

ABCmouse Significantly Improves Student Outcomes in Pre-K and Kindergarten

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Abstract

School failure often begins in the early grades. Research establishes the importance of early reading and math skills in predicting both academic success¹ and grade retention.² In two studies, we examined the impact of ABCmouse.com *Early Learning Academy*, a comprehensive supplemental digital early learning resource, on the acquisition of literacy and math skills in a longitudinal study of prekindergarten and kindergarten students. In Study 1, all participating prekindergarten students were identified as at risk for school failure. Those students who completed more ABCmouse learning activities evidenced greater academic gains than those who completed fewer activities.

In Study 2, we followed the prekindergarten sample into kindergarten with a quasi-experimental design. Study 2 demonstrated that regular ABCmouse usage helped accelerate kindergarten growth in literacy and math across multiple assessments. Even students who began with a lower readiness level at kindergarten entry were able to catch up to their peers through regular usage of ABCmouse.

Results suggest that regular usage of ABCmouse across two grade levels helped students who had been identified as at risk for school failure to better prepare for

kindergarten and achieve greater growth in literacy and math during kindergarten.

Participants

Study 1 (2013–14) included 230 prekindergarten students (49% male, 51% female) from 12 classrooms in the public school district prekindergarten (DPK) program in Tupelo, Mississippi. Enrollment was prioritized for children whose pretest scores indicated a risk for school failure, as well as English language learners, children with developmental disabilities/delays, and/or children living in poverty or homelessness.

Study 2 (2014–15) included 571 kindergarten students; 210 were students from the DPK sample, and 361 students had not taken part in the district prekindergarten program (non-DPK). Four elementary schools (33 classrooms) participated, with eight or nine kindergarten classrooms of 12 to 20 students in each school.

Design & Procedure

Study 1 had a naturalistic design in which DPK students had varying usage of ABCmouse during the school year. The school district tested students at the beginning and end of the school year with the nationally validated Early Prevention of School Failure (EPSF) assessment.³

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¹ Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., et al. (2007). School readiness and later achievement. *Developmental Psychology*, 43, 1428–1446. doi: 10.1037/0012-1649.43.6.1428

² Davoudzadeh, P., McTernan, M. L., & Grimm, K. J. (2015). Early school readiness predictors of grade retention from kindergarten through eighth grade: A multilevel discrete-time survival analysis approach. *Early Childhood Research Quarterly*, 32, 183–192. doi: 10.1016/j.ecresq.2015.04.005

³ Zeh, J. D., & Baenen, N. R. (1991). *Early Prevention of School Failure: Evaluation Report*. NC: Wake County Public School System. Available: <http://files.eric.ed.gov/fulltext/ED351097.pdf>.

Study 2 used a quasi-experimental design, in which the district assigned two elementary schools full access to ABCmouse for the entire school year (Full-access Group). The other two schools in the district received restricted access to ABCmouse, including no access to most ABCmouse literacy activities for the first half of the year, and full access to the entire ABCmouse curriculum for the second half (Restricted-access Group). Teachers were provided training and instructed to use ABCmouse for at least 45 minutes per week with their students. The students accessed ABCmouse in various ways during the kindergarten year, including tablet carts, computer labs, and classroom computers and tablets. As a result of the research design, the Full-access Group not only had greater access to the full ABCmouse curriculum but also completed many more ABCmouse learning activities, especially literacy activities, than the Restricted-access Group. When the Restricted-access Group switched to

the full ABCmouse curriculum in the second half of the school year, the two groups completed similar numbers of learning activities. Therefore, “regular usage” refers to both the access type and higher usage levels of the Full-access Group, and “limited usage” refers to both the limited access and lower usage levels of the Restricted-access Group. Students were tested at the beginning, middle, and end of the school year with the Classworks⁴ and STAR⁵ assessments, and with the DIBELS⁶ at the end of the school year.

Results

The results from both studies demonstrate that ABCmouse helps accelerate academic growth, particularly literacy gains, in prekindergarten and kindergarten. The three main findings from these studies are summarized below.

Finding 1

In Study 1, the more ABCmouse learning activities a student completed, the greater his or her kindergarten readiness score at the end of prekindergarten, indicating a reduction in the level of risk for school failure.

Students who completed at least 35 activities (median activities completed) during prekindergarten demonstrated an additional 65% gain on the EPSF assessment than those who completed fewer than 35 activities, and there was no statistically significant difference in the students’ pretest scores administered before the prekindergarten year (Figure 1).

