Q-Comp Final Report - Sample pages

III. Methods

B. Activity 4 – Student Performance Data

In order to gather the necessary to data to address the central question of whether or not student achievement has been affected by different types of Q Comp implementation strategies, student achievement data as well as teacher and administrator survey data from Q Comp schools had to be obtained. The student achievement data was obtained from MDE's Universal File Format. MCAII scale scores in reading and math for grades 3-8 and 10-11 for 2006, 2007, and 2008 were identified for each Q Comp school, along with additional variables such as types of school, Tap schools, and level of Q Comp implementation for each year. Years in Q Comp had to be computed from the data base. There were 684,326 cases in the data base. However, many of the students were duplicated because there were a total of 42 permutations – 2 for subject (reading and math), 7 for grade level (grades 3-8 plus grade 10 in reading and grade 11 in math), and 3 for year (2006-2008). Therefore, approximately 16,294 unique students in Q Comp were in the data base.

Q Comp implementation strategies were measured by the teacher and administrator on-line surveys described in Activity 3. The results of these surveys were merged with the MDE file with MCAII scores. A total of 45 districts responded to both the teacher and administrator surveys.

To answer the question about the effect that Q Comp strategies may have had on student achievement, a series of regression analyses were conducted to determine the set of variables from the surveys that best predict student achievement. Each response on the surveys, plus Q Comp level, were used as independent or predictor variables and MCAII scale scores were used as a measure of student achievement, or the dependent variable. In total, there were 232 predictor variables. Given such a large number of predictor variables, it was necessary to conduct three iterations of regression analyses. Due to the different permutations in the data base, a total o f 36 regression equations had to be computed – 6 for the first iteration, 12 for the second and 18 for the third. Regression analyses were done for both subject areas, each of the three year for which we had data, and for three grades (3, 8 and 10/11).

Stepwise regression was used so that each time a variable was entered into a regression equation, it was also possible to remove a variable from the equation if doing so maximized predictive power. Stepwise regression also allows two requirements for each variable as it is being considered for entry into the equation. One entry requirement is a simple correlation of the variable to the dependent variable, and the other is the change in predictive power that the variable contributes over the previous set of variables in the equation.

For the first regression iteration, all 232 predictor variables were entered into the equation. This iteration of regression equations only involved MCAII scores from

2008. That set of regressions produced a combination of 11 variables that contributed variance to the dependent variable. For the second iteration of regression equations, all 232 variables were again entered into regression equations, this time involving only 2006 and 2007. Nine of the 11 variables from the first iteration contributed significant variance to MCAII scores. These 9 variables were the product of the second iteration. The third regression iteration used only these 9 variables in regression equations involving both reading and math, grades 3, 8 and 10/11, and all three years. From those regression equations, we were able to identify 4 variables that contributed to test score variance in all three years.

Once that was done, bivariate Pearson correlations were conducted with each of the 4 variables with MCAII scores for both subject areas and all three levels for 2008. The purpose of doing that was to determine the strength of the individual variable correlation and to determine the direction of the correlation.

After regression analyses were conducted, t-tests were conducted to compare the means of MCAII scores of TAP schools vs Non TAP schools and Charter vs Non Charter schools. In addition, bivariate Pearson correlations were conducted to determine the relationship between student achievement and the number of years schools have been in Q Comp, and between student achievement and the Q Comp level of schools. Lastly, descriptive statistics were calculated for all demographic variables in the data base, including ethnicity, limited English proficient status, free and reduced lunch status, and special education status.

IV. Findings

C2d. Q Comp impact on Student Achievement

Predicting Student Achievement

Stepwise regression reveals what variables in combination have a causal relationship with the variable that we wish to affect. In this evaluation, we attempted to reveal what set of Q Comp implementation strategies in combination best predict or produce success in student achievement. There is a wide variety of Q Comp implementation strategies that districts used, and this evaluation identified as many as possible in the teacher and administrator surveys. Therefore, responses to these surveys are the predictor variables used in the regression equations. MCAII scores are the dependent variable because they represent student achievement. Again, there is a wide array of variables or factors that contribute to or cause student success, and MCAII scores represent only one such measure. Non-the-less, state assessment tests, like MCAII, are an important measure of student success. Table I below illustrates the first iteration of regression using all 232 independent variables from the surveys. The R coefficient is the multiple correlation coefficient and is cumulative down the list of variables, so the last variable in the list gives a total cumulative regression coefficient at the point where adding another variable adds nothing to the prediction. The corresponding R Square is the percent of variance accounted for in MCAII scores from this list of survey variables.

