



Exact Path Diagnostic and State of Wisconsin Forward Exam Correlational Study

Summary

This research study investigated the correlation between scores on the Exact Path diagnostic assessment and scores on the Forward Exam. The findings in this study show strong correlations between the Exact Path diagnostic and Forward Exam scores across content areas and grades, providing evidence that the assessments tend to measure the same skills and knowledge.



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Background

The Exact Path diagnostic assessment is a computer-adaptive test that can be administered up to four times a year in language arts, reading, and/or mathematics and which results in a scale score that ranges from 500 to 1500 regardless of grade level. One elementary school and one school district in Wisconsin administered the Exact Path diagnostic and provided student scores on the Forward Exam, Wisconsin's accountability assessment. Scores were provided for students in grades three through eight, totaling 1461 student scores in math, 1460 student scores in reading, and 1119 student scores in language arts. This study investigates the strength of the relationship between scores on the Exact Path diagnostic and the Forward Exam by investigating correlations between student scores on both tests. Correlations between two tests offer a source of validity evidence, with strong correlations providing evidence that the assessments tend to measure the same skills and knowledge.

Sample Description

The school and district in Wisconsin participated in this study by providing Edmentum with student demographic and performance data from the Spring 2021 Forward Exam test. These data were then joined with Exact Path diagnostic data using a unique student identification number.

Table 1 shows the demographic composition of students in the sample compared to the overall state student population. No student demographic data was missing from the study sample. For this study,

student ethnicity (Hispanic vs not Hispanic) was reported separately from race. In general, the students in the study sample were more likely to be White and less likely to qualify for free or reduced-price lunch than the overall state population.

Table 1. Student Characteristics

Student Characteristic	Sample Percent (%)	State Percent (%)	Difference (%)
American Indian/Alaskan Native	1.37	1.23	-0.14
Asian	0.96	4.77	3.81
Black	1.85	10.17	8.32
Native Hawaiian or Other Pacific Islander	1.57	10.17	8.32
Two or More Races	1.10	5.28	4.18
White	92.88	78.46	-14.42
Hispanic	12.53	12.80	0.28
Female	50.03	48.50	-1.53
Male	49.97	51.50	1.53
English Language Learner	4.93	5.28	0.35
Free/Reduced Lunch	29.50	43.66	14.16
Special Education	12.66	14.21	1.55

Source: Wisconsin Department of Public Instruction (2021c)

Table 2 compares the mean mathematics and English language arts Forward Exam scale scores from the study sample to the overall state population for grades 3-8. Forward Exam scores are divided into four performance levels: Below Basic, Basic, Proficient, and Advanced. Table 3 compares the proportion of students in the sample who obtained each proficiency level based on their state test scores, compared to

the overall state population. Results show that, on average, the study participants scored somewhat higher than the state population in mathematics, language arts, and reading,

Table 2. Mean Forward Exam Scores for Study Sample and State

Grade	Mathematics		ELA	
	Sample	State	Sample	State
3	563.53	550.56	548.91	551.24
4	594.98	573.00	578.07	578.62
5	604.56	595.70	591.79	593.98
6	609.40	603.14	608.25	604.72
7	631.70	621.10	630.59	626.03
8	658.12	639.29	642.97	628.70

Source: Wisconsin Department of Public Instruction (2021d)

Table 3. Distribution Across Proficiency Levels for Study Sample and State

Grade	Proficiency Level	Mathematics		ELA	
		Sample (% of students)	State (% of students)	Sample (% of students)	State (% of students)
3	Below Basic	11.57	22.67	22.70	26.74
	Basic	32.41	31.09	46.81	37.88
	Proficient	41.20	35.22	27.66	31.14
	Advanced	14.81	11.02	2.84	5.23
4	Below Basic	9.13	21.40	20.98	26.42
	Basic	31.12	36.36	46.85	32.72
	Proficient	43.98	31.55	26.57	33.21
	Advanced	15.77	10.71	5.59	7.65
5	Below Basic	22.03	28.41	27.71	26.92
	Basic	27.54	28.87	36.95	34.93
	Proficient	39.83	32.86	32.13	32.91
	Advanced	10.59	9.86	3.21	5.23
6	Below Basic	25.00	31.83	21.67	24.67
	Basic	30.60	31.79	36.12	36.29
	Proficient	38.81	31.53	37.26	31.05
	Advanced	5.60	4.85	4.94	7.99
7	Below Basic	29.28	34.07	16.76	22.69