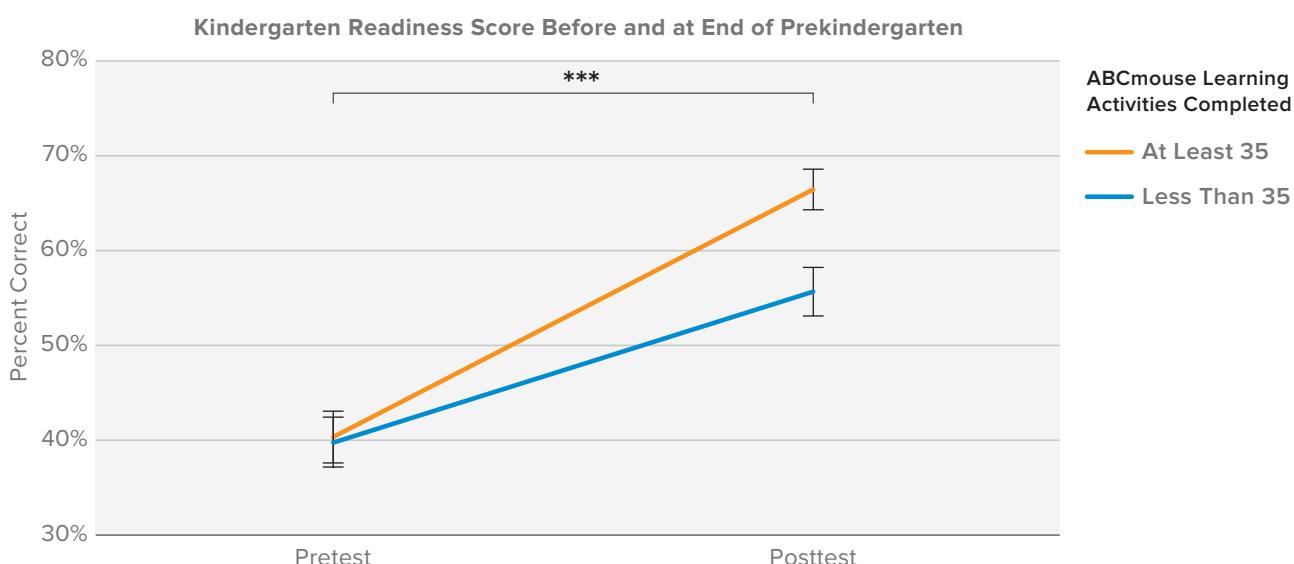


Figure 1. Mean Pre- and Posttest EPSF scores, grouped by the number of ABCmouse learning activities completed. Error bars represent ± 1 standard error. *** $t(202) = 3.39$ on gain scores, $p < .001$, effect size $d = .47$.

⁴ Classworks Reading and Classworks Math, Curriculum Advantage, Inc.

⁵ STAR Math and STAR Reading, Renaissance Learning, Inc.

⁶ Good, R. H., & Kaminski, R. A. (Eds.) (2007). *Dynamic Indicators of Basic Early Literacy Skills* (6th ed.). Eugene, OR: Institute for the Development of Educational Achievement. Available: <http://dibels.uoregon.edu/>.

Finding 2

In Study 2, regular ABCmouse usage in kindergarten predicted students' learning gains in literacy and math skills.

While students in the Full-access Group started in Fall with slightly lower scores on the Classworks assessment than the Restricted-access Group, students in the Full-access Group demonstrated an additional 120% gain on early literacy skills from Fall to Winter, as compared to students in the Restricted-access Group (Figure 2).

