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Educational Report Card Growth Model For Minnesota Public Schools

April, 2008

Report Card Growth

The Minnesota district and school report cards will continue to report reading and math attainment of Adequately Yearly Progress (AYP) and the percentage of students proficient on grade level standards using the Minnesota Comprehensive Assessments (MCAII).

In addition the report card will display the percentage of students in each of the 9 AYP subgroups and gender who made "typical gain" and "accelerated gain" (percent making low gain may be displayed as well). These data must be displayed tabular or graphic form (graphic is preferable) and will include the state, district and school percentages. An example of graphic display follows:



Example of Math Growth for a District and School vs. State Growth

Data for each males and females and for each subgroup of students as defined by No Child Left Behind (NCLB) legislation must also be displayed in tabular or graphic form on the report card. An example of a subgroup graph follows:

Example of Math Growth for a District and School vs. State Norm - Students Receiving Free or reduced price lunch



Verification of State Growth Norms

The Minnesota Department of Education must verify the accuracy of the State growth norms for math (Appendix A) and the State growth norms for reading (Appendix B) from the data file of MCAII Vertically Linked scale scores for continuously enrolled students. This file should include only students tested with the MCAII/MTELL in 2006 at grade n-1 and tested with the MCAII/MTELL at grade n. For example, the 4th grade growth norms will include all students tested with the MCAII/MTELL in the Spring of 2006 who were enrolled in 3rd grade at the time of the test who were subsequently enrolled and tested in the MCAII/MTELL in 4th grade in the Spring of 2007.

Growth norms shall be reported for pretest (i.e., Spring 2006 vertically linked scale scores) in grouped frequency bands as listed in Appendix A and Appendix B of this document.

Computations and Computer Programming Logic

Standard SPSS (Statistical Package for the Social Sciences) syntax can be used to compute gain scores and translating gain scores into growth categories as follows:

(SPSS Syntax for executing trichotomous Growth Categories using Grade 4 Math growth norms)

COMPUTE MathVScalegain = (VerticalScaleScore – PreviousYearVerticalScaleScore).

(Repeat for each pretest range)

Compute Growthcategory=1. If (PreviousYearVerticalScaleScore < 2999 and MathVScalegain < 291)Growthcategory=0. If (PreviousYearVerticalScaleScore < 2999 and MathVScalegain 291)Growthcategory=2.

Where growthcategory '0' = "Low growth"; growthcategory '1' = "Typical growth"; growthcategory '2' = "Accelerated growth"

Appendix A MCAII and MTELL Growth Norms

Pretest Range	Number of Students	Low Growth	Typical Growth	Accelerated Growth
Math Grade 3 Scale Score 2500-2999 3000-3099 3100-3199 3200-3299 3300-3399 3400-3499 3500-3599 3600-3699 3700-3799 3800-3899	225 359 649 1470 3212 5358 8830 10231 12615 5885	Vertical Scale Score Gain less than 291 112 94 71 60 58 55 46 29 (8)	Vertical Scale Score Gain between 291-385 112-249 94-223 71-185 60-173 58-163 55-154 46-136 29-130 (8) -118	Vertical Scale Score Gain greater than 385 249 223 185 173 163 154 136 130 118
3900-3999 3900-3999	2369 2369	(85) (85)	(85)-100 (85)-100	100 100
4000- 4399	1731	(218)	(218)-(27)	(27)

Grade 4 MCAII and MTELL Math Growth Norms

Pretest Range	Number of Students	Low Growth	Typical Growth	Accelerated Growth
Math Grade 4		Vertical Scale Score	Vertical Scale	Vertical Scale Score
Scale Score		Gain less than	Score Gain between	Gain greater than
2500-2999	152	252	252-519	519
3000-3099	88	195	195-316	316
3100-3199	393	134	134-255	255
3200-3299	884	90	90-224	224
3300-3399	1757	80	80-209	209
3400-3499	4153	90	90-187	187
3500-3599	5540	83	83-179	179
3600-3699	10660	80	80-176	176
3700-3799	9896	73	73-174	174
3800-3899	10803	63	63-171	171
3900-3999	4803	24	24-132	132
3900-3999	3219	(18)	<mark>(18)</mark> -111	111
4000- 4399	871	(73)	<mark>(73)</mark> -68	68