	Basic	29.66	30.26	37.43	33.85
	Proficient	34.98	32.11	37.99	34.48
	Advanced	6.08	3.56	7.82	8.98
8	Below Basic	17.30	31.72	17.36	25.73
	Basic	39.24	37.68	35.42	38.24
	Proficient	35.44	24.07	37.50	28.30
	Advanced	8.02	6.53	9.72	7.73

Source: Wisconsin Department of Public Instruction (2021b)

Data and Methods

In this study, student academic performance within a subject is measured through two assessments: the Exact Path diagnostic and the Forward Exam. The Exact Path diagnostic assessments in mathematics, language arts, and reading result in scores on a vertical scale so that performance within a subject can be compared across grades. However, the vertical scale for each subject is distinct, so scores cannot be compared between subjects. The Forward Exam assesses academic performance in mathematics and English language arts. While Exact Path assesses reading and language arts separately resulting in two separate scores, the Forward Exam is focused on assessing the Wisconsin English language arts Standards (Wisconsin Department of Public Instruction, 2021a).

To perform correlational studies, students must typically take both tests (e.g., the Exact Path diagnostic and the Forward Exam) within the same time frame. Ideally, both tests would be administered within two weeks of each other and then student scores from both tests would be correlated. Practically, however, administering multiple tests within a short time span can be unreasonable. Students in this study completed the Exact Path diagnostic in language arts, reading, and mathematics between April 15, 2021 and May 26, 2021. The Forward Exam for both English language arts and mathematics was completed between March 22, 2021 and May 14, 2021. For this particular correlation study, it is important to note that schooling was interrupted during the 2020-2021 school year due to the COVID-19 pandemic. The federal government provided more flexibility in end-of-year testing than usual, and the opt-out rates were much higher than pre-COVID levels. This sample's participating school districts, however, retained high participation rates, average participation rates ranging from of 95-100% across math and language arts in both school districts (Wisconsin's Information System for Education Data Dashboard, 2022).

The participating Wisconsin school and district provided Edmentum with student data from the Spring 2021 Forward Exam, which Edmentum then merged with Exact Path diagnostic data from Spring 2021. Forward Exam mathematics scores were merged with Exact Path diagnostic scores in mathematics, and Forward Exam English language arts scores were merged two ways: with Exact Path diagnostic scores in language arts and again with Exact Path diagnostic score in reading. It is expected that student performance on Forward Exam and the Exact Path language arts diagnostic will show a high degree of correlation. Table 4 shows the number of students in the merged sample by grade and content area.

Table 4. Sample Size (Number of Students)

	Mathematics	Language Arts	Reading
Grade 3	216	141	216
Grade 4	242	143	242
Grade 5	236	249	251
Grade 6	267	263	265
Grade 7	263	179	263
Grade 8	237	144	223

Results

The analysis begins by considering the relationship between Exact Path diagnostic scores and Forward Exam proficiency levels. The distribution of Exact Path diagnostic scores by Forward Exam proficiency category (Wisconsin Department of Public Instruction, 2021b) and by subject area are displayed in the box plots in Figures 1-3. The boxes represent the distribution of Exact Path scores from the first quartile to the third quartile, with a horizontal line intersecting the box at the median. Based on the vertical progression of the box plots across performance levels, these figures show that within each subject, there is a clear relationship between the Forward Exam proficiency levels and Exact Path diagnostic scores. Within each grade and subject area, median Exact Path diagnostic scores are consistently greater with increasingly higher proficiency levels. This suggests a strong relationship between Forward Exam performance levels and Exact Path diagnostic scores. Median and mean scale scores by Forward Exam performance level should not be interpreted as proficiency level predications or cut scores but rather provide evidence that students that scored higher on the Exact Path diagnostic also received Forward Exam scores corresponding to higher performance levels and vice versa. Tables with descriptive statistics reporting this data are included in Tables A1-A3 in the appendix.