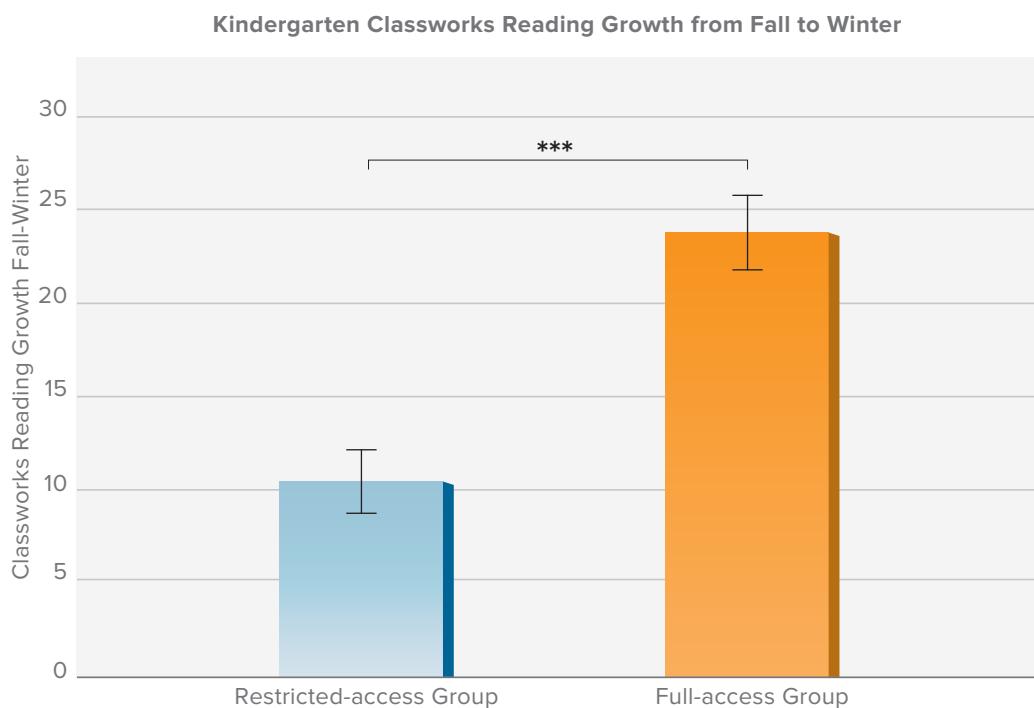


Figure 2. Mean Classworks Reading Growth from Fall to Winter by access group in kindergarten. Error bars represent ± 1 standard error.

*** $t(531) = 7.66, p < .001$, effect size $d = .66$. The growth achieved by the Full-access Group was significantly higher than that of the Restricted-access Group when controlling for participation in the DPK program, $F(1,531) = 29.00, p < .001, \eta_p^2 = .05$.

Students in the Full-access Group also showed an additional 150% gain on early mathematics skills, compared to students in the Restricted-access Group (Figure 3). There was no group difference in Fall scores on early mathematics skills.

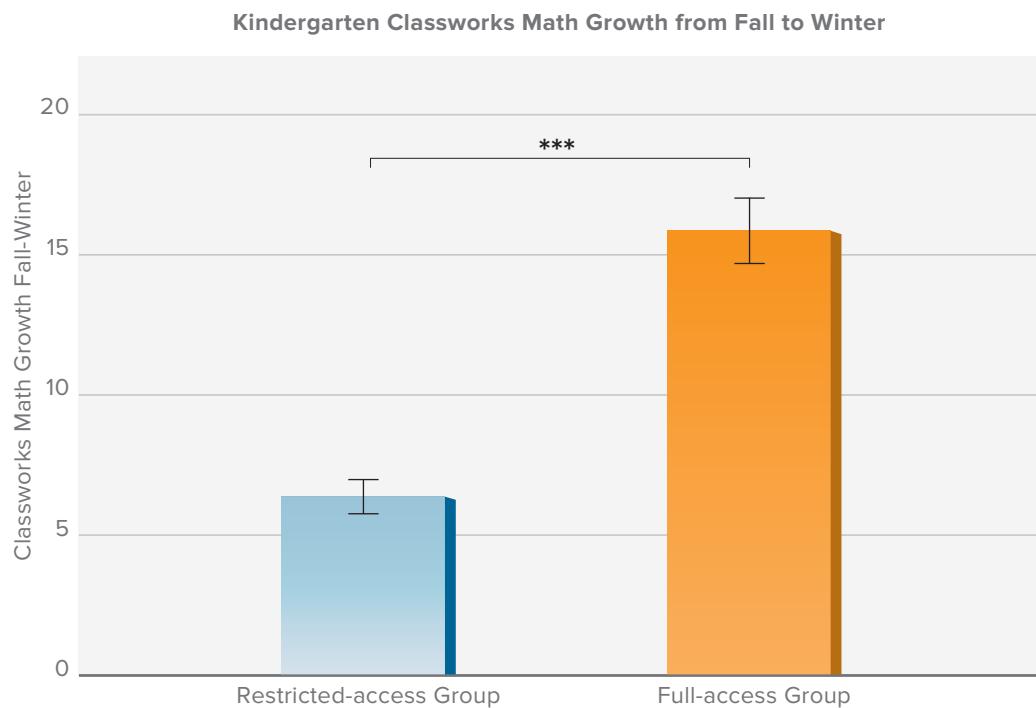


Figure 3. Mean Classworks Math Growth from Fall to Winter by access group in kindergarten. Error bars represent ± 1 standard error.
 $*** t(533) = 3.49, p < .001$, effect size $d = .30$. The growth achieved by the Full-access Group was significantly higher than that of the Restricted-access Group when controlling for participation in the DPK program, $F(1,530) = 59.64, p < .001, \eta_p^2 = .10$.

