PRI Middle and High School Follow-Up Project

July 2018 Progress Update

Study conducted by the Peabody Research Institute

at Vanderbilt University

PEABODY research institute

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Acknowledgements

We are enormously grateful for the assistance of the Metropolitan Nashville Public Schools, most especially Christine Stenson of the MNPS Research Department, and the administrators and teachers in MNPS middle and high schools.

We also want to express our appreciation for the contributions of Lisa Swain, who tirelessly checked our student direct assessment data and followed through working with the teacher rating scales.

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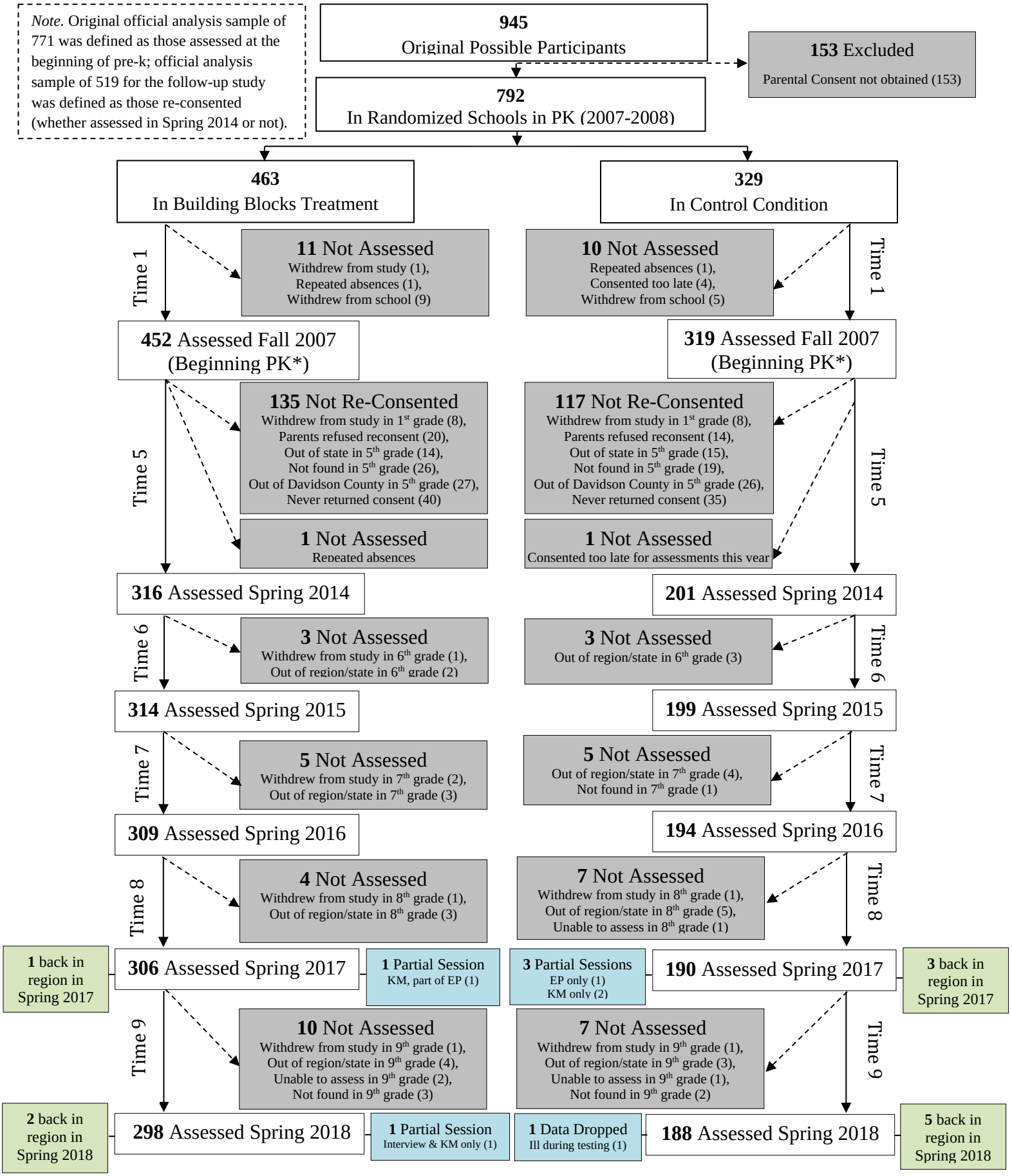
Official Analysis Sample

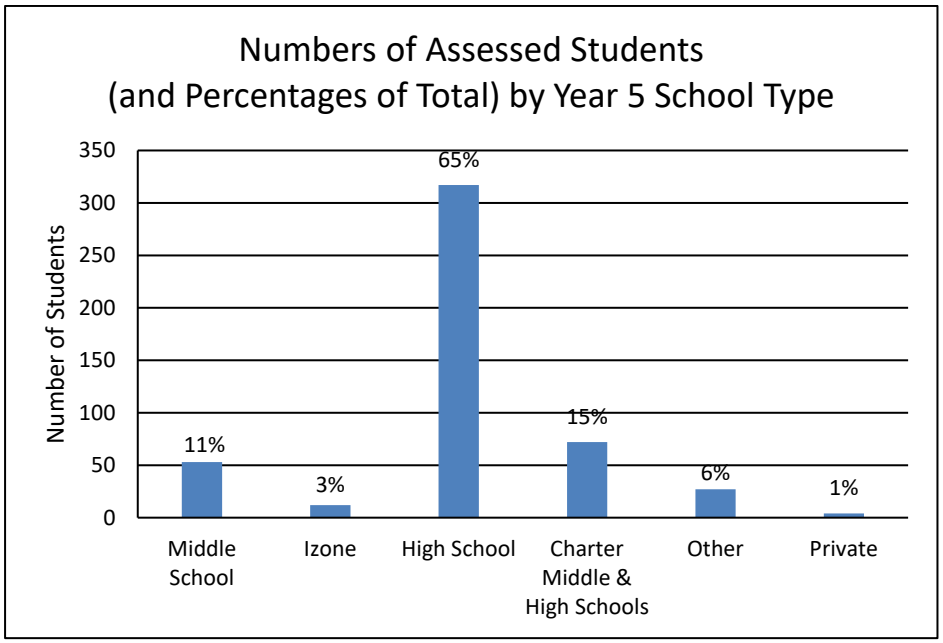
- There were 771 students in our database from the Pre-K study, and the goal for the newly consented sample, as written in the grant proposal, was 500 students.
- **THE OFFICIAL ANALYSIS SAMPLE CONSISTS OF 519 STUDENTS (517 assessed in Year 1, 513 assessed in Year 2, 503 assessed in Year 3, 496 assessed in Year 4, and 486 assessed in Year 5).**
    - *Note.* In year 5, 484 students have complete direct assessment data. We dropped all assessment scores for 1 student because he was ill during the assessment session and fell asleep twice. Another student completed part of the session but left school early because she was sick. We dropped the assessments completed on the day she was ill (TIMSS and Woodcock-Johnson subtests) but kept her student interview and KeyMath data because it was collected on a different day.

Consort Chart: From Original Early Math Study through Middle School Follow-Up

Note. Original official analysis sample of 771 was defined as those assessed at the beginning of pre-k; official analysis sample of 519 for the follow-up study was defined as those re-consented (whether assessed in Spring 2014 or not).

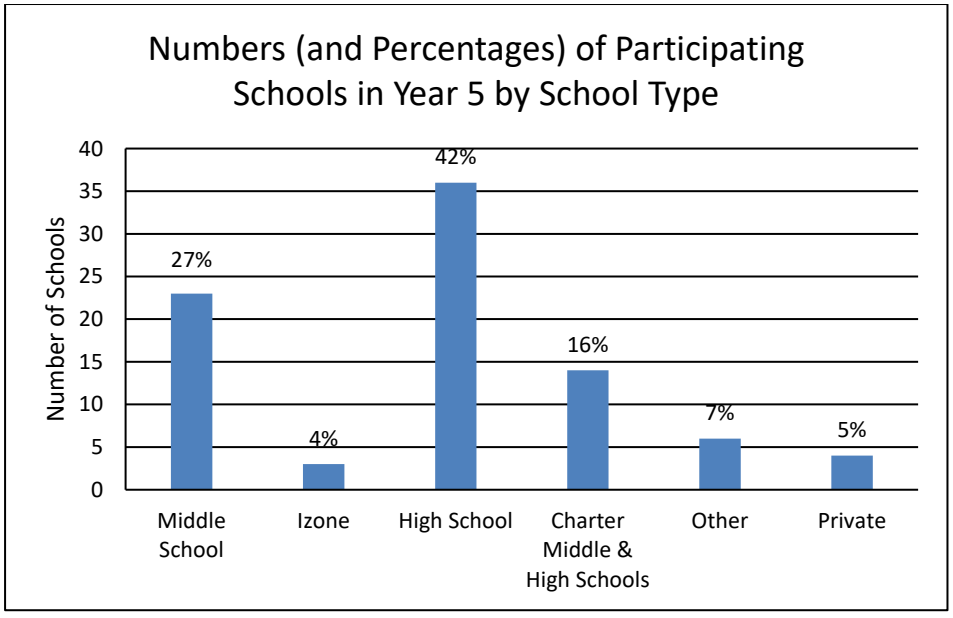


Assessed Students in Year 5



Note. "Other" schools include 1 that only serves students with IEPs, 1 K-12 school, 2 alternative schools, 1 school serving grades 7–12, and 2 students who were homeschooled.

Participating Schools in Year 5



Note. "Other" schools include 1 school that only serves students with IEPs, 1 K-12 school, 2 alternative schools, and 1 school serving grades 7–12. 2 students were homeschooled during Year 5 and are also included in the "Other" category.

Mobility of Students between Schools in Year 5

	Frequency	Percent
Attended 1 School	432	89.1
Attended 2 Schools	42	8.7
Attended 3 Schools	6	1.2
Attended 4 Schools	5	1.0

Note. 15 of the students assessed during Year 5 (3.1%) attended an alternative school at some point during the year.

School Enrollment across Years

		Attended MNPS School		Did Not Attend MNPS School	
Year	**N**	**Freq**	**Pct**	**Freq**	**Pct**
Year 1	519	519	100.0	0	0.0
Year 2	513	508	99.0	5	1.0
Year 3	503	483	96.0	20	4.0
Year 4	496	460	92.7	36	7.3
Year 5	485	432	89.1	53	10.9

DCS Custody across Years

Year	# Students in DCS Custody
Year 1	0
Year 2	0
Year 3	0
Year 4	6
Year 5	7

Note. We have documentation that the students listed in the above table were in DCS (TN Deptartment of Children's Services) custody at some point during the respective school year.

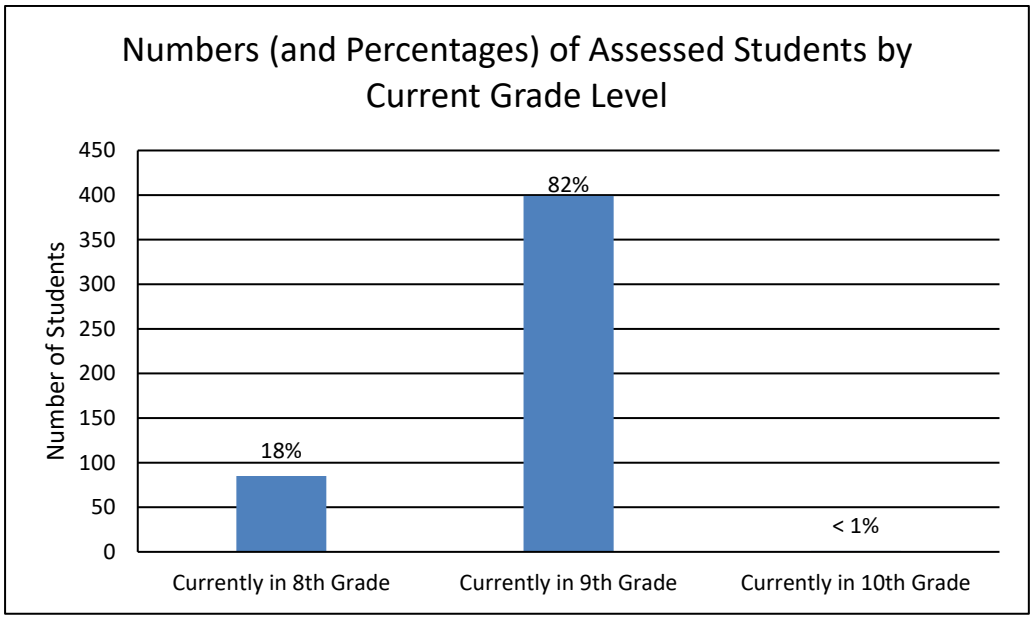
Demographic Information (Assessed Sample for Year 5)

	N	Min	Max	Mean	SD
Age at Time of Testing (in years)	485	14.35	16.51	15.00	.333
PK Building Blocks Treatment	298	14.35	16.51	14.97	.333
PK Control Condition	187	14.41	16.28	15.04	.331

	Overall		PK Building Blocks		PK Control	
	Freq	Pct	Freq	Pct	Freq	Pct
Ethnicity						
Black	384	79.2	244	81.9	140	74.9
White	39	8.0	19	6.4	20	10.7
Hispanic	41	8.5	20	6.7	21	11.2
Other	21	4.3	15	5.0	6	3.2
Gender						
Male	212	43.7	132	44.3	80	42.8
Female	273	56.3	166	55.7	107	57.2
Number of Current Schools	87	-	71	-	59	-
Pre-K School System						
Head Start (MAC)	195	40.2	143	48.0	52	27.8
MNPS Pre-K	290	59.8	155	52.0	135	72.2

Note. Most students were located in Davidson County, but we also assessed any student who had moved to a contiguous county (2 in Cheatham, 10 in Clarksville-Montgomery, 3 in Robertson, 15 in Rutherford, 10 in Sumner, 2 in Williamson, and 5 in Wilson). In addition, 4 students attended a private school, and 2 were homeschooled.

