut-score range specified in the 2006-2007 MSJC course catalog. The table below presents the findings for each individual course.

	ACCUPLACER test used for placement	Cut score range from the 2006-2007 MSJC Catalog	Num. & % of students whose ACCUPLACER assessment score falls **within** the cut-score range		Num. & % of students whose ACCUPLACER assessment score falls **outside** the cut-score range		Total Sample Size (*n*)
Reading 063	Reading Comprehension	1-44	385	99.7%	1	0.3%	386
Reading 064	Reading Comprehension	45-82	783	97.5%	20	2.5%	803
English 061	Reading Comprehension & Sentence Skills	1-57	1,450	98.6%	21	1.4%	1,471
English 062	Reading Comprehension & Sentence Skills	58-79	2,034	92.0%	178	8.0%	2,212
English 098	Reading Comprehension & Sentence Skills	80-99	2,890	93.0%	217	7.0%	3,107
English 101	Reading Comprehension & Sentence Skills	100-120	1,299	83.6%	255	16.4%	1,554
Math 050	Arithmetic	1-44	2,925	99.5%	15	0.5%	2,940
Math 051	Arithmetic	45-75	1,392	93.9%	90	6.1%	1,482
Math 090	Arithmetic OR Algebra	76-120 44-62	2,018	94.2%	125	5.8%	2,143
Math 096	Algebra	63-103	1,994	98.0%	106	5.0%	2,100
Math 102	College Level Math [OR *Algebra?*]	62-76 [*104+*]	54	91.5%	5	8.5%	59
Math 105	College Level Math [OR *Algebra?*]	62-76 [*104+*]	410	92.8%	32	7.3%	442
Math 110	College Level Math	77-103	53	93.0%	4	7.0%	57
Math 140	College Level Math [OR *Algebra?*]	62-76 [*104+*]	47	88.7%	6	11.3%	53
Math 211	College Level Math	104-120	4	57.1%	3	42.9%	7
Total			17,678	94.3%	1,078	5.7%	18,756

Although the majority of the placement decisions appear to be based on students ACCUPLACER assessment scores, approximately 5.7% (*n* = 1,078) of students assessment scores fall outside of the cut-score range, suggesting that the placement decisions for these students were influenced by the students responses to the additional questions.

To assess the degree of influence the additional measures have on student's placement decisions, the 1,078 students whose assessment scores fell outside of the range specified by their placement decision were further examined. Although it was initially assumed that the 1,078 student's whose assessment scores did not correspond to their placement decisions, were students whose placement decisions had been influenced by the additional measures, the analysis revealed that just over half (54.5%, *n* = 588) were students whose

placement decisions appeared to have been influenced by the additional measures. For the remaining 45.5% (*n* = 480) of students, the additional measures do not appear to have been the influential factor as these students did not respond to the additional measures. Thus, it is unclear why their placement decisions do not correspond to the placement decisions based strictly on the ACCUPLACER cut-scores. Because of this important finding, further analyses were performed.

For the students whose placement decisions appear to have been influenced by the additional measures, 91.9% of the students scored within ± 3 points of the cut-score range. Thus, students whose placement decisions were influenced by the additional measures were primarily students who fell at either the high or low end of a cut-score range. Thus, the placement decisions for students with a borderline level of preparation, based on the student's assessment score, were more likely to be placed in a higher or lower course depending on how they responded to the additional questions regarding their prior education and general behavior.

A similar analysis was performed with the 480 students whose assessment scores did not correspond to their placement decision, but who did not provide answers to the additional measures. Analysis of their assessment scores revealed a much wider range. For this group, only 58.0% of students had scores that fell within ± 3 points of the cut-score range. In several instances, assessment scores were ± 20 or more from the upper or lower cut-score boundary. Thus, the placement decision for these students appears to be somewhat random.

For a breakdown of the findings by course see Appendix B.

Summary. Based on the results of the descriptive analysis, it can be concluded that for the majority of the students their placement decisions are based exclusively on their ACCUPLACER test scores, with only 3.1% of placement decisions appearing to be influenced by student responses to the additional measures. What is unclear from this analysis is how placement decisions are being made for the 2.6% of students whose scores fell outside of the cut score range, and for whom responses to the additional measures were missing. Further investigation of these students' placement decisions is recommended.

Part II: Correlational Analyses

To evaluate the adequacy of the multiple measures used to place students, correlations were run between ACCUPLACER scores, each of the additional items used as multiple measures, and end-of-course grades. According to the State Chancellor's Office of the California Community Colleges[1], measures used in the placement process should be correlated with course performance (ideally, assessment test scores and course performance should be correlated at the .35 level or higher). The Chancellor's Office recommends performing the correlations prior to implementing a cut-score system. Thus, because existing cut scores are in place these results should be interpreted with caution. When an existing cut score system is in place, lower correlations between the multiple measures and course performance are likely to be found due to a restricted range in course grades and assessment scores.

Relationship of ACCUPLACER Test Scores to Student Performance

To demonstrate that an adequate relationship (i.e., .35 or higher) exists between the ACCUPLACER assessment test scores and student performance, point biseral correlations were run. In the current study, end-of-course grades were used as the indicator of student performance. To be consistent across the departments and courses, a credit/no credit grading system was used. A credit/no credit grading system was used because the basic skills Reading and English courses (i.e., Reading 063 and 064, English 061 and 062) do not assign letter grades.

