Aggregate Results

The tables below present summary information from the 2009 administration of the Missouri Assessment Program to Grades 3 to 8 in Communication Arts and Mathematics, and to Grades 5 and 8 in Science.

Table 1 shows the state-level means for all grades from 2006 to 2009 for Communication Arts and Mathematics and from 2008 and 2009 for Science. Science MAP was administered for the first time in 2008. As is shown in Table 1, the mean scale scores in all grades and content areas were stable across years.

Table 2 shows the percent of students in each achievement level in 2006 through 2009 on the Communication Arts test. The percentages at or above Proficient tended to be stable from 2008 to 2009, with small increases in all grades except Grade 3 which did not change.

Table 3 shows the percent of students in each achievement level in 2006 through 2009 on the Mathematics test. As compared to 2008, increases in the percentage of students at or above Proficient were observed in all grades in 2009, except Grade 6 which decreased slightly.

Table 4 shows the percent of students in each achievement level in 2008 and 2009 on the Science test. In both Grades 5 and 8, the percentage of students at or above Proficient increased from 2008 to 2009.

Effect Size

Some believe that fairness is an issue whenever the measured ability differences between subgroups are overly large; however, a criterion for large difference is lacking. One way to evaluate the magnitude of the differences is to calculate the effect size. Cohen's D was used to calculate the effect size and is given by the formula:

$$d = \frac{\overline{x_a} - \overline{x_b}}{\sqrt{\frac{(n_a - 1)s_a^2 + (n_b - 1)s_b^2}{(n_a + n_b) - 2}}}$$

where $\overline{x_a}$ is the mean score of group A, $\overline{x_b}$ is the mean score of group B, s_a^2 is the variance of group A, s_b^2 is the variance of group B, n_a is the number of students in group A, and n_b is the number of students in group B.

Cohen's *d,* then, expresses the difference in group means in terms of the standard deviation. For example if d=.34 for two groups, then it may be interpreted as the mean

difference between the two groups is .34 of the pooled standard deviation. Cohen (1988) offered guidelines for interpreting the meaning of the *d* statistic: *d*=.20 is a small effect size, *d*=.50 is a medium effect size, and *d*=.80 is a large effect size.

Using Cohen's (1988) guidelines, certain trends become apparent in Tables 5 to 10. On the Communication Arts test in all grades, gender has a small effect on mean test scores where girls outperform boys.

In terms of the race/ethnicity in all grades, there is a moderate difference in mean Communication Arts test scores of black students compared to white students, where black students under perform white students on average. There is a small effect on mean test scores where Hispanics under perform white students on the Communication Arts tests. There is a small effect on the mean test scores, where Native Americans under perform white students on Communication Arts in Grades 3, 4, and 8. There is a small difference where Asians outperform white students in Grades 5 and 6 Communication Arts.

There is a large difference in mean Mathematics tests scores of black students compared to white students in all grades, except Grade 3 where there is a moderate effect size. There is a small difference in mean Mathematics test scores of Hispanic students compared to white students in Grades 3 through 8, where Hispanic students under perform white students. There is a small effect on mean test scores of Native American students compared to white students, where Native Americans under perform white students in all grades except Grade 6. Finally, there is a small effect on mean test scores of Asian students, where Asian students outperform white students in Grades 3 through 8 in Mathematics.

There is a large effect on mean Science test scores of Black students compared to white students in Grades 5 and 8, where Black students under perform white students. There is a moderate effect on mean Science test scores of Hispanic students compared to white students in Grades 5 and 8 where Hispanic students under perform white students. There was a small effect on means Science test scores of Native American students compared to white students in Grades 5 and 8, where Native American students under perform white students.

