Washington State *Math Trailblazers* Student Achievement Report

A report by the TIMS Project
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Math Trailblazers is a comprehensive mathematics curriculum for Grades K–5 that was developed by the Teaching Integrated Math and Science (TIMS) Project at the University of Illinois at Chicago with funds from the National Science Foundation (NSF). *Math Trailblazers* is now in use in several school districts in the state of Washington. Washington mandates the administration of the Iowa Test of Basic Skills (ITBS) in third grade and the Washington Assessment of Student Learning (WASL) in fourth grade. In this document, we examine scores of *Math Trailblazers'* students on these two tests in the year 2000 from schools in five school districts. Through a telephone survey we confirmed the implementation of *Math Trailblazers* in each school. Scores from a complete grade in a school were included in the study if the school reported using *Math Trailblazers* during the 1999-2000 school year and students at that grade had exposure to *Math Trailblazers* for at least two years. In this study *Math Trailblazers'* schools were compared to other schools in Washington that do not use an NSF-funded comprehensive, mathematics curriculum.[1] The *Math Trailblazers* schools were rigorously matched to non-using, comparison schools by reading level, socioeconomic status, and other variables.

Mean scale scores on the ITBS for the *Math Trailblazers* schools, comparison schools, and the state as a whole are summarized in the table below.

Table 1: Mean ITBS Scores (Scaled)

School	Computation			Concepts and Estimation[2]			Problem Solving and Data Interpretation[3]			Total[4]		
	mean	s.d.	n	Mean	s.d.	n	Mean	s.d.	n	mean	s.d.	n
Math Trailblazers	188.2	17.13	2836	192.5	21.52	2818	199.1	25.13	2814	193.5	19.43	2777
Comparison	188.2	16.83	2213	190.6	21.03	2200	197.3	25.50	2183	192.3	18.49	2165
State	185.7	16.76	73811	187.4	20.60	73486	192.1	25.46	73746	188.7	18.76	72273

Significance levels of differences of means between *Math Trailblazers* and comparison schools: [2]p=.001, [3]p=.011, [4]p=.024.

The difference between the mean scores at the *Math Trailblazers* schools and the mean scores at the comparison schools are statistically significant in each category except computation, where the mean scores are the same. Thus, based on student achievement on the ITBS, the *Math Trailblazers* schools outperform the comparison schools in two of the three categories and the total score. The statewide scores are provided as a reference.

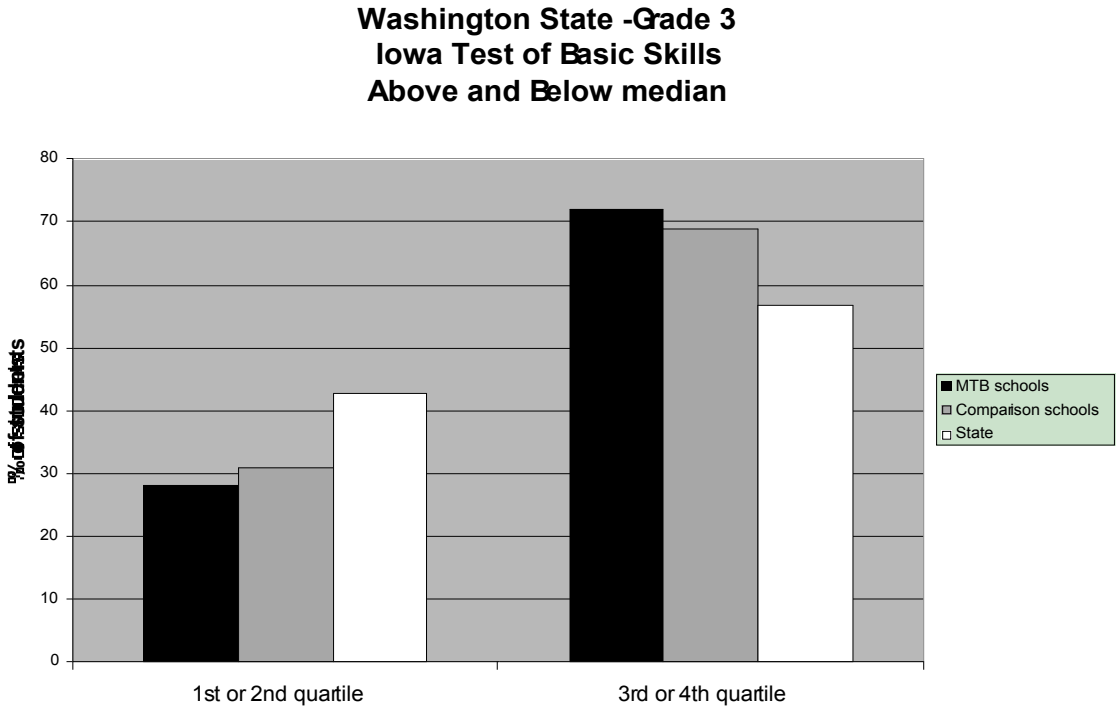
A different criterion for student performance is the proportion of students below and above the national median. This is given in the next table.