Grade Retention Information in Year 5

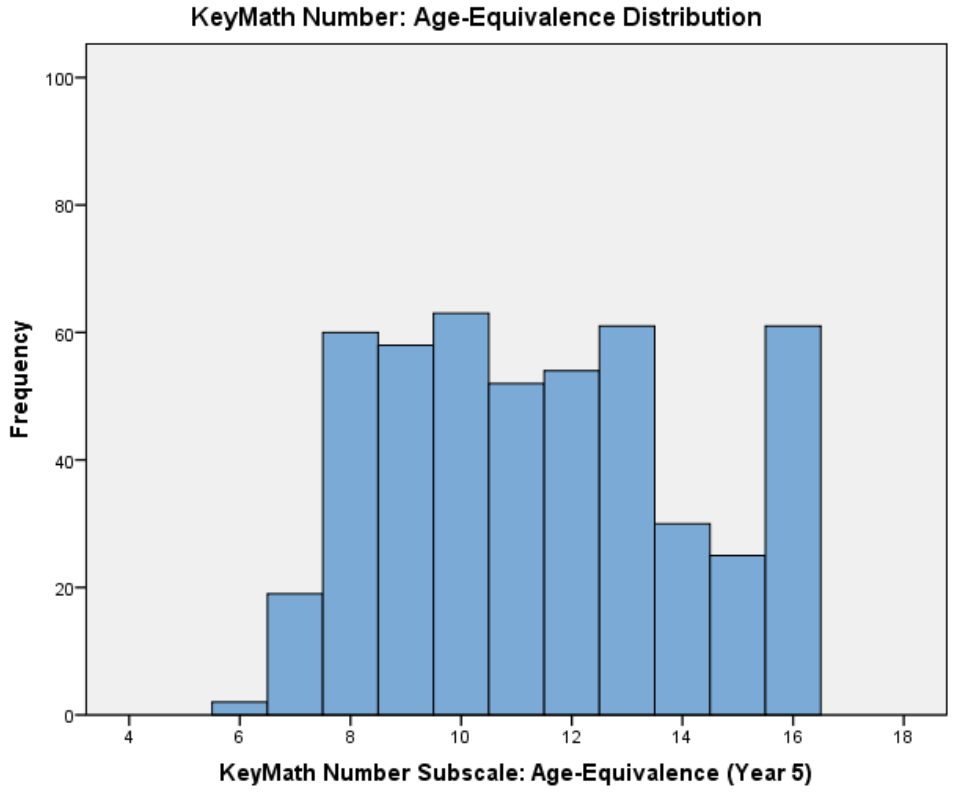


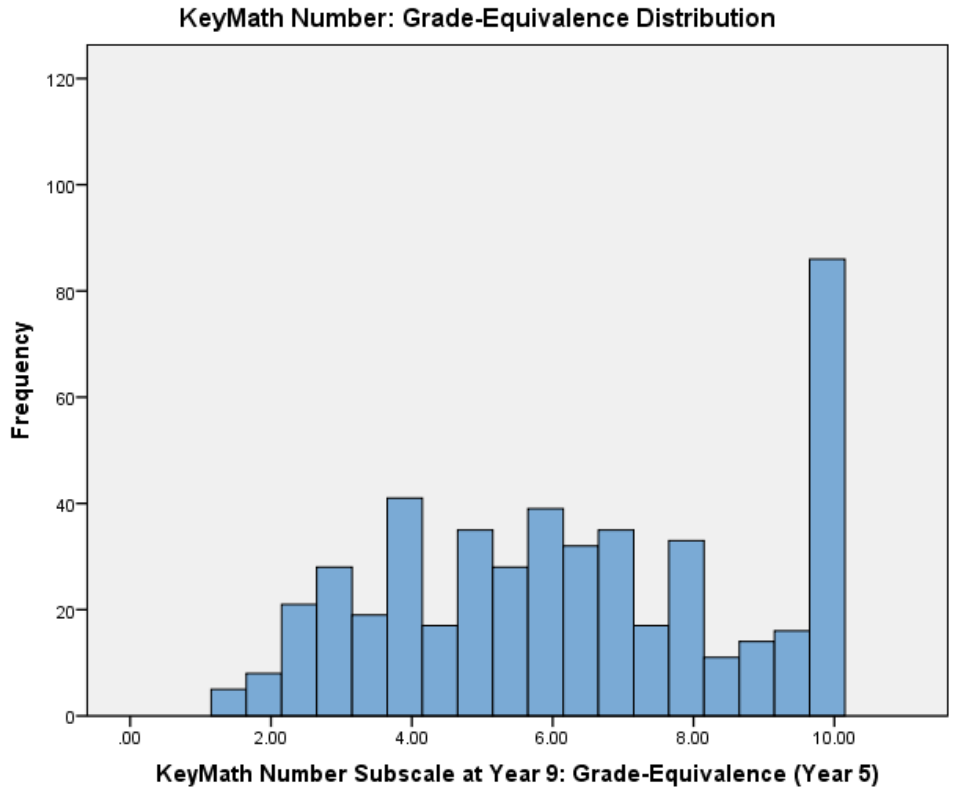
- 393 students have gone through 5th, 6th, 7th, 8th, and 9th grade as expected.
- 67 students were in 4th grade in year 1, 5th grade in year 2, 6th grade in year 3, 7th grade in year 4, and in 8th grade this year.
- 3 students were in 4th grade in year 1, 5th grade in year 2, 6th grade in year 3, 7th grade in year 4, and 9th grade in year 5.
- 8 students were in 5th grade in year 1, repeated 5th grade in year 2, were in 6th grade in year 3, 7th grade in year 4, and in 8th grade this year.
- 6 students were in 5th grade in year 1, 6th grade in year 2, repeated 6th grade in year 3, were in 7th grade in year 4, and in 8th grade this year.
- 2 students were in 5th grade in year 1, 6th grade in year 2, 7th grade in year 3, repeated 7th grade in year 4, and were in 8th grade this year.
- 2 students were in 5th grade in year 1, 6th grade in year 2, 7th grade in year 3, 8th grade in year 4, and repeated 8th grade this year.
- 1 student was in 6th grade in year 1, 7th grade in year 2, 8th grade in year 3, 9th grade in year 4, and in 10th grade this year.
- 1 student was in 4th grade in year 1, 5th grade in year 2, started year 3 in 6th grade but was moved up to 7th grade mid-year, was in 7th grade in year 4, and in 8th grade this year.
- 1 student was in 5th grade in year 1, 6th grade in year 2, repeated 6th grade in year 3, was in 7th grade in year 4, and in 9th grade this year.
- 1 student was in 5th grade in year 1, 6th grade in year 2, repeated 6th grade in year 3, was in 8th grade in year 4, and in 9th grade this year.

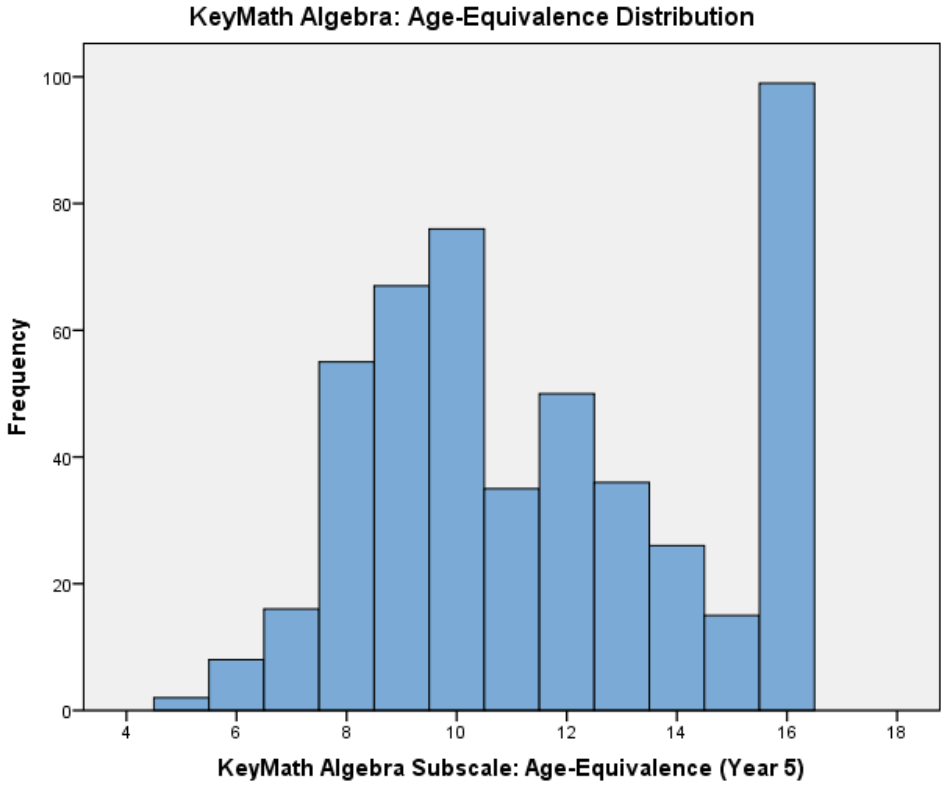
Student Outcomes: KeyMath

Note. The average age of the students at testing was 15.0 years. The average current grade level of the students was 9.77.

	N	Min	Max	Mean	SD
KeyMath: Numeration					
Age-Scaled Score	485	2.00	19.00	7.55	2.72
Age Equivalent	485	6.00	16.00	11.47	2.72
Grade Equivalent	485	1.40	10.00	6.32	2.50
KeyMath: Algebra					
Age-Scaled Score	485	1.00	17.00	7.86	2.99
Age Equivalent	485	5.00	16.00	11.54	3.00
Grade Equivalent	485	0.40	10.00	6.47	2.62
KeyMath: Geometry					
Age-Scaled Score	485	1.00	19.00	7.65	2.52
Age Equivalent	485	5.00	16.00	11.09	2.72
Grade Equivalent	485	0.50	10.00	6.24	2.47


KeyMath Number: Age-Equivalence Distribution
Frequency
0
20
40
60
80
100
4
6
8
10
12
14
16
18
KeyMath Number Subscale: Age-Equivalence (Year 5)


KeyMath Number: Grade-Equivalence Distribution
Frequency
0
20
40
60
80
100
120
.00
2.00
4.00
6.00
8.00
10.00
KeyMath Number Subscale at Year 9: Grade-Equivalence (Year 5)


KeyMath Algebra: Age-Equivalence Distribution
Frequency
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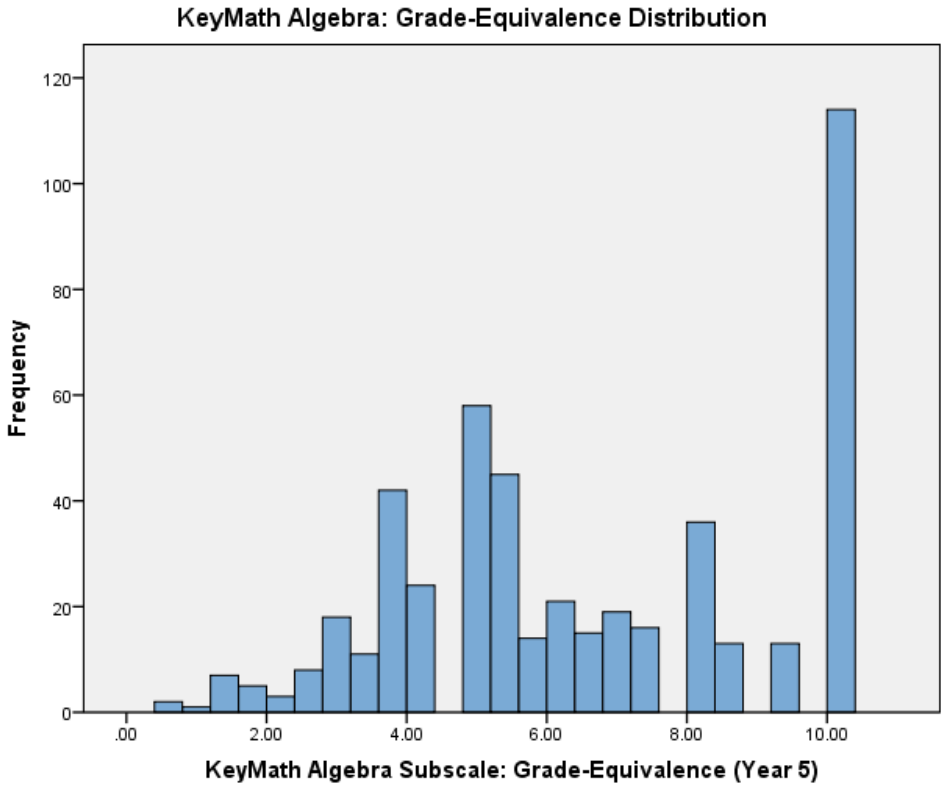
20
40
60
80
100
4
6
8
10
12
14
16
18
KeyMath Algebra Subscale: Age-Equivalence (Year 5)


KeyMath Algebra: Grade-Equivalence Distribution
Frequency
0
20
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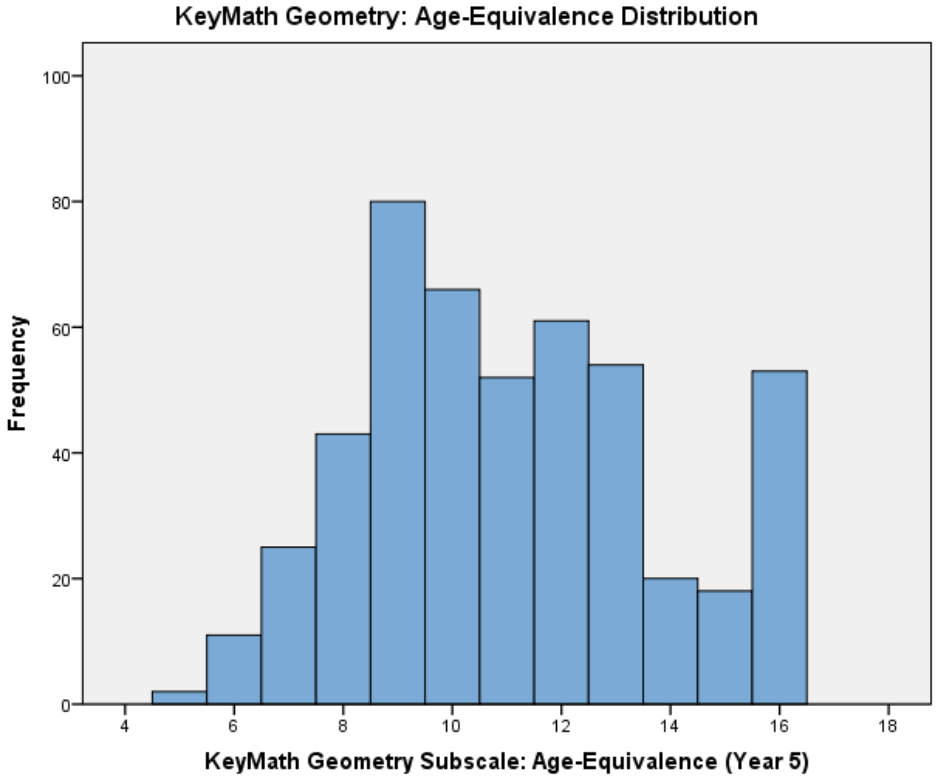
10.00
KeyMath Algebra Subscale: Grade-Equivalence (Year 5)