Table 1: Comparison of State-Level Means, 2006, 2007, 2008, and 2009 Census Data

		Communication Arts			Mathematics			Science		
Grade	Year	N	Mean SS	S.D. SS	N	Mean SS	S.D. SS	N	Mean SS	S.D. SS
3	2006	64,486	639.86	36.84	64,763	621.59	39.11			
	2007	66,347	639.58	38.04	66,640	622.40	38.72			
	2008	66,179	637.60	37.54	66,258	621.65	36.92			
	2009	67,163	637.43	38.18	67,232	621.67	36.76			
4	2006	65,179	654.55	38.56	65,306	643.88	37.07			
	2007	65,274	656.11	39.51	65,363	644.47	36.56			
	2008	66,873	655.61	33.63	66,944	644.18	34.19			
	2009	66,490	656.77	33.41	66,587	644.20	33.89			
5	2006	66,007	668.18	37.09	66,123	660.06	39.99			
	2007	65,461	671.01	37.14	65,498	663.21	41.50			
	2008	65,544	671.48	33.71	65,636	661.43	40.73	65,586	661.64	31.52
	2009	67,083	671.58	32.84	67,155	662.07	40.52	67,118	662.22	30.40
6	2006	66,948	666.85	33.70	67,017	673.30	39.80			
	2007	66,247	667.99	34.63	66,332	676.31	41.75			
	2008	65,672	671.27	33.50	65,716	678.46	41.13			
	2009	65,716	671.67	33.04	65,755	678.87	39.56			
7	2006	70,290	671.63	37.06	70,698	675.38	41.27			
	2007	67,167	672.11	36.26	67,554	677.41	42.62			
	2008	66,701	675.87	35.08	66,727	681.15	41.38			
	2009	66,316	677.68	34.75	66,330	683.63	40.72			
8	2006	72,483	686.85	37.87	72,542	697.73	40.37			
	2007	70,187	686.90	37.54	70,204	698.33	41.98			
	2008	67,278	691.05	33.57	67,312	701.30	39.40	67,209	694.36	30.67
	2009	66,741	692.56	33.31	66,770	703.60	38.63	66,702	695.65	30.94

Table2: Comparison of Percent of Students in each Achievement Level, Communication Arts 2006, 2007, 2008, and 2009 Census Data

Grade	Year	N	No Level	Below Basic	Basic	Proficient	Advanced	Prof & Adv
3	2006	65,344	1.3	8.8	47.5	25.7	16.7	42.4
	2007	67,259	1.4	9.4	46.6	25.8	16.8	42.6
	2008	66,357	0.3	9.3	50.2	25.2	15.1	40.3
	2009	67,357	0.3	9.6	49.8	25.1	15.2	40.3
4	2006	65,849	1.0	10.6	44.5	28.8	15.0	43.8
	2007	65,982	1.1	10.5	43.4	28.2	16.8	45.1
	2008	67,049	0.3	8.0	46.7	33.4	11.7	45.1
	2009	66,709	0.3	7.6	45.8	33.6	12.7	46.3
5	2006	66,704	1.0	9.1	44.8	29.6	15.4	45.0
	2007	66,098	1.0	8.3	42.9	29.8	18.0	47.8
	2008	65,734	0.3	6.4	45.1	32.2	15.9	48.1
	2009	67,307	0.3	6.3	44.6	33.9	14.9	48.8
6	2006	67,709	1.1	11.9	44.8	31.6	10.6	42.2
	2007	67,045	1.2	11.2	44.0	31.8	11.7	43.6
	2008	65,830	0.2	9.0	43.5	34.0	13.4	47.4
	2009	65,908	0.3	8.6	43.4	33.8	13.9	47.7
7	2006	71,632	1.9	13.7	41.8	30.5	12.2	42.7
	2007	68,404	1.8	13.1	40.7	32.8	11.6	44.4
	2008	66,923	0.3	10.0	40.7	36.1	12.9	49.0
	2009	66,531	0.3	8.7	40.3	37.2	13.6	50.8
8	2006	73,516	1.4	9.1	48.0	26.6	15.0	41.5
	2007	71,200	1.4	8.7	48.3	26.9	14.6	41.6
	2008	67,574	0.4	5.7	45.8	33.1	15.0	48.1
	2009	67,077	0.5	5.3	44.5	33.4	16.3	49.7

Table 3: Comparison of Percent of Students in each Achievement Level, Mathematics 2006, 2007, 2008, and 2009 Census Data

