

# Impacts of Edmentum's Exact Path on Student Language Arts Achievement

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## Executive Summary

Century Analytics, Inc. conducted a rigorous evaluation of Edmentum's Exact Path to estimate the impact of Exact Path use on student achievement in language arts in Grade 1 through Grade 8. Exact Path is an online educational tool designed to support individualized student instruction. This study's quasi-experimental design (QED), analyses, and measures meet the What Works Clearinghouse (WWC) 4.0 standards needed to achieve a rating of *Meets WWC Group Design Standards with Reservations* (WWC, 2017). This study also meets the Every Student Succeeds Act (ESSA) guidance for *Moderate Evidence* (U.S. Department of Education, 2016).

Two groups of students were compared in this study. Students in the Exact Path intervention group completed at least eight Exact Path lessons between the fall administration and the winter administration of the Exact Path diagnostic assessment. Students in the comparison group completed zero lessons between the two test administrations.

The study established baseline equivalence of the Exact Path group and the comparison group. Both the baseline measure and outcome meet WWC standards for educational outcomes. Data were analyzed using a WWC acceptable analytic approach, and no confounds were present between the intervention and comparison groups.

Analyses revealed statistically significant positive impacts for student usage of Exact Path on language arts achievement in Grades 1 through Grade 8, except for Grade 7. Impacts had effect sizes ranging from 0.09 for Grade 5 to 0.29 for Grade 1 and improvement indexes ranging from 3.98 to 11.41. Improvement indexes show the expected change in percentile rank for an average comparison student if he or she had been in the intervention group. For example, an improvement index of 11.41 is equivalent to a comparison group student improving from the 50<sup>th</sup> percentile to better than the 61<sup>st</sup> percentile.

Results of this study suggest that students who use Exact Path and complete at least eight lessons as assigned by Exact Path will make statistically significant gains in achievement relative to students who do not complete any Exact Path lessons. These results also suggest that Exact Path is targeting the skills that students need to develop in order to improve their language arts achievement.

This study is not without limitations. The definition for the Exact Path intervention group focused solely on lesson completion. The study does not shed any light on the potential impact of any other of Exact Path's student resources (e.g., practice tasks, mastery quizzes, progress checks, worksheets) or the impact of Exact Path when integrated into classroom instruction. The narrow definition for the Exact Path intervention group and the lack of any student demographic variables limits the generalizability of the study's findings.

Future research on Exact Path should incorporate a broader definition of student usage in order to estimate the impact of the many student resources available beyond assigned lessons. This future research also should include student demographic characteristics to help understand which groups of students may benefit most from Exact Path and to support generalizing study findings.

Future research also should examine the impacts of Exact Path usage at the classroom level. Exact Path is designed to supplement classroom instruction and has many resources available to teachers. The full potential impact of Exact Path cannot be estimated without examining its effects at the classroom level.

## Introduction

Edmentum's Exact Path is an online educational tool designed to support individualized student instruction. Exact Path includes a diagnostic assessment, individualized instruction and skill practice, progress checks, and additional supporting resources for students. Exact Path provides students with immediate feedback and adjusts in real time to student progress, and it incorporates a formative assessment approach to monitoring student progress and adjusting instruction.

Exact Path usage begins with an adaptive diagnostic assessment. The diagnostic can be administered in either mathematics, reading, and/or language arts. The diagnostic assessment is typically administered at least three times per school year (fall, winter, and spring), and results provide each student with an individualized placement on the Exact Path learning progression.

Within each subject area, the learning progression is a continuous sequence of lessons and skills from kindergarten to high school. The learning sequences are based on national and state content standards in each subject area. Each subject area's learning sequence includes lessons and skills from a number of sub-domains. The number of lessons per subject area and grade level varies but typically range from 20 to 30 per grade.

Students are placed on the learning progression in a subject area in order to address their most significant weakness. Lessons are assigned to students in groups of three or four, with each lesson targeting a specific skill or set of skills. Once placed on the learning path, students work on completing lessons targeted to their achievement level as indicated by their diagnostic results. Each lesson is typically followed by a short quiz to check the student's understanding of the lesson. After completing the lessons for the group of three to four skills, students take a progress check to assess their understanding of all the skills in the group. When progress checks are passed (80% correct), students receive a new set of lessons. If progress checks are not passed, students are assigned lessons to support development in needed skills. As students pass the sequential progress checks, they advance to skills and concepts further along the learning progression.