While students in the DPK program entered kindergarten at a higher readiness level on the STAR assessment in literacy and math than non-DPK students, with regular usage of the full ABCmouse curriculum in kindergarten (i.e., Full-access Group), non-DPK students were able to catch up with their DPK peers in both academic domains. Non-DPK students from both the Restricted-access Group and Full-access Group started out in Fall with significantly lower STAR Literacy scores than DPK students (p 's $< .001$, effect sizes were .45 for Restricted-access and .28 for Full-access), yet the non-DPK students with regular ABCmouse usage were able to close this gap and catch up to their DPK peers by Winter (p 's $> .10$ in Winter and Spring).⁷ The same patterns were seen with the STAR Early Numeracy scores (p 's $< .001$, and effect sizes were .48 for Restricted-access and .28 for Full-access in Fall; p 's $> .10$ in Winter and Spring).⁸

By Spring, non-DPK students with regular usage demonstrated higher growth on early reading and math on the Classworks than non-DPK students with limited usage (Figures 4 and 5; $p < .001, d = .42$ for Reading and $p < .05, d = .23$ for Math). For DPK students, Spring scores were as high or higher than non-DPK students' scores, but differences between DPK students' Spring scores based on participation in the Full-access Group versus the Restricted-access Group were not statistically significant.

⁷ In the Restricted-access Group, DPK students performed better than non-DPK students at all time points (p 's $< .001, d = .45$ to .55). In the Full-access Group, non-DPK students had lower scores than the DPK students in Fall ($p = .03, d = .28$), but not in Winter and Spring (p 's $> .10$)

⁸ In the Restricted-access Group, DPK students performed better than non-DPK students at all time points (p 's $< .001, d = .48$ to .55). In the Full-access Group, non-DPK students had lower scores than the DPK students in Fall ($p = .04, d = .28$), but not in Winter and Spring (p 's $> .10$).