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[1] Chancellor's Office of the California Community Colleges. (February 1991). *Assessment Validation Project Local Research Options*. Design 11: Validating Placement Rules.

Reading. Placement decisions for the two reading courses students may be recommended to enroll in are based on students' scores on the ACCUPLACER Reading Comprehension test. Overall, a positive correlation was found between students reading comprehension test scores and end-of-course grades for both Reading 063 and 064 (see Table below). The positive correlations indicate that students with higher ACCUPLACER test scores were more likely to receive credit in the course. Although positive correlations were found, the correlations for both courses were below the .35 standard.

	Reading 063	Reading 064
Point Biseral Correlation Coefficient *(r)*	.105	.129
Significance level *(p)*	.068	.002
n	303	594

English. English placement decisions are based on students combined ACCUPLACER Sentence Skills and Reading Comprehension test scores. Thus, to examine the relationship between assessment test scores and course performance, students' Sentence Skills and Reading Comprehension scores were combined by multiplying each score by .5 and then adding the two scores together. Correlations were then performed with the combined scores.

For each of the four English courses, positive correlations were found between the combined ACCUPLACER test scores and end-of-course grades (see the table below). Students with higher ACCUPLACER test scores were more likely to receive credit in the course they enrolled in. Although the correlations were significant for each of the four English courses, the state standard of .35 was not met.

	English 061	English 062	English 098	English 101
Point Biseral Correlation Coefficient *(r)*	.150	.047	.124	.055
Significance level *(p)*	<.001	.045	<.001	.045
n	1,164	1,854	2,659	1,334

Math. Three different ACCUPLACER assessment tests are used to place students into math courses. For the two lowest level math courses, Math 050 and 051, the Arithmetic test is used to place students. A positive correlation was found between Arithmetic test scores and end-of-course grades in both Math 050 and 051.

	Math 050	Math 051
Point Biseral Correlation Coefficient *(r)*	.298	.090
Significance level *(p)*	<.001	.001
n	2,481	1,252

For Math 090, the Arithmetic or Elementary Algebra test are used. Although a positive correlation was found between Arithmetic test scores and end-of-course grades, a negative correlation was found between Elementary Algebra test scores and end-of-course grades. The negative correlation between end-of-course grades and the assessment test scores indicates that students with higher scores on the Elementary Algebra test were less likely to receive credit (i.e., pass) in Math 090.

	Math 090
Arithmetic	
Point Biseral Correlation Coefficient *(r)*	.259
Significance level *(p)*	<.001
n	740
Elementary Algebra	
Point Biseral Correlation Coefficient *(r)*	-.050
Significance level *(p)*	.037
n	1,768

Placement into Math 096 is based on Elementary Algebra test scores. A positive relationship was found between Elementary Algebra test scores and end-of-course grades in Math 096 (r = .181, p < .001, n = 1,777).

For the courses Math 102, 105, and 140 the same cut scores are used for placement into all of these courses. Although the 2006-2007 MSJC course catalog states that placement into these courses is based on College Level Mathematics (CLM) test scores, many students did not have CLM test scores and appeared to be placed in the course if they received an Elementary Algebra test score of 104 or higher, thus correlations were run for both Elementary Algebra and CLM test scores. For each of the three courses, positive correlations were found between Elementary Algebra and CLM test scores and end-of-course grades.

	Math 102	Math 105	Math 140
Elementary Algebra			
Point Biseral Correlation Coefficient *(r)*	.290	.104	.364
Significance level *(p)*	.032	.043	.017
n	55	378	43
College Level Mathematics			
Point Biseral Correlation Coefficient *(r)*	.175	.226	.221
Significance level *(p)*	.210	<.001	.170
n	53	347	40

For Math 110 and 211 scores on the College Level Mathematics test are used to place students. For Math 211 a positive correlation between CLM test scores and end-of-course grades was found. However, for Math 110 a negative correlation was found between CLM test scores and end-of-course grades[2]. The negative correlation suggests that students with higher CLM scores are less likely to receive credit in Math 110.

	Math 110	Math 211
Point Biseral Correlation Coefficient *(r)*	-.107	.538
Significance level *(p)*	.446	.271
n	53	6

Summary. Two correlations met the state standard of .35, (1) the correlation between Elementary Algebra test scores and end-of-course grades in Math 140, and (2) the correlation between College Level Mathematics test scores and end-of-course grades in Math 211. All other correlations were below the minimum standard. Furthermore, two of the correlations were negative, (1) the correlation between Elementary Algebra test scores and end-of-course grades in Math 090, and (2) the correlation between College Level Mathematics test scores and end-of-course grades in Math 110.

As discussed earlier, correlations between test scores and course grades ideally should be performed prior to implementing cut scores. Correlations run after the implementation of cut score rules, are likely to be lower than correlations prior to implementation due to a restriction in the range of assessment scores and end-of-course grades. Thus, the relatively low correlations found in the current analysis may be due to the restricted range imposed by the existing cut-scores.

Although, the relatively low correlations may be the result of the restricted range, the negative correlations between course performance and assessment scores should be further monitored.