Students typically retake the diagnostic assessment in the winter of each school year. They receive an updated diagnostic score reflecting their learning growth since the previous diagnostic score. Students are then placed on the learning progression again based on the latest diagnostic score. Depending on the score, students may repeat lessons not yet passed or progress to new lessons and skills further along the learning progression. Students are also often administered the diagnostic assessment in the spring.

### Study Purpose

The purpose of this study was to provide a rigorous estimate of the impact of Exact Path use on student achievement in language arts. Rigorous studies of educational interventions and estimates of impacts are needed by state and local education agencies to select and implement interventions that improve academic outcomes for students (U.S. Department of Education, 2016).

The study was designed to meet the What Works Clearinghouse (WWC) 4.0 standards for quasi-experimental designs (QED) necessary to achieve a rating of *Meets WWC Group Design Standards with Reservations* (WWC, 2017). In meeting WWC standards, the study also was designed to meet the requirements of the Every Student Succeeds Act (ESSA) guidance for *Moderate Evidence* (U.S. Department of Education, 2016).

The study aimed to estimate the effects of student usage of Exact Path. Usage included administration of the diagnostic assessment in both fall and winter, placement of students along the learning progression, and completion of at least eight lessons according to the learning progression placement.

## **Research Question**

The following research question guided the design and analyses used in this study.

What is the impact of Exact Path usage between the Fall diagnostic and Winter diagnostic assessment on student language arts achievement in 1<sup>st</sup> through 8<sup>th</sup> grade relative to students who do not use Exact Path?

## **Method**

### **Data**

Century Analytics obtained student data from Edmentum to conduct the study. These data included unique student identifiers, student grade level, identifiers for subject area, Exact Path diagnostic scores from the fall and winter in each subject area, and detailed information on the Exact Path skills completed, progress checks, and time spent on lesson activities for all subject areas and domains within each subject area. The study used data on the Fall diagnostic score as the baseline measure and scores on the Winter diagnostic as the outcome measure. Students were identified for the intervention and comparison groups based on lesson completion between the fall and winter administrations of the diagnostic assessment. No student demographic variables were available for analysis.

### **Design**

This study used a quasi-experimental design in order to meet WWC (4.0) standards with reservations. According to the WWC, a quasi-experimental design (QED) uses a non-random process to form the intervention and comparison conditions (WWC, 2017). The WWC allows groups to be formed using a variety of methods as long as the groups are mutually exclusive. That is, units (e.g., students or schools) can only be analyzed as a member of a single group. Further, in a QED, the WWC accepts assignment to the intervention based on observed characteristics. Assignment to study conditions for this study was conducted at the student level.

The intervention group was defined as students who had both Fall and Winter Exact Path diagnostic assessment scores and who also completed at least eight lessons within the language arts subject area. That is, students needed to complete at least eight lessons within the three sub-domains (Language, Writing, and Speaking & Listening). A minimum of eight lessons was chosen as the definition for Exact Path implementation after discussion between Century Analytics and Edmentum staff for the following reasons.

First, lessons are assigned in groups of three to four. Specifying eight lessons helps ensure that students are working their way through the learning progression and are using Exact Path as intended – that is, completing a set of lessons, taking a progress check, and moving further along the learning progression.

Second, between 20-30 skills per grade are provided for the language arts subject area in kindergarten to Grade 8. This means 12 lessons represent approximately one semester's worth of learning on the learning progression. Given the study examined student achievement from the Fall diagnostic to the Winter diagnostic, a minimum of eight lessons was deemed to be a reasonable amount of Exact Path use.

The number of lessons completed by students in the Exact Path intervention group varied. No maximum number of lessons completed was set for inclusion into the intervention group. In kindergarten, only eight students met the definition for the Exact Path intervention group. Kindergarten, therefore, was excluded from the analyses. Although data were available for students in Grades 9 through 12, Exact Path usage was not sufficient among students at these grade levels to form intervention groups; only two students across Grades 9 through 12 met the intervention group definition. Grades 9 through 12 also were excluded from the analyses. More detail on the number of lessons completed by Exact Path intervention group students by grade level is provided in the Analysis and Results section below.

Comparison group students were those who had both Fall and Winter Exact Path diagnostic assessment scores and who completed zero lessons within the language arts subject area during the study period. This definition helps ensure that students in the comparison group were not using Exact Path as intended: to address weaknesses in their language arts achievement as identified by the diagnostic assessment. This definition of the comparison group also ensures that no students were included in both groups for the analyses. In other words, the study groups were mutually exclusive.