KeyMath Geometry: Age-Equivalence Distribution
Frequency
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20
40
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80
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4
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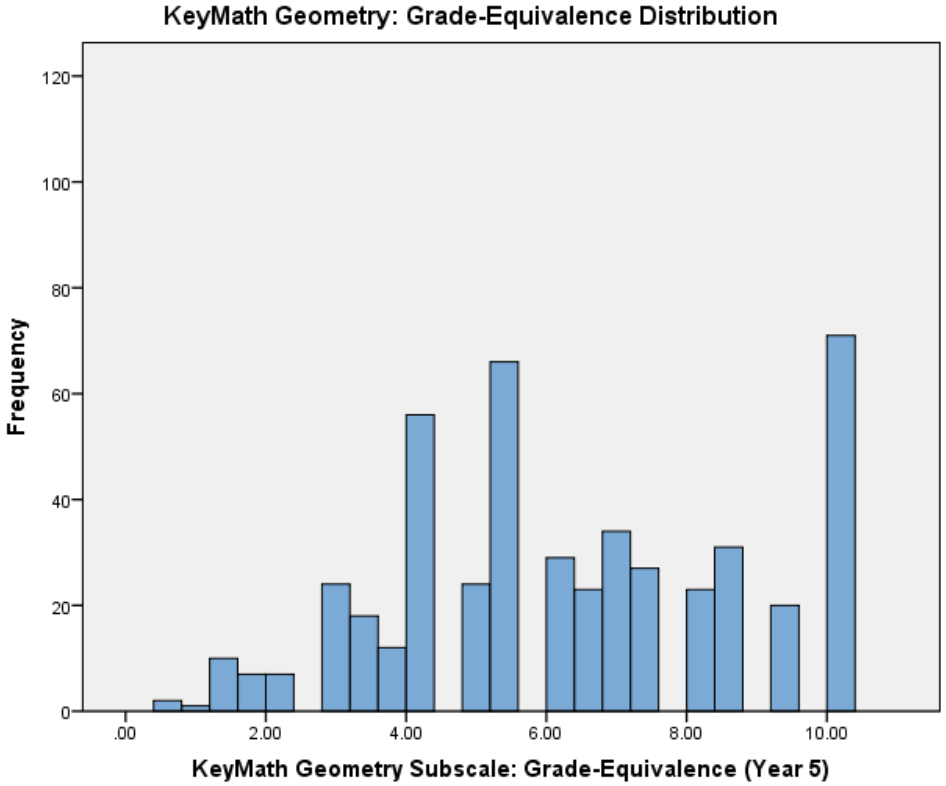
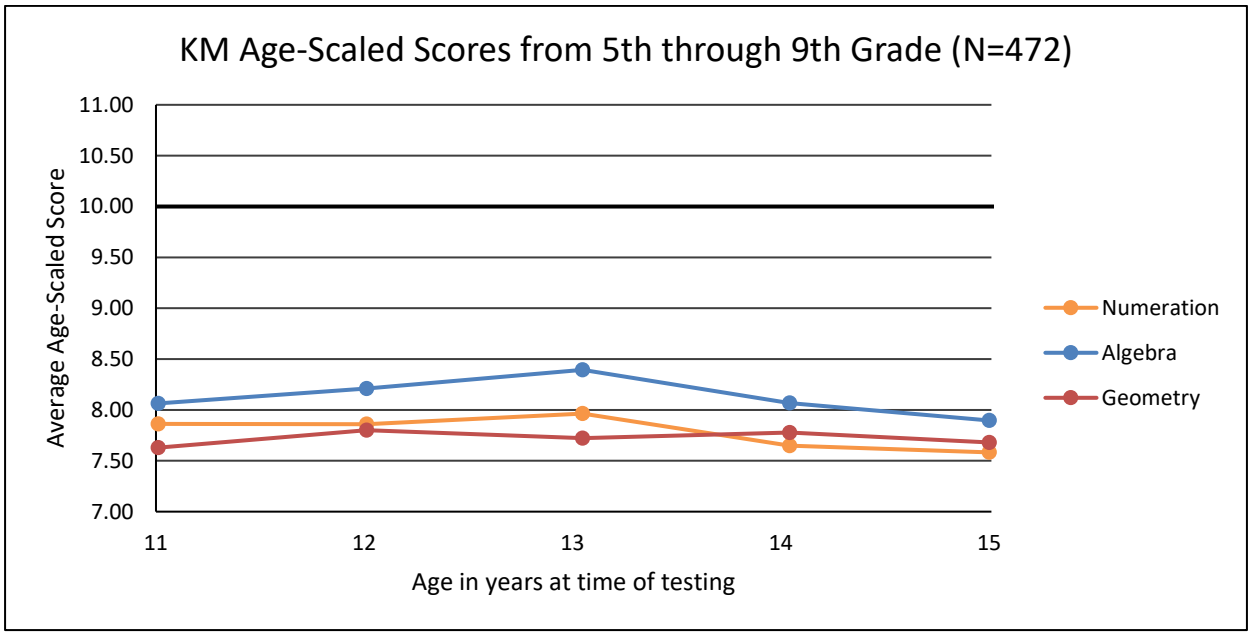
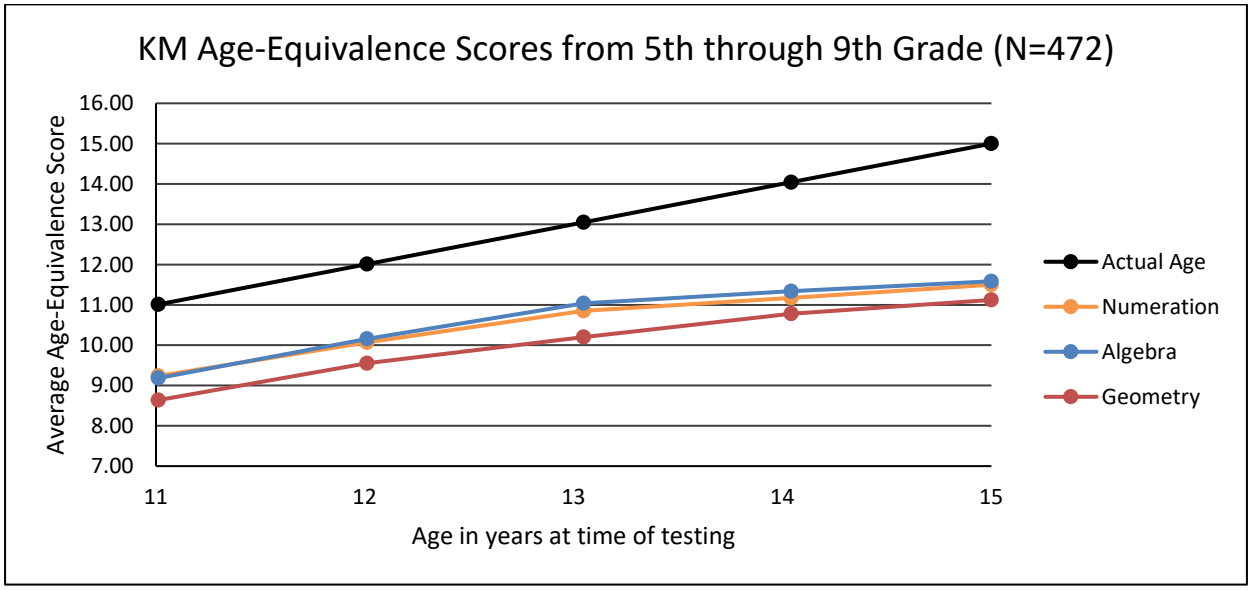
8
10
12
14
16
18
KeyMath Geometry Subscale: Age-Equivalence (Year 5)


KeyMath Geometry: Grade-Equivalence Distribution
Frequency
0
20
40
60
80
100
120
.00
2.00
4.00
6.00
8.00
10.00
KeyMath Geometry Subscale: Grade-Equivalence (Year 5)

KeyMath Scores across Years

- In the PRI Middle School Follow-Up Study, there have been 5 testing time points for KeyMath. They were: spring of 5th grade, spring of 6th grade, spring of 7th grade, spring of 8th grade, and spring of 9th grade.
- The graphs below show the scores over time for those 472 who were tested at all possible time points.





KeyMath Age Equivalence across Years

Year	Mean Age	Test	N	M	SD	Actual - Expected
Year 1	11.01 years	Number	517	9.21	2.04	-1.80
		Algebra	517	9.15	1.96	-1.86
		Geometry	517	8.61	1.99	-2.40
Year 2	12.01 years	Number	513	10.03	2.23	-1.98
		Algebra	513	10.10	2.41	-1.91
		Geometry	513	9.51	2.10	-2.50
Year 3	13.05 years	Number	503	10.82	2.62	-2.23
		Algebra	503	11.00	2.76	-2.05
		Geometry	503	10.17	2.32	-2.88
Year 4	14.04 years	Number	495	11.15	2.76	-2.89
		Algebra	495	11.31	2.97	-2.73
		Geometry	495	10.74	2.71	-3.30
Year 5	15.00 years	Number	485	11.47	2.72	-3.53
		Algebra	485	11.54	3.00	-3.46
		Geometry	485	11.09	2.72	-3.91

KeyMath Grade Equivalence across Years

Year	Mean Grade	Test	N	M	SD	Actual - Expected
Year 1	5.83	Number	517	4.20	1.98	-1.63
		Algebra	517	4.31	1.84	-1.52
		Geometry	517	3.90	1.97	-1.93
Year 2	6.84	Number	513	4.98	2.15	-1.86
		Algebra	513	5.20	2.25	-1.64
		Geometry	513	4.80	2.06	-2.04
Year 3	7.85	Number	503	5.74	2.48	-2.11
		Algebra	503	6.02	2.53	-1.83
		Geometry	503	5.42	2.26	-2.43
Year 4	8.84	Number	495	6.04	2.56	-2.80
		Algebra	495	6.25	2.64	-2.59
		Geometry	495	5.95	2.50	-2.89
Year 5	9.77	Number	485	6.32	2.50	-3.45
		Algebra	485	6.47	2.62	-3.30
		Geometry	485	6.24	2.47	-3.53

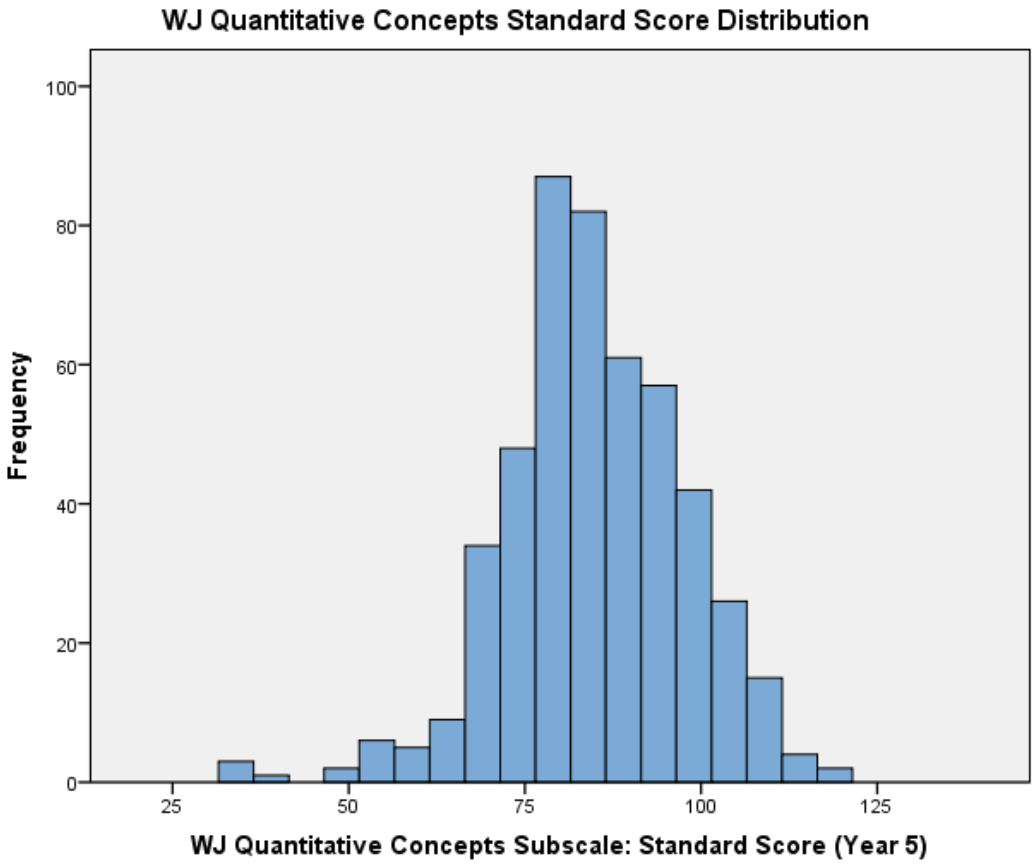
Student Outcomes on KeyMath by Retention Status

	N	Min	Max	Mean	SD
Not Retained					
Average Age =15.02 years, Average Grade = 9.77					
KeyMath: Numeration					
Age-Scaled Score	399	2.00	19.00	7.96	2.65
Age Equivalent	399	6.00	16.00	11.88	2.65
Grade Equivalent	399	1.40	10.00	6.71	2.40
KeyMath: Algebra					
Age-Scaled Score	399	1.00	17.00	8.32	2.94
Age Equivalent	399	5.00	16.00	12.02	2.98
Grade Equivalent	399	0.40	10.00	6.89	2.57
KeyMath: Geometry					
Age-Scaled Score	399	1.00	19.00	8.03	2.45
Age Equivalent	399	5.00	16.00	11.51	2.63
Grade Equivalent	399	0.50	10.00	6.64	2.36

	N	Min	Max	Mean	SD
Retained					
Average Age = 14.88 years, Average Grade = 8.77					
KeyMath: Numeration					
Age-Scaled Score	86	2.00	12.00	5.64	2.15
Age Equivalent	86	6.00	16.00	9.55	2.18
Grade Equivalent	86	1.40	10.00	4.49	2.11
KeyMath: Algebra					
Age-Scaled Score	86	2.00	10.00	5.72	2.17
Age Equivalent	86	6.00	14.00	9.33	1.91
Grade Equivalent	86	1.50	9.50	4.54	1.88
KeyMath: Geometry					
Age-Scaled Score	86	2.00	11.00	5.91	2.07
Age Equivalent	86	5.00	16.00	9.13	2.24
Grade Equivalent	86	0.50	10.00	4.42	2.15

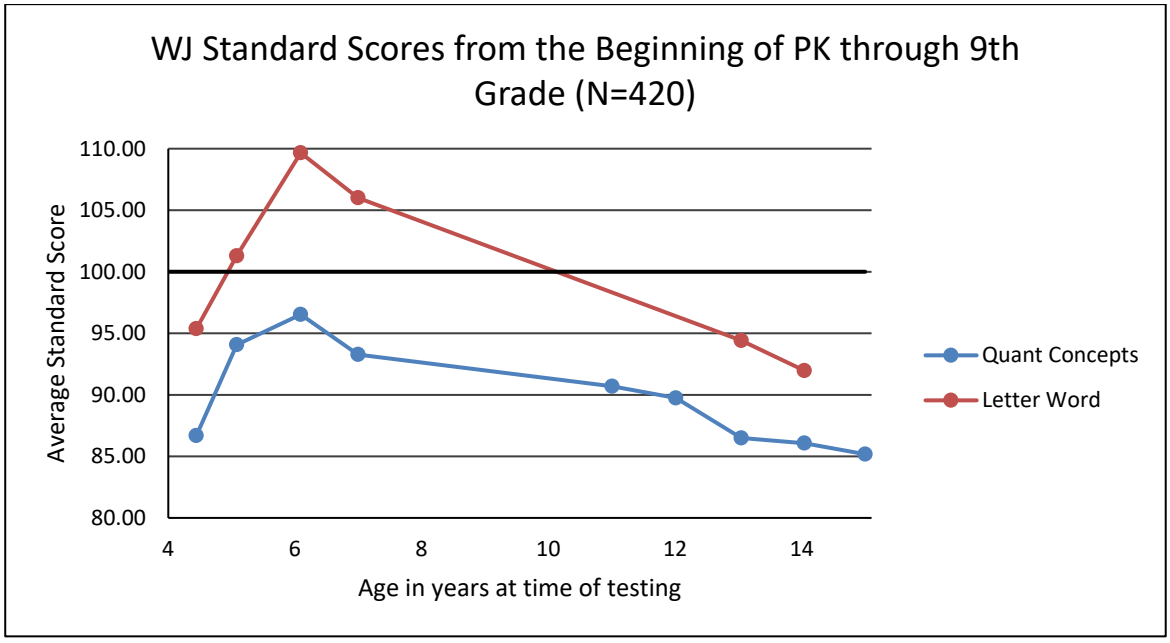
Student Outcomes: Woodcock-Johnson Subtests

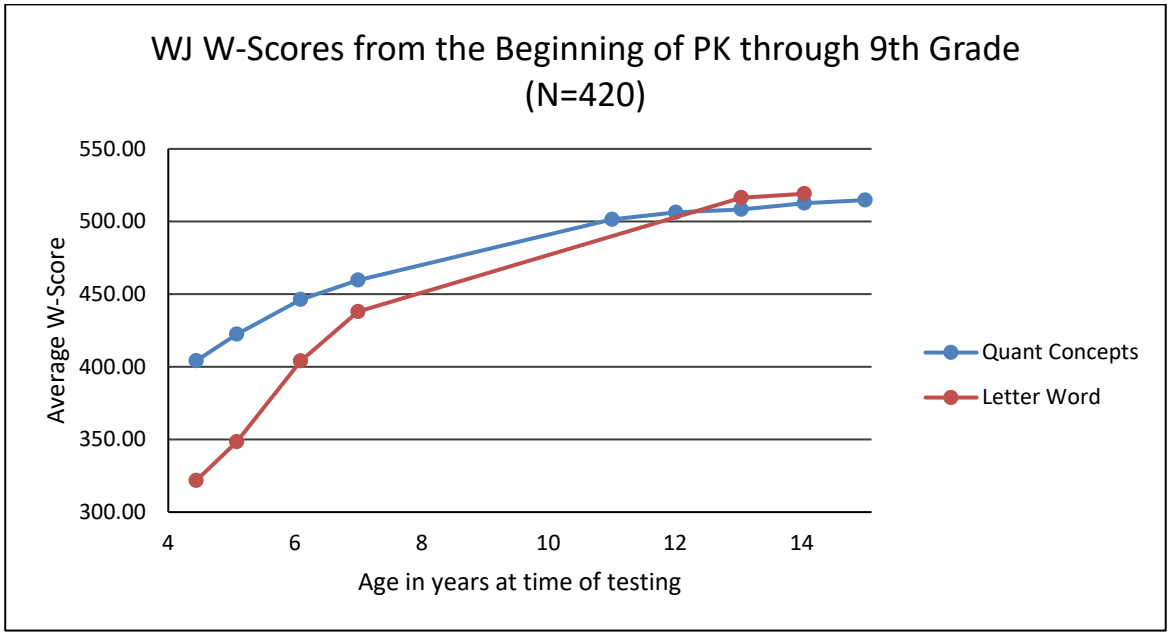
		N	Min	Max	Mean	SD
Quantitative Concepts	W-Score	484	458	557	514.40	14.46
	Standard Score	484	34	121	84.87	12.94



Woodcock-Johnson Scores across Years

- From the original Building Blocks study through this year, there were 9 testing time points. They were: fall of PK, spring of PK, spring of K, spring of 1st grade, and spring of 5th, 6th, 7th, 8th, and 9th grades.
- Letter-Word Identification was only given in fall of PK, spring of PK, spring of K, spring of 1st grade, and spring of 7th and 8th grades.
- The graphs below show the scores over time for those 420 students who were tested at all possible time points.