Table 1: Regression 1: Reading, Grade 3, 2008

Variable	R	R square	
T6b	.181	.033	*
A19a	.225	.05	*
T16b_a	.242	.059	*
A2a	.255	.065	*
T13e_sup	.267	.071	
A9a	.279	.078	*
A8c	.288	.083	*
A13a_2	.300	.09	
A16b_b	.314	.099	*
A6b	.398	.158	

Table 2: Regression 1: Math, Grade 3, 2008

Variable	R	R Square	
T6a	.164	.027	*
A1a	.196	.038	*
A19a	.213	.045	
T2d	.231	.053	
A6e	.252	.063	*
T22f	.269	.072	
T21f	.292	.085	*
A2d	.319	.101	
T6e	.526	.276	

Table 3: Regression 1: Reading, Grade 8, 2008

Variable	R	R Square	
T6b	.188	.035	
T16b	.235	.055	
A19a	.255	.065	
A2a	.273	.075	
Q Comp level	.288	.083	
A16a	.308	.095	
A8c	.325	.105	
T20	.425	.181	

Table 4: Regression 1: Math, Grade 8, 2008

Variable	R	R Square	
T21e	.154	.024	*
T21b	.200	.040	
A6c	.228	.052	
A9b	.241	.058	
T6a	.248	.061	
A4d	.259	.067	
A4c	.269	.072	
A16b_b	.281	.079	
A13b_2	.426	.182	

Table 5: Regression 1: Reading, Grade 10, 2008

Variable	R	R Square
A1a	.150	.022
T6a	.209	.044
A5h	.240	.057
A21b	.262	.069
T21e	.275	.076
A7	.284	.081
T5j	.291	.084
A5i	.297	.088
T5d	.302	.091
T22a	.305	.093
T4c	.308	.095
A16b_b	.311	.097
A5j	.333	.111
T19b	.433	.187

Table 6: Regression 1: Math, Grade 11, 2008

Variable	R	R Square
T8a	.167	.028
T6a	.205	.042
A4b	.258	.067
T12	.273	.075
A6e	.285	.081
T16c	.300	.090

The variables designated with an asterik (*) in the above tables were also included in regression equations in either 2006 or 2007 or both. Each change in R Sqaure was tested for statistical significance using an F ratio. The contribution of each variable as it entered the equation was significant at $p<.01$. The 11 variables that were identified in this first round of regressions are defined below:

A1a - Admin. Survey: Teachers consider Q Comp to be successful so far in our district.

A2a – Admin. Survey: Level of input the following groups had in developing their school's/district's Q Comp plan – Individual teachers.

A8c – Admin. Survey: How could the evaluation process be improved? – Evaluations conducted by better trained/more experienced teachers.

A9a – Admin. Survey: Degree you agree to the following statements: Those in the Q Comp system who evaluate teacher's performance against Q Comp goals are impartial.

A16b_b – Admin. Survey: Indicate to what degree you agree with the following statement: Teachers have a clear understanding of their role and duties in their career ladder positions.

A19a - Admin. Survey: Job embedded professional development in your school/district typically takes place during the teacher contract day.

T6a – Teacher Survey: Who is responsible for conducting Q Comp teacher evaluations/observations? Principal

T6b - Teacher Survey: Who is responsible for conducting Q Comp teacher evaluations/observations? Principal/Vice Principal

T16b_a -Teacher Survey: To What degree do you agree with the following statements: With the addition of multiple career paths, I will remain in the teaching profession longer.

T21e - Teacher Survey: What topics do the professional development activities and discussions in our school address? Standards-based lessons.

T21f - Teacher Survey: What topics do the professional development Activities and discussions in our school address? Student assessments

The next iteration of regression equations were conducted to determine if additional analyses from 2006 and 2007 would change the variable combinations that best predict student achievement. Table 7 illustrates how many regression equations in 2006 and 2007 included which of the 11 variables from 2008 regressions. In this way we can eliminate some of the variables that predicted only in 2008 and not in the previous two years. The asteriks (*) in Table 7 indicate the number of regression equations in 2006 and 2007 that included that particular variable.

Table 7: Regression 2: Inclusion of 2006 and 2007

Variable 2008	2007	2006
A19a	*	
T6a	***	*
T21f		
T6b	*	*
T16b_a		*
A2a	*	
A9a		
A8c	**	
A16b_b	**	
Ala	*	*
T21e	*	*

All 232 variables were entered into regression equations for both subjects and for three levels (grades 3, 8 and 10/11) for 2006 and 2007, just like they were for 2008. The results indicated that 9 out of the 11 original variables from the 2008 analyses were also included in at least one regression equation in these additional analyses.

The third iteration of regressions was performed on these 9 remaining variables. Table 8 below shows the 9 variables identified from the second iteration. The numbers in the table refer to the number of regression equations that included each variable as a contributor to MCAII variance for each of the three years.

Table 8: Regression 3: Number of Regression Equations by Year

Variable	2008	2007	2006	Number of Equations
A19a	1			1
Ala	2	4	4	10
A2a		1	2	3
T6a	3	2	4	9
A8c				0
T21e	2	4	5	11
T16b_a	2	2	2	6
A16b_b				0
T6b				0

It is clear from the set of regression equations from the third iteration that Variable A1a, T6a, T21e and T16b_a are the best combination of predictors of student success across subjects, across grade levels and across years. In order to interpret

these regression findings, we must first determine the direction of the correlations of each variable to the MCAII scores. Table 9 below displays Pearson bivariate correlations between these 4 survey variables and MCAII scores across subject and grades in 2008.

The purpose in constructing Table 9 is to determine the direction of the correlation between the predictor variables and student achievement in order to aid interpretation. The bivariate correlations in Table 9 are very low, yet statistically significant due to the high N. To better estimate the relationship of predictor variables to MCAII scores, the multiple correlations (R) and R Squares in Tables 1-6 should be considered.