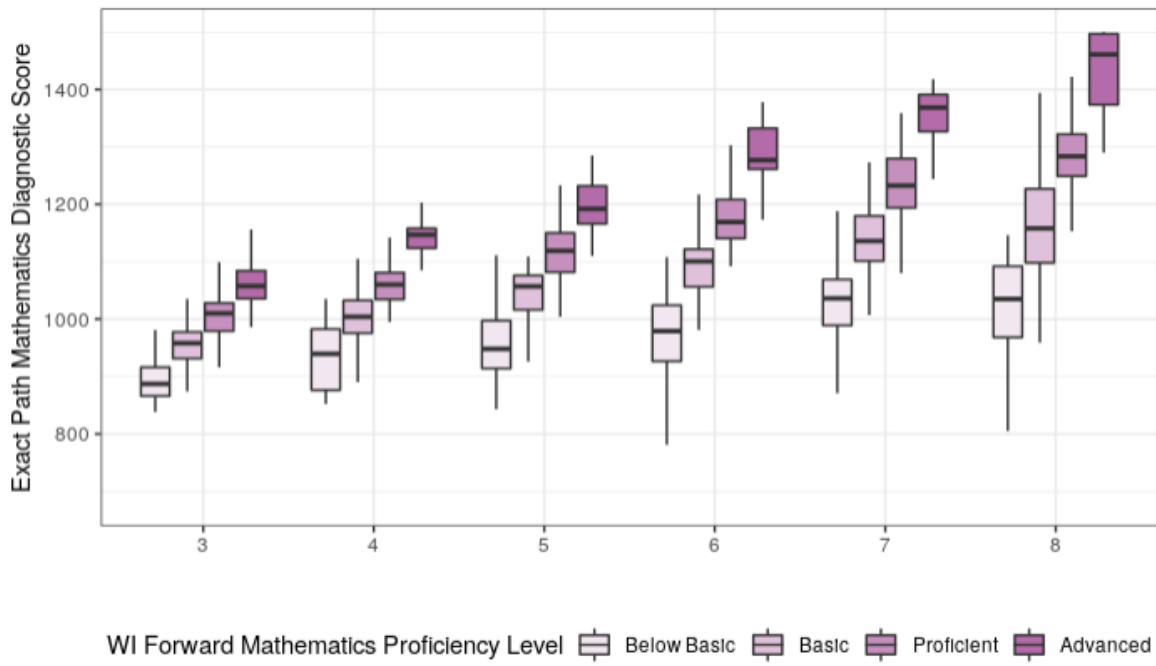


Figure 1. Exact Path Mathematics Diagnostic Score Distribution by Forward Exam Mathematics Proficiency Level