Relationship of Additional Measures to Student Performance

To examine whether the additional measures used in the placement process relate to student performance, correlations were run between each of the additional measures currently in use by MSJC and course grades.

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[2] Further analysis revealed that Elementary Algebra test scores were positively related to end-of-course grades in Math 110, though this correlation is not significant (r = .133, p = .413, n = 40).

To examine which measures relate to course performance in each course and department, separate correlations were run for each individual course and then overall correlations were run for each department (i.e., Reading, English, Math). In order to correlate students responses to the matrix question, the matrix variable had to be divided into two variables one representing the number of hours a student plans on working and a second variable representing the number of classes the student plans on taking within a given semester. By splitting the variable into two, two linear variables were created which could then be used to run the correlations.

Reading. Three of the additional measures (highest English, reading hours, and the number of courses students plan on taking) were found to be related to end-of-course grades in reading. The strongest correlation was found between highest English and end-of-course grades, overall highest English accounted for 1.23% (r^2) of the variability in end-of-course grades. Whereas the number of courses a student plans on enrolling in and the number of hours a student reports reading within a given week account for less than 1% of the variability each in end-of-course grades. These findings indicate that students who took a higher English course, plan on enrolling in more courses within a semester, and report reading more hours within a given week generally due better in Reading 063 and 064.

	Correlation with Course Grades						
	Variables Currently Used for Reading Course Placement Decisions					Other Variables Included in the Assessment Process	
Course	Highest English	Reading Hours	Study Hours	Matrix: Work Hours	Matrix: Num. of Courses	Years since last math course	Highest Math
All Reading (*n* = 902)	.111* *p* =.004	.092* *p* =.016	-.002 *p* =.966	.035 *p* =.358	.099* *p* =.009	-.024 *p* =.525	.146* *p* <.001
Reading 063 (*n* = 285)	.075 *p* =.261	.147* *p* =.028	.042 *p* =.532	.072 *p* =.283	.123 *p* =.065	.035 *p* =.606	.166* *p* =.012
Reading 064 (*n* = 460)	.095* *p* =.042	.043 *p* =.361	-.056 *p* =.227	-.016 *p* =.726	.061 *p* =.190	-.044 *p* =.342	.072 *p* =.122

Although three variables were found to be significantly related to course performance for students in all reading courses, when the correlations were examined for each of the individual reading courses only reading hours was correlated with end-of-course grades in Reading 063 and highest English was correlated with end-of-course grades in Reading 064.

Based on the results, it is recommended that highest English, reading hours, and number of courses be kept as multiple measures for use in the placement process. Because of the weak and inconsistent direction of the correlations found for study hours and work hours they do not appear to be good predictors of course performance.

English. For all of the English courses combined, only highest English was found to be related to course performance at a statistically significant level. Students who indicated completing a higher-level English course were more likely to receive credit in the course they were recommended to enroll in. Highest English accounted for 1% (r^2) of the variability in course grades.

	Correlation with Course Grades						
	Variables Currently in Use for English Course Placement Decisions					Other Variables Included in the Assessment Process	
Course	Highest English	Reading Hours	Study Hours	Matrix: Work Hours	Matrix: Num. of Courses	Years since last math course	Highest Math
All English (*n* = 5,258)	.104* *p* <.001	.026 *p* =.058	.005 *p* =.721	-.009 *p* =.512	.008 *p* =.567	-.014 *p* =.320	.149* *p* <.001

English 061 (n = 894)	.157* p <.001	.016 p =.589	.035 p =.291	.009 p =.778	.018 p =.592	-.077* p =.021	.211* p <.001
English 062 (n = 1,454)	.016 p = .544	.005 p =.864	-.013 p =.631	-.005 p =.860	-.024 p =.357	-.001 p =.963	.055* p =.035
English 098 (n = 1,989)	.060* p =.007	-.024 p =.276	.030 p =.187	-.041 p =.070	-.046* p =.040	.039 p =.083	.067* p <.001
English 101 (n = 922)	.023 p =.490	-.009 p =.783	.006 p =.863	-.102* p =.002	.046 p =.167	-.010 p =.762	.040 p =.220

Although highest English was the only variable correlated with course grades among all of the English courses combined and the only variable related to course grades in English 061 and 062, two additional variables were related to course grades in English 098, and one additional variable was related to course grades in English 101. In English 098, study hours and the number of courses students intend to take were significantly correlated with course performance. The results indicate that students who reported an intention to study more hours and take fewer courses within a given semester were more likely to have higher course grades. Although significant, the strength of each of these correlations is low, accounting for less than 1% of the variance in course grades. Finally in English 101, a negative relationship was found between the number of hours students indicated working within a semester and course grades. The intention to work more hours was associated with lower course performance.

Based on the results of the correlation analysis, it is recommended that highest English be kept as a multiple measure for use in the placement process. Of the measures currently in use, highest English was the strongest and most consistent predictor of end-of-course grades.

<u>Math.</u> For all of the math courses combined, highest math and the number of courses students intend to take were significantly correlated to end-of-course grades. Completion of a higher level math course and the intention to take fewer courses were positively related to end-of-course grades. Furthermore, highest math was a significant predictor of end-of-course grades in four of the individual math courses and approached significant in one other course. Thus, across the courses it appears to be an adequate predictor of course success, as a result it is recommended that highest math be kept as part of the placement process.

