



# Exact Path Research Brief: Effectiveness Study

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## Executive Summary

This paper presents the results of a year-long study of Edmentum’s Exact Path learning platform from a nationwide field test of the K–6 beta product during the 2016–17 school year.

Results indicate that use of Edmentum’s Exact Path learning platform is positively associated with student achievement outcomes in math, reading, and language arts. **Statistically significant effects** were found linking **the amount of time spent on the Exact Path** learning platform and **end-of-year diagnostic scores**.

The evidence presented here for Exact Path meets the standards for “**promising evidence**” as an assessment and as an intervention, as laid out by ESSA (U.S. Department of Education, 2016).

## Field Test Sample

A national sample of 26 schools within 13 districts were recruited for the field test of the Exact Path assessments and learning paths. The districts were from California, Minnesota, Wisconsin, Idaho, Pennsylvania, New Jersey, Michigan, Florida, and Arizona. This sample consisted of 6,577 unique students in kindergarten through 6th grade who took diagnostic assessments across the 2016–17 academic year and who were placed in learning progressions in midyear.

The student count by grade is shown below:

Grade	Count
K	498
1	841
2	1,361
3	1,174
4	1,212
5	1,002
6	489

Each student could take up to three diagnostic tests within each subject area over the course of the school year. In total, students took 12,560 math, 13,846 reading, and 8,809 ELA diagnostic tests.

## ESSA Levels of Evidence

The study reported here achieves the requirements of “promising evidence,” as defined by the United States Department of Education (2016). Its framework issues the designation of

“promising evidence” to a “well-designed and well-implemented correlational study with statistical controls for selection bias” (p. 7).

This study is considered a well-designed study because it had a large sample of over 6,000 students taken from multiple schools and states across the United States. Usage of the Exact Path platform included training and professional development for teachers. Test scores were reviewed for person misfit or other signs of test invalidity.

The study is correlational because students were not broken into two groups of users and nonusers. All users of the platform were observed together with their growth scores, as well as other relevant variables. Positive correlations were found between time-on-task in the learning modules and end-of-year diagnostic scale scores.

Finally, the correlations between time-on-task and end-of-year scale scores were computed after first statistically controlling for other factors, including school, grade, baseline score (aptitude), and instruction. A rigorous effort was made to remove the effects of selection bias and other spurious influences.

Because these criteria were met, this finding reaches the threshold of “promising evidence.”

## Effectiveness of Exact Path Learning Modules

### Personalized Learning

Edmentum subscribes to the mastery learning model as its research framework for personalized learning. Many learning scientists recognize the Carroll model (Carroll, 1989) as one of the most influential theories for understanding learning outcomes in relation to concrete instructional variables. The Carroll model defines the key variables influencing student outcomes as aptitude, opportunity to learn, time on task, motivation, and auxiliary factors.

These factors are essential to personalized learning. The Carroll model maintains that aptitude, opportunity, time-on-task, and motivation are not equal in their effects, nor are they equally distributed in classrooms. Aptitude has a large influence on student achievement. But, instruction and interventions make a difference. In fact, a personalized learning philosophy is the evidence-based belief that, given sufficient time to work on lessons—the amount of time is inversely related to aptitude—most children can and do master course material. The variable “time-on-task” is therefore essential to personalized learning. One way to view the Carroll model is to display the causal variables of student achievement in a stacked effect model. When personalized learning is practiced to its fullest potential, the effect of time-on-task should increase, while the effect of aptitude should decrease.