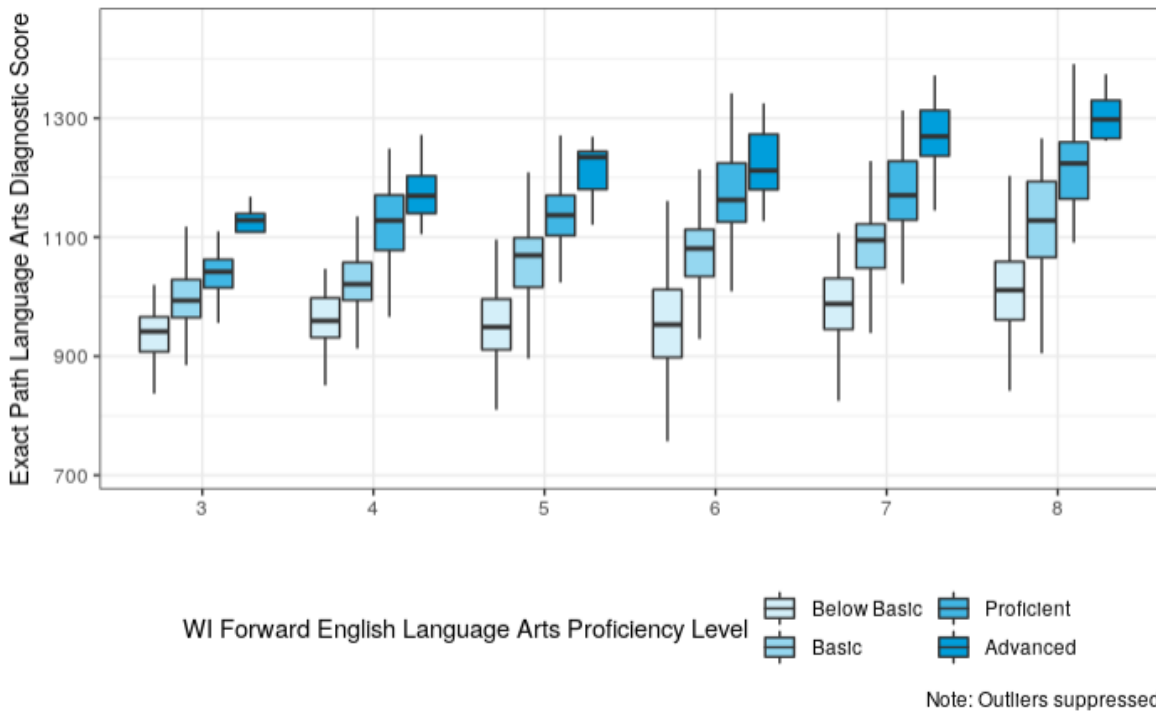


Figure 2. Exact Path Language Arts Diagnostic Score Distribution by Forward Exam English Language Arts Proficiency Level