Table 9: Correlation Matrix Between Final Predictor Variables and MCAII

Variable	R,Grade3	M,Grade3	R,Grade8	M,Grad8	R,Grade10	M,Grade11
A1a	+.091**	+.102**	+.066**	+.089**	+.140**	+.120**
T6a	-.076**	-.141**	-.102**	-.084**	-.096**	-.151**
T21e	-.074**	-.089**	-.123**	-.099**	-.079**	-.142**
T16b_a	+.06**	+.198**	+.132**	+.101**	+.122**	+.079**
N	11,655	11,131	12,824	12,547	13,295	12,471

**p<.01

What is important about the correlations in Table 9 is the consistent direction of the correlations for each variable. All correlations for Ala and T16B_a are positive and all correlations for T6b and T21a are negative. The implication of this finding is that when Q Comp is implemented in schools the following set of conditions best predict or cause student achievement to rise:

1. When school administrators feel that their teachers consider Q Comp to be successful in their school.
2. When teachers feel that someone other than the principal is responsible for conducting Q Comp teacher evaluations/observations.
3. When standards-based lessons are *not* the main topic of professional development activities and discussions, but other topics are addressed.
4. When teachers feel that the addition of multiple career paths in their school will encourage them to remain in the teaching profession longer.

Relationship of Q Comp Level and Years to Student Achievement

To understand the relationship between Q Comp level and student achievement and between the number of years involved in Q Comp and student achievement, bivariate Pearson correlations were performed. Table 10 illustrates the correlations of Q Comp level to MCAII scores, and Table 11 illustrates the correlations of years in Q Comp to MCAII scores. All computations are for 2008.

Table 10: Correlation of Level and MCAII

Subject/ Grade	Correlation	P value	N	Subject/ Grade	Correlation	P value	N
R/3	.013	.128	14221	M/3	.000		13502
R/4	.029**	.000	14202	M/4	.016	.059	13618
R/5	.056**	.000	14490	M/5	.009	.293	13886
R/6	.097**	.000	14620	M/6	.095**	.000	14140
R/7	.072**	.000	14826	M/7	.102**	.000	14372
R/8	.062**	.000	15225	M/8	.062**	.000	14804
R/10	.110**	.000	15919	M/11	.111**	.000	14895

**p<.01

Table 11: Correlation of Years in Q Comp and MCAII

Subject/ Grade	Correlation	P value	N	Subject/ Grade	Correlation	P value	N
R/3	.093	.000**	16212	M/3	.039**	.000	15124
R/4	.07	.000**	16141	M/4	.058**	.000	15231
R/5	.06	.000**	16509	M/5	.028**	.001	15613
R/6	.09	.000**	16693	M/6	.077**	.000	15911
R/7	.065	.000**	16943	M/7	.072**	.000	16227
R/8	.083	.000**	17432	M/8	.06**	.000	16704
R/10	.05	.000**	17696	M/11	.015*	.048	16310

*p<.05
**p<.01

The correlations in Tables 10 and 11 clearly indicate that there is a significant and positive relationship between the Q Comp level and student achievement, and the number of years a school is in Q Comp with student academic achievement. That relationship is slightly less pronounced at the lower elementary in Table 10.

TAP Schools, Charter Schools, Q Comp Levels

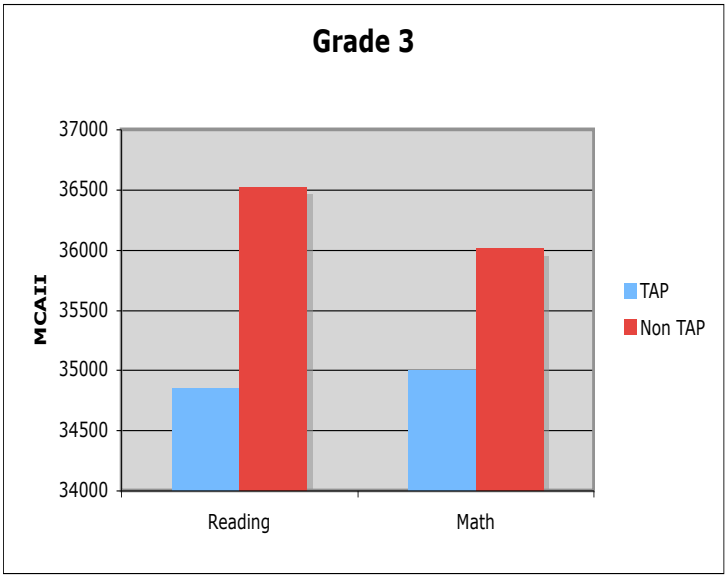
This section reports on the mean differences between TAP schools, Charter Schools, Q Comp level relative to MCAII scores. Oneway ANOVAs and t-tests are used to test the differences. Table 12 and Figure 1 illustrate the differences between TAP and Non TAP schools in 2008, Table 13 and Figure 2 illustrate the differences between Charter and Non Charter schools in 2008, and Table 14 and Figure 3 illustrate the differences between Q Comp Levels in 2008.