	Correlation with Course Grades						
	Variables Currently Used for Math Course Placement Decisions				Other Variables Included in the Assessment Process		
Course	Highest Math	Study Hours	Matrix: Work Hours	Matrix: Num. of Courses	Reading Hours	Years since last math course	Highest English
All Math (n = 6,015)	.079* p<.001	.006 p =.645	-.021 p =.098	-.031* p =.016	.032* p =.014	.072* p<.001	.054* p<.001
Math 050 (n = 1,899)	.084* p <.001	.007 p =.773	.031 p =.177	-.026 p =.259	.035 p =.133	-.096* p <.001	.123* p <.001
Math 051 (n = 964)	.062 p =.055	.014 p =.665	-.046 p =.155	-.013 p =.693	.023 p =.481	.100* p =.002	.014 p =.669
Math 090 (n = 1,354)	.055* p =.042	.046 p =.090	-.026 p =.339	-.040* p =.140	.028 p =.298	.104* p <.001	.052 p =.055
Math 096 (n = 1,389)	.090* p =.001	-.034 p =.207	-.049 p =.066	-.062* p =.022	.041 p =.128	.054* p =.044	-.008 p =.759
Math 102 (n = 46)	.065 p =.670	-.068 p =.653	-.042 p =.781	-.076 p =.616	-.064 p =.674	.183 p =.218	.136 p =.368
Math 105 (n = 281)	.116 p =.051	.006 p =.922	-.194* p =.001	-.092 p =.126	.014 p =.816	-.042 p =.481	-.014 p =.816
Math 110 (n = 39)	-.106 p =.522	.216 p =.187	-.345* p =.031	.074 p =.656	-.048 p =.772	.129 p =.434	-.064 p =.699
Math 140	-.050	.160	.067	.230	-.367*	-.073	.133

(*n* = 34)	*p* =.780	*p* =.365	*p* =.707	*p* =.190	*p* =.033	*p* =.681	*p* =.454
Math 211[3] (*n* = 5)	-	-	-	-	-	-	-

In addition to highest math, it is recommended that "years since last math course" be considered for use in the placement process. In many of the individual math courses, years since last math course, was a stronger predictor of end-of-course grades than highest math.

Summary. For each department, significant correlations were found between one or more additional measures and end-of-course grades. For Reading, English, and Math the highest English and/or math course completed was found to be a significant predictor of course performance. Students who completed a higher English or math course generally did better in the course. Thus the two questions assessing highest English and Math course completed with a grade of 'C' or better should be kept as additional measures. Furthermore, the two components of the matrix question were intermittently related to course performance in various courses across the departments. Thus, it is recommended that the matrix question be kept as an additional measure. However, it is further recommended that the question be divided into two separate questions that independently assess the number of hours a student plans on working and the number of courses they intend to take. It is further recommended that reading hours be kept as an additional measure. Reading hours was significantly correlated with course success in reading courses (but not in English). In addition to the questions recommended to be kept, it is recommended that years since last math course be added as an additional measure. Although it is currently not used in the placement process, it was found to be a significant predictor of course success in math. Thus, adding years since last math course may help improve placement decisions in math. Finally, it is recommended that the variable study hours be removed as an additional measure. Across the departments and courses, study hours was unrelated to course performance.

Part III: Chi-square Analyses

To further investigate the relationship between the additional measures and course performance. A series of chi-square analyses were performed. Specifically the chi-square analyses were performed to examine the relationship between placement decisions and two separate indicators of course performance (course success and completion). Specifically, the following analyses were performed to determine whether students are more or less likely to succeed or complete a course if their placement decisions were influenced by the additional measures.

For this analysis course success was defined as receiving an A, B, C, or CR grade and course completion was defined as receiving any grade other than a W. Rates of success and completion were examined among those whose placement decisions where or where not influenced by the additional measures. The 480 students for whom it could not be determined how their placement decisions were generated were omitted from the analyses.

The Relationship between Course Success and Placement Decisions

To examine whether students who are recommended to enroll in a course based on their responses to the additional measures are more or less successful than students recommended to enroll in a course based exclusively on their ACCUPLACER assessment scores, 2-way chi-square analyses were performed for each course. The results of the individual course analyses can be found in Appendix C.

Based on the results of the chi-square analyses, course success was found to be unrelated to placement decisions. Across the courses, students who were placed in a course based on their combined ACCUPLACER test scores and their responses to the additional measures were no more likely to succeed in

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[3] Correlations could not be run for Math 211 because not enough students provided answers to the multiple measures.

the course than students who were placed in the course based on their ACCUPLACER assessment scores alone. This finding suggests that the additional measures do not have a significant impact on course performance.

Furthermore in two courses, course success was found to be negatively related to placement decisions. In Math 096 (χ^2 (1) = 4.87, p = .036) and Math 140 (χ^2 (1) = 6.10, p = .061), it was found that more students than would be expected did not receive credit in their course when their placement decision was influenced by the additional measures, and fewer students than expected received credit when their placement decision was influenced by the additional measures. This finding suggests that students who were recommended to enroll in Math 096 and 140 based on their combined ACCUPLACER test score and answers to the additional measures were less likely to succeed in the course.