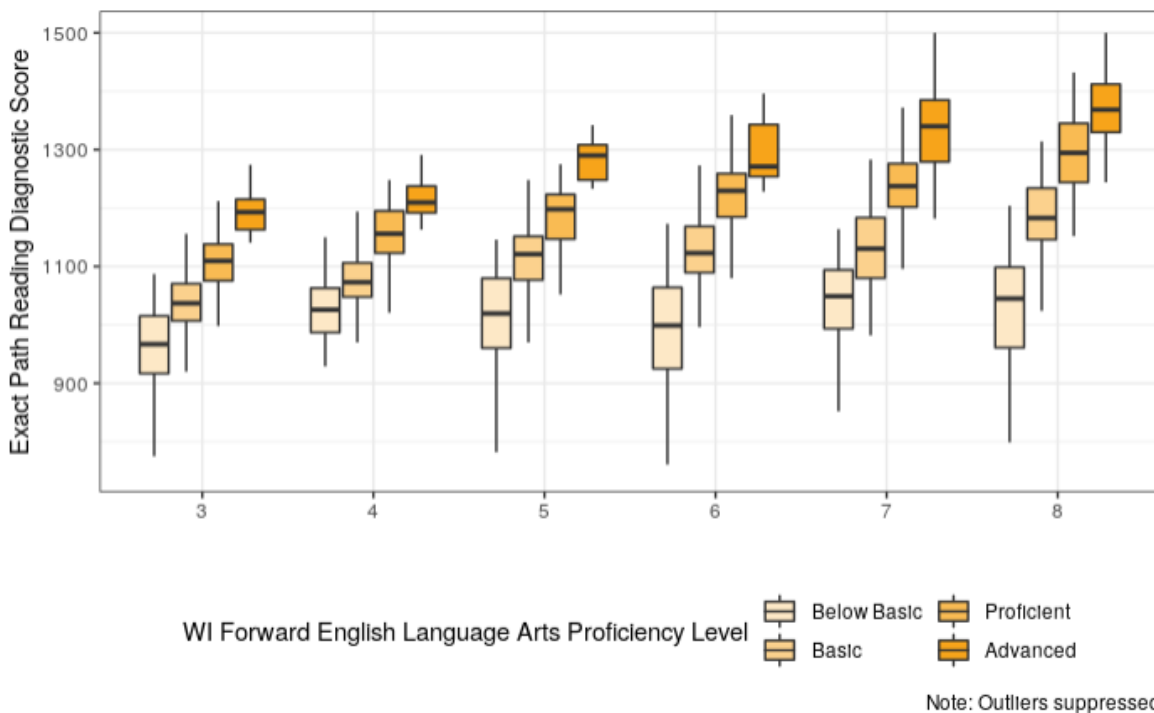


Figure 3. Exact Path Reading Diagnostic Score Distribution by Forward Exam Language Arts Proficiency Level

Table 5 shows correlation coefficients between Spring 2021 Forward Exam scale scores and Spring 2021 Exact Path diagnostic scores, by grade level and content area. The correlation coefficient measures the linear correlation between two variables, and ranges from 0 to +/-1, where the larger the absolute value of the correlation coefficient, the stronger the association between the two measures.

All correlations show a strong positive relationship between the Exact Path diagnostic and the Forward Exam. To understand the magnitude of the association Cohen, Cohen, West, & Aiken (2003) provided a standard or rule of thumb for interpreting the strength of the relationship. Correlation coefficients between 0.10 and 0.29 represent a small association, coefficients between 0.30 and 0.49 represent a medium association, and coefficients of 0.50 and above represent a large association or relationship.

Scatter plots, showing the relationship between student performance on each test, by grade and content area are provided in Figures A1-A6 in the appendix. These figures and correlations demonstrate that students who score high on the Exact Path diagnostic tend to score high on the Forward Exam and students who score low on the Exact Path diagnostic tend to score low on the Forward Exam.

Table 5. Correlation Between 2021 Forward Exam Scores and Exact Path Scores

	Mathematics	Language Arts	Reading
Grade 3	0.815	0.695	0.748
Grade 4	0.750	0.774	0.747
Grade 5	0.845	0.774	0.812
Grade 6	0.855	0.769	0.828

Grade 7	0.817	0.797	0.818
Grade 8	0.852	0.740	0.820

Conclusion

Results indicated that performance on the Exact Path diagnostic is highly correlated with performance on the Forward Exam. In other words, students that score high on the Forward Exam also score high on the Exact Path diagnostic and students who score low on the Exact Path diagnostic tend to score low on the Forward Exam. These results suggest that both the Forward Exam and the Exact Path diagnostic measure similar constructs and provide predictive validity evidence for the Exact Path diagnostic.

References

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Appendix

Table A1. Mean and Standard Deviation of Exact Path Mathematics Score by Forward Exam Mathematics Proficiency Level

Forward Exam Level	Grade 3		Grade 4		Grade 5	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Below Basic	885.0 (56.7)	25	938.3 (72.8)	22	955.1 (69.4)	52
Basic	951.4 (36.2)	70	1004.3 (44.4)	75	1047.6 (41.7)	65
Proficient	1007.8 (38.1)	89	1060.0 (34.9)	106	1116.8 (48.0)	94
Advanced	1064.1 (46.3)	32	1136.5 (39.5)	39	1207.3 (69.0)	25

Forward Exam Level	Grade 6		Grade 7		Grade 8	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Below Basic	973.8 (89.3)	67	1017.2 (97.2)	77	1022.7 (87.8)	41
Basic	1088.7 (53.0)	82	1137.9 (66.3)	78	1164.2 (80.4)	93
Proficient	1178.5 (53.3)	104	1232.8 (67.8)	92	1287.8 (68.5)	84
Advanced	1288.3 (58.0)	14	1364.7 (58.2)	16	1433.6 (71.8)	19