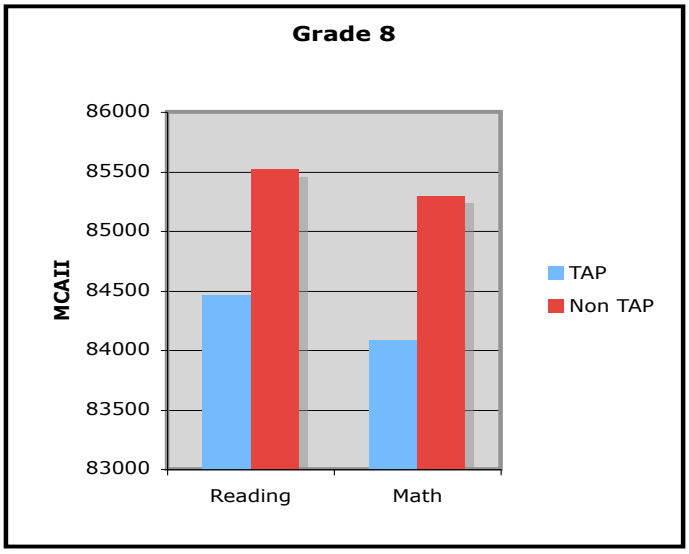
Table 12: TAP vs. Non TAP

Subject, Grade	TAP Mean	NonTAP Mean	t value
R, Grade 3	34854	36521	-.36.7**
N	1769	455467	
M, Grade 3	35002	36009	-30.7**
N	1473	44598	
R, Grade 8	84462	85520	-32.6**
N	1963	49572	
M, Grade 8	84093	85303	-32.6**
N	1714	48938	
R, Grade 10	104100	105600	-27.6**
N	711	51832	
M, Grade 11	112100	114300	-21.9**
N	447	49134	

**p<.01

Figure 1: TAP vs. Non TAP




Grade 8
86000
85500
85000
84500
84000
83500
83000
MCAII
Reading
Math
TAP
Non TAP

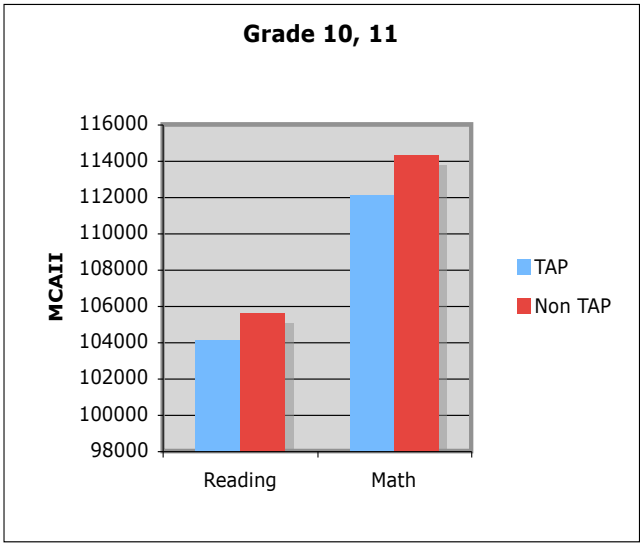
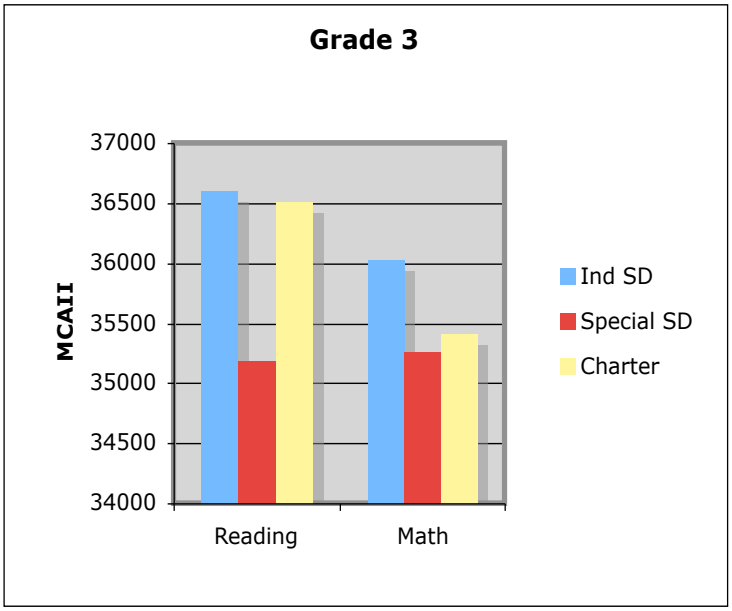

Grade 10, 11
116000
114000
112000
110000
108000
106000
104000
102000
100000
98000
MCAII
Reading
Math
TAP
Non TAP