Grade 5 MCAII and MTELL Math Growth Norms

Pretest Range	Number of Students	Low Growth	Typical Growth	Accelerated Growth
Math Grade 5		Vertical Scale Score	Vertical Scale	Vertical Scale Score
Scale Score		Gain less than	Score Gain between	Gain greater than
2500-2999	140	447	447-563	563
3000-3099	109	228	228-348	348
3100-3199	176	132	132-282	282
3200-3299	568	99	99-237	237
3300-3399	753	63	63-196	196
3400-3499	2095	28	28-158	158
3500-3599	3657	32	32-141	141
3600-3699	6704	33	33-128	128
3700-3799	9751	29	29-111	111
3800-3899	10245	11	11-110	110
3900-3999	10365	5	5-95	95
4000-4099	5336	(14)	(14)-94	94
4100-4199	3540	(60)	<mark>(60)</mark> -41	41
4200-4299	751	(90)	(90)-(21)	(21)
4300-4399	470	(171)	(171)-(59)	(59)

Grade 6 MCAII and MTELL Math Growth Norms

Pretest Range	Number of Students	Low Growth	Typical Growth	Accelerated Growth
Math Grade 6		Vertical Scale Score	Vertical Scale	Vertical Scale Score
Scale Score		Gain less than	Score Gain between	Gain greater than
2500-2999	232	751	751-879	879
3000-3099	145	263	263-422	422
3100-3199		227	227-385	385
3200-3299	198	191	191-348	348
3300-3399	647	107	107-244	244
3400-3499	1376	63	63-177	177
3500-3599	3164	31	31-139	139
3600-3699	5283	32	32-135	135
3700-3799	7056	35	35-123	123
3800-3899	9609	38	38-119	119
3900-3999	10858	39	39-124	124
4000-4099	8978	31	31-131	131
4100-4199	4395	15	15-103	103
4200-4299	1881	(31)	<mark>(31)</mark> -53	53
4300-4399	591	(92)	<mark>(92)</mark> -15	15
4400-4499				
4500-4599	337	(207)	(207)-(130)	(130)
4600-4699	112	(264)	(264)-(167)	(167)

Grade 7 MCAII and MTELL Math Growth Norms

Note: Negative gain is in (red) Interpolated scores in blue

Pretest Range	Number of	Low Growth	Typical Growth	Accelerated Growth
	Students			
Math Grade 7		Vertical Scale Score	Vertical Scale	Vertical Scale Score
Scale Score		Gain less than	Score Gain between	Gain greater than
2500-2999	112	716	716-865	865
3000-3099	97	293	293-507	507
3100-3199		225	225-414	414
3200-3299	402	156	156-321	321
3300-3399	294	124	124-251	251
3400-3499	1328	42	42-201	201
3500-3599	2521	36	36-166	166
3600-3699	3476	28	28-142	142
3700-3799	6668	36	36-133	133
3800-3899	8118	34	34-124	124
3900-3999	12426	38	38-122	122
4000-4099	9677	36	36-125	125
4100-4199	8089	27	27-120	120
4200-4299	2701	3	3-108	108
4300-4399	875	(55)	<mark>(55)</mark> - 59	59
4400-4499	651	(103)	(103)- 39	39
4500-4599	380	(202)	(202)-(98)	(98)
4600-4699	190	(284)	(284)-(142)	(142)

Grade 8 MCAII and MTELL Math Growth Norms

Note: Negative gain is in (red) Interpolated scores in blue

Appendix B MCAII Reading Growth Norms

Pretest Range	Number of Students	Low Growth	Typical Growth	Accelerated Growth
Reading Grade 3 Scale		Vertical Scale Score Change less than	Vertical Scale Score Change	Vertical Scale Score Change greater than
Score		change less than	between	change grouter than
2300-2999	400	245	245-444	444
3000-3099	399	147	147-259	259
3100-3199	850	85	85-237	237
3200-3299	1362	78	78-214	214
3300-3399	2274	74	74-211	211
3400-3499	3644	72	72-190	190
3500-3599	6707	68	68-187	187
3600-3699	6736	66	66-173	173
3700-3799	10322	50	50-170	170
3800-3899	4350	27	27-137	137
3900-3999	8741	(8)	<mark>(8)</mark> -120	120
4000-4100		(60)	(60)-70	70
4100-4199	3384	(151)	(151)-(30)	(30)
4200- 4299	1602	(200)	(200)-(60)	(60)