Table A2. Mean and Standard Deviation of Exact Path Language Arts Score by Forward Exam English Language Arts Proficiency Level

Forward Exam Level	Grade 3		Grade 4		Grade 5	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Below Basic	938.4 (55.8)	32	961.7 (59.8)	30	951.3 (72.5)	69
Basic	996.5 (53.2)	66	1024.4 (57.4)	67	1059.1 (75.1)	92
Proficient	1040.1 (51.6)	39	1128.7 (65.2)	38	1133.3 (68.3)	80
Advanced	1119.8 (47.6)	4	1174.2 (53.3)	8	1212.4 (50.9)	8

Forward Exam Level	Grade 6		Grade 7		Grade 8	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Below Basic	941.2 (95.8)	57	981.8 (75.1)	30	1017.5 (87.2)	25
Basic	1074.5 (74.0)	95	1084.0 (74.8)	67	1115.9 (93.5)	51
Proficient	1169.1 (78.9)	98	1170.9 (76.6)	68	1212.4 (77.9)	54
Advanced	1234.7 (86.8)	13	1277.2 (77.6)	14	1281.5 (80.0)	14

Table A3. Mean and Standard Deviation of Exact Path Reading Score by Forward Exam Language Arts Proficiency Level

Forward Exam Level	Grade 3		Grade 4		Grade 5	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Below Basic	958.2 (84.4)	44	1021.6 (67.2)	45	1012.8 (78.3)	68
Basic	1037.7 (53.1)	99	1075.8 (51.9)	100	1117.6 (60.3)	95
Proficient	1106.0 (62.4)	64	1152.1 (56.1)	79	1184.4 (56.7)	80
Advanced	1193.2 (41.5)	9	1202.2 (71.6)	18	1273.6 (60.7)	8

Forward Exam Level	Grade 6		Grade 7		Grade 8	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
Below Basic	990.3 (94.0)	57	1036.4 (84.9)	39	1028.5 (100.1)	34
Basic	1125.5 (65.4)	95	1127.9 (72.9)	92	1181.0 (79.1)	85
Proficient	1222.6 (72.9)	100	1235.9 (59.9)	104	1285.7 (82.9)	78
Advanced	1294.3 (53.1)	13	1338.9 (76.6)	28	1373.0 (70.2)	26