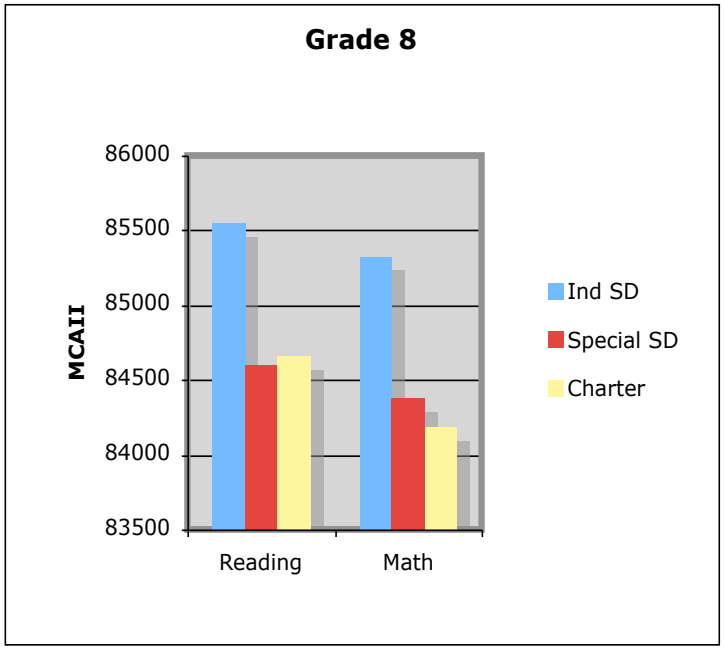
Table 13: Charter vs. Non Charter

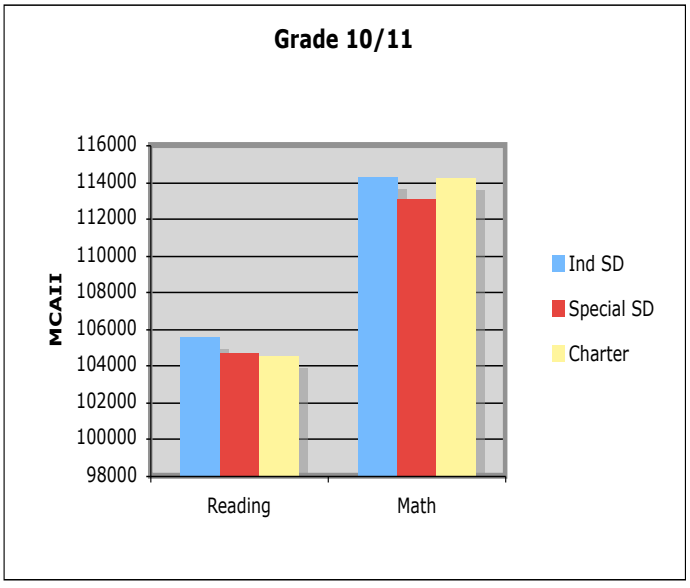
Subject, Grade	Ind. SD Mean	Special SD Mean	Charter Mean	F Ratio
R, Grade 3	36602	35194	36507	703.9**
N	43504	2312	1420	
M, Grade 3	36028	35265	35409	508.8**
N	42738	1983	1351	
R, Grade 8	85545	84598	84659	743.2**
N	47934	2754	847	
M, Grade 8	85325	84373	84191	664.1**
N	47420	84373	727	
R, Grade 10	105600	104700	104500	590.6**
N	50050	1476	1017	
M, Grade 11	114300	113100	114200	739.4**
N	47413	1175	993	

**p<.01

Figure 2: Charter vs. Non Charter




Grade 8
86000
85500
85000
84500
84000
83500
MCAII
Reading
Math
Ind SD
Special SD
Charter


Grade 10/11
116000
114000
112000
110000
108000
106000
104000
102000
100000
98000
MCAII
Reading
Math
Ind SD
Special SD
Charter

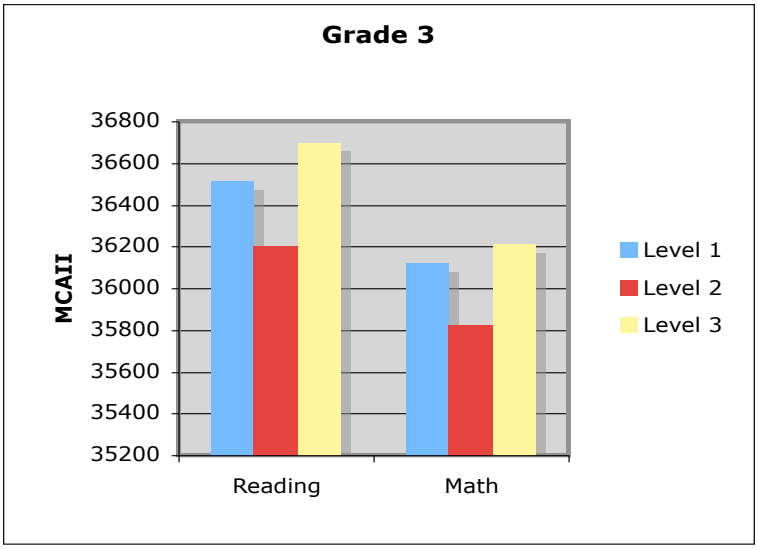
The data on TAP schools vs. Non TAP schools is clear. Non TAP schools, or Q Comp schools, consistently outperform TAP schools on MCAII scores in both reading and math at grades 3, 8 and in high school. The ANOVA results showing the mean differences between the three types of schools indicate that there are significant test score differences between them. When comparing Charter schools to Non Charter schools, we find consistency across subject areas and grade levels. In all cases examined, except in 8th grade Math, Charter schools performed better on average than did Special School Districts but performed worse on average than did Independent School Districts.