Grade 4 MCAII Reading Growth Norms

Note: Negative change is in (red)

Interpolated scores in blue (based on 3rd order polynomial regression, below)



Grade 4 Reading Growth Norm Cut Scores

Pretest Range	Number of Students	Low Growth	Typical Growth	Accelerated Growth
Reading		Vertical Scale Score	Vertical Scale	Vertical Scale Score
Grade 4 Scale		Change less than	Score Change	Change greater than
Score		chunge lebs thun	between	chunge grouter thun
2300-2999	214	348	348-522	522
3000-3099	165	235	235-379	379
3100-3199	432	125	125-276	276
3200-3299	918	115	115-235	235
3300-3399	1418	85	85-223	223
3400-3499	2041	79	79-200	200
3500-3599	3969	75	75-187	187
3600-3699	5512	68	68-182	182
3700-3799	8672	60	60-177	177
3800-3899	5942	45	45-144	144
3900-3999	6687	13	13-128	128
4000-4100	6602	0	0-82	82
4100-4199	2923	(92)	<mark>(92)-</mark> 68	68
4200- 4299	2465	(133)	(133)-49	49
4300-4399	1773	(201)	(201)-(72)	(72)

Grade 5 MCAII Reading Growth Norms

Pretest Range	Number of Students	Low Growth	Typical Growth	Accelerated Growth
Reading		Vertical Scale Score	Vertical Scale	Vertical Scale Score
Grade 5 Scale		Change less than	Score Change	Change greater than
Score		change less than	between	enange greater than
2300-2999	214	288	288-509	509
3000-3099	165	138	138-313	313
3100-3199	432	96	96-253	283
3200-3299	918	77	77-240	240
3300-3399	1418	74	74-223	223
3400-3499	2041	71	71-201	201
3500-3599	3969	67	67-194	194
3600-3699	5512	61	61-185	185
3700-3799	8672	41	41-177	177
3800-3899	5942	27	27-142	142
3900-3999	6687	4	4-128	128
4000-4100	6602	(45)	(45)-82	82
4100-4199	2923	(92)	<mark>(92)</mark> -68	68
4200- 4299	2465	(133)	(133)-(20)	(20)
4300- 4399	1773	(254	(254)-(72)	(72)

Grade 6 MCAII Reading Growth Norms

Pretest Range	Number of Students	Low Growth	Typical Growth	Accelerated Growth
Reading		Vertical Scale Score	Vertical Scale	Vertical Scale Score
Score		Change less than	Score Change	Change greater than
2300-2999	124	626	626-906	906
3000-3099	79	377	377-475	475
3100-3199	313	182	182-335	335
3200-3299	202	129	129-272	245
3300-3399	819	103	103-233	233
3400-3499	1148	73	73-198	198
3500-3599	1656	61	61-185	185
3600-3699	3075	46	46-175	175
3700-3799	6361	38	38-150	150
3800-3899	7256	28	28-126	126
3900-3999	6796	2	2-104	104
4000-4100	9668	(10)	<mark>(10)</mark> -84	84
4100-4199	6987	(48)	<mark>(48)</mark> -60	60
4200-4299	4066	(93)	(93)-23	23
4300-4399	3202	(127)	(127)-(24)	(24)
4400-4499	1066	(193)	(193)-(44)	(44)
4500-4599	781	(229)	(229)-(126)	(126)
4600-4699	491	(337)	(337)-(175)	(175)
4700-4799		(391)	(391)-(250)	(250)
4800-4899	213	(445)	(445)-(332)	(332)
4900-4999	99	(554)	(554)-(427)	(427)