## **Outcomes**

Student achievement, both at baseline (fall) and follow-up (winter) was measured using Exact Path's diagnostic assessment. The language arts diagnostic is an adaptive assessment of varying length depending on student performance and assesses language arts achievement in two domains (Language and Writing). The diagnostic has an average of 48 items per grade level—with fewer items at Grade 1—and typically requires between 15 to 60 minutes to complete (Edmentum, 2017). Scores from the assessment are on a vertical scale that runs from kindergarten to high school. Scores are provided for the entire subject area and for each domain within the subject area. Internal reliabilities for the fall and winter administration of the diagnostic in language arts range from .79 to .95.

The diagnostic assessment meets the WWC standards for outcomes in terms of validity and reliability. Because the diagnostic assessment measures content aligned to national and state standards it is not over-aligned to the Exact Path intervention.

## **Baseline Equivalence**

In order to meet WWC standards with reservation for a QED, baseline equivalence must be established for the analytic samples of the intervention (Exact Path) and comparison groups. In addition, baseline equivalence needs to be established separately for each grade level included in the analyses. Finally, baseline equivalence must be established using a measure that meets WWC standards.

Baseline equivalence was established using the Exact Path Fall diagnostic scores. As described above in the Outcomes section, the Exact Path diagnostic assessment meets WWC standards for baseline and outcome measures.

To establish the study groups, students were first identified who met the definitions of the intervention and comparison groups described above. Once these samples were identified, descriptive statistics on the baseline measure (Fall diagnostic scores) were produced for each group by grade level (see Appendix A, Table A.1). Using these descriptive statistics, each grade level was checked for baseline equivalence of the originally identified samples using the WWC threshold for baseline equivalence (i.e.,  $\leq 0.25$  standard deviation) and the WWC method for calculating baseline differences (WWC, 2017).

Only the samples for Grades 1 and 3 were below the necessary threshold for baseline equivalence using the original sample. Propensity score matching was used to match intervention and comparison students in all the other grades. The logistic regression propensity score model used the fall language arts diagnostic score as the matching variable, and nearest neighbor matching was conducted. Where possible, one-to-many matching was conducted to increase the sample size of the comparison group. The sample for Grade 6 used 1-to-2 matching, and Grades 7 and 8 used 1-to-3 matching. The matching resulted in the baseline equivalence for all grade levels (Appendix A, Table A.2).

## Analyses and Results

Data were first analyzed to show the number of lessons completed by the students in the Exact Path intervention group for each grade level (Appendix B). These data are for the samples of students included in the impact analyses described below. Between 60-75% of students completed 8 to 12 lessons. Typically, less than 10% of student completed 21 lessons or more, except for Grade 1 where approximately 15% of students in the intervention group completed 21 or more lessons.

Next, data were analyzed to estimate differences between intervention and comparison groups on the outcome (i.e., Winter diagnostic score). Impact analyses were conducted using the following linear regression model fit to the data separately for each grade level.

$$Y_i = \beta_0 + \beta_1(\text{TREAT})_i + \beta_2(\text{BASE})_i + e_i$$

Where:  $Y_i$  is student  $i$ 's Winter language arts diagnostic score.  $\beta_0$  is the regression adjusted comparison group mean.  $\beta_1$  is the adjusted mean difference between the intervention and comparison groups, and TREAT represents the group status of student  $i$  coded as 0 = comparison and 1 = intervention.  $\beta_2$  is the regression slope for the baseline (fall) diagnostic score. BASE is student  $i$ 's baseline diagnostic score in language arts, and  $e_i$  is the residual for student  $i$ .

Impact analyses yielded statistically significant positive impacts for all grade levels in language arts except Grade 7 (Table 1). Detailed output from the regression analyses are provided in Appendix D. For the grade levels with statistically significant impacts, adjusted mean differences between the intervention and comparison groups ranged from 11.67 for Grade 5 to 25.82 for Grade 1. These differences translate into effect sizes ranging from 0.09 for Grade 5 to 0.29 for Grade 1.

In addition to translating the impacts of Exact Path into effect sizes, the improvement index is another useful method to aid in the interpretation of the practical importance of impacts. The improvement index represents the difference in percentile rank at the mean (i.e., the 50th percentile) between the intervention group and the comparison group (WWC, 2017). The improvement index shows the expected change in percentile rank for an average comparison student if he or she had received the intervention.