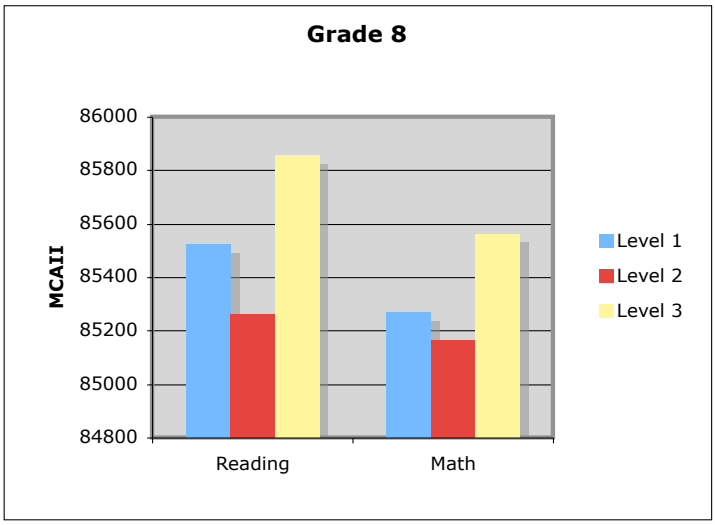
Table 13: Q Comp Levels in 2008

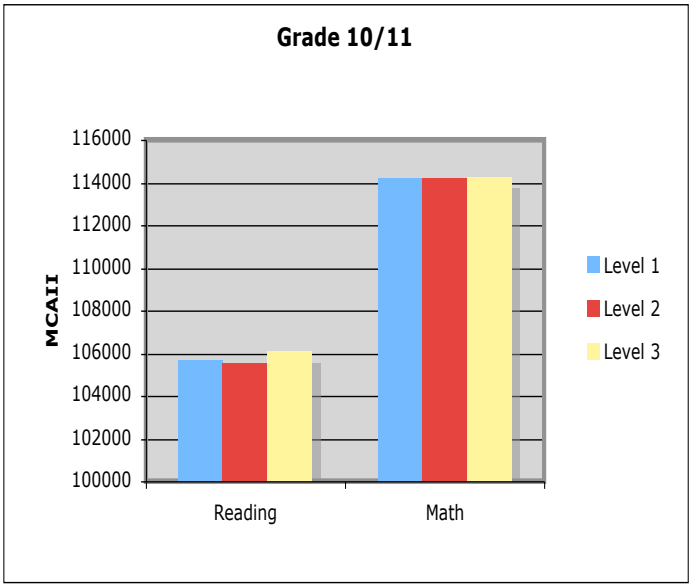
Subject, Grade	Level 1	Level 2	Level 3	F Ratio
R, Grade 3	36516.3	36200.1	36697	62.3**
N	6996	4336	2889	
M, Grade 3	36122.3	35824.2	36214	108.7**
N	6652	4041	2809	
R, Grade 8	85524.8	85262.2	85857.6	168.3**
N	7701	4283	3241	
M, Grade 8	85268	85165.1	85564.9	68.1**
N	7445	4162	3197	
R, Grade 10	105700	105600	106100	184.1**
N	7992	4416	3511	
M, Grade 11	114200	114200	114300	128.3**
N	7558	4021	3316	

p<.01

Figure 3: Q Comp Levels in 2008




Grade 8
86000
85800
85600
85400
85200
85000
84800
MCAII
Reading
Math
Level 1
Level 2
Level 3