Grade 7 MCAII Reading Growth Norms

Pretest Range	Number of Students	Low Growth	Typical Growth	Accelerated Growth
Reading Grade 7 Scale Score		Vertical Scale Score Change less than	Vertical Scale Score Change	Vertical Scale Score Change greater than
2300-2999	69	620	620-827	827
3000-3099	46	379	379-464	464
3100-3199	93	240	240-400	400
3200-3299	245	197	197-320	320
3300-3399	372	112	111-236	218
3400-3499	900	78	78-191	191
3500-3599	1302	44	44-159	159
3600-3699	2390	31	31-142	142
3700-3799 3800-3899	3742 6171	19 12	19-128 12-125 7.122	128 125
4000-4100 4100-4199	8333 9542	1 (15)	1-108 (15)-95	122 108 95
4200- 4299	5986	(27)	(27)-56	56
4300- 4399	4695	(80)	(80)-38	38
4400-4499	1594	(143)	(143)-2	2
4500-4599 4600-4699 4700-4799	1092 598	(200) (247) (294)	(200)-(98) (247)-(127) (294)-(179)	(98) (127) (179)
4800-4899	322	(389)	(389)-(266)	(266)
4900-4999		(484)	(484)-(354)	(354)

Grade 8 MCAII Reading Growth Norms

Appendix C Background and Rationale for the Report Card Growth Model

The Minnesota State Legislature has specified a Growth-based value-added model for reporting reading and mathematics achievement gains for Minnesota public school students in grades 3 through 8. Using the Minnesota Comprehensive Assessment II vertically linked scale scores, achievement growth is defined as the difference between a student's achievement scores at two distinct points in time. During school year 2008-09 achievement growth will be summarized on the Minnesota School Report Card using State growth norms on continuously enrolled students¹ who were tested during the 2006 and 2007 spring administrations of the MCAII and MTELL assessments. Growth in vertically linked scale scores for students assessed in the Spring 2007 to Spring 2008 will be summarized for each district and school in Minnesota by the 9 subgroups defined under 2001 No Child Left Behind Federal legislation and also by gender.

At the end of the 2007-08 school year individual student academic growth in reading and math will be reported to students and families in much the same way as height and weight growth is depicted in a doctor's office. Just as a child's height can be plotted across time versus national growth norms, reading and math achievement will be plotted on a graph versus the Minnesota Comprehensive Assessments reading and math proficiency standards (see graph below for an example).



¹ For district reporting, a continuously enrolled student is enrolled in October and April of the current school year in the same district and has MCAII or MTELL test scores for the current and previous year of enrollment For school level reporting, a continuously enrolled student is enrolled in October and April of the current school year in the same school and has MCAII or MTELL test scores for the current and previous year of enrollment



Growth Norms

The State report card will summarize all of the individual student growth curves by comparing individual student growth to State growth norms in reading and math. The growth norms are a census of reading and math gains for students in Minnesota by grade level from Spring 2006 to Spring 2007.

Once the census of achievement gains were collected, the growth norms were created by calculating the frequency of achievement gains for students who start at various achievement levels in the previous year. If gain scores were in the bottom third of the distribution they were categorized as "low growth"; if the gain scores were in the middle third of the distribution they were categorized as "typical growth"; and if they were in the top third of the distribution they were categorized as "accelerated growth".

In the example for 3rd to 4th grade math gains (see graph above), the individual student started with a vertically linked scale score of 3400 in 3rd grade and gained 300 scale score points to a score of 3700 in 4th grade. The State growth norms classify this magnitude of growth as "accelerated" since less than 1/3 of students who started at 3400 in 3rd grade made gains of 300 or more scale score points. The growth categories for students who scored 3400 to 3499 on third grade MCAII math are as follows:

"Low growth" = less than 58 vertical scale score gain "Typical growth" = 58 to 163 vertical scale score gain "Accelerated growth" = greater than 163 vertical scale score gain

Growth norms for all math grade levels are in Appendix A of this document. Growth norms for all reading grade levels are in Appendix B.