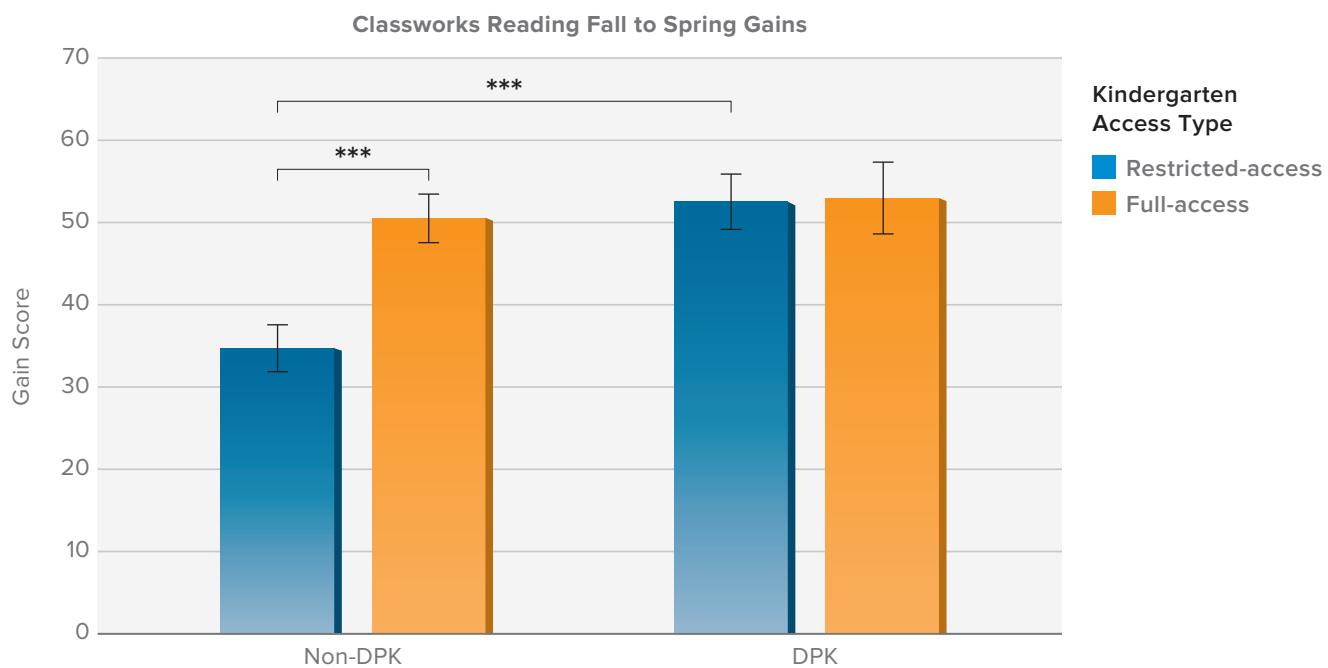


Figure 4. Classworks Reading score gain from Fall to Spring by participation in the DPK program and by ABCmouse access type. Error bars represent ± 1 standard error. ***Non-DPK: Full-access vs. Restricted-access, $t(326) = 3.82, p < .001$, effect size $d = .42$; ***Restricted-access: DPK vs. Non-DPK, $t(270) = 4.06, p < .001$, effect size $d = .50$.

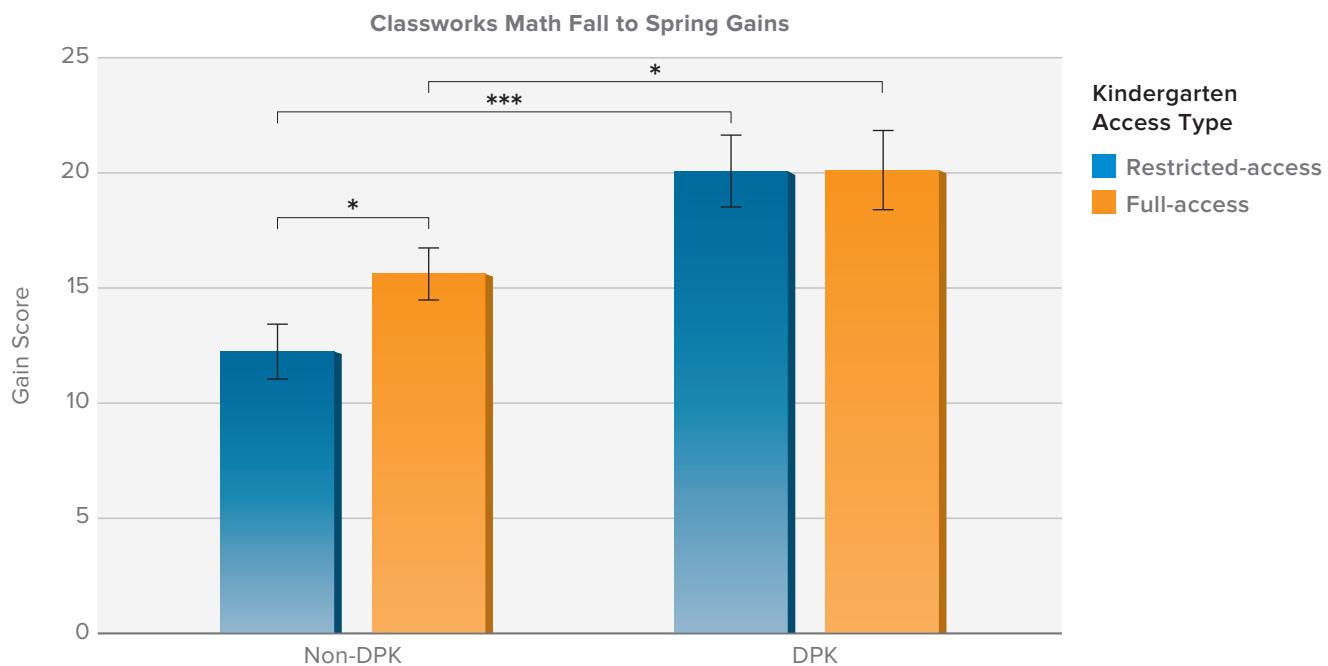


Figure 5. Classworks Math score gain from Fall to Spring by participation in the DPK program and by ABCmouse access type. Error bars represent ± 1 standard error. *Non-DPK: Full-access vs. Restricted-access, $t(327) = 2.04, p = .04$, effect size $d = .23$; ***Restricted-access: DPK vs. Non-DPK, $t(272) = 4.06, p < .001$, effect size $d = .49$; *Full-access: DPK vs. Non-DPK, $t(257) = 2.24, p = .03$, effect size $d = .30$.