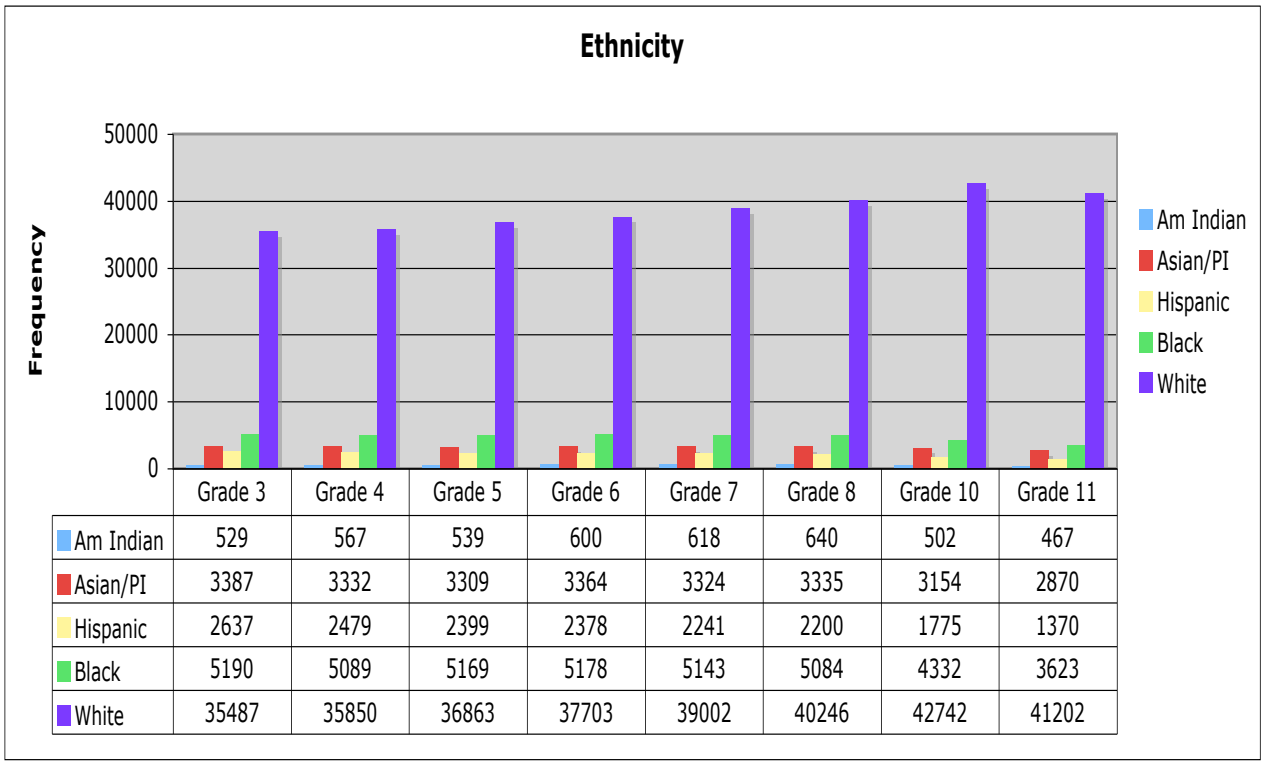

Grade 10/11
116000
114000
112000
110000
108000
106000
104000
102000
100000
MCAII
Reading
Math
Level 1
Level 2
Level 3

The ANOVA analysis performed on Q Comp levels and MCAII scores reveals that there are significant differences in the mean MCAII scores between levels 1, 2, and 3 in both subjects across all grade levels. More interesting is the fact that in all cases, level 3 Q Comp schools consistently outperformed level 1 and level 2 schools. In each case, level 2 schools performed lower than level 1 school, except in Grade 11 math where they tied. However, level 3 schools outperformed both level 1 and level 2 schools. This trend might suggest that after a school progresses from level 1 to level 2, scores go down perhaps due to implementation adjustments, but once they reach level 3 implementation schools significantly improve in student achievement.

Student Demographics

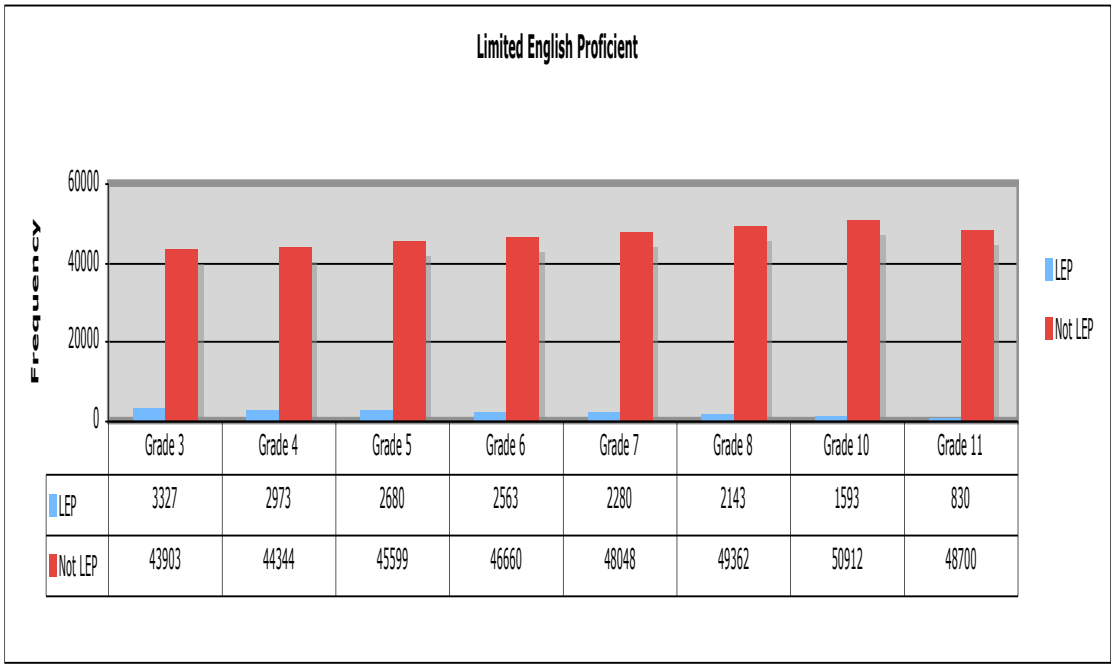
The next series of figures show demographic breakdowns from the data base by ethnicity, students with limited English proficiency, special education students, and students receiving free and reduced lunch. This data is reported by grade level for all three years – 2006, 2007, and 2008.