Percentile improvements for Exact Path usage in language arts ranged from 3.98 for Grade 5 to 11.41 for Grade 1. Most improvement indexes were greater than 5. An improvement index of 11.41 is equivalent to a comparison student improving from the 50<sup>th</sup> percentile to better than the 61<sup>st</sup> percentile.

**Table 1. Impacts on Language Arts.**

	N	Mean	SD	Adjusted Mean Difference (SE)	Pooled Standard Deviation	Effect Size	Improve Index
<b>Grade 1</b>							
Comparison	761	793.44	87.44	25.82***	87.82	0.29	11.41
Intervention	143	819.26	89.82	(6.85)			
<b>Grade 2</b>							
Comparison	384	860.66	84.82	22.83***	88.08	0.26	10.64
Intervention	384	883.49	91.22	(4.78)			
<b>Grade 3</b>							
Comparison	650	914.05	114.65	19.45***	110.53	0.18	7.14
Intervention	616	933.50	106.02	(4.07)			
<b>Grade 4</b>							
Comparison	579	973.07	127.06	14.74**	122.27	0.12	4.78
Intervention	579	987.82	117.30	(4.52)			
<b>Grade 5</b>							
Comparison	533	993.10	132.55	11.67*	126.77	0.09	3.98
Intervention	533	1004.77	120.71	(4.79)			
<b>Grade 6</b>							
Comparison	718	1013.71	120.07	22.18***	120.22	0.18	7.53
Intervention	359	1035.90	120.50	(5.21)			
<b>Grade 7</b>							
Comparison	495	1020.56	129.45	4.22	134.08	0.03	1.60
Intervention	165	1024.77	147.15	(7.97)			
<b>Grade 8</b>							
Comparison	540	1044.69	129.52	23.56**	133.50	0.18	7.14
Intervention	180	1068.25	144.84	(7.99)			

SE = Standard error

Improve Index = Improvement index

\* =  $p$ -value < .05

\*\* =  $p$ -value < .01

\*\*\* =  $p$ -value < .001

## Summary

This study was conducted at the level of rigor needed to meet WWC standards with reservations (WWC, 2017). Baseline equivalence was established between the Exact Path intervention group and the comparison group, using propensity score matching for some grade levels. The measure used to establish baseline equivalence and as the achievement outcome meet WWC standards for validity and reliability. The baseline and outcome measures are aligned to national and state academic content standards and so are not over-aligned to the Exact Path intervention. The study had no confounds.

The study also meets criteria set forth by the Every Students Succeeds Act (U.S. Department of Education, 2016). The Department of Education considers a quasi-experimental study to be “well-designed and well-implemented” if it receives a *Meets WWC Design Standards with Reservations* rating or is of equal quality (U.S. Department of Education, 2016). The study also meets the ESSA criteria for statistically significant positive effects. These two aspects of the study mean it qualifies as providing *Moderate Evidence* (Level 2) of Exact Path’s effectiveness.

Exact Path had a statistically significant impact on student language arts achievement at every grade level analyzed except Grade 7. These impacts occurred between the fall and winter administrations of the diagnostic assessment. Students who met the definition for the Exact Path intervention—completion of at least eight lessons between the Fall and Winter diagnostic assessments—showed greater gains in language arts achievement than students who completed zero Exact Path lessons. Additional lesson completion over the entire school year would likely result in a greater impact on student language arts achievement.

The results of this study suggest that students who use Exact Path and complete lessons on the learning progression assigned to them by Exact Path will make gains in achievement relative to students who do not complete any lessons. The statistically significant gains made by students in the Exact Path intervention group over those students in the comparison group also suggest that Exact Path lessons are targeting skills students need to develop in order to improve their achievement. Had Exact Path targeted skills students already had mastered, it is likely students would not have seen the same gains in achievement between administrations of the diagnostic assessment. These results suggest a practical impact and importance of Exact Path usage and completion of at least eight lessons.

The data on lesson completion in Appendix B show that most students in the Exact Path intervention group completed between 8 to 12 lessons. Only around 10% of intervention students completed 21 or more lessons. As prior research has shown, Exact Path usage is positively correlated with achievement as measured by the diagnostic assessment (Edmentum, 2018). Although not addressed in this study, an increase in the number of Exact Path lessons completed likely results in increases in scores on the diagnostic assessment.