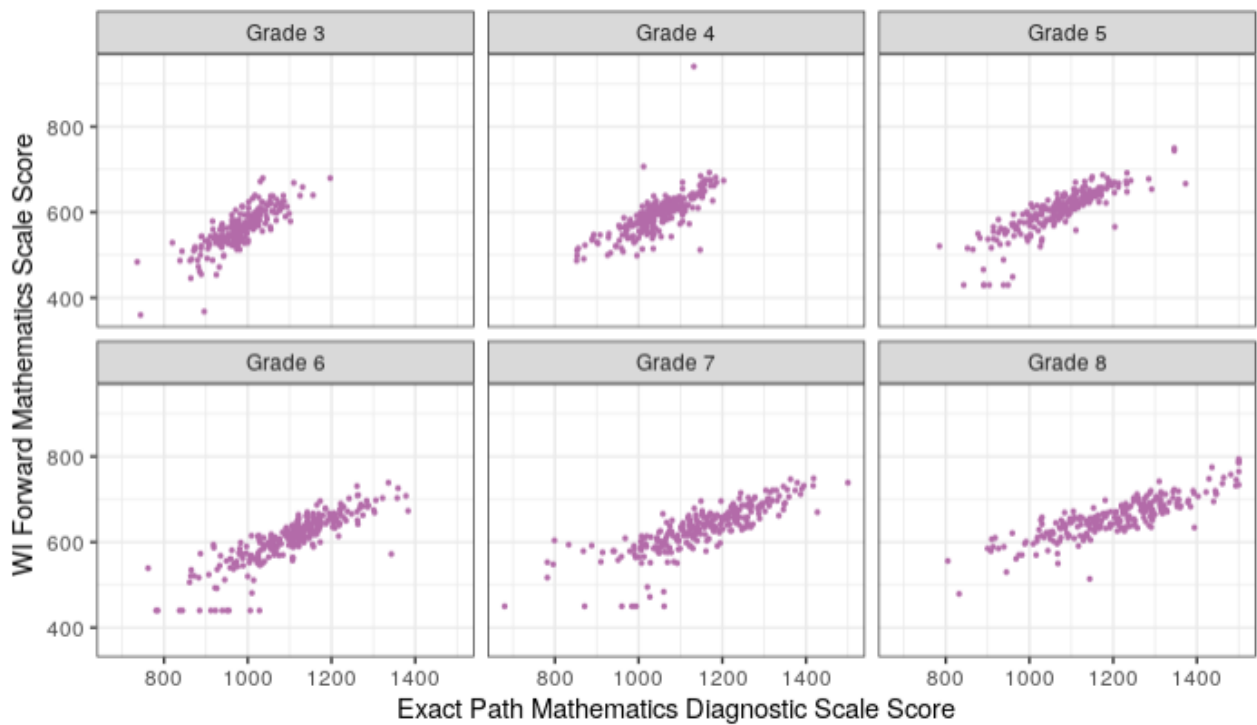


Figure A1. Scatterplot of Exact Path Mathematics Score and Forward Mathematics Score