The Relationship between Course Completion and Placement Decisions

In addition to course success, the relationship between course completion and whether or not placement decisions were influenced by the additional measures was examined. The results of the individual course analyses can be found in Appendix D.

Across the courses it was found, that the tendency to withdraw from a class was unrelated to whether or not students' placement decisions were influenced by the additional measures. Approximately the same percentage of students who withdrew from a course had placement decisions that were influenced by the additional measures as compared to those whose placement decisions were based solely on the ACCUPLACER scores.

Although only marginally significant, in Math 096 a negative relationship between course completion and placement decisions was found, χ^2 (1) = 3.46, p = .086. Students in Math 096 whose placement decisions were based on their ACCUPLACER assessment scores and their responses to the additional measures were more likely than would be expected to withdraw from the course. This finding again suggests that for students in Math 096, placement decisions based on the additional measures may be related to decreased course performance.

Summary. Overall, no relationship was found between course success or course completion and whether or not placement decisions were influenced by the additional measures. Thus, the additional measures appear to have no impact on student success in a course or on the tendency to withdraw from a course. Indicating that for those students whose placement decisions are influenced by the additional measures they are no not more likely to experience success in a course, or be more likely to complete a course.

Where we got the data:

End-of-course grades were obtained from Chancellor's Office MIS files submitted by MSJC through Information Technology for each of the terms examined. ACCUPLACER test scores, responses to the additional measures, and the computer generated placement decisions were obtained from Datatel extracts performed by Information Technology.

Appendix A
Frequency Distributions of Student Responses to the Additional Measures by Department

Reading

Highest English	Frequency	Percent	Valid Percent	Cumulative Percent
Sophomore or less	128	10.8	14.2	14.2
Junior	162	13.6	18.0	32.2
Senior	570	47.9	63.3	95.4
Advanced literature or writing course	20	1.7	2.2	97.7
Honors studies or advanced placement (AP)	21	1.8	2.3	100.0
Total	901	75.8	100.0	
Missing	288	24.2		
Total	1189	100.0		

Matrix: Student Work Hours and Number of Courses	Frequency	Percent	Valid Percent	Cumulative Percent
I will work 10 hours or less/wk and enroll in 2 or fewer classes	88	7.4	7.4	31.6
I will work 10 hours or less/wk and enroll in 3 classes	101	8.5	8.5	40.1
I will work 10 hours or less/wk and enroll in 4 classes	119	10.0	10.0	50.1
I will work 10 hours or less/wk and enroll in 5 or more classes	78	6.6	6.6	56.7
I will work 11-20 hours/wk and enroll in 2 or fewer classes	21	1.8	1.8	58.5
I will work 11-20 hours/wk and enroll in 3 classes	53	4.5	4.5	62.9
I will work 11-20 hours/wk and enroll in 4 classes	105	8.8	8.8	71.7
I will work 11-20 hours/wk and enroll in 5 or more classes	67	5.6	5.6	77.4
I will work 21+ hours/wk and enroll in 2 or fewer classes	63	5.3	5.3	82.7
I will work 21+ hours/wk and enroll in 3 classes	62	5.2	5.2	87.9
I will work 21+ hours/wk and enroll in 4 classes	82	6.9	6.9	94.8
I will work 21+ hours/wk and enroll in 5 or more classes	62	5.2	5.2	100.0
Missing	288	24.2	24.2	24.2
Total	1189	100.0	100.0	

Reading Hours	Frequency	Percent	Valid Percent	Cumulative Percent
1 or less hour/wk	345	29.0	38.3	38.3
2-3 hours/wk	384	32.3	42.6	80.9
4-5 hours/wk	117	9.8	13.0	93.9
6 or more hours/wk	55	4.6	6.1	100.0
Total	901	75.8	100.0	
Missing	288	24.2		
Total	1189	100.0		

Study Hours	Frequency	Percent	Valid Percent	Cumulative Percent
1/2 hour or less	26	2.2	2.9	2.9
1-1 1/2 hrs	240	20.2	26.6	29.5
1-1/2-2 hrs	337	28.3	37.4	66.9

	298	25.1	33.1	100.0
More than 2 hours	298	25.1	33.1	100.0
Total	901	75.8	100.0	
Missing	288	24.2		
Total	9283	1189	100.0	

English

Highest English	Frequency	Percent	Valid Percent	Cumulative Percent
Sophomore or less	633	7.6	10.1	10.1
Junior	846	10.1	13.5	23.6
Senior	4020	48.2	64.1	87.7
Advanced literature or writing course	380	4.6	6.1	93.8
Honors studies or advanced placement (AP)	389	4.7	6.2	100.0
Total	6268	75.1	100.0	
Missing	2076	24.9		
Total	8344	100.0		