Rationale for the Report Card Growth Model

The main purposes of reporting achievement growth at a school district and school level are to document the effectiveness of educational efforts by schools and districts across Minnesota and to highlight accelerated progress for subgroups of students who traditionally have not demonstrated accelerated growth in reading and math achievement. Schools and districts with large numbers of students making accelerated growth will be recognized and invited to participate in studies of effective reading and math educational efforts. Citizens of Minnesota can all learn from these "beat the odds" schools.

Use of a growth model which tracks individual student achievement gains across time is superior to "attainment" models (Meyer, 2003) which report average scores or percentage of students proficient on different cohorts of students from year to year. The typical attainment model will report the percentage of students proficient in 3rd grade one year compared to the percentage of students proficient in 3rd grade the next year. The problems with the "attainment model" are many. Robert Meyer, director of the

Value-Added Research Center at the University of Wisconsin has clearly articulated the four main problems as follows:

- 1) The average or percent proficient at a particular point in time is **contaminated by factors other than school performance**. In particular, prior student achievement and the effects of student, family and community effects on student academic growth confound the simple comparison of one third grade class to another. For example, each third grade cohort may have significant differences in the quality and quantity of quality preschool and home life experiences.
- 2) The attainment score reflects information about school performance with tends to be out-of-date. For example, different 3rd grade cohorts may have had prior instruction in first and second grade which was differentially effective or ineffective. Perhaps a fabulous second grade teacher retired before the second cohort arrived in second grade and they received instruction from a poorly trained substitute teacher.
- 3) The attainment score may be **highly contaminated due to student mobility**. For example, one third grade cohort may include only students who speak English as the primary language at home while the next cohort may include large numbers of new immigrants from countries where English is not the primary language.
- 4) The attainment score fails to localize the (pinpoint) school performance to a particular grade level. This is particularly true in the upper grades where, for example, the average 8th grade math score fails to distinguish the 6th and 7th grade effects from the instruction at 8th grade.

The Minnesota Growth-based value-added system addresses each of the problems delineated by Meyer.

By comparing individual student longitudinal growth to typical gains in the Minnesota growth norms, factors other than school performance are minimized. For example, the quality of early

childhood experiences are reflected in the prior year. Evaluation of the effects of 4th grade instruction are not contaminated by prior experiences since the prior experiences are "captured" in the 3rd grade score.

Information about school productivity is localized to the particular grade level using a pretestposttest evaluation design. Gains from 3rd to 4th grade can be separates from 2nd grade effects. Student mobility is controlled by creating growth norms on continuously enrolled students and analyzing scores for students who have stayed in the same school/district from October to April of the school year in question.

Controlling for these confounding variables makes the The Minnesota Growth-based valueadded system much more fair and accurate in measuring the productivity of schools and districts throughout the State. Using a simple achievement growth model rather than more sophisticated linear modeling makes the results much easier to for student, families and the general public to understand.

Using the data from the Education Report Card, district will be able to simultaneously evaluate school performance on two dimensions: growth and attainment.

The following 2 x 2 matrix depicts a possible classification analysis.

Using Growth and Achievement Status in a School Accountability Model



Districts may have schools in one or all of the 4 quadrants. Schools with high growth and high percent proficient on the State tests can be distinguished from schools that score high on average on the State tests but are showing little growth. Schools that are "not yet" on achieving standards

but making accelerated growth may be distinguished from schools that need intensive immediate assistance - i.e. the low growth, low attainment schools.

Schools may be identified for further study that demonstrate accelerated growth for students of color, students in poverty, English Language Learners, or any of the other subgroups of students.

References

- Heistad, D.J. & Spicuzza, R. (2000). <u>Measuring school performance to improve student achievement:</u> <u>And to reward effective programs</u>. Paper presentation at the Annual American Educational Research Association Conference in New Orleans, April 2000.
- Meyer, R.H. (2003). <u>Value-added indicators. Can they make an important difference?</u> Evidence from the <u>Milwaukee Public Schools</u> Working paper, Wisconsin Center for Educational Research: Madison, WI.
- Raudenbush, S.W., & Willms, D.J. (1995). The estimation of school effects, <u>Journal of Educational and</u> <u>Behavioral Statistics, 20</u>, 307-336.