Student Outcomes on Woodcock-Johnson Subtests by Retention Status

	N	Min	Max	Mean	SD
Not Retained					
Average Age =15.02 years, Average Grade = 9.77					
Quantitative Concepts					
W-Score	398	461	557	516.61	13.97
Standard Score	398	36	121	86.78	12.55

	N	Min	Max	Mean	SD
Retained					
Average Age = 14.88 years, Average Grade = 8.77					
Quantitative Concepts					
W-Score	86	458	531	504.22	12.18
Standard Score	86	34	101	76.00	10.88

Correlations between Direct Assessments and TCAP/TNReady

Correlations Among KeyMath and Quantitative Concepts across Years

	KeyMath Raw Scores									WJ Quant Concepts W Scores		
	I. Num Y5	II. Num Y6	III. Num Y8	IV. Alg Y5	V. Alg Y6	VI. Alg Y8	VII. Geo Y5	VIII. Geo Y6	IX. Geo Y8	X. WJQC Y5	XI. WJQC Y6	XII. WJQC Y8
I. KeyMath Numeration Y5												
II. KeyMath Numeration Y6	.85**											
III. KeyMath Numeration Y8	.84**	.89**										
IV. KeyMath Algebra Y5	.83**	.79**	.78**									
V. KeyMath Algebra Y6	.80**	.85**	.84**	.81**								
VI. KeyMath Algebra Y8	.77**	.81**	.87**	.77**	.84**							
VII. KeyMath Geometry Y5	.69**	.61**	.62**	.66**	.60**	.62**						
VIII. KeyMath Geometry Y6	.68**	.74**	.71**	.65**	.72**	.69**	.65**					
IX. KeyMath Geometry Y8	.67**	.69**	.76**	.64**	.67**	.74**	.66**	.72**				
X. WJ Quant Concepts Y5	.67**	.69**	.70**	.69**	.73**	.70**	.54**	.59**	.60**			
XI. WJ Quant Concepts Y6	.70**	.73**	.74**	.72**	.76**	.73**	.53**	.62**	.61**	.73**		
XII. WJ Quant Concepts Y8	.73**	.77**	.80**	.73**	.80**	.81**	.55**	.68**	.66**	.76**	.80**	

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations Among Student Direct Assessment Scores & TCAP/TNReady Scores across Years

	Key Math Raw Scores									WJ Quant Concepts W Scores		
	Num Y5	Num Y6	Num Y8	Alg Y5	Alg Y6	Alg Y8	Geo Y5	Geo Y6	Geo Y8	WJQC Y5	WJQC Y6	WJQC Y8
TCAP Math Scale Score 2013-2014 (5th)	.63**	.69**	.69**	.62**	.66**	.69**	.45**	.56**	.56**	.57**	.60**	.64**
TCAP Math Scale Score 2014-2015 (6th)	.61**	.66**	.68**	.60**	.67**	.70**	.49**	.57**	.58**	.55**	.60**	.66**
TNReady Math Scale Score 2016-2017 (8th)	.60**	.65**	.69**	.60**	.63**	.70**	.50**	.58**	.60**	.51**	.56**	.66**

Student Direct Assessment Scores within TCAP/TNReady Levels

5th Grade (2013-2014) Direct Assessment Scores by TCAP Performance Level

		KeyMath: Numeration Grade Equivalence Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below Basic	98	0.20	6.30	2.88	1.12
Basic	162	1.40	8.70	3.81	1.46
Proficient	133	1.40	10.00	5.01	1.67
Advanced	63	2.20	10.00	6.63	2.01

		KeyMath: Algebra Grade Equivalence Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below Basic	98	0.40	6.50	3.12	1.15
Basic	162	0.80	7.50	4.00	1.32
Proficient	133	2.20	10.00	5.18	1.51
Advanced	63	3.30	10.00	6.44	1.82

		KeyMath: Geometry Grade Equivalence Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below Basic	98	0.00	6.00	2.94	1.49
Basic	162	0.20	10.00	3.76	1.82
Proficient	133	0.50	9.30	4.36	1.83
Advanced	63	1.50	10.00	5.86	1.98

		Woodcock-Johnson: Quantitative Concepts Standard Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below Basic	98	43.00	106.00	82.22	12.63
Basic	162	59.00	118.00	90.71	9.27
Proficient	133	53.00	121.00	96.88	8.92
Advanced	63	79.00	120.00	101.83	8.85

6th Grade (2014-2015) Direct Assessment Scores by TCAP Performance Level

		KeyMath: Numeration Grade Equivalence Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below Basic	158	0.80	6.80	3.44	1.33
Basic	179	1.40	10.00	4.94	1.79
Proficient	110	1.80	10.00	6.29	1.92
Advanced	33	4.80	10.00	8.04	1.70

		KeyMath: Algebra Grade Equivalence Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below Basic	158	0.00	8.70	3.70	1.45
Basic	179	1.80	10.00	4.97	1.72
Proficient	110	1.20	10.00	6.70	2.09
Advanced	33	4.20	10.00	8.42	2.01

		KeyMath: Geometry Grade Equivalence Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below Basic	158	0.20	8.00	3.64	1.63
Basic	179	0.50	10.00	4.61	1.78
Proficient	110	1.80	10.00	5.88	1.73
Advanced	33	4.00	10.00	7.52	1.88

		Woodcock-Johnson: Quantitative Concepts Standard Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below Basic	158	35.00	119.00	80.58	12.38
Basic	179	59.00	120.00	90.82	10.36
Proficient	110	58.00	115.00	95.15	10.44
Advanced	33	78.00	132.00	102.27	11.83

8th Grade (2016-2017) Direct Assessment Scores by TNReady Performance Level

		KeyMath: Numeration Grade Equivalence Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below	231	0.80	10.00	4.69	2.03
Approaching	125	2.50	10.00	6.98	2.16
On-Track	63	3.10	10.00	8.69	1.80
Mastered	5	10.00	10.00	10.00	0.00

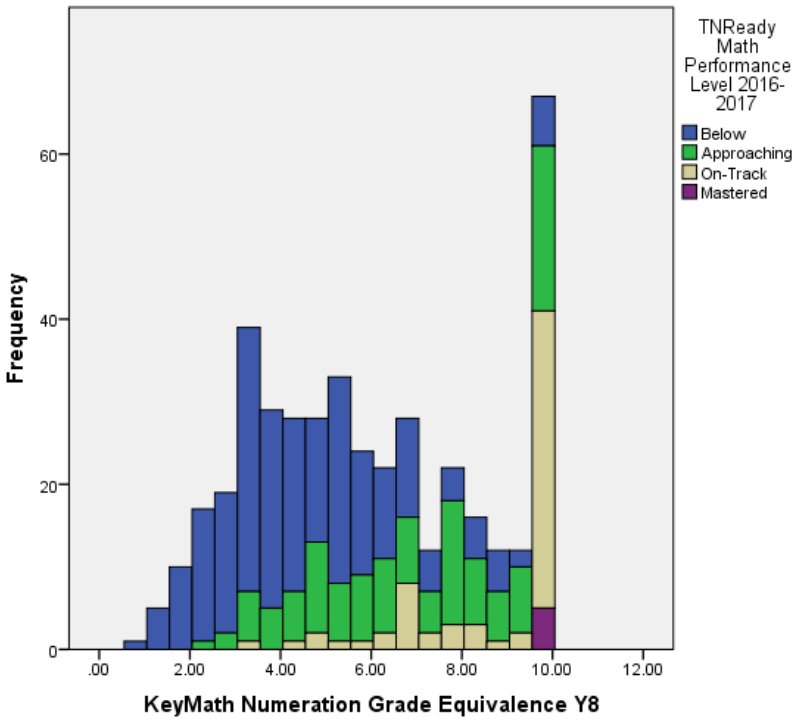
		KeyMath: Algebra Grade Equivalence Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below	231	0.40	10.00	4.90	2.14
Approaching	125	2.80	10.00	6.91	2.07
On-Track	63	4.20	10.00	9.42	1.26
Mastered	5	10.00	10.00	10.00	0.00

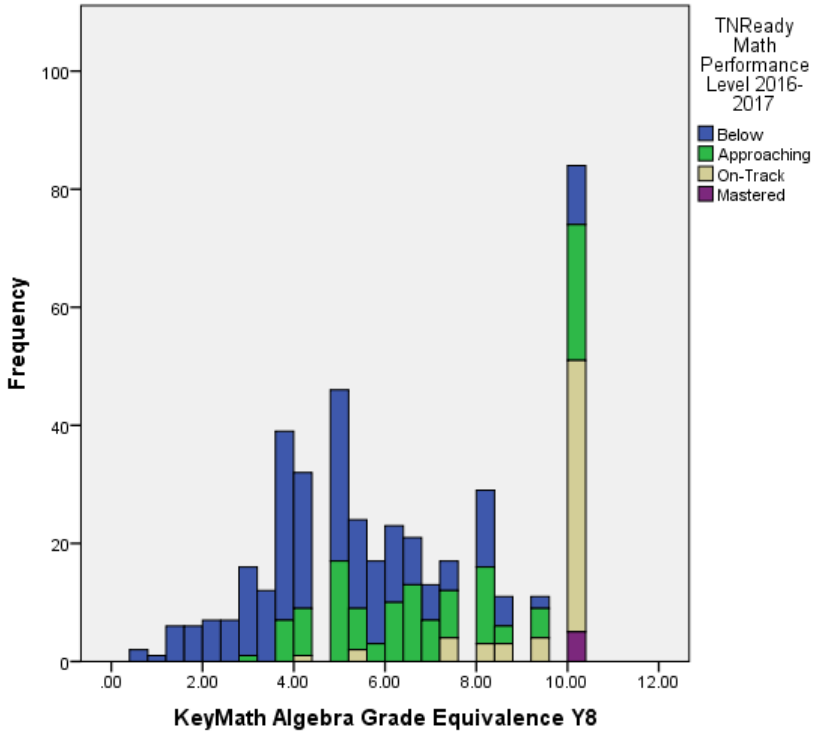
		KeyMath: Geometry Grade Equivalence Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below	231	0.00	10.00	4.86	2.10
Approaching	125	0.80	10.00	6.60	2.18
On-Track	63	3.20	10.00	8.36	1.85
Mastered	5	10.00	10.00	10.00	0.00

		Woodcock-Johnson: Quantitative Concepts Standard Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below	231	44.00	109.00	79.67	11.41
Approaching	125	69.00	118.00	90.43	8.35
On-Track	63	77.00	119.00	97.94	8.68
Mastered	5	103.00	117.00	108.80	5.40

		Woodcock-Johnson: Letter-Word ID Standard Score			
Perf. Level	**N**	**Min**	**Max**	**Mean**	**SD**
Below	231	37.00	112.00	87.52	13.14
Approaching	125	71.00	117.00	95.54	8.79
On-Track	63	74.00	125.00	100.51	9.97
Mastered	5	96.00	102.00	99.20	2.78

TNReady Levels within KeyMath Grade Levels





Correlations among 9th Grade Measures

	I. KM NUM (Age-Scaled)	II. KM ALG (Age-Scaled)	III. KM GEO (Age-Scaled)	IV. WJ QC (Std Score)
I. KeyMath Number (Age-Scaled)				
II. KeyMath Algebra (Age-Scaled)	0.86			
III. KeyMath Geometry (Age-Scaled)	0.76	0.72		
IV. Woodcock-Johnson Quantitative Concepts (Standard Score)	0.81	0.82	0.69	

Correlations among 8th Grade and 9th Grade Measures

		Year 4 (8th Grade) Outcomes														
Year 5 (9th Grade) Outcomes		KM NUM	KM ALG	KM GEO	QCS	LWS	NUM Acc	NUM RT	MAP Acc	MAP RT	HAF Acc (cong)	HAF RT (cong)	HAF Acc (incong)	HAF RT (incong)	HAF Acc (mix)	HAF RT (mix)
	KM NUM	0.91	0.83	0.71	0.78	0.55	0.29	-0.23	0.44	-0.06	0.13	-0.13	0.26	-0.30	0.39	-0.14
	KM ALG	0.85	0.87	0.68	0.81	0.57	0.31	-0.25	0.49	-0.07	0.17	-0.17	0.26	-0.29	0.41	-0.13
	KM GEO	0.75	0.73	0.79	0.67	0.53	0.28	-0.21	0.44	0.00	0.13	-0.12	0.25	-0.28	0.41	-0.08
	QCS	0.81	0.82	0.67	0.86	0.66	0.31	-0.26	0.48	-0.10	0.14	-0.18	0.23	-0.29	0.45	-0.12

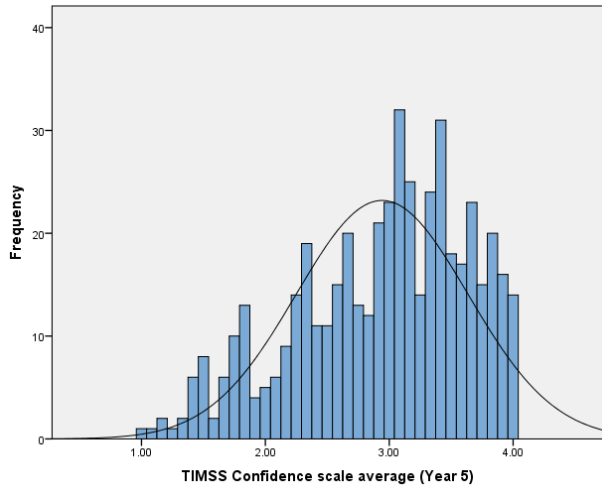
Note. Red cells indicate correlations greater than .20. Green cells indicate correlations less than -.20.