Grade	Year	N	No Level	Below Basic	Basic	Proficient	Advanced	Prof & Adv
3	2006	65,325	0.9	7.2	48.7	33.3	10.0	43.3
	2007	67,257	0.9	7.2	46.9	35.0	10.0	45.0
	2008	66,357	0.1	6.5	49.6	35.0	8.8	43.8
	2009	67,357	0.2	6.8	48.5	35.6	8.8	44.4
4	2006	65,845	0.8	8.3	47.5	34.4	9.0	43.4
	2007	65,975	0.9	8.1	46.5	35.2	9.3	44.5
	2008	67,049	0.2	7.6	48.0	36.0	8.2	44.2
	2009	66,709	0.2	7.3	48.2	36.6	7.8	44.4
5	2006	66,703	0.9	8.1	47.8	32.7	10.6	43.3
	2007	66,075	0.9	7.6	44.9	33.1	13.4	46.6
	2008	65,734	0.1	7.5	46.5	34.4	11.4	45.8
	2009	67,307	0.2	7.5	45.1	35.6	11.6	47.2
6	2006	67,706	1.0	11.1	44.1	34.4	9.5	43.9
	2007	67,039	1.1	11.1	40.0	35.5	12.3	47.8
	2008	65,830	0.2	9.5	39.6	37.8	12.9	50.7
	2009	65,908	0.2	8.9	40.7	37.5	12.6	50.1
7	2006	71,575	1.2	17.4	38.5	32.7	10.2	42.9
	2007	68,405	1.2	16.7	37.1	33.2	11.7	44.9
	2008	66,923	0.3	13.9	36.3	36.7	12.8	49.5
	2009	66,531	0.3	12.5	35.2	37.6	14.3	51.9
8	2006	73,523	1.3	21.1	37.8	27.6	12.2	39.8
	2007	71,190	1.4	21.4	36.6	26.6	14.0	40.6
	2008	67,574	0.4	18	37.7	29.9	13.9	43.8
	2009	67,077	0.5	16.4	36.8	31.5	14.9	46.4

Table 4: Percent of Students in each Achievement Level, Science 2008 and 2009 Census Data

Grade	Year	N	No Level	Below Basic	Basic	Proficient	Advanced	Prof & Adv
5	2008	65,734	0.2	11.2	44.0	29.6	14.9	44.5
	2009	67,307	0.3	10.6	44.1	30.3	14.8	45.1
8	2008	67,574	0.5	19.3	37.0	36.7	6.5	43.2
	2009	67,077	0.6	18.2	36.5	37.2	7.6	44.8

Table 5: Impact Analysis, Grade 3

Content Area	Category	Group	N	Mean	Std. Dev.	Effect Size
Communication Arts	Ethnicity	White (not Hispanic)	50411	642.58	36.08	
		Black (not Hispanic)	12138	617.94	39.64	0.67
		Hispanic	2924	625.51	36.83	0.47
		Asian/Pacific Islander	1341	648.05	38.68	-0.15
		Native American	271	634.49	40.96	0.22
	Gender	Male	34461	632.91	38.94	
		Female	32633	642.25	36.71	-0.25
	Accommo-dations	No				
		Yes				
Mathematics	Ethnicity	White (not Hispanic)	50410	627.03	34.34	
		Black (not Hispanic)	12139	600.21	37.76	0.77
		Hispanic	2953	612.01	34.92	0.44
		Asian/Pacific Islander	1379	637.00	41.12	-0.29
		Native American	273	619.13	34.81	0.23
	Gender	Male	34501	621.76	37.92	
		Female	32663	621.62	35.46	0.00
	Accommo-dations	No				
		Yes				

Table 6: Impact Analysis, Grade 4

Content Area	Category	Group	N	Mean	Std. Dev.	Effect Size
Communication Arts	Ethnicity	White (not Hispanic)	50182	660.88	31.63	
		Black (not Hispanic)	11965	641.09	35.46	0.61
		Hispanic	2738	646.64	33.26	0.45
		Asian/Pacific Islander	1244	666.10	32.75	-0.16
		Native American	297	652.57	32.59	0.26
	Gender	Male	34054	651.51	34.05	
		Female	32370	662.33	31.77	-0.33
	Accommo-dations	No				
		Yes				
Mathematics	Ethnicity	White (not Hispanic)	50191	649.39	31.56	
		Black (not Hispanic)	11982	622.65	34.60	0.83
		Hispanic	2759	636.87	30.91	0.40
		Asian/Pacific Islander	1293	659.77	35.77	-0.33
		Native American	297	640.12	34.35	0.29
	Gender	Male	34122	644.48	34.98	
		Female	32399	643.94	32.69	0.02
	Accommo-dations	No				
		Yes				