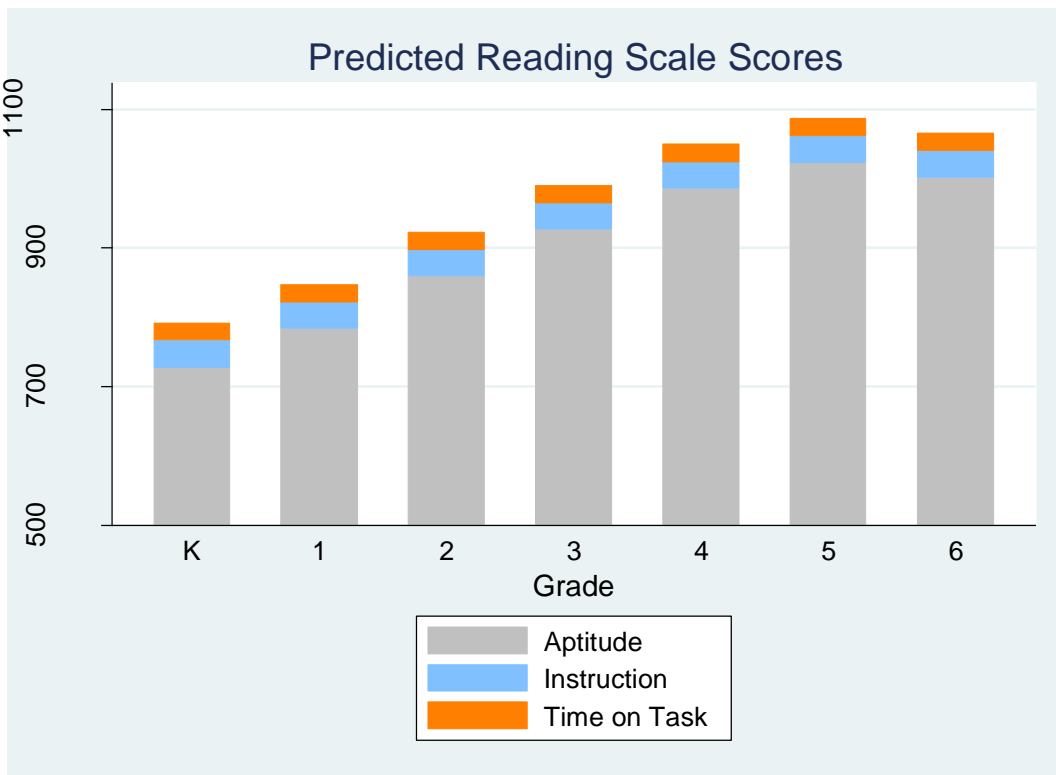
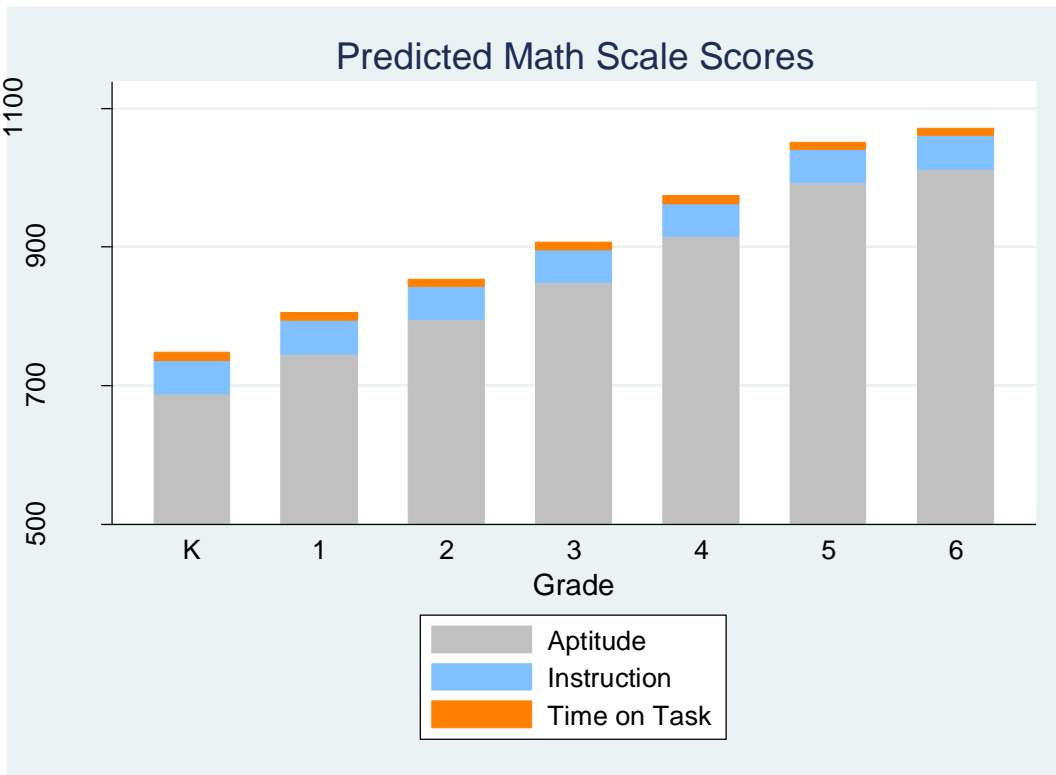
Until such a time as personalized learning is accessible to all classrooms, it is expected that time-on-task in specific interventions will improve student outcomes.

