



The Mathseeds Effect: An Independent Effectiveness Study of Mathseeds on Kindergarteners



July 2016



Abstract

The purpose of this study is to explore the impact of Mathseeds on kindergarteners' learning of math skills. The study investigated the following question: Do students in classes that use Mathseeds show more improvement in math skills than comparable students who do not use Mathseeds?

The study used a mixed-method, quantitative and qualitative research design. First, using a pre-post, treatment-control design, the study compared the student math skills measured by the Stanford Achievement Test and a teacher observation assessment while controlling for initial math ability from the Stanford Achievement Test administration during the fall. Second, a qualitative study of teacher perceptions of Mathseeds' effectiveness using surveys and interviews was conducted.

The findings indicate that kindergarteners using Mathseeds showed more growth in mathematics skills than comparable students who did not use Mathseeds. Teachers found Mathseeds to be effective in improving student's math skills. The overall satisfaction rating for teachers was 8.9 out of 10 and for students was 9.2 out of 10. Teachers agreed strongly that Mathseeds was easy for students to use, engaging