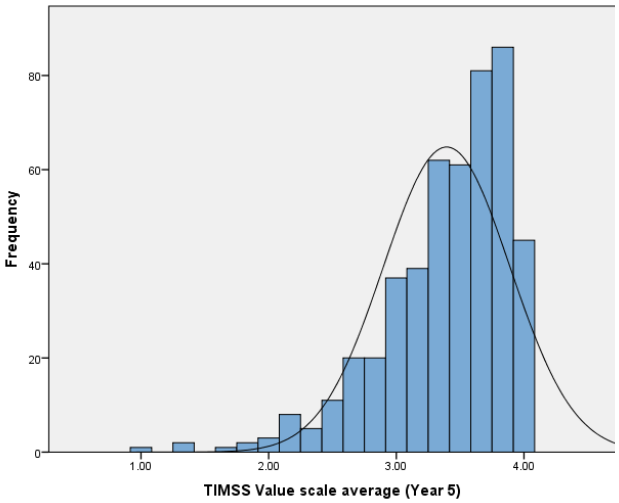
Student Survey Outcomes: TIMSS *(Trends in International Mathematics and Science Study)*

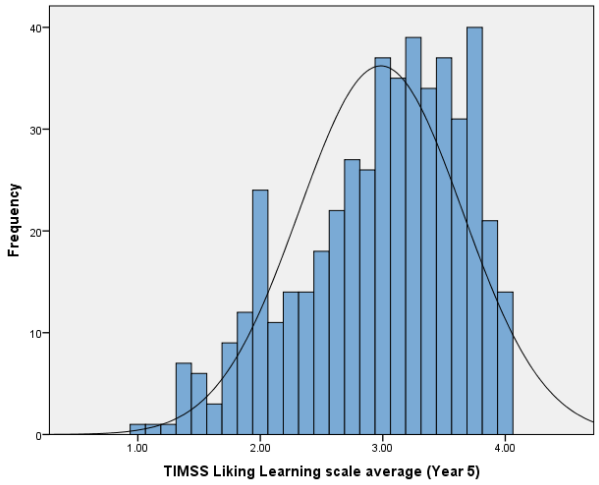
	N	Min	Max	Mean	SD
Confidence Scale Average	**484**	**1.00**	**4.00**	**2.94**	**0.69**
I know what my math teacher expects	484	1.00	4.00	3.62	0.62
My math teacher is easy to understand	484	1.00	4.00	2.88	0.94
I usually do well in math	484	1.00	4.00	3.14	0.88
Math is more difficult for me than my classmates (reverse coded)	484	1.00	4.00	2.74	1.06
Math is not one of my strengths (reverse coded)	484	1.00	4.00	2.64	1.18
I learn quickly in math	484	1.00	4.00	2.82	0.95
Math makes me confused and nervous (reverse coded)	484	1.00	4.00	2.67	1.01
I am good at working out hard math problems	484	1.00	4.00	2.67	0.94
My teacher thinks I am good at working out hard math problems	484	1.00	4.00	3.10	0.87
My teacher tells me I am good at math	484	1.00	4.00	3.09	0.95
Math is harder for me than other subjects (reverse coded)	484	1.00	4.00	2.66	1.18
My family thinks I am good at math	484	1.00	4.00	3.31	0.86
Value Scale Average	**484**	**1.00**	**4.00**	**3.39**	**0.50**
It is important to do well in math	484	1.00	4.00	3.90	0.34
Learning math will help me in daily life	484	1.00	4.00	3.60	0.68
I need math to learn other subjects	484	1.00	4.00	3.29	0.80
I need to do well in math to get into college	484	1.00	4.00	3.62	0.70
I need to do well in math to get the job I want	484	1.00	4.00	3.47	0.77
I would like a job that uses math	484	1.00	4.00	2.49	1.02
Like Learning Scale Average	**484**	**1.00**	**4.00**	**2.98**	**0.67**
I enjoy learning math	484	1.00	4.00	3.17	0.84
I wish I did not have to study math (reverse coded)	484	1.00	4.00	2.99	1.00
Math is boring (reverse coded)	484	1.00	4.00	2.82	0.96
I learn interesting things in math	484	1.00	4.00	3.41	0.80
I like math	484	1.00	4.00	3.02	1.02
I think of things not related to the lesson (reverse coded)	484	1.00	4.00	2.35	0.88
I am interested in what my math teacher says	484	1.00	4.00	3.09	0.86
My math teacher gives me interesting things to do	484	1.00	4.00	3.03	0.95

Note. All negative items above were reverse coded (e.g., Math is boring) so that on all items higher scores mean more positive student ratings.

Distributions of Student Survey Subscales in Year 5







Student Ratings for Subscales by Year

	Year 2		Year 3		Year 4		Year 5	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
Students' Confidence in Mathematics Avg	3.22	0.58	3.07	0.62	3.01	0.65	2.94	0.69
Students Value Mathematics Avg	3.55	0.40	3.52	0.42	3.47	0.43	3.39	0.50
Students Like Learning Mathematics Avg	3.37	0.53	3.21	0.60	3.06	0.62	2.98	0.67

Student Outcomes and TIMSS Ratings by School Type

Direct Assessment Outcomes by School Type												
	MIDDLE		*IZONE*		*HIGH*		*CHARTER*		*OTHER*		*PRIVATE*	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
KM Num (age-scaled)	53	5.64	12	4.83	317	7.66	72	8.28	27	8.96	4	9.75
KM Alg (age-scaled)	53	5.70	12	4.58	317	8.01	72	8.65	27	9.41	4	9.50
KM Geo (age-scaled)	53	5.94	12	5.58	317	7.78	72	8.24	27	8.70	4	8.75
WJ QC (standard score)	53	76.68	12	69.08	316	85.53	72	88.39	27	90.11	4	89.50

Student Ratings by School Type												
	MIDDLE		*IZONE*		*HIGH*		*CHARTER*		*OTHER*		*PRIVATE*	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
TIMSS: Confidence	53	2.88	12	2.98	316	2.93	72	3.00	27	3.09	4	2.92
TIMSS: Value	53	3.60	12	3.49	316	3.36	72	3.38	27	3.40	4	3.46
TIMSS: Liking	53	3.14	12	3.06	316	2.92	72	3.04	27	3.19	4	3.41
TIMSS: Total	53	81.28	12	81.17	316	78.59	72	80.67	27	83.00	4	83.00

Student Ratings if Attended an Alternative School						
	Attended Alternative School			*Didn't Attend Alternative School*		
	N	Mean	SD	N	Mean	SD
TIMSS: Confidence	15	2.87	0.70	469	2.94	0.69
TIMSS: Value	15	3.40	0.43	469	3.39	0.50
TIMSS: Liking	15	2.82	0.68	469	2.99	0.67
TIMSS: Total	15	77.40	14.19	469	79.61	14.38

Student Ratings by School Level										
	Attended Middle School					*Attended High School*				
	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD
TIMSS: Confidence	86	1.33	4.00	2.94	0.65	398	1.00	4.00	2.94	0.70
TIMSS: Value	86	2.17	4.00	3.57	0.38	398	1.00	4.00	3.36	0.51
TIMSS: Liking	86	1.63	4.00	3.13	0.60	398	1.00	4.00	2.95	0.68
TIMSS: Total	86	50.00	104.00	81.74	12.70	398	36.00	104.00	79.07	14.67

Teacher Survey and Ratings of Students (TSSR)

- The TSSR includes:
  - Section with teacher-specific questions (demographics, education, experience)
  - Section with student-specific questions (each consented student's math abilities, work habits, etc.) and classroom-specific questions (for math classes taught that include consented students, enrollment by ethnicity, etc.)
- We sent out 156 TSSRs to teachers with at least 1 consented student.
- **For Year 5, we have 137 <u>fully</u> completed and checked TSSRs. We also had 3 teachers who completed their teacher survey and part of 1 student survey.**
  - **In total, we have complete data on 455 students (87.7% of the consented student sample) and partial data on 3 students (0.6% of the consented student sample).**

Teacher Survey Information

Information from the 140 completed teacher surveys

- Gender
  - 94 females (67%), 46 males (33%)
- Ethnicity
  - Asian or Pacific Islander: 1 (1%)
  - Black: 32 (23%)
  - Hispanic: 2 (1%)
  - White: 99 (71%)
  - Other: 1 (1%)
  - Prefer not to answer: 5 (4%)
- Grades Taught
  - 1 teaches 7th grade (1%), 31 teach 8th grade (22%), 57 teach 9th grade (41%), 1 teaches 11th grade (1%), and 50 teach multiple grades (36%)
  - *Note that there were no 7th or 11th grade students in our sample, so those teachers did not report this accurately.*
- Math Taught
  - 118 teachers (84%) currently only teach math, while 22 teachers (16%) also teach other subjects
- Experience
  - Years as a teacher
    - This is 1st year: 12 (9%)
    - 2-4 years: 36 (26%)
    - 5-10 years: 46 (33%)
    - More than 10 years: 46 (33%)
  - Years at current school
    - This is 1st year: 36 (26%)
    - 2-4 years: 65 (46%)
    - 5-10 years: 29 (21%)
    - More than 10 years: 10 (7%)
- Ever Taught Middle School Math
  - Yes: 71 (51%)
  - No: 69 (49%)
- Years Teaching Middle School Math
  - 1 year: 8 (6%)
  - 2-4 years: 34 (24%)
  - 5-10 years: 20 (14%)
  - More than 10 years: 9 (6%)
  - Never taught middle school math: 69 (49%)
- Ever Taught High School Math
  - Yes: 118 (84%)
  - No: 22 (16%)

- Years Teaching High School Math
    - 1 year: 13 (9%)
    - 2-4 years: 39 (28%)
    - 5-10 years: 39 (28%)
    - More than 10 years: 27 (19%)
    - Never taught high school math: 22 (16%)
- Licensure (categories add up to more than 100%)
    - Elementary license (at least): 105 (76%)
    - Middle Grades license (at least): 15 (11%)
    - Mathematics (6-12) (at least): 48 (35%)
    - Special Education license (at least): 11 (8%)
- Education
    - Highest degree earned
        - Bachelor's degree: 57 (41%)
        - Master's degree: 58 (41%)
        - Master's degree + 30: 20 (14%)
        - Doctoral degree: 5 (4%)
    - Majored in math in undergraduate program
        - Yes: 64 (46%)
        - No: 76 (54%)
    - Minored in math in undergraduate program
        - Yes: 19 (14%)
        - No: 94 (67%)
        - No minor (NA): 27 (19%)
    - Majored in math in graduate school
        - Yes: 26 (19%)
        - No: 73 (52%)
        - No grad school (N/A): 41 (29%)
- Integrated Math
    - Teaches Integrated Math
        - Yes: 94 (67%)
        - No: 46 (33%)
    - Years teaching Integrated Math
        - 1 year: 27 (19%)
        - 2 years: 27 (19%)
        - 3 years: 31 (22%)
        - 4 years: 4 (3%)
        - 5 or more years: 5 (4%)
        - N/A (doesn't teach Integrated Math): 46 (33%)
    - Uses Integrated Math textbook
        - Yes: 60 (43%)
        - No: 34 (24%)
        - N/A (doesn't teach Integrated Math): 46 (33%)

- Supplements the Integrated Math textbook with other materials
  - Yes: 59 (42%)
  - No: 1 (1%)
  - N/A (doesn't teach Integrated Math and/or use the Integrated Math textbook): 80 (57%)
- Amount Integrated Math textbook is supplemented with other materials
  - Almost never: 2 (1%)
  - A little: 5 (4%)
  - Somewhat: 22 (16%)
  - A lot: 30 (21%)
  - N/A (doesn't teach Integrated Math, use the Integrated Math textbook, and/or supplement the textbook with other materials): 81 (58%)

Teacher Ratings of Students

Information from the 455 completed and 3 partially completed teacher-rated students

- Does student receive individual tutoring in math?
  - Receives Tier 2 Instruction: 54 (11.8%)
  - Receives Tier 3 Instruction: 37 (8.1%)
  - Does Not Receive Tier 2 or Tier 3 Instruction: 367 (80.1%)
- Does student receive pullout small group instruction in math?
  - Receives Tier 2 Instruction: 48 (10.5%)
  - Receives Tier 3 Instruction: 42 (9.2%)
  - Does Not Receive Tier 2 or Tier 3 Instruction: 368 (80.3%)
- Is ability grouping used within this student's grade?
  - Yes: 254 (55.5%)
  - No: 204 (44.5%)
- If there is ability grouping, how do the students in this student's class compare to typical students in this grade at this school?
  - Less skilled: 65 (14.2%)
  - About the same: 126 (27.5%)
  - More advanced: 63 (13.8%)
  - Not applicable (no ability grouping): 204 (44.5%)
- Does the teacher use ability grouping in this student's class?
  - Yes: 201 (43.9%)
  - No: 257 (56.1%)
- If there is ability grouping, how does this student compare to others in the class?
  - Less skilled: 71 (15.5%)
  - About the same: 86 (18.8%)
  - More advanced: 44 (9.6%)
  - Not applicable (no ability grouping): 257 (56.1%)
- How often does this student work to the best of his/her ability in math?
  - Always: 59 (12.9%)
  - Usually: 156 (34.1%)
  - Erratic: 140 (30.6%)
  - Seldom: 69 (15.1%)
  - Never: 34 (7.4%)
- How does this student's math skills compare to others in his/her grade?
  - Far above average: 31 (6.8%)
  - Above average: 116 (25.3%)
  - Average: 152 (33.2%)
  - Below average: 96 (21.0%)
  - Far below average: 62 (13.5%)

- How does this student's interest in math compare to others in his/her grade?
    - Far above average: 17 (3.7%)
    - Above average: 78 (17.0%)
    - Average: 207 (45.2%)
    - Below average: 95 (20.7%)
    - Far below average: 60 (13.1%)
- How prepared is this student for the next level in math?
    - Highly prepared: 51 (11.1%)
    - Mostly prepared: 105 (22.9%)
    - May struggle but is prepared: 123 (26.9%)
    - Somewhat unlikely to be prepared: 102 (22.3%)
    - Very unlikely to be prepared: 76 (16.6%)
- How long has the teacher taught this student math this year?
    - More than 6 months: 332 (72.5%)
    - 4-6 months: 94 (20.5%)
    - 1-3 months: 27 (5.9%)
    - Less than 1 month: 4 (0.9%)
- This student concentrates well and is not easily distracted when doing a task.
    - Strongly agree: 70 (15.3%)
    - Agree: 138 (30.1%)
    - Disagree: 160 (34.9%)
    - Strongly disagree: 89 (19.4%)
- This student easily plans and carries out activities that have several steps.
    - Strongly agree: 67 (14.6%)
    - Agree: 173 (37.8%)
    - Disagree: 145 (31.7%)
    - Strongly disagree: 72 (15.7%)
- This student finishes tasks and activities.
    - Strongly agree: 73 (15.9%)
    - Agree: 201 (43.9%)
    - Disagree: 104 (22.7%)
    - Strongly disagree: 79 (17.2%)
- This student actively uses resources for help and information.
    - Strongly agree: 59 (12.9%)
    - Agree: 169 (36.9%)
    - Disagree: 152 (33.2%)
    - Strongly disagree: 77 (16.8%)

Teacher Ratings of Students by Year

	Year 1 (N=463)		Year 2 (N=503)		Year 3 (N=481)		Year 4 (N=471)		Year 5 (N=457)	
	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
Works to best of ability in math	3.68	0.97	3.46	0.99	3.46	1.00	3.43	1.02	3.30	1.10
Math skills compared to others	2.93	1.05	2.74	1.02	2.83	1.03	2.85	1.06	2.91	1.13
Interest in math compared to others	2.97	0.87	2.92	0.89	2.90	0.92	2.83	0.94	2.77	1.00
Prepared for next level in math	3.26	1.18	2.94	1.21	2.89	1.20	2.97	1.24	2.90	1.25

Note. These ratings were on a scale from 1 to 5, so 3 would be an average rating.

Teacher Ratings of Students by School Type

Ratings of Student Skills

	Range	CHARTER (N=70)	IZONE (N=12)	MIDDLE (N=48)	HIGH (N=302)	OTHER (N=21)	PRIVATE (N=4)
Works to best of ability in math	1 to 5	3.63 (0.98)	2.83 (1.11)	3.35 (1.06)	3.22 (1.13)	3.38 (1.02)	4.00 (0.82)
Math skills compared to others	1 to 5	3.16 (1.10)	2.42 (0.79)	2.44 (1.03)	2.93 (1.16)	3.05 (0.80)	3.50 (0.58)
Interest in math compared to others	1 to 5	2.87 (0.93)	2.58 (0.79)	2.67 (0.95)	2.76 (1.04)	2.95 (0.92)	3.25 (0.50)
Prepared for next level in math	1 to 5	3.20 (1.29)	2.92 (1.16)	2.44 (1.17)	2.86 (1.24)	3.29 (1.10)	4.00 (0.82)
Concentrates well/not easily distracted	1 to 4	2.57 (0.89)	2.08 (0.90)	2.42 (0.94)	2.36 (1.00)	2.81 (0.81)	2.50 (0.58)
Easily plans and carries out activities that have several steps	1 to 4	2.76 (0.88)	2.25 (0.75)	2.33 (0.86)	2.48 (0.96)	2.71 (0.78)	3.00 (0.82)
Finishes tasks and activities	1 to 4	2.87 (0.90)	2.33 (0.78)	2.50 (0.85)	2.51 (0.99)	3.05 (0.59)	3.00 (0.82)
Actively uses resource for help and information	1 to 4	2.66 (0.85)	2.17 (0.84)	2.48 (0.92)	2.39 (0.93)	2.81 (0.87)	3.00 (0.82)

Note. 3 students moved out-of-region during the school year and could not be assessed, but their former teacher completed a student survey. In addition, we have student survey data for 2 students who attended an in-county school but could not be assessed due to repeated absences. Green cells indicate the highest overall rating for that item.