Matrix: Student Work Hours and Number of Courses	Frequency	Percent	Valid Percent	Cumulative Percent
I will work 10 hours or less/wk and enroll in 2 or fewer classes	479	5.7	5.7	30.6
I will work 10 hours or less/wk and enroll in 3 classes	422	5.1	5.1	35.7
I will work 10 hours or less/wk and enroll in 4 classes	608	7.3	7.3	43.0
I will work 10 hours or less/wk and enroll in 5 or more classes	483	5.8	5.8	48.8
I will work 11-20 hours/wk and enroll in 2 or fewer classes	211	2.5	2.5	51.3
I will work 11-20 hours/wk and enroll in 3 classes	468	5.6	5.6	56.9
I will work 11-20 hours/wk and enroll in 4 classes	878	10.5	10.5	67.4
I will work 11-20 hours/wk and enroll in 5 or more classes	520	6.2	6.2	73.6
I will work 21+ hours/wk and enroll in 2 or fewer classes	570	6.8	6.8	80.5
I will work 21+ hours/wk and enroll in 3 classes	591	7.1	7.1	87.6
I will work 21+ hours/wk and enroll in 4 classes	646	7.7	7.7	95.3
I will work 21+ hours/wk and enroll in 5 or more classes	392	4.7	4.7	100.0
Missing	2076	24.9	24.9	24.9
Total	8344	100.0	100.0	

Reading Hours	Frequency	Percent	Valid Percent	Cumulative Percent
1 or less hour/wk	1971	23.6	31.4	31.4
2-3 hours/wk	2451	29.4	39.1	70.5
4-5 hours/wk	1073	12.9	17.1	87.7
6 or more hours/wk	773	9.3	12.3	100.0
Total	6268	75.1	100.0	
Missing	2076	24.9		
Total	Total	8344	100.0	

Study Hours	Frequency	Percent	Valid Percent	Cumulative Percent
1/2 hour or less	149	1.8	2.4	2.4
1-1 1/2 hrs	1890	22.7	30.2	32.5

1-1/2-2 hrs	2439	29.2	38.9	71.4
More than 2 hours	1790	21.5	28.6	100.0
Total	6268	75.1	100.0	
Missing	2076	24.9		
Total	9283	8344	100.0	

Math

Highest Math	Frequency	Percent	Valid Percent	Cumulative Percent
Basic arithmetic or lower	685	7.4	9.7	9.7
Pre-algebra	875	9.4	12.3	22.0
Elementary Algebra (Algebra 1)	1229	13.2	17.3	39.3
Geometry	1575	17.0	22.2	61.5
Intermediate Algebra (Algebra 2)	1776	19.1	25.0	86.6
Trigonometry	359	3.9	5.1	91.6
Pre-calculus	482	5.2	6.8	98.4
Calculus	111	1.2	1.6	100.0
Total	7092	76.4	100.0	
Missing	2191	23.6		
Total	9283	100.0		

Matrix: Student Work Hours and Number of Courses	Frequency	Percent	Valid Percent	Cumulative Percent
I will work 10 hours or less/wk and enroll in 2 or fewer classes	627	6.8	6.8	30.4
I will work 10 hours or less/wk and enroll in 3 classes	472	5.1	5.1	35.4
I will work 10 hours or less/wk and enroll in 4 classes	687	7.4	7.4	42.8
I will work 10 hours or less/wk and enroll in 5 or more classes	487	5.2	5.2	48.1
I will work 11-20 hours/wk and enroll in 2 or fewer classes	256	2.8	2.8	50.8
I will work 11-20 hours/wk and enroll in 3 classes	453	4.9	4.9	55.7
I will work 11-20 hours/wk and enroll in 4 classes	943	10.2	10.2	65.9
I will work 11-20 hours/wk and enroll in 5 or more classes	538	5.8	5.8	71.7
I will work 21+ hours/wk and enroll in 2 or fewer classes	803	8.7	8.7	80.3
I will work 21+ hours/wk and enroll in 3 classes	692	7.5	7.5	87.8
I will work 21+ hours/wk and enroll in 4 classes	722	7.8	7.8	95.6
I will work 21+ hours/wk and enroll in 5 or more classes	412	4.4	4.4	100.0
Missing	2191	23.6	23.6	23.6
Total	9283	100.0	100.0	

Study Hours	Frequency	Percent	Valid Percent	Cumulative Percent
1/2 hour or less	156	1.7	2.2	2.2
1-1 1/2 hrs	2125	22.9	30.0	32.2
1-1/2-2 hrs	2709	29.2	38.2	70.4
More than 2 hours	2102	22.6	29.6	100.0
Total	7092	76.4	100.0	
Missing	2191	23.6		
Total	9283	100.0		