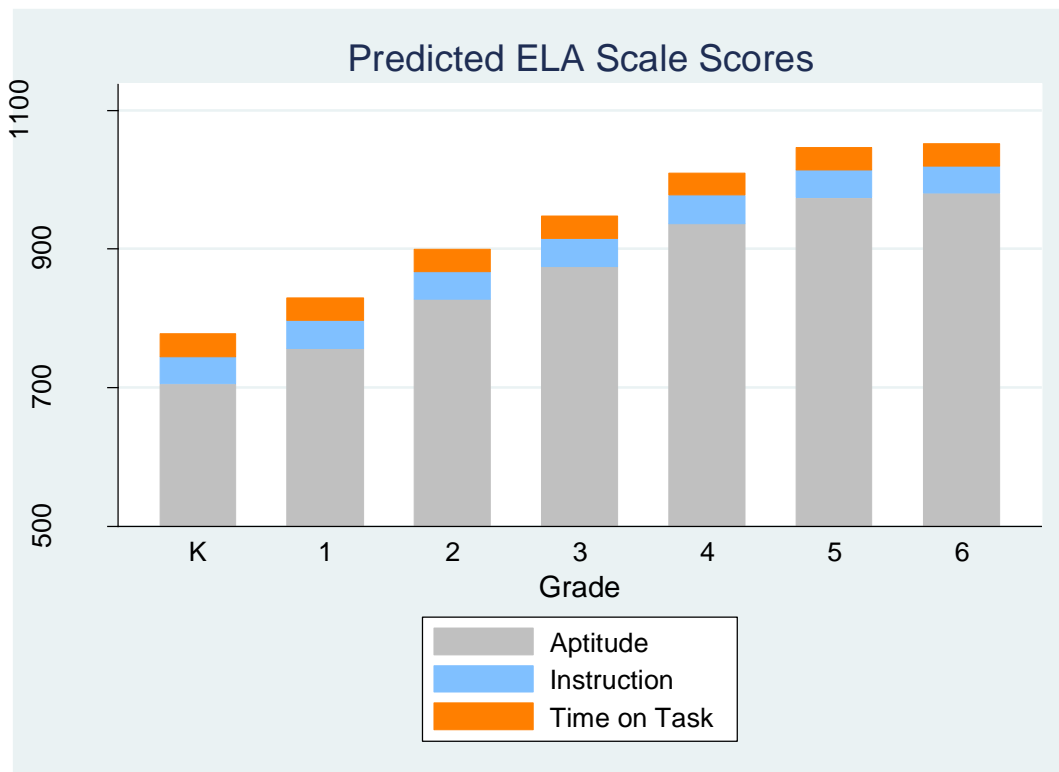
**Key factors that influence student achievement outcomes:**

<b>Time-on-Task</b>	<b>Time-on-task</b> is the amount of attention <i>and</i> effort the student puts into the learning activity being validated. In our case, it refers to the use of <b>Exact Path learning modules</b> .
<b>Instruction</b>	<b>Instruction</b> is the global impact of the instructional environment, which is typically measured by a window of time. At Edmentum, we define two instructional periods, the 12-week instruction window from fall to winter, and the 12-week instructional period from winter to spring.
<b>Aptitude</b>	<b>Aptitude</b> is the baseline, domain-general knowledge the student possesses at a given time. It is typically measured by a beginning-of-year score on a reputable achievement or skills test. Aptitude can be thought of as the default readiness of the student for learning, and it impacts the amount of time, opportunity, and effort the student will need to succeed. The lower the aptitude, or preparedness, the more time should be apportioned to the learning task. It includes surrounding factors like the historical opportunity to learn, working-memory capacity, long-term memory, and processing speed.

To test the effectiveness of Exact Path lessons, researchers at Edmentum used the operational student usage data to construct a mathematical model that mirrors the Carroll mastery model. The statistical technique used is called a hierarchical linear model (HLM); it isolates all the effects to sort out how to each variable influences the end-of-year achievement test scores. The color scheme from Carroll's model has been retained for ease of interpretation. In the following outcome figures, if a variable was found to be statistically significant, the color will appear stacked with the other effects. In addition, the size of the rectangle in each color indicates the comparative size of the effect.

All variables in the Carroll mastery model were found to be statistically significant, meaning that each variable was a significant predictor of end-of-year achievement outcomes. **Importantly, focused time spent on the Exact Path learning modules contributed significantly to student outcomes, as did teacher instruction.**





These figures display effect sizes, or score magnitudes, for each educational variable. Aptitude plays the largest role in student outcomes, followed by instruction, and specific interventions. In this study, aptitude is measured by the Period 1 Baseline (grey stack). This measure encompasses all the previous learning each child has accrued over life experience upon entering his or her current grade. The effect of instruction (blue stacks) represents the aggregated influence of the school environment, including direct instruction from teachers, influence from family and peers, homework, extracurricular activities, and so on. Finally, time-on-task refers to the minutes per session using the Exact Path learning modules (orange stack).

**Minutes per Session.** As shown in the figure above, the behavioral variable in the model was “minutes per session.” The graphs depict the specific case where students spend 10 minutes per session. This variable **is the average amount of time spent each instructional session over the student’s aggregate time using the learning modules.** A session is a discrete login and logout in an Exact Path learning module. Typically, students had around two sessions per week on the Exact Path learning platform.

Keep in mind that time-on-task for 10 minutes per session means that this rate of engagement is sustained **every week for the 12-week duration** of the study. This emphasis on persistence of effort resonates with a recent book by Duckworth (2016), wherein the author describes the development of mastery and expertise by means of the concept of grit, which incorporates persistence and passion in learning.

## Conclusion

Edmentum's Exact Path assessments and learning paths meet the standard of "promising evidence" as defined by the U.S. Department of Education (2016). The evidence presented here indicates that there is a positive, statistically significant correlation between usage of Edmentum's learning paths and student achievement.

## References

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