Figure 4: Ethnicity



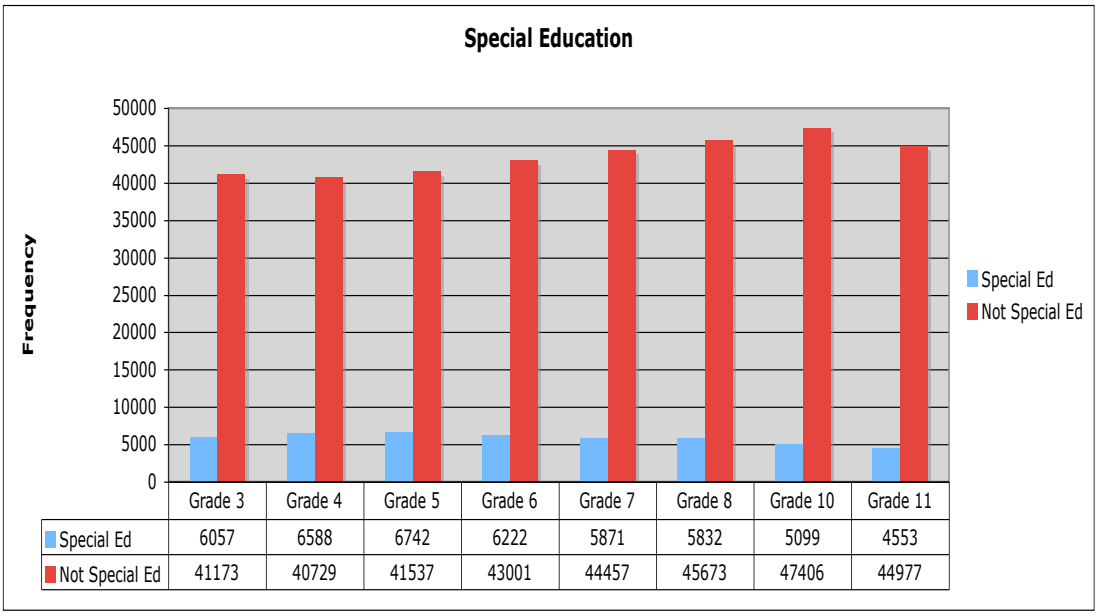
	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 10	Grade 11
Am Indian	529	567	539	600	618	640	502	467
Asian/PI	3387	3332	3309	3364	3324	3335	3154	2870
Hispanic	2637	2479	2399	2378	2241	2200	1775	1370
Black	5190	5089	5169	5178	5143	5084	4332	3623
White	35487	35850	36863	37703	39002	40246	42742	41202

Figure 5: Limited English Proficient



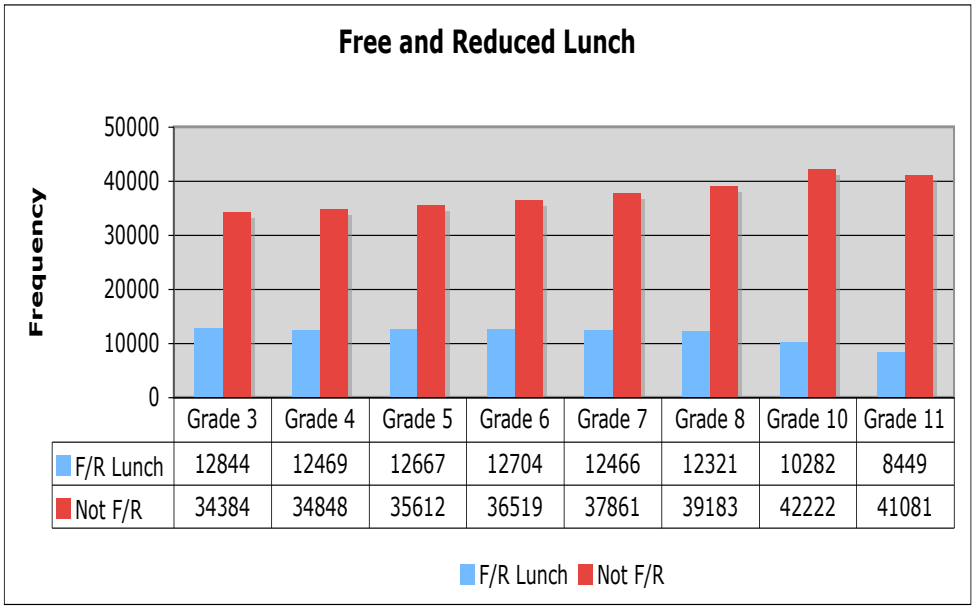
	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 10	Grade 11
LEP	3327	2973	2680	2563	2280	2143	1593	830
Not LEP	43903	44344	45599	46660	48048	49362	50912	48700

Figure 6: Special Education



	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 10	Grade 11
Special Ed	6057	6588	6742	6222	5871	5832	5099	4553
Not Special Ed	41173	40729	41537	43001	44457	45673	47406	44977

Figure 7: Free and Reduced Lunch



From the demographic data above it is clear that white students compared to minorities comprise the majority of the student population in the data base. Also, the vast majority of students in the data base are not LEP or Special Education students. The majority of students do not receive free or reduced lunch and, therefore, are not considered economically disadvantaged.