Table 2: Proportion of Student Scores Above and Below the Median on the ITBS

Schools	Below (national) median	Above (national) median
Math Trailblazers	28.0%	72.0%
Comparison	31.1%	68.9%
State	43.0%	57.0%

[1] The three NSF-funded, comprehensive curricula are *Math Trailblazers*, *Everyday Mathematics*, and *Investigations in Data, Number, and Space*.

The proportion of students above the median is significantly higher in the *Math Trailblazers* schools than the comparison schools (p=.008). This information is shown in the graph below. Note that the proportion of students in the whole state scoring above and below the median is in white.



The first two tables compare the performances of a typical student in a *Math Trailblazers* and a comparison school. The next table compares student achievement on the ITBS for a typical student at the 25th and the 75th percentiles. For each *Math Trailblazers* school and each comparison school, the 25th and the 75th percentiles are computed, as well as the interquartile range, which is the difference in these percentiles. Table 3 gives the means for these quantities.

Table 3: Mean Scale Score on the ITBS at the 25th and the 75th Percentiles

	Mean 25th percentile	Mean 75th percentile	Mean interquartile range
Math Trailblazers schools	181.29	205.76	24.44
Comparison schools	178.72	204.22	25.65

This suggests that *Math Trailblazers* students from both below and above the median performed better than corresponding students in comparison schools. Finally, among students scoring at or above the 75th percentile, those at *Math Trailblazers* schools had a significantly higher mean (209.91, s.d=10.49, n=1307) than those at the comparison schools (208.85, s.d.=10.29, n=974), (p=.017), whereas, even though among students scoring at or below the 25th percentile, those at *Math Trailblazers* schools had mean slightly

lower (162.24, s.d=6.40, n=343) than those at the comparison schools (162.56, s.d.=6.38, n=252), the difference was not statistically significant.
An identical analysis for WASL scores is in Table 5 below.

Table 4: Mean WASL Scores

	Comparison Schools		*Math Trailblazers* Schools		State	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
Number Sense	3.77	1.69	3.83	1.74	3.51	1.74
Measurement Concepts[5]	3.77	1.69	3.97	1.69	3.55	1.75
Geometric Sense[6]	4.63	1.64	4.78	1.67	4.47	1.72
Probability and Statistics	3.70	1.25	3.65	1.25	3.58	1.31
Algebraic Sense	4.60	1.88	4.62	1.85	4.34	1.92
Solving Problems[7]	3.24	2.46	3.41	2.46	2.89	2.42
Reasoning Logically	3.96	2.02	3.96	2.03	3.60	2.06
Communicating Understanding	3.10	1.83	3.13	1.75	2.82	1.80
Making Connections[8]	2.85	1.50	2.95	1.52	2.66	1.52
Total Raw Score[9]	33.62	11.78	34.30	12.03	31.43	12.29
Scaled Score	397.53	32.88	399.12	33.94	391.22	34.93

Significance levels of differences of means between *Math Trailblazers* and comparison schools: [5]p=.0001, [6]p=.0003, [7]p=.013, [8]p=.015, [9]p=.033.

2888 students took the WASL at *Math Trailblazers* schools, 2653 at the comparison schools, and 76,321 in Washington. The scores at the *Math Trailblazers* schools are significantly higher than scores at comparison schools in the following categories: measurement concepts, geometric sense, solving problems, making connections, and total raw score. In the remaining categories the differences are not statistically significant.

Tables 5: Proportion of students at different levels of WASL

Level	1 Serious Deficiencies	2 Not Meeting Standards	3 Meeting Standards	4 Exceeding Standards
Math Trailblazers schools	23.2%	23.9%	26.6%	26.3%
Comparison schools	24.8%	25.0%	26.8%	23.4%
State	32.0%	25.4%	22.9%	19.8%

More *Math Trailblazers* students exceeded the standards than comparison students – the difference is statistically significant (p=.006). Also, significantly more *Math Trailblazers* students met or exceeded the standards than comparison students (p=.025).