## Limitations

This study is not without limitations. This study used a focused definition for the intervention group: students who had completed at least eight lessons on the Exact Path learning progression. But Exact Path is much more than lessons, and Exact Path usage involves much more than lesson completion. Once placed on the learning progression, Exact Path provides students with a variety of resources to support their learning. These resources include practice tasks, mastery quizzes, progress checks, worksheets, videos, etc. Although the students included in the Exact Path intervention group for this



study likely used these resources, this study did not estimate the impact of using these resources on student language arts achievement.

This study used a design sufficient to meet WWC standards with reservations. The Exact Path intervention students and comparison students were equivalent at baseline (Fall diagnostic administration) on language arts achievement. Students' fall language arts scores were used as a statistical adjustment for estimating impacts on winter language arts achievement. No other student characteristics, however, were included in the study. The lack of student demographic characteristics limits the generalizability of the study results. It is unclear from this study what types of student were included in the intervention group or if students of differing backgrounds experienced differing impacts from Exact Path usage.

This study assigned students to the intervention and comparison groups. Exact Path usage typically differs by students, so using students as the unit of assignment is appropriate. Exact Path, however, also has many resources available to teachers and is designed to supplement and be integrated into regular classroom instruction. Teachers can use Exact Path to assign students lessons in areas of need, group students by ability—even by domains within a subject area—for focused instruction, and view multiple reports on student progress and achievement. All of these Exact Path teacher and classroom resources are likely to affect classroom practice and instruction, and therefore likely to affect student achievement. This study, however, was unable to estimate the impacts of teacher use of Exact Path on classroom level student achievement.

This study used a rigorous quasi-experimental design (QED) that is acceptable to meet WWC standards with reservations. Along with the statistically significant positive impacts, this study meets ESSA Level 2 standards. That said, the study was unable to control for student characteristics other than baseline (fall) achievement. It is possible that other student or classroom characteristics are responsible for the difference in achievement between the Exact Path intervention and comparison groups.

This study is also limited by the lack of any implementation fidelity data. Other than the completion of eight or more lessons, no information on Exact Path usage was included in this study. Although statistically significant positive impacts on student achievement were found with the completion of eight or more lessons, this study was unable to estimate the impact of any other aspects of student usage of Exact Path.

### **Further Research**

This study provides a rigorous estimate of the impact of student completion of Exact Path lessons on student achievement in language arts. Additional research is needed to understand how other aspects of Exact Path usage impact student achievement. Future research also should consider addressing the limitations of this study. In addition to including student demographic characteristics as part of future analyses, further research should examine other aspects of student usage and how they might impact student achievement. These could include student use of worksheets, additional lessons, practice tasks, and videos.

Perhaps the greatest opportunity for better understanding the impacts of Exact Path usage are at the classroom level. Exact Path provides many resources to support classroom instruction, yet the current study did not examine the impact of any of these. This means Exact Path's full impact might be underestimated in this study. A study at the classroom level would likely provide a much more complete

estimate of the impact of Exact Path usage on student achievement. Any study conducted at the classroom level also should use demographic data on classrooms and schools included in the study.

Although the baseline and outcome measures used in this study meet WWC standards, a future study that examines the impact of Exact Path on broader and policy relevant outcomes would provide potential users with important information as they consider which educational intervention to adopt and as they prepare their students for high-stakes testing and, more importantly, college and career.

A truly unbiased estimate of Exact Path's impact can only be provided by a random controlled trial (RCT). In this type of study, students or classrooms are randomly assigned to either use Exact Path or conduct business as usual, creating two groups that are equivalent in expectation on all characteristics, known and unknown. This equivalence means any difference in achievement between the study groups can be attributed to Exact Path usage. A well-conducted RCT eliminates the possibility that differences between intervention and comparison groups on outcomes are caused by differences in characteristics rather than the intervention itself, a limitation of the present study.

Finally, studies of an intervention's impact are best conducted in parallel with studies of implementation fidelity. Findings from the two types of studies complement each other and aid in the interpretation of results. Studies of implementation fidelity inform the impact research by aiding in the definition of intervention groups and communicating to the research audience what level of usage resulted in the impacts. Studies of impact inform implementation research by estimating impacts at different levels of implementation and helping to focus on how much usage is needed to produce statistically significant and meaningful increases in student achievement.