Appendix B

Course	ACCUPLACER test	Cut-score range	Total num.	Students recommended to enroll in a course whose ACCUPLACER score falls outside of the cut-score range					
				Num. of students with missing responses to the additional measures			Num. of students with responses to the additional measures		
				Num.	Test score range	Width of range	Num.	Test score range	Width of range
Reading 063	Reading Comprehension	1-44	1	0	-	-	1	45	+1
Reading 064	Reading Comprehension	45-82	20	4	42-44	-3	16	44	-1
English 061	Reading Comprehension & Sentence Skills	1-57	21	12	58-74	+17	9	58-59	+2
English 062	Reading Comprehension & Sentence Skills	58-79	178	60	35-57/ 80-98	-23/ +19	118	55-57/ 80-83	-3/ +4
English 098	Reading Comprehension & Sentence Skills	80-99	217	80	60-79/ 100-114	-20/ +15	137	76-79/ 100-103	-4/ +4
English 101	Reading Comprehension & Sentence Skills	100-120	255	132	72-99	-28	123	95-99	-5
Math 050	Arithmetic	1-44	15	12	(see footnote)[4]	-	3	45-46	+2
Math 051	Arithmetic	45-75	90	30	43-44/ 76-77	-2/ +2	60	43-44/ 76-77	-2/ +2
Math 090	Arithmetic OR Algebra	76-120 44-62	125	105	34-75 23-43/ 63-85	-42 -21/ +23	20	28-75 36-43/ 63	-48 -8/ +1
Math 096	Algebra	63-103	106	37	57-62/ 104	-6/ +1	69	61-62/ 104-105	-2/ +2
Math 102	College Level Math *[OR Algebra?][5]*	62-76 *[104+]*	5	1	86 *[115]*	+10 -	4	20-47 *[102-103]*	-42 *[-2]*
Math 105	College Level Math *[OR Algebra?]*	62-76 *[104+]*	32	11	25-61 *[102-103]*	-37 *[-2]*	21	20-60 *[100-103]*	-42 *[-4]*
Math 110	College Level Math	77-103	4	1	76	-1	3	76	-1
Math 140	College Level Math *[OR Algebra?]*	62-76 *[104+]*	6	3	29-57 *[103]*	-33 *[-1]*	3	19-61 *[103]*	-43 *[-1]*
Math 211	College Level Math	104-120	3	2	103	-1	1	102	-2

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[4] All 12 of the students had missing Arithmetic scores. 11 of the 12 had Algebra scores that ranged from 23-42 and 1 student had a CLM score of 12.

[5] Although the course catalog states that CLM scores are used for placement decisions in Math 102, 105, and 140, many students recommended to enroll in these courses did not have CLM test scores. The students appeared to be placed based on their ACCUPLACER Algebra test scores.

Appendix C

Results from the Chi-square Analyses Examining the Relationship between Course Success and Placement Decisions

English 061 – χ^2 (1) = 2.459, p = .196

English 061		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	4	412	416
	Expected Count	2.2	413.8	416.0
Credit	Count	2	737	739
	Expected Count	3.8	735.2	739.0
Total	Count	6	1149	1155
	Expected Count	6.0	1149.0	1155.0

English 062 – χ^2 (1) = .061, p = .891

English 062		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	16	307	323
	Expected Count	16.9	306.1	323.0
Credit	Count	79	1414	1493
	Expected Count	78.1	1414.9	1493.0
Total	Count	95	1721	1816
	Expected Count	95.0	1721.0	1816.0

English 098 – χ^2 (1) = .275, p = .591

English 098		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	19	379	398
	Expected Count	17.1	380.9	398.0
Credit	Count	92	2101	2193
	Expected Count	93.9	2099.1	2193.0
Total	Count	111	2480	2591
	Expected Count	111.0	2480.0	2591.0

English 101 – χ^2 (1) = 1.660, p = .249

English 101		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	11	164	175
	Expected Count	15.5	159.5	175.0
Credit	Count	97	949	1046
	Expected Count	92.5	953.5	1046.0
Total	Count	108	1113	1221
	Expected Count	108.0	1113.0	1221.0

Reading 063 – The χ^2 statistic was not calculated for Reading 063 because only one person had a score outside of the cut score range.

Reading 064 -- χ^2 (1) = .532, p = 1.00

Reading 064		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	0	122	122
	Expected Count	.4	121.6	122.0
Credit	Count	2	458	460
	Expected Count	1.6	458.4	460.0
Total	Count	2	580	582
	Expected Count	2.0	580.0	582.0

Math 050 – χ^2 (1) = .173, p = .547

Math 050		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	1	575	576
	Expected Count	.7	575.3	576.0
Credit	Count	2	1905	1907
	Expected Count	2.3	1904.7	1907.0
Total	Count	3	2480	2483
	Expected Count	3.0	2480.0	2483.0

Math 051 – χ^2 (1) = .172, p = .691

Math 051		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	9	199	208
	Expected Count	8.0	200.0	208.0
Credit	Count	38	983	1021
	Expected Count	39.0	982.0	1021.0
Total	Count	47	1182	1229
	Expected Count	47.0	1182.0	1229.0

Math 090 – χ^2 (1) = .535, p = .552

Math 090		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	5	399	404
	Expected Count	3.8	400.2	404.0
Credit	Count	11	1302	1313
	Expected Count	12.2	1300.8	1313.0
Total	Count	16	1701	1717
	Expected Count	16.0	1701.0	1717.0

Math 096 – χ^2 (1) = 4.866, p = .036

Math 096		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	17	334	351
	Expected Count	10.7	340.3	351.0
Credit	Count	36	1358	1394
	Expected Count	42.3	1351.7	1394.0
Total	Count	53	1692	1745

	Expected Count	53.0	1692.0	1745.0

Math 102 – χ^2 (1) = .540, p = 1.00

Math 102		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	0	6	6
	Expected Count	.4	5.6	6.0
Credit	Count	4	44	48
	Expected Count	3.6	44.4	48.0
Total	Count	4	50	54
	Expected Count	4.0	50.0	54.0

Math 105 – χ^2 (1) = .507, p = .447

Math 105		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	3	36	39
	Expected Count	2.1	36.9	39.0
Credit	Count	17	323	340
	Expected Count	17.9	322.1	340.0
Total	Count	20	359	379
	Expected Count	20.0	359.0	379.0

Math 110 – χ^2 (1) = .565, p = 1.00

Math 110		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	0	8	8
	Expected Count	.5	7.5	8.0
Credit	Count	3	42	45
	Expected Count	2.5	42.5	45.0
Total	Count	3	50	53
	Expected Count	3.0	50.0	53.0

Math 140 – χ^2 (1) = 6.102, p = .061

Math 140		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
No Credit	Count	2	9	11
	Expected Count	.5	10.5	11.0
Credit	Count	0	32	32
	Expected Count	1.5	30.5	32.0
Total	Count	2	41	43
	Expected Count	2.0	41.0	43.0

Math 211 – The χ^2 statistic could not be calculated for Math 211, because all students received credit in the course.