Table 7: Impact Analysis, Grade 5

Content Area	Category	Group	N	Mean	Std. Dev.	Effect Size
Communication Arts	**Ethnicity**	White (not Hispanic)	50657	675.85	30.93	
		Black (not Hispanic)	12113	654.77	34.60	0.67
		Hispanic	2672	663.08	31.89	0.41
		Asian/Pacific Islander	1234	682.21	34.71	-0.21
		Native American	283	670.35	26.68	0.18
	Gender	Male	34415	668.40	34.06	
		Female	32545	675.02	31.07	-0.20
	Accommo-dations	No				
		Yes				
Mathematics	**Ethnicity**	White (not Hispanic)	50671	668.23	37.61	
		Black (not Hispanic)	12118	636.92	42.13	0.81
		Hispanic	2696	651.92	36.92	0.43
		Asian/Pacific Islander	1264	680.97	43.78	-0.34
		Native American	283	658.43	33.53	0.26
	Gender	Male	34444	661.09	41.57	
		Female	32588	663.20	39.29	-0.05
	Accommo-dations	No				
		Yes				
Science	**Ethnicity**	White (not Hispanic)	50651	668.14	26.83	
		Black (not Hispanic)	12105	639.24	32.52	1.03
		Hispanic	2692	652.11	29.47	0.59
		Asian/Pacific Islander	1265	669.21	34.47	-0.04
		Native American	282	660.56	27.70	0.28
	Gender	Male	34423	663.45	31.37	
		Female	32573	661.00	29.23	0.08
	Accommo-dations	No				
		Yes				

Table 8: Impact Analysis, Grade 6

Content Area	Category	Group	N	Mean	Std. Dev.	Effect Size
Communication Arts	Ethnicity	White (not Hispanic)	50138	675.69	31.38	
		Black (not Hispanic)	11567	654.89	34.28	0.65
		Hispanic	2460	663.83	31.80	0.38
		Asian/Pacific Islander	1213	682.67	34.61	-0.22
		Native American	291	671.68	35.47	0.13
	Gender	Male	33450	667.19	34.68	
		Female	32208	676.38	30.52	-0.28
	Accommo-dations	No				
		Yes				
Mathematics	Ethnicity	White (not Hispanic)	50132	684.75	36.65	
		Black (not Hispanic)	11566	653.74	40.70	0.83
		Hispanic	2475	669.14	37.49	0.43
		Asian/Pacific Islander	1242	696.64	46.09	-0.32
		Native American	292	678.37	40.53	0.17
	Gender	Male	33468	678.05	40.74	
		Female	32227	679.79	38.25	-0.04
	Accommo-dations	No				
		Yes				

Table 9: Impact Analysis, Grade 7

Content Area	Category	Group	N	Mean	Std. Dev.	Effect Size
Communication Arts	Ethnicity	White (not Hispanic)	50989	681.92	33.10	
		Black (not Hispanic)	11486	659.83	35.57	0.66
		Hispanic	2296	668.96	32.53	0.39
		Asian/Pacific Islander	1207	686.37	39.18	-0.13
		Native American	287	676.67	36.49	0.16
	Gender	Male	33806	672.47	35.76	
		Female	32457	683.15	32.73	-0.31
	Accommo-dations	No				
		Yes				
Mathematics	Ethnicity	White (not Hispanic)	50976	689.83	37.93	
		Black (not Hispanic)	11473	656.62	40.77	0.86
		Hispanic	2316	672.91	37.36	0.45
		Asian/Pacific Islander	1232	701.22	46.95	-0.30
		Native American	285	680.34	37.62	0.25
	Gender	Male	33803	683.56	42.09	
		Female	32476	683.76	39.20	0.00
	Accommo-dations	No				
		Yes				

Table 10: Impact Analysis, Grade 8

Content Area	Category	Group	N	Mean	Std. Dev.	Effect Size
Communication Arts	**Ethnicity**	White (not Hispanic)	51012	697.07	31.24	
		Black (not Hispanic)	11778	674.23	34.74	0.72
		Hispanic	2317	682.72	33.29	0.46
		Asian/Pacific Islander	1235	701.56	36.17	-0.14
		Native American	293	687.97	37.27	0.29
	Gender	Male	34325	687.51	34.74	
		Female	32317	697.96	30.80	-0.32
	Accommo-dations	No				
		Yes				
Mathematics	**Ethnicity**	White (not Hispanic)	50998	709.70	35.57	
		Black (not Hispanic)	11779	677.59	39.51	0.88
		Hispanic	2338	693.32	37.40	0.46
		Asian/Pacific Islander	1257	722.91	40.75	-0.37
		Native American	292	696.00	38.90	0.38
	Gender	Male	34345	702.97	40.55	
		Female	32327	704.34	36.41	-0.04
	Accommo-dations	No				
		Yes				
Science	**Ethnicity**	White (not Hispanic)	50967	701.43	27.33	
		Black (not Hispanic)	11753	671.78	33.22	1.04
		Hispanic	2329	686.20	30.83	0.55
		Asian/Pacific Islander	1254	704.54	33.50	-0.11
		Native American	292	691.40	32.14	0.37
	Gender	Male	34297	695.77	32.28	
		Female	32306	695.57	29.42	0.01
	Accommo-dations	No				
		Yes				