Correlations among 9th Grade Student Outcomes and Teacher Ratings

Direct Assessment	TSSR: Math skills compared to others	TSSR: Interest in math compared to others	TSSR: Prepared for next level in math	TSSR: Self-Reg Items (Mean)
KM Number (Age-Scaled)	0.49	0.37	0.45	0.33
KM Algebra (Age-Scaled)	0.50	0.37	0.46	0.37
KM Geometry (Age-Scaled)	0.48	0.33	0.43	0.34
WJ Quant Cpts. (Std Score)	0.48	0.35	0.46	0.37
TIMSS Confidence Subscale	0.45	0.38	0.43	0.37
TIMSS Value of Math Subscale	0.04	0.07	0.06	0.05
TIMSS Like Math Subscale	0.32	0.30	0.33	0.32
TIMSS Total Score	0.39	0.35	0.39	0.34

Note. Red cells indicate correlations greater than .20.

Low-Scoring Students

- Students were selected who were below a seventh-grade level this past year on all 3 KeyMath subscales. This group ended up including 211 students, which is about 41% of the current sample.

Descriptive Statistics										
	Low-Scoring					Not Low-Scoring				
	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD
WJ Quant. Cpts. (Std Score)	211	34.00	92.00	75.07	9.89	273	72.00	121.00	92.44	9.46
TIMSS (Total)	211	40.00	104.00	75.75	14.78	273	36.00	104.00	82.48	13.34

Note. We dropped the Woodcock-Johnson and TIMSS data for one student who completed KeyMath. This student was ill during the Woodcock-Johnson and TIMSS assessments, but completed KeyMath on another day.

Characteristics of Low-Scoring Students

	Low-Scoring		Not Low-Scoring	
	Freq	Pct	Freq	Pct
Ethnicity				
Black	176	45.8	208	54.2
White	16	41.0	23	59.0
Hispanic	16	39.0	25	61.0
Other	3	14.3	18	85.7
Gender				
Male	95	44.8	117	55.2
Female	116	42.5	157	57.5
ELL in Pre-K Year				
ELL	15	33.3	30	66.7
Not ELL	196	44.6	243	55.4
Pre-K Curriculum Condition				
Building Blocks	127	42.6	171	57.4
Control	84	44.9	103	55.1
Pre-K School System				
Head Start	91	46.7	104	53.3
MNPS Pre-K	120	41.4	170	58.6
Year 1 School Type				
Charter	29	29.0	71	71.0
Izone	28	38.9	44	61.1
Middle	101	41.1	145	58.9
Other	1	100.0	0	0.0
Elementary	52	78.8	14	21.2

	Low-Scoring		Not Low-Scoring	
	Freq	Pct	Freq	Pct
Year 2 School Type				
Charter	42	35.9	75	64.1
Izone	29	43.9	37	56.1
Middle	137	46.1	160	53.9
Other	2	66.7	1	33.3
Year 3 School Type				
Charter	40	37.4	67	62.6
Izone	26	44.1	33	55.9
Middle	140	45.2	170	54.8
Other	1	50.0	1	50.0
Private	0	0.0	1	100.0
Year 4 School Type				
Charter	31	32.6	64	67.4
Izone	22	53.7	19	46.3
Middle	146	45.1	178	54.9
Other	8	44.4	10	55.6
Private	1	50.0	1	50.0
Year 5 School Type				
Charter	24	33.3	48	66.7
Izone	11	91.7	1	8.3
Middle	42	79.2	11	20.8
High	126	39.7	191	60.3
Other	7	25.9	20	74.1
Private	1	25.0	3	75.0

Note. 6 students were out-of-region in Year 2, Year 3, and/or Year 4 but returned in Year 5. 1 student is missing a pre-k year ELL designation.

High-Scoring Students

- Students were selected who were above a ninth-grade level this past year on all 3 KeyMath subscales. This ended up including 46 students, which is about 9% of the current sample.

Descriptive Statistics										
	High-Scoring					Not High-Scoring				
	N	Min	Max	Mean	SD	N	Min	Max	Mean	SD
WJ Quant. Cpts. (Std Score)	46	88.00	121.00	103.46	7.13	438	34.00	112.00	82.92	11.81
TIMSS (Total)	46	56.00	104.00	88.00	11.16	438	36.00	104.00	78.66	14.38

Note. We dropped the Woodcock-Johnson and TIMSS data for one student who completed KeyMath. This student was ill during the Woodcock-Johnson and TIMSS assessments, but completed KeyMath on another day.

Characteristics of High-Scoring Students

	High-Scoring		Not High-Scoring	
	Freq	Pct	Freq	Pct
Ethnicity				
Black	28	7.3	356	92.7
White	7	17.9	32	82.1
Hispanic	4	9.8	37	90.2
Other	7	33.3	14	66.7
Gender				
Male	24	11.3	188	88.7
Female	22	8.1	251	91.9
ELL in Pre-K Year				
ELL	6	13.3	39	86.7
Not ELL	40	9.1	399	90.9
Pre-K Curriculum Condition				
Building Blocks	23	7.7	275	92.3
Control	23	12.3	164	87.7
Pre-K School System				
Head Start	12	6.2	183	93.8
MNPS Pre-K	34	11.7	256	88.3
Year 1 School Type				
Charter	13	13.0	87	87.0
Izone	6	8.3	66	91.7
Middle	26	10.6	220	89.4
Other	0	0.0	1	100.0
Elementary	1	1.5	65	98.5

	High-Scoring		Not High-Scoring	
	Freq	Pct	Freq	Pct
Year 2 School Type				
Charter	15	12.8	102	87.2
Izone	5	7.6	61	92.4
Middle	26	8.8	271	91.2
Other	0	0.0	3	100.0
Year 3 School Type				
Charter	14	13.1	93	86.9
Izone	4	6.8	55	93.2
Middle	26	8.4	284	91.6
Other	1	50.0	1	50.0
Private	1	100.0	0	0.0
Year 4 School Type				
Charter	12	12.6	83	87.4
Izone	5	12.2	36	87.8
Middle	24	7.4	300	92.6
Other	4	22.2	14	77.8
Private	1	50.0	1	50.0
Year 5 School Type				
Charter	8	11.1	64	88.9
Izone	0	0.0	12	100.0
Middle	0	0.0	53	100.0
High	31	9.8	286	90.2
Other	6	22.2	21	77.8
Private	1	25.0	3	75.0

Note. 6 students were out-of-region in Year 2, Year 3, and/or Year 4 but returned in Year 5. 1 student is missing a pre-k year ELL designation.

Early Correlates of Later Skills

Zero-Order Correlations: All Students																
	Fall PK QC	Spring PK QC	Spring K QC	Spring G1 QC	Fall PK AP	Spring PK AP	Spring K AP	Spring G1 AP	Fall PK REMA NUM	Spring PK REMA NUM	Spring K REMA NUM	Spring G1 REMA NUM	Fall PK REMA GEO	Spring PK REMA GEO	Sprin g K REMA GEO	Spring G1 REMA GEO
KM Number (Age-Scaled)	0.44	0.53	0.51	0.52	0.34	0.47	0.52	0.57	0.38	0.50	0.59	0.60	0.30	0.47	0.42	0.45
KM Algebra (Age-Scaled)	0.43	0.52	0.52	0.55	0.35	0.47	0.54	0.58	0.38	0.50	0.59	0.62	0.32	0.43	0.43	0.40
KM Geometry (Age-Scaled)	0.44	0.49	0.48	0.49	0.35	0.48	0.51	0.55	0.41	0.49	0.58	0.56	0.36	0.49	0.48	0.47
WJ Quant. Cpts. (Std Score)	0.41	0.50	0.53	0.55	0.35	0.45	0.51	0.55	0.37	0.48	0.59	0.63	0.31	0.44	0.40	0.41
TIMSS (Total)	0.05	0.04	0.07	0.13	-0.02	0.05	0.16	0.15	0.04	0.11	0.15	0.11	0.02	0.09	0.12	0.05

Note. Red cells indicate correlations > .20.

Student Interview Coding

Information from the 485 completed student interviews

- If you or other students do not understand some things in your math class, what do you think are the reasons?

Code	Freq	Pct
Student blames students (only)	128	26.4
Student blames teacher (only)	97	20.0
Student blames hard content (only)	48	9.9
Student blames both students and teacher	75	15.5
Student blames students and hard content	77	15.9
Student blames teacher and hard content	42	8.7
Student blames students, teacher, and hard content	17	3.5
Student blames none of the above	1	0.2

- What does your teacher do if you don't understand?

Code	Freq	Pct
Prognosis for Student Difficulties		
Productive (maintains high cognitive demand)	20	4.1
Unproductive (lowers the cognitive demand)	431	88.9
Mixed (productive and unproductive)	33	6.8
Subcodes of Productive Categories		
Launch (focus on how the task is introduced or setup)	4	0.8
Multiple (use tasks with multiple entry points, differentiated instruction)	26	5.4
Norms (focus on norms of participation)	3	0.6
Contrib (assign competence to students, celebrate mathematical accomplishments)	0	0.0
Group (group students in ways that aim to maximize participation)	23	4.7
Subcodes of Unproductive Categories		
Shorten (remove prompts that ask students to explain thinking, shorten problems, assign fewer problems, slow down the pace)	37	7.6
Walkthru (show student how to complete similar problems, provide examples, teacher walks through the steps of solving problems, direct instruction)	357	73.6
Practice (drill, study hall, tutoring, RTI, etc.)	60	12.4
Nonmath (teacher prescribes non-math-specific strategy)	3	0.6
Other (teacher does something that does not fit into categories)	114	23.5

Note. The prognosis codes are mutually exclusive, but the subcodes are not. 1 student's response did not fit the coding scheme, so we did not assign a prognosis code.

- Which do you like better, middle school or high school math? Why?

Code	Freq	Pct
Preferred Middle School	**197**	**40.6**
Middle school was easier	165	34.0
Middle school was more fun and had more activities	13	2.7
Middle school was better for some other reason	33	6.8
Preferred High School	**179**	**36.9**
High school is more challenging and/or prepares you more for the future	132	27.2
High school is easy	30	6.2
High school is better for some other reason	33	6.8
Liked Middle and High School Math the Same	**24**	**4.9**
Question not asked (8th grade student)	**85**	**17.5**

Note. Students had to state a preference for middle school, high school, or both. The subcodes for middle and high school are not mutually exclusive.

Teacher Interview Coding

Information from the 114 interviews completed this year with high school math teachers

- Teachers were asked which math course(s) they teach.

Code	Freq	Pct
General Math	10	8.8
Integrated Math I	71	62.3
Integrated Math II	23	20.2
Integrated Math III	5	4.4
Algebra I or II	30	26.3
Geometry	2	1.8
Advanced Math	14	12.3

Note. Codes are not mutually exclusive.

Prompted Codes about High Quality Math Classrooms

- Teachers were asked questions about the role of a high quality math teacher and what class discussion would look like in a high quality math class.

Code	Freq	Pct
Role of Teacher		
4 More Knowledgeable Other	13	11.4
3 Facilitator	25	21.9
2 Monitor	27	23.7
1 Deliverer of Knowledge	45	39.5
0 Motivator	4	3.5
Patterns/Structure of Classroom Talk		
4 Whole Class Conversation Not Dependent on Teacher	7	6.1
3 Whole Class Conversation Dependent on Teacher	52	45.6
2 Student-Student Discourse Only in Small Groups	35	30.7
1 Traditional Lecturing	15	13.2
Did not discuss	5	4.4
Nature of Classroom Talk		
4 Talk Should Be Conceptually Oriented	24	21.1
3 Talk Is Calculation Oriented or Generally Involves Questions/Explanations	50	43.9
2 Talk is about Math but no Content Specifics	23	20.2
Did not discuss	17	14.9

- Teachers were asked what they find are the typical reasons students sometimes don't learn math as expected.

Code	Freq	Pct
General Productivity of Response		
Productive (within teacher's control)	4	3.5
Unproductive (outside of teacher's control)	69	60.5
Mixed (productive and unproductive)	41	36.0
Reasons for Student Difficulties		
Gaps in Student Knowledge	55	48.2
Teachers Need to Use Different Strategies	45	39.5
Student Laziness or Lack of Motivation	65	57.0
Home Life Issues	21	18.4
School System Issues	8	7.0
Students Lack Confidence	31	27.2
Bad Behavior	7	6.1
Poor Curriculum	1	0.9
Students Move Frequently	1	0.9
Class Sizes Too Large	2	1.8

Note. The specific reasons for student difficulties are not mutually exclusive codes.

- Teachers were asked how they address the reasons their students don't learn math as expected.

Code	Freq	Pct
General Productivity of Response		
Productive (maintains high cognitive demand)	15	13.2
Unproductive (lowers the cognitive demand)	78	68.4
Mixed (productive and unproductive)	21	18.4
Productive Teacher Strategies to Support Struggling Students		
Focus on how task was launched	12	10.5
Use differentiated instruction or tasks with multiple entry points	9	7.9
Focus on "mastery" norms of participation	10	8.8
Assign competence to students' mathematical contributions	6	5.3
Group students in ways to maximize participation	13	11.4
Unproductive Teacher Strategies to Support Struggling Students		
Shorten problems/remove prompts to explain thinking	6	5.3
Walk students through the steps of solving a problem	37	32.5
Study hall, tutoring, etc. as extra practice opportunities for struggling students	56	49.1
Teacher does not assign a math-specific strategy	50	43.9

Note. The specific strategy codes for productive/unproductive are not mutually exclusive.

- Teachers were asked what support they think students need to transition from middle school math to high school math.

Code	Freq	Pct
Whose Responsibility to Support Student Transition to High School Math[1]		
High school teachers only	6	5.3
High school teacher and someone else	42	37.2
School system only	29	25.7
Students and their families only	9	8.0
Mix of factors outside teacher's direct control	27	23.9
Strategies to Support Transition[2]		
High school teachers should **check** into the background of their incoming students	19	16.7
There should be a **coach** or other counselor at the high school level	16	14.0
Teachers should connect high school math to their students' **interests**	0	0.0
There should be a built in tutoring or **RTI** math period	40	35.1
The **students** and their families have to make the effort	47	41.2
The **middle schools** should better prepare students before they get to high school	49	43.0
Students should know particular math **concepts** before entering high school	27	23.7
No strategies offered	6	5.3

Note[1]. 1 teacher's response did not fit the coding scheme, so we did not assign a code for whose responsibility it is to support student transition to high school math.
Note[2]. The specific strategies to support transition are not mutually exclusive codes.