Appendix D
Results from the Chi-square Analysis Examining the Relationship between Course Completion and Placement Decisions

English 061 – χ² (1) = .869, p = .404

English 061		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	3	300	303
	Expected Count	1.9	301.1	303.0
Did not withdraw	Count	6	1150	1156
	Expected Count	7.1	1148.9	1156.0
Total	Count	9	1450	1459
	Expected Count	9.0	1450.0	1459.0

English 062 – χ² (1) = 1.688, p = .225

English 062		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	22	291	313
	Expected Count	17.2	295.8	313.0
Did not withdraw	Count	96	1743	1839
	Expected Count	100.8	1738.2	1839.0
Total	Count	118	2034	2152
	Expected Count	118.0	2034.0	2152.0

English 098 – χ² (1) = 1.793, p = .202

English 098		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	24	390	414
	Expected Count	18.7	395.3	414.0
Did not withdraw	Count	113	2500	2613
	Expected Count	118.3	2494.7	2613.0
Total	Count	137	2890	3027
	Expected Count	137.0	2890.0	3027.0

English 101 – χ² (1) = .197, p = .782

English 101		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	15	177	192
	Expected Count	16.6	175.4	192.0
Did not withdraw	Count	108	1122	1230
	Expected Count	106.4	1123.6	1230.0
Total	Count	123	1299	1422
	Expected Count	123.0	1299.0	1422.0

Reading 063 – The χ² statistic was not calculated for Reading 063 because only one person had a score outside of the cut score range.

Reading 064 – χ^2 (1) = .054, p = 1.00

Reading 064		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	1	159	160
	Expected Count	.8	159.2	160.0
Did not withdraw	Count	3	624	627
	Expected Count	3.2	623.8	627.0
Total	Count	4	783	787
	Expected Count	4.0	783.0	787.0

Math 050 – χ^2 (1) = .528, p = 1.00

Math 050		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	0	438	438
	Expected Count	.4	437.6	438.0
Did not withdraw	Count	3	2487	2490
	Expected Count	2.6	2487.4	2490.0
Total	Count	3	2925	2928
	Expected Count	3.0	2925.0	2928.0

Math 051 – χ^2 (1) = 1.958, p = .197

Math 051		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	13	209	222
	Expected Count	9.2	212.8	222.0
Did not withdraw	Count	47	1182	1229
	Expected Count	50.8	1178.2	1229.0
Total	Count	60	1391	1451
	Expected Count	60.0	1391.0	1451.0

Math 090 – χ^2 (1) = .335, p = .533

Math 090		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	4	309	313
	Expected Count	3.1	309.9	313.0
Did not withdraw	Count	16	1709	1725
	Expected Count	16.9	1708.1	1725.0
Total	Count	20	2018	2038
	Expected Count	20.0	2018.0	2038.0

Math 096 – χ^2 (1) = 3.461, p = .086

Math 096		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	16	299	315
	Expected Count	10.5	304.5	315.0
Did not withdraw	Count	53	1695	1748
	Expected Count	58.5	1689.5	1748.0
Total	Count	69	1994	2063

		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Expected Count		69.0	1994.0	2063.0

Math 102 – χ^2 (1) = .318, p = 1.00

Math 102		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	0	4	4
	Expected Count	.3	3.7	4.0
Did not withdraw	Count	4	50	54
	Expected Count	3.7	50.3	54.0
Total	Count	4	54	58
	Expected Count	4.0	54.0	58.0

Math 105 – χ^2 (1) = 1.019, p = .492

Math 105		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	1	49	50
	Expected Count	2.4	47.6	50.0
Did not withdraw	Count	20	359	379
	Expected Count	18.6	360.4	379.0
Total	Count	21	408	429
	Expected Count	21.0	408.0	429.0

Math 110 – χ^2 (1) = .179, p = 1.00

Math 110		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	0	3	3
	Expected Count	.2	2.8	3.0
Did not withdraw	Count	3	50	53
	Expected Count	2.8	50.2	53.0
Total	Count	3	53	56
	Expected Count	3.0	53.0	56.0

Math 140 – χ^2 (1) = 1.323, p = .330

Math 140		Placement decision was influenced by the additional measures	ACCUPLACER score is within of the cut score range	Total
Withdrew from the course	Count	1	5	6
	Expected Count	.4	5.6	6.0
Did not withdraw	Count	2	41	43
	Expected Count	2.6	40.4	43.0
Total	Count	3	46	49
	Expected Count	3.0	46.0	49.0

Math 211 – The χ^2 statistic could not be calculated for Math 211, because all students received credit in the course.