## References

- Edmentum. (2017). Edmentum Exact Path – Research Base for Reading and Language Arts: Growth through Adaptive Assessments and Learning Paths. Minneapolis: Author.
- Edmentum. (2018). Research Report: Examination of Exact Path Use and Variables Impacting Diagnostic Scores. Minneapolis: Author.
- U.S. Department of Education, Office of Elementary and Secondary Education. (2016, September). Non-Regulatory Guidance: Using Evidence to Strengthen Education Investments. Retrieved from <https://www2.ed.gov/policy/elsec/leg/essa/guidanceuseinvestment.pdf>.
- What Works Clearinghouse, Institute of Education Sciences, U.S. Department of Education. (2017, October). What Works Clearinghouse: Standards Handbook (Version 4.0). Retrieved from <http://whatworks.ed.gov>.

**Appendix A**  
**Baseline Equivalence**

**Table A.1. Baseline Equivalence in Language Arts for Original Samples by Grade Level.**

Grade Level	N	Mean	SD	Difference	Pooled Standard Deviation	Effect Size
<b>Grade 1</b>						
Comparison	761	772.48	81.97	5.68	80.60	0.07
Intervention	143	778.15	72.83			
<b>Grade 2</b>						
Comparison	510	816.24	83.57	23.84	80.78	0.29
Intervention	384	840.08	76.93			
<b>Grade 3</b>						
Comparison	650	889.19	110.85	5.27	103.18	0.05
Intervention	616	894.46	94.41			
<b>Grade 4</b>						
Comparison	629	967.69	130.34	-33.49	121.24	-0.28
Intervention	579	934.20	110.49			
<b>Grade 5</b>						
Comparison	935	1016.65	138.54	-45.76	133.42	-0.34
Intervention	533	970.88	123.92			
<b>Grade 6</b>						
Comparison	1368	1060.34	124.66	-80.61	125.48	-0.64
Intervention	359	979.73	128.56			
<b>Grade 7</b>						
Comparison	1102	1075.41	122.48	-90.92	124.91	-0.73
Intervention	165	984.50	140.15			
<b>Grade 8</b>						
Comparison	1132	1110.04	112.05	-87.18	115.75	-0.75
Intervention	180	1022.81	136.84			

**Table A.2. Baseline Equivalence in Language Arts for Matched (Final) Samples by Grade Level.**

Grade Level	N	Mean	SD	Difference	Pooled Standard Deviation	Effect Size
<b>Grade 1</b>						
Comparison	761	772.48	81.97	5.68	80.60	0.07
Intervention	143	778.15	72.83			
<b>Grade 2</b>						
Comparison	384	839.60	76.07	0.48	76.50	0.01
Intervention	384	840.08	76.93			
<b>Grade 3</b>						
Comparison	650	889.19	110.85	5.27	103.18	0.05
Intervention	616	894.46	94.41			
<b>Grade 4</b>						
Comparison	579	949.38	119.01	-15.18	114.83	-0.13
Intervention	579	934.20	110.49			
<b>Grade 5</b>						
Comparison	533	966.93	128.01	3.95	125.98	0.03
Intervention	533	970.88	123.92			
<b>Grade 6</b>						
Comparison	718	988.63	120.78	-8.90	123.43	-0.07
Intervention	359	979.73	128.56			
<b>Grade 7</b>						
Comparison	495	998.32	127.60	-13.82	130.84	-0.11
Intervention	165	984.50	140.15			
<b>Grade 8</b>						
Comparison	540	1041.00	114.72	-18.19	120.62	-0.15
Intervention	180	1022.81	136.84			

Note. Grade 1 and Grade 3 did not require propensity score matching. These two grades used the originally identified samples.

**Appendix B**  
**Exact Path Lessons Completed**

**Table B.1. Number of Students in the Intervention Group Completing Language Arts Lessons by Grade Level.**

Lessons completed	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
8 lessons	29	79	121	129	119	97	44	59
9 lessons	26	47	80	83	85	50	25	28
10 lessons	15	38	82	68	45	42	19	27
11 lessons	12	42	51	46	33	27	14	14
12 lessons	7	24	46	49	38	21	13	7
13 lessons	5	23	39	34	27	22	10	9
14 lessons	6	13	33	32	31	13	3	7
15 lessons	7	16	30	29	22	8	2	6
16 lessons	3	15	20	22	25	13	2	3
17 lessons	5	15	21	12	17	6	4	3
18 lessons	4	15	21	14	19	11	8	2
19 lessons	2	13	17	5	11	11	4	1
20 lessons	1	14	10	5	15	5	2	2
21 or more lessons	21	30	45	51	46	33	15	12
Total	143	384	616	579	533	359	165	180