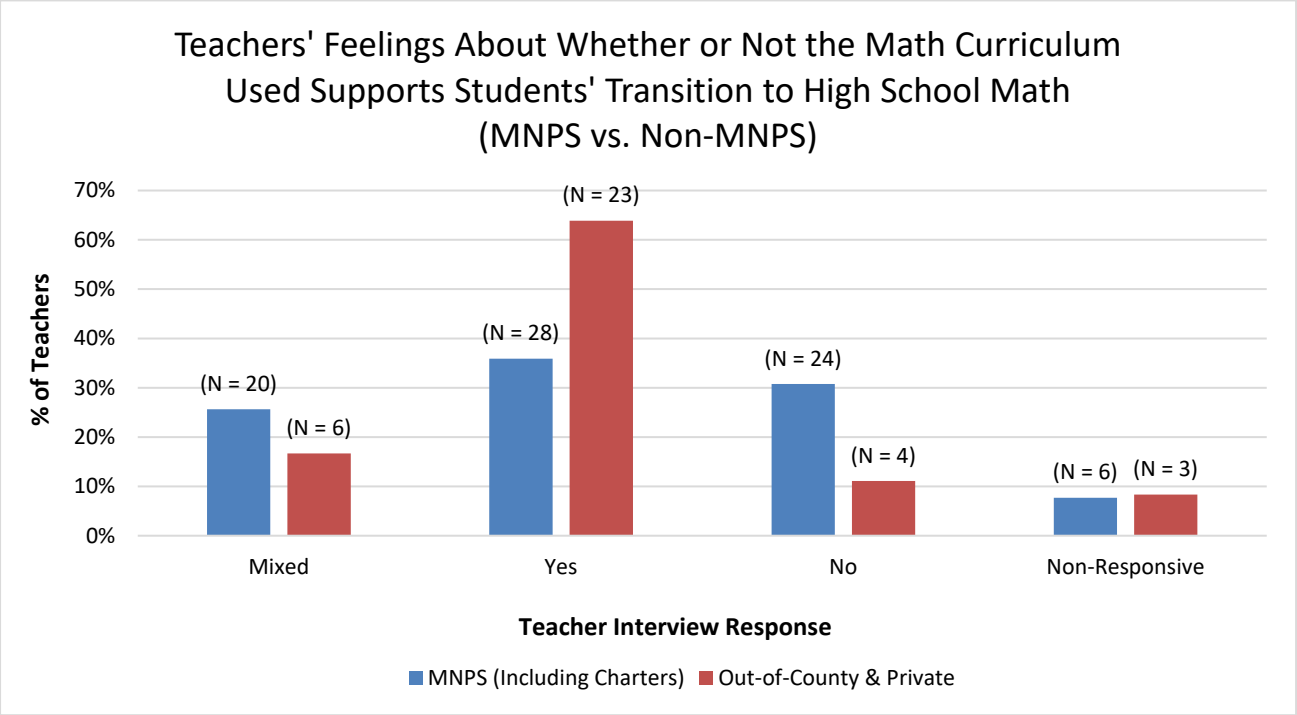
- Teachers were asked if the curriculum they use does a good job of supporting the transition from middle to high school math.

Overall Teacher Responses about Math Curriculum Supporting Student Transition

Code	Freq	Pct
Yes	51	44.7
No	28	24.6
Mixed	26	22.8

Note. 9 teachers did not answer this question in a way that fit the coding scheme, so their responses were not coded.

- Teachers were asked if the curriculum they use does a good job of supporting the transition from middle to high school math.



Year 5 Teacher Ratings by Race/Ethnicity of Teacher

	White		Black		Hispanic		Asian		Other		Prefer Not to Answer		Missing	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
Role of Teacher	74	1.95	21	2.14	1	2.00	1	4.00	1	4.00	3	2.00	13	1.62
Pattern and Structure of Talk	70	2.41	21	2.81	1	4.00	1	3.00	1	4.00	3	2.67	12	1.83
Nature of Talk	62	3.10	20	2.80	1	4.00	1	4.00	1	3.00	3	3.67	9	2.44
Diagnosis of Student Difficulties	74	1.64	21	2.05	1	5.00	1	3.00	1	3.00	3	2.00	13	1.46

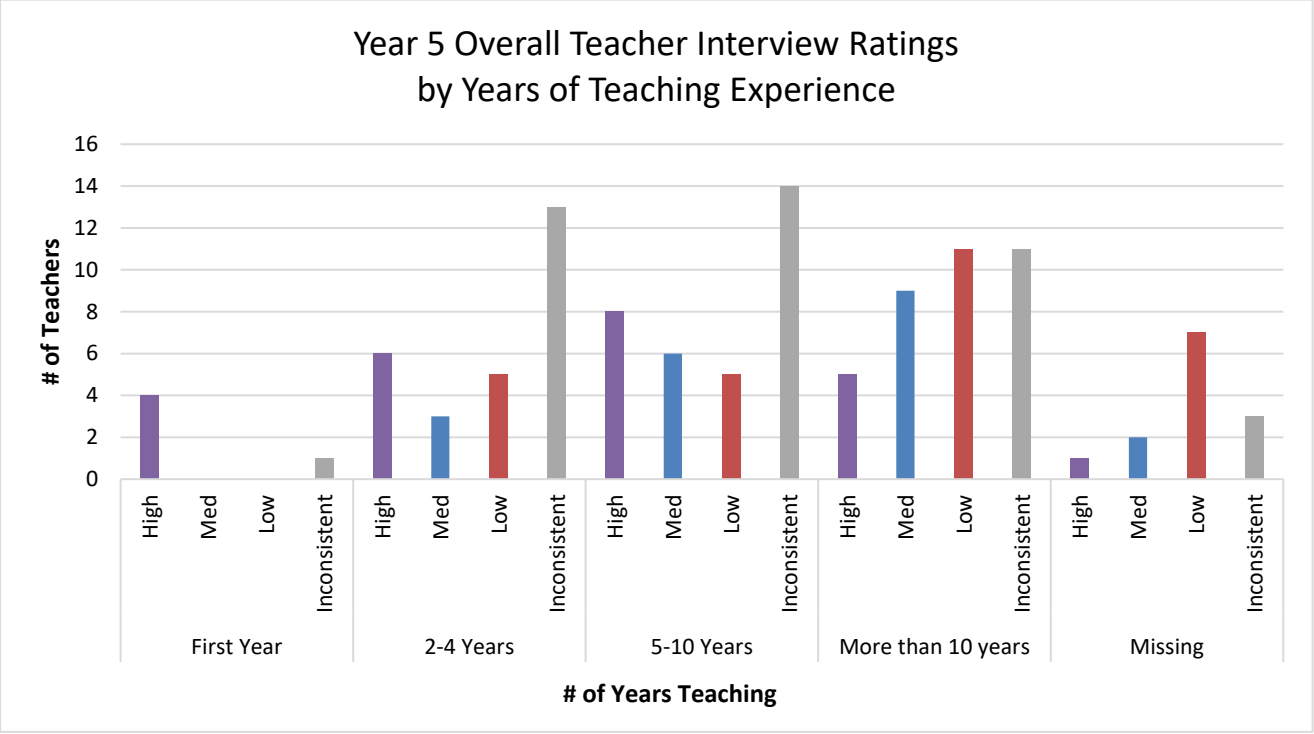
Note. Role of Teacher and Pattern/Structure of Talk codes are scaled from 1-4; Nature of Talk is scaled from 2-4; Diagnosis of Student Difficulties is scaled from 1-5.

Year 5 Reasons for Student Difficulties by Race/Ethnicity of Teacher

	White		Black		Hispanic		Asian		Other		Prefer Not to Answer		Missing	
	Freq	Pct	Freq	Pct	Freq	Pct	Freq	Pct	Freq	Pct	Freq	Pct	Freq	Pct
Gaps in Student Knowledge	38	51.3	11	52.4	0	0.0	1	100.0	0	0.0	2	66.7	3	21.4
Teachers Need to Use Different Strategies	26	35.2	10	47.6	1	100.0	1	100.0	1	100.0	1	33.3	5	35.7
Student Laziness or Lack of Motivation	41	55.4	13	61.9	0	0.0	1	100.0	1	100.0	1	33.3	8	61.5
Home Life Issues	15	20.3	2	9.5	0	0.0	0	0.0	0	0.0	0	0.0	4	28.6
School System Issues	4	5.4	2	9.5	0	0.0	0	0.0	0	0.0	1	33.3	1	7.7
Students Lack Confidence	16	21.6	11	52.4	0	0.0	0	0.0	0	0.0	0	0.0	4	28.6
Bad Behavior	5	6.8	1	4.8	0	0.0	0	0.0	0	0.0	0	0.0	1	7.1
Poor Curriculum	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
Students Move Frequently	1	1.4	0	0.0	0	0.0	0	0.0	0	0	0	0.0	0	0.0
Class Sizes Too Large	1	1.4	0	0.0	0	0.0	0	0.0	0	0	1	33.3	0	0.0

Year 5 Overall Teacher Interview Rating by Years of Teaching Experience

- Teachers were rated for their responses to our interview questions which asked about (1) the role of the teacher, (2) the pattern and structure of classroom talk, and (3) the nature of classroom talk.
- Based on teachers' responses to these questions, we categorized them as:
  - High: Teacher consistently rated 3 or 4
  - Med: Teacher consistently rated 2 or 3
  - Low: Teacher consistently rated 0, 1, or 2
  - Inconsistent: Teachers had wide range of different ratings across items
  - Missing: Teacher did not provide data on years teaching



Teacher Interview Coding across Years

- During the fall of 2016, we conducted 104 teacher interviews with in-county teachers.
- During the fall of 2017 (students' 9th grade year), 114 high school math teachers were interviewed. These interviews included both MNPS and out-of-county teachers.

Overall Teacher Interview Ratings across Years

School Year	Rating	N	Mean	SD
2016-2017	Role of Teacher	100	2.27	1.15
	Patterns/Structure of Classroom Talk	94	2.61	0.90
	Nature of Classroom Talk	83	3.04	0.69
	Average Teacher Rating	**104**	**2.57**	**0.75**
2017-2018	Role of Teacher	114	1.98	1.11
	Patterns/Structure of Classroom Talk	109	2.47	0.81
	Nature of Classroom Talk	97	3.01	0.70
	Average Teacher Rating	**114**	**2.41**	**0.75**

Teachers' Diagnosis of Student Learning Difficulties across Years

	2016-2017		2017-2018	
Code	Freq	Pct	Freq	Pct
General Productivity of Response				
Productive	6	5.8	4	3.5
Unproductive	38	36.5	69	60.5
Mixed	59	56.7	41	36.0
Reasons for Student Difficulties				
Gaps in Student Knowledge	70	67.3	55	48.2
Teachers Need to Use Different Strategies	65	62.5	45	39.5
Student Laziness or Lack of Motivation	49	47.1	65	57.0
Home Life Issues	39	37.5	21	18.4
School System Issues	16	15.4	8	7.0
Students Lack Confidence	32	30.8	31	27.2
Bad Behavior	8	7.7	7	6.1
Poor Curriculum	9	8.7	1	0.9
Students Move Frequently	3	2.9	1	0.9
Class Sizes Too Large	5	4.8	2	1.8

Cognitive Dissonance Coding across Years

- The cognitive dissonance code indicates that a teacher acknowledged a difference during the teacher interview between what the research says is best practice or what an "ideal" classroom would like, versus what they can actually do in their classroom.
    - For example, "*I know the research says you should be doing a whole lot of discussion and students should explore problems, but my students just don't have the skills to do that.*"
- A teacher received a cognitive dissonance code if they expressed this opinion at any point during the interview.

	2016-2017		2017-2018	
	Freq	**Pct**	**Freq**	**Pct**
Cognitive Dissonance	38	36.5	46	40.4
No Cognitive Dissonance	66	63.5	68	59.6

Student & Teacher Interview Coding in Relation to Student Outcomes

- We calculated students' mean scores based on their student and teacher interview diagnosis codes (e.g., students who blamed students and whose teacher gave an unproductive response had a mean Numeration score of 6.24).

Year 5 Mean KeyMath Scores (Grade Equiv.) by Year 5 Interview Diagnosis Codes

		Student Interview Code		
		Student Blames Students	Student Blames Teacher	Student Mentions Hard Content
Teacher Interview Diagnosis Code	Productive	NUM: 7.11 (2.19) ALG: 6.94 (2.24) GEO: 6.16 (1.76) (N = 7)	NUM: 8.14 (1.54) ALG: 7.29 (2.57) GEO: 8.30 (2.10) (N = 7)	NUM: 7.92 (1.85) ALG: 7.45 (2.58) GEO: 8.33 (1.90) (N = 6)
	Unproductive	NUM: 6.24 (2.43) ALG: 6.67 (2.53) GEO: 6.17 (2.34) (N = 124)	NUM: 6.91 (2.23) ALG: 7.11 (2.33) GEO: 6.88 (2.18) (N = 89)	NUM: 5.96 (2.42) ALG: 6.40 (2.37) GEO: 6.10 (2.26) (N = 76)
	Mixed	NUM: 6.99 (2.38) ALG: 7.04 (2.66) GEO: 6.67 (2.45) (N = 99)	NUM: 6.89 (2.33) ALG: 7.06 (2.55) GEO: 6.84 (2.27) (N = 87)	NUM: 7.34 (2.10) ALG: 7.60 (2.41) GEO: 7.28 (2.16) (N = 65)

Note. Only high school teachers were interviewed. Student codes are not mutually exclusive.

Year 5 Mean Quant Concepts Standard Scores by Year 5 Interview Diagnosis Codes

		Student Interview Code		
		Student Blames Student	Student Blames Teacher	Student Mentions Hard Content
Teacher Interview Diagnosis Code	Productive	88.29 (10.97) (N = 7)	95.43 (13.71) (N = 7)	98.83 (10.93) (N = 6)
	Unproductive	85.60 (12.46) (N = 124)	88.43 (9.94) (N = 89)	82.91 (9.70) (N = 76)
	Mixed	87.05 (13.70) (N = 99)	88.07 (10.94) (N = 86)	89.03 (13.45) (N = 64)

Note. Only high school teachers were interviewed. Student codes are not mutually exclusive.

- We calculated students' mean scores based on their teachers' diagnosis codes in Year 4 and Year 5 of the study (e.g., students who had an unproductive teacher both years had a mean Numeration score of 6.37).

Year 5 Mean KeyMath Scores (Grade Equiv.) by Teacher Diagnosis Code across Years

		Year 5 (2017-2018) Teacher Diagnosis Code		
		Productive	Unproductive	Mixed
Year 4 (2016-2017) Teacher Diagnosis Code	Productive	NUM: ---	NUM: 6.26 (2.50)	NUM: 7.68 (2.83)
		ALG: ---	ALG: 6.46 (2.73)	ALG: 7.94 (2.07)
		GEO: ---	GEO: 6.95 (2.17)	GEO: 8.26 (2.11)
		(N = 0)	(N = 10)	(N = 5)
	Unproductive	NUM: 8.56 (1.67)	NUM: 6.37 (2.32)	NUM: 7.05 (2.49)
		ALG: 8.46 (1.82)	ALG: 6.75 (2.41)	ALG: 7.05 (2.60)
		GEO: 7.99 (1.81)	GEO: 6.46 (2.28)	GEO: 6.79 (2.33)
		(N = 7)	(N = 75)	(N = 83)
	Mixed	NUM: 5.70 (1.04)	NUM: 6.37 (2.48)	NUM: 6.76 (2.17)
		ALG: 4.13 (0.76)	ALG: 6.58 (2.55)	ALG: 6.98 (2.68)
		GEO: 6.13 (3.49)	GEO: 6.11 (2.44)	GEO: 6.59 (2.29)
		(N = 3)	(N = 78)	(N = 63)

Note. No student had a productive teacher for both years.