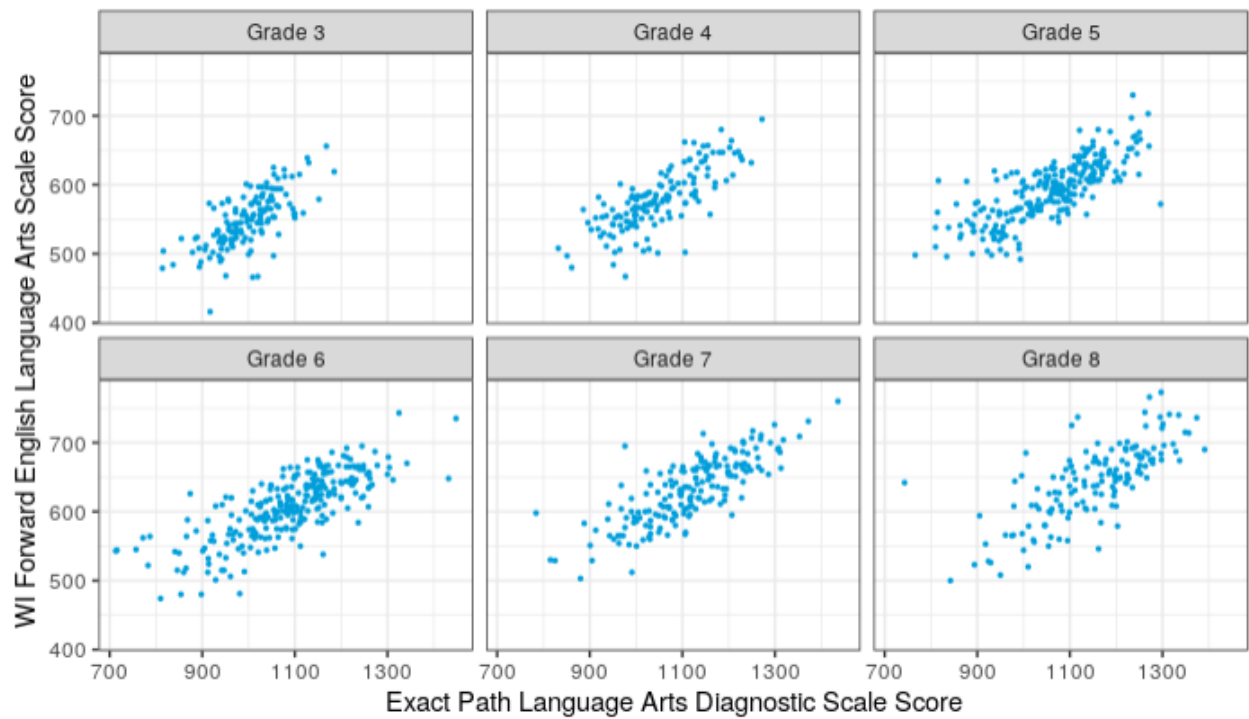


Figure A2. Scatterplot of Exact Path Language Arts Score and Forward English Language Arts Score

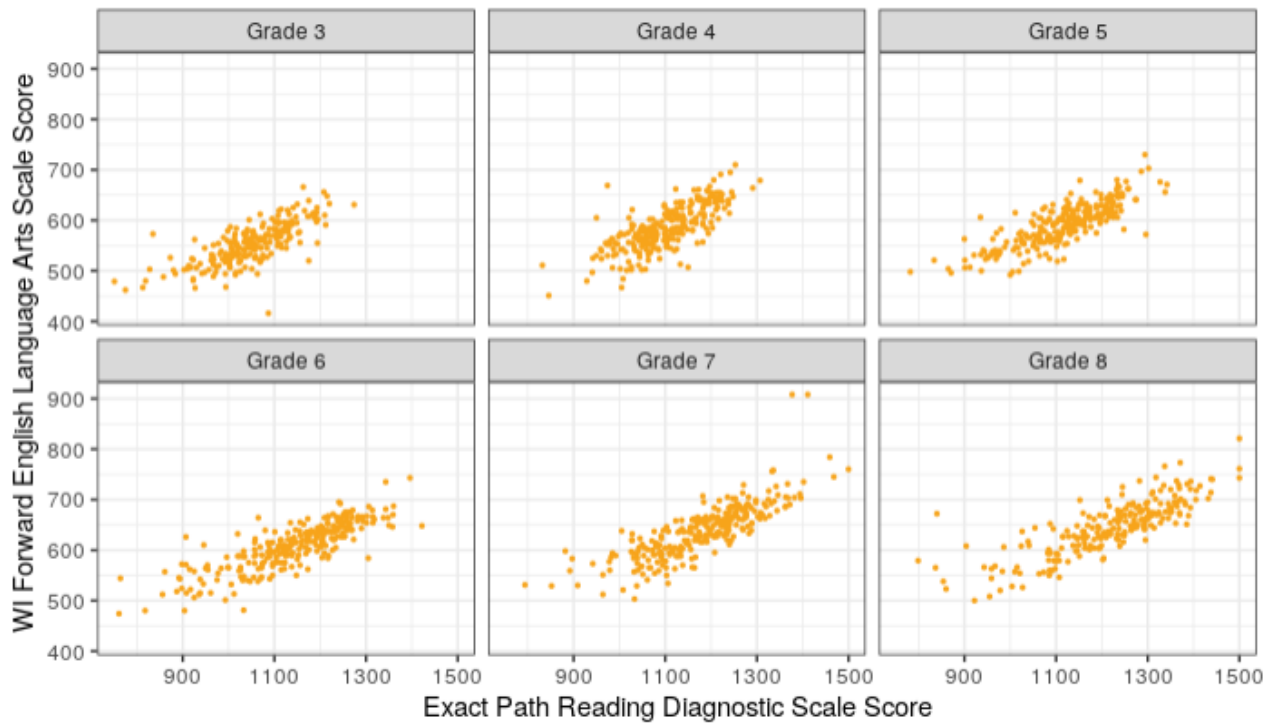


Figure A3. Scatterplot of Exact Path Reading Score and Forward Language Arts Score