**Appendix C**  
**Regression Analysis Output**

**Table C.1. Grade 1 Estimates of Regression Coefficients**

Parameter	Coefficient	Std. Error	<i>t</i> value	<i>p</i> -value	95% Conf. Int.	
Exact Path	25.8171	6.8518	3.77	0.000	12.3697	39.2645
Fall diagnostic	0.5645	0.0310	18.18	0.000	0.5036	0.6255
Intercept	357.3508	24.1375	14.80	0.000	309.9786	404.7230

Std. Error = standard error

95% Conf. Int. = 95% confidence interval

**Table C.2. Grade 2 Estimates of Regression Coefficients**

Parameter	Coefficient	Std. Error	<i>t</i> value	<i>p</i> -value	95% Conf. Int.	
Exact Path	22.8286	4.7849	4.77	0.000	13.4354	32.2217
Fall diagnostic	0.7586	0.0313	24.23	0.000	0.6972	0.8201
Intercept	223.7002	26.5091	8.44	0.000	171.6610	275.7395

Std. Error = standard error

95% Conf. Int. = 95% confidence interval

**Table C.3. Grade 3 Estimates of Regression Coefficients**

Parameter	Coefficient	Std. Error	<i>t</i> value	<i>p</i> -value	95% Conf. Int.	
Exact Path	19.4503	4.0743	4.77	0.000	11.4571	27.4435
Fall diagnostic	0.8095	0.0197	40.99	0.000	0.7707	0.8482
Intercept	194.2910	17.7865	10.92	0.000	159.3966	229.1853

Std. Error = standard error

95% Conf. Int. = 95% confidence interval

**Table C.4. Grade 4 Estimates of Regression Coefficients**

Parameter	Coefficient	Std. Error	<i>t</i> value	<i>p</i> -value	95% Conf. Int.	
Exact Path	14.7427	4.5188	3.26	0.001	5.87676	23.60853
Fall diagnostic	0.8294	0.0196	42.21	0.000	0.79084	0.86794
Intercept	185.6657	18.9255	9.81	0.000	148.53350	222.79790

Std. Error = standard error

95% Conf. Int. = 95% confidence interval

**Table C.5. Grade 5 Estimates of Regression Coefficients**

Parameter	Coefficient	Std. Error	<i>t</i> value	<i>p</i> -value	95% Conf. Int.	
Exact Path	11.6673	4.7913	2.44	0.015	2.2658	21.0687
Fall diagnostic	0.7922	0.0190	41.63	0.000	0.7548	0.8295
Intercept	227.1090	18.7115	12.14	0.000	190.3934	263.8246

Std. Error = standard error

95% Conf. Int. = 95% confidence interval

**Table C.6. Grade 6 Estimates of Regression Coefficients**

Parameter	Coefficient	Std. Error	<i>t</i> value	<i>p</i> -value	95% Conf. Int.	
Exact Path	22.1833	5.2068	4.26	0.000	11.9667	32.3999
Fall diagnostic	0.7236	0.0199	36.37	0.000	0.6846	0.7626
Intercept	298.3235	19.8954	14.99	0.000	259.2853	337.3617

Std. Error = standard error

95% Conf. Int. = 95% confidence interval

**Table C.7. Grade 7 Estimates of Regression Coefficients**

Parameter	Coefficient	Std. Error	<i>t</i> value	<i>p</i> -value	95% Conf. Int.	
Exact Path	4.2159	7.9664	0.53	0.597	-11.4266	19.8585
Fall diagnostic	0.7701	0.0264	29.20	0.000	0.7183	0.8219
Intercept	251.7358	26.6311	9.45	0.000	199.4435	304.0281

Std. Error = standard error

95% Conf. Int. = 95% confidence interval

**Table C.8. Grade 8 Estimates of Regression Coefficients**

Parameter	Coefficient	Std. Error	<i>t</i> value	<i>p</i> -value	95% Conf. Int.	
Exact Path	23.5573	7.9941	2.95	0.003	7.8627	39.2518
Fall diagnostic	0.7972	0.0287	27.80	0.000	0.7409	0.8535
Intercept	214.8480	30.1184	7.13	0.000	155.7172	273.9789

Std. Error = standard error

95% Conf. Int. = 95% confidence interval