Year 5 Mean Quant Concepts Standard Scores by Teacher Diagnosis Code across Years

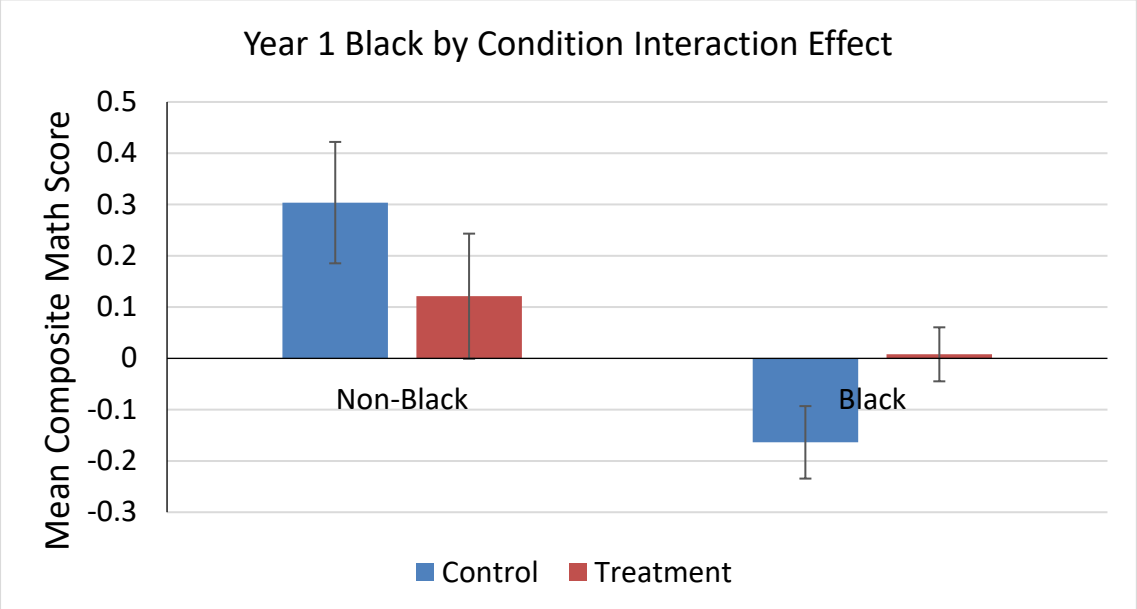
		Year 5 (2017-2018) Teacher Diagnosis Code		
		Productive	Unproductive	Mixed
Year 4 (2016-2017) Teacher Diagnosis Code	Productive	--- (N = 0)	83.10 (15.58) (N = 10)	95.80 (8.64) (N = 5)
	Unproductive	99.57 (9.57) (N = 7)	86.08 (12.04) (N = 75)	87.18 (13.64) (N = 82)
	Mixed	82.00 (7.00) (N = 3)	85.03 (12.78) (N = 78)	87.68 (12.30) (N = 63)

Note. No student had a productive teacher for both years.

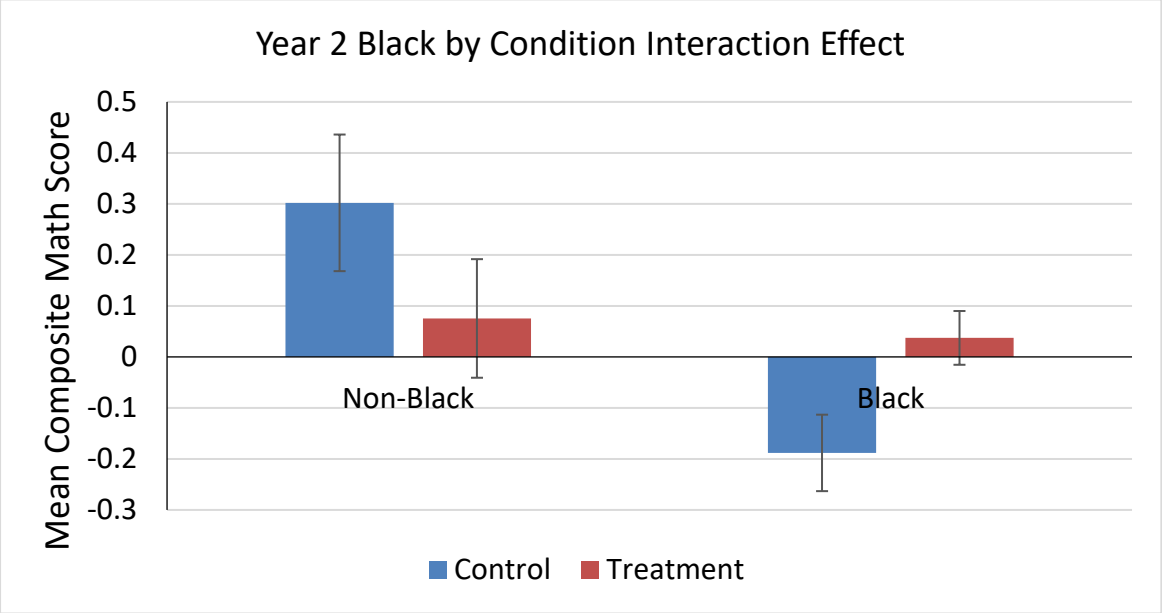
Outcomes by Pre-K Curriculum Condition over Time

- We created a composite variable for math outcomes for each year of the follow-up (KeyMath tests and WJ QC). Similar patterns were found when using the individual measures as outcomes.
- We wanted to examine the long-term effects of the Building Blocks curriculum. For each time point, we ran multilevel models to test the effect of PK curriculum condition with children nested within PK school and with appropriate covariates.

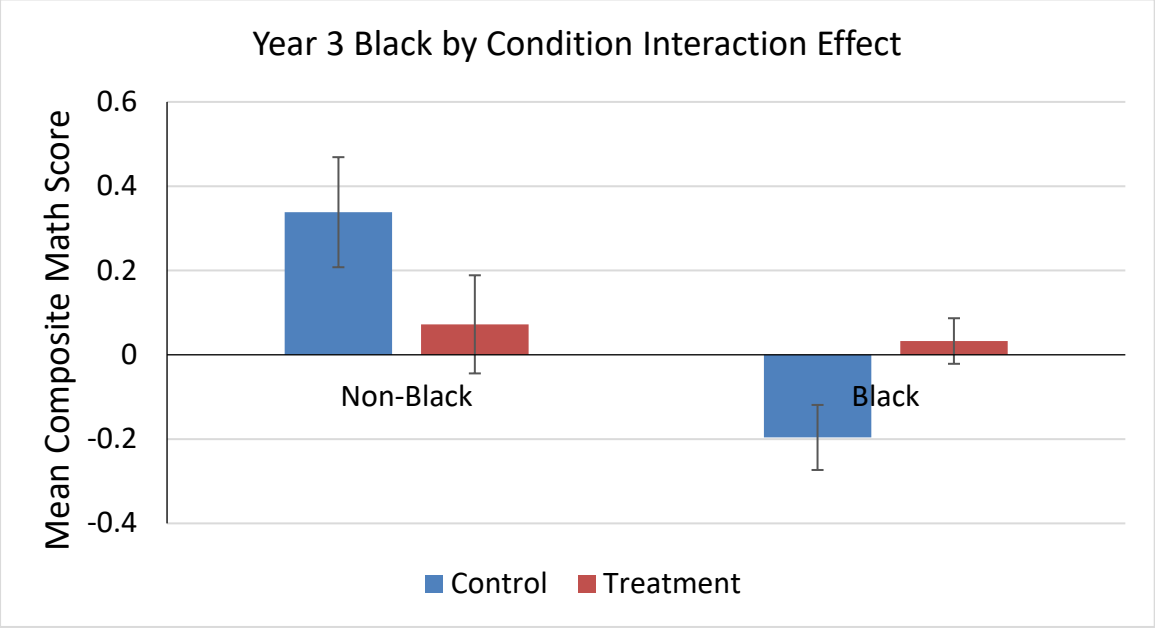
Year 1	Coef.	SE	z	P>z	95% Confidence Interval	
Condition	**-0.39**	**0.13**	**-2.95**	**0.003**	**-0.66**	**-0.13**
Black*Condition	**0.32**	**0.15**	**2.12**	**0.034**	**0.02**	**0.61**
Black	-0.35	0.13	-2.68	0.007	-0.61	-0.09
Hispanic	-0.23	0.22	-1.04	0.299	-0.67	0.20
ELL	0.63	0.22	2.89	0.004	0.20	1.05
Gender	0.27	0.06	4.29	0.000	0.14	0.39
Age	-0.06	0.01	-6.98	0.000	-0.07	-0.04
PK System	0.03	0.07	0.41	0.685	-0.10	0.15
SES	0.08	0.02	4.05	0.000	0.04	0.12
QCW Fall PK	0.02	0.00	4.08	0.000	0.01	0.03
APW Fall PK	0.01	0.00	4.46	0.000	0.00	0.01
LWW Fall PK	0.00	0.00	0.69	0.490	0.00	0.00
REMA NUM Fall PK	0.03	0.01	3.22	0.001	0.01	0.04
REMA GEO Fall PK	0.02	0.01	1.25	0.213	-0.01	0.05
Intercept	-3.02	1.80	-1.68	0.093	-6.54	0.50



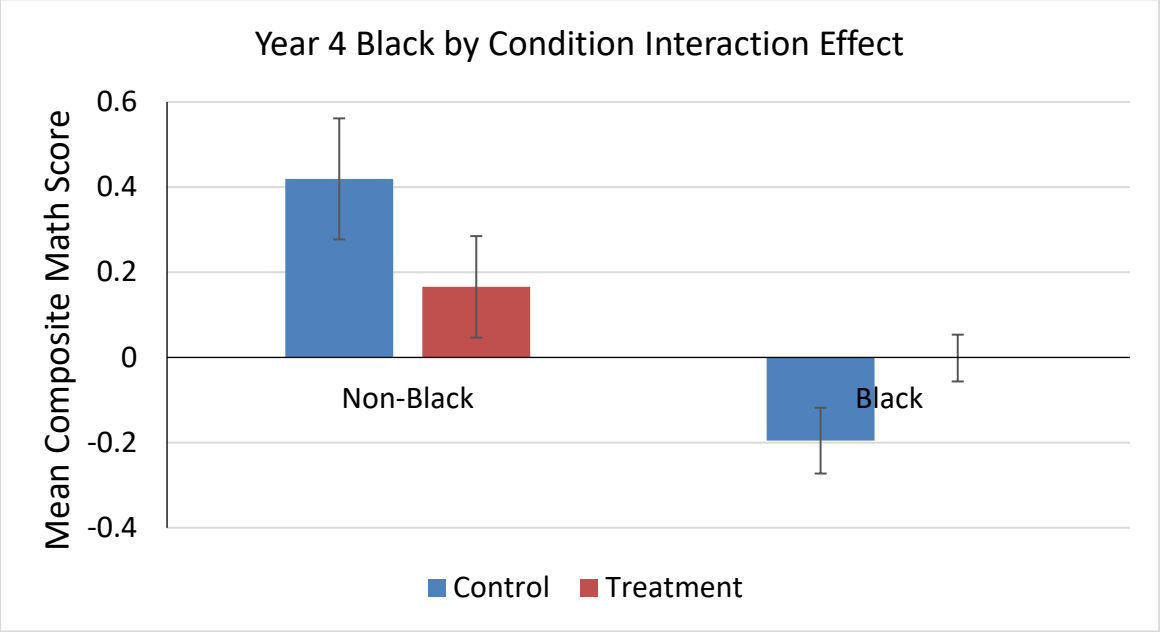
Year 2	Coef.	SE	z	P>z	95% Confidence Interval	
Condition	**-0.45**	**0.15**	**-3.11**	**0.002**	**-0.74**	**-0.17**
Black*Condition	**0.43**	**0.16**	**2.66**	**0.008**	**0.11**	**0.75**
Black	-0.42	0.14	-2.96	0.003	-0.69	-0.14
Hispanic	-0.14	0.24	-0.59	0.558	-0.61	0.33
ELL	0.49	0.23	2.11	0.035	0.03	0.95
Gender	0.31	0.06	4.72	0.000	0.18	0.43
Age	-0.06	0.01	-7.28	0.000	-0.08	-0.05
PK System	0.03	0.08	0.38	0.702	-0.13	0.19
SES	0.07	0.02	3.40	0.001	0.03	0.11
QCW Fall PK	0.02	0.00	4.97	0.000	0.01	0.03
APW Fall PK	0.01	0.00	3.47	0.001	0.00	0.01
LWW Fall PK	0.00	0.00	-0.04	0.969	0.00	0.00
REMA NUM Fall PK	0.02	0.01	2.92	0.003	0.01	0.04
REMA GEO Fall PK	0.02	0.01	1.62	0.105	0.00	0.05
Intercept	-2.55	1.91	-1.34	0.182	-6.30	1.20



Year 3	Coef.	SE	z	P>z	95% Confidence Interval	
Condition	**-0.50**	**0.15**	**-3.40**	**0.001**	**-0.78**	**-0.21**
Black*Condition	**0.47**	**0.16**	**2.89**	**0.004**	**0.15**	**0.79**
Black	-0.41	0.14	-2.87	0.004	-0.69	-0.13
Hispanic	-0.11	0.25	-0.45	0.652	-0.59	0.37
ELL	0.56	0.24	2.34	0.019	0.09	1.03
Gender	0.26	0.07	3.96	0.000	0.13	0.39
Age	-0.69	0.11	-6.40	0.000	-0.90	-0.48
PK System	0.01	0.08	0.07	0.940	-0.14	0.15
SES	0.08	0.02	3.95	0.000	0.04	0.13
QCW Fall PK	0.02	0.00	3.85	0.000	0.01	0.03
APW Fall PK	0.01	0.00	3.53	0.000	0.00	0.01
LWW Fall PK	0.00	0.00	0.51	0.610	0.00	0.00
REMA NUM Fall PK	0.03	0.01	3.24	0.001	0.01	0.04
REMA GEO Fall PK	0.03	0.02	1.90	0.058	0.00	0.06
Intercept	-1.22	2.02	-0.61	0.544	-5.17	2.73



Year 4	Coef.	SE	z	P>z	95% Confidence Interval	
Condition	**-0.45**	**0.15**	**-3.07**	**0.002**	**-0.74**	**-0.16**
Black*Condition	**0.42**	**0.17**	**2.53**	**0.012**	**0.09**	**0.74**
Black	-0.39	0.15	-2.72	0.007	-0.68	-0.11
Hispanic	-0.10	0.25	-0.42	0.675	-0.59	0.38
ELL	0.70	0.24	2.91	0.004	0.23	1.18
Gender	0.24	0.07	3.59	0.000	0.11	0.38
Age	-0.65	0.11	-5.98	0.000	-0.86	-0.44
PK System	0.04	0.07	0.54	0.591	-0.10	0.18
SES	0.08	0.02	3.66	0.000	0.04	0.12
QCW Fall PK	0.02	0.00	3.67	0.000	0.01	0.03
APW Fall PK	0.01	0.00	3.31	0.001	0.00	0.01
LWW Fall PK	0.00	0.00	0.35	0.724	0.00	0.00
REMA NUM Fall PK	0.03	0.01	3.28	0.001	0.01	0.04
REMA GEO Fall PK	0.04	0.02	2.35	0.019	0.01	0.07
Intercept	-0.76	2.14	-0.35	0.723	-4.95	3.43



Year 5	Coef.	SE	z	P>z	95% Confidence Interval	
Condition	**-0.37**	**0.16**	**-2.37**	**0.018**	**-0.67**	**-0.06**
Black*Condition	**0.32**	**0.17**	**1.86**	**0.063**	**-0.02**	**0.66**
Black	-0.41	0.15	-2.75	0.006	-0.70	-0.12
Hispanic	-0.05	0.25	-0.20	0.844	-0.54	0.44
ELL	0.49	0.24	2.02	0.044	0.01	0.97
Gender	0.28	0.07	4.01	0.000	0.14	0.41
Age	-0.53	0.11	-4.89	0.000	-0.74	-0.32
PK System	0.04	0.09	0.41	0.679	-0.14	0.21
SES	0.08	0.02	3.59	0.000	0.04	0.12
QCW Fall PK	0.02	0.00	3.99	0.000	0.01	0.03
APW Fall PK	0.01	0.00	3.24	0.001	0.00	0.01
LWW Fall PK	0.00	0.00	0.26	0.792	0.00	0.00
REMA NUM Fall PK	0.03	0.01	2.92	0.004	0.01	0.04
REMA GEO Fall PK	0.03	0.02	2.14	0.032	0.00	0.06
Intercept	-2.57	2.21	-1.16	0.244	-6.90	1.76