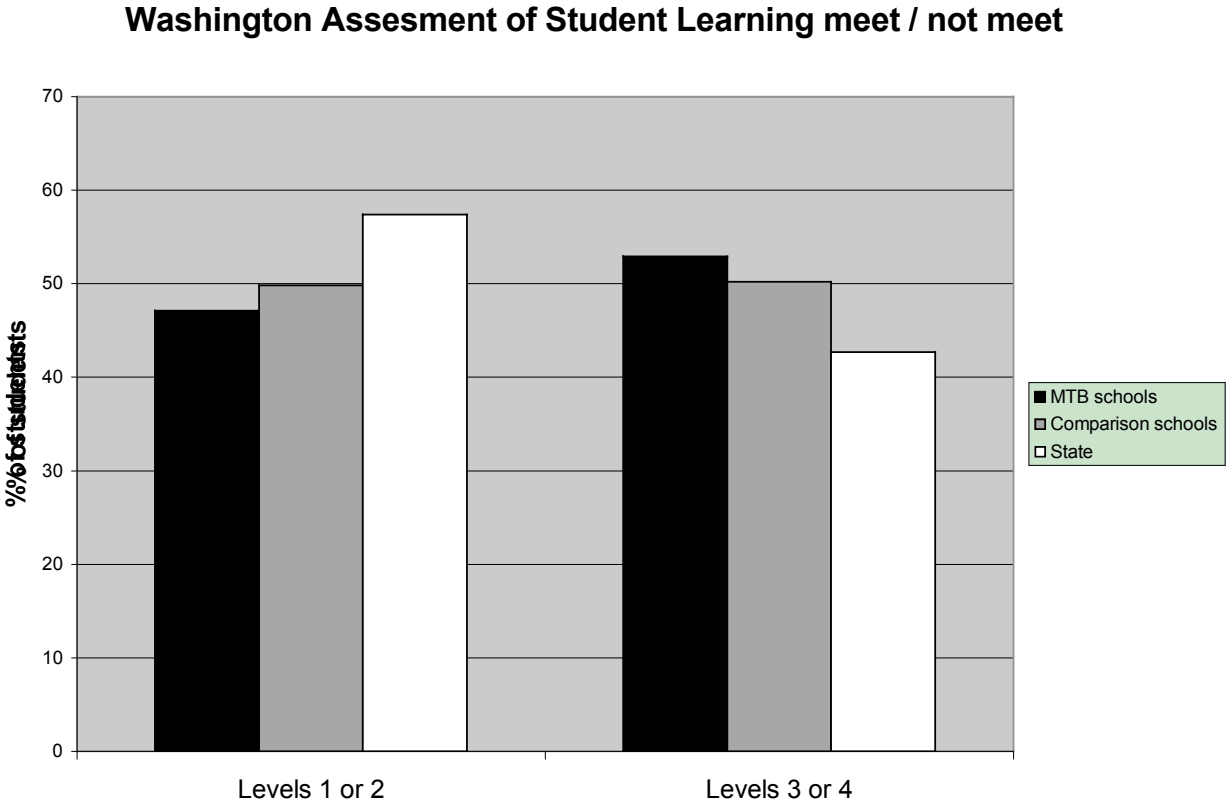


Table 6: Mean WASL Raw Scores at the 25th and the 75th percentiles

	Mean 25th percentile	Mean 75th percentile	Mean interquartile range
Math Trailblazers schools	25.49	42.60	17.12
Comparison schools	25.24	42.44	17.21

As in the case of ITBS scores, student achievement measured by the WASL is higher for the *Math Trailblazers* schools than for the comparison schools for the overall means, as well as the means at the 25th and 75th percentiles. While the standard deviation for the *Math Trailblazers* schools is slightly higher (Table 4), the lower interquartile range of the *Math Trailblazers* schools (Table 6) offsets it.

In summary, the *Math Trailblazers* program significantly raised the performance of the average student, in comparison to the matched schools, based on the ITBS total score and WASL total raw score. Students in *Math Trailblazers* schools in the bottom quartile had similar scores on the ITBS in comparison to students in the matched schools. The percentage of students of both groups with serious deficiencies on the WASL was also nearly the same. *Math Trailblazers* students in the upper quartile outperformed the

corresponding students in the comparison schools on the ITBS. At the same time the percentage of students who exceeded state standards on the WASL was higher in *Math Trailblazers* schools than in the comparison schools. Therefore, *Math Trailblazers* students in Washington at all levels are performing as well or better than corresponding students in comparison schools.