Finding 3

The number of ABCmouse learning activities completed over both school years was a strong predictor of literacy and math outcomes.

ABCmouse usage over both school years reliably predicted students' literacy and math performance at the end of kindergarten, after controlling for the effects of age, DPK enrollment, and ABCmouse access type received in kindergarten.⁹

The multiple linear regression model on literacy outcomes predicts that for each 100 additional ABCmouse learning activities completed over both school years, students would realize an increase of .03 points on the DIBELS composite score, 9 points on the STAR Literacy, and 3 points on the Classworks Reading (Table 1). These are noteworthy increases, considering the range of total activities completed in both years was 0 to 5,784 activities (including repeats), and the ranges of Spring scores were -2.02 to 2.96 on DIBELS composite (z-scores), 127 to 1,655 on STAR Literacy, and 1,200 to 1,330 on Classworks Reading.

Literacy in Spring

Outcome	F	R ²	Predictors	B	Beta
DIBELS	10.22***	.08	Activities Completed***	.0003***	.19
			Age*	.21*	.11
			DPK Participation	-.02	-.22
			Access Type***	-.35***	-.23 ^a
STAR Literacy	8.05***	.06	Activities Completed***	.09***	.21
			Age	6.85	.02
			DPK Participation**	33.65**	.12
			Access Type	-9.56	-.03
Classworks Reading	14.12***	.10	Activities Completed***	.03***	.25
			Age*	8.29*	.09
			DPK Participation***	13.46***	.17
			Access Type	-.008	.00

Table 1. Multiple linear regression predicting each of Spring literacy and reading scores from total number of learning activities completed in prekindergarten and kindergarten, age, DPK participation, and access type.

Note. DPK was coded as 1 and non-DPK as 0; Restricted-access as 0, Full-access as 1.

Statistically significant predictors are marked as follows: *** = p < .001, ** = p < .01, * = p < .05.

⁹ English Language Learning status and disability information were not available for students in the kindergarten sample.

^a The finding that having full access is negatively correlated with Spring DIBELS and STAR Literacy scores may be related at least in part to the children in the Restricted-access Group having started in Fall of kindergarten with higher scores on the Classworks Reading than children in the Full-access Group.

Similarly, the multiple linear regression model on math outcomes predicts that for each 100 additional learning activities completed, students would realize a .8-point increase on the STAR Early Numeracy and a 1.2-point increase on the Classworks Math (Table 2). The range of STAR Early Numeracy in Spring was 20 to 99, and the range of Classworks Math scores in Spring was 1,200 to 1,270. In most cases, DPK participation was also a statistically significant and positive predictor of Spring scores in literacy and math.

Mathematics in Spring

Outcome	F	R ²	Predictors	B	Beta
STAR Early Numeracy	7.79***	.06	Activities Completed***	.008***	.20
			Age	.89	.03
			DPK Participation**	2.88**	.12
			Access Type	-.37	-.02
Classworks Math	16.74***	.11	Activities Completed***	.012***	.24
			Age**	4.53**	.12
			DPK Participation***	6.88***	.20
			Access Type	.03	.001

Table 2. Multiple linear regression predicting each of the Spring mathematics scores from total number of learning activities completed in prekindergarten and kindergarten, age, DPK participation, and access type.

Note. DPK was coded as 1 and non-DPK as 0; Restricted-access as 0, Full-access as 1.

Statistically significant predictors are marked as follows: *** = p < .001, ** = p < .01, * = p < .05.

Conclusion

This longitudinal study reveals that when young students complete more ABCmouse learning activities, their academic performance improves. The use of ABCmouse within the DPK program reduced the risk of school failure by the end of the prekindergarten year. This finding held constant during kindergarten. Furthermore, access to the full ABCmouse curriculum independently contributed to the academic growth of non-DPK students. The findings from these studies highlight the value of ABCmouse as a supplemental teaching resource in both prekindergarten and kindergarten, when students are learning the foundational skills in literacy and math that are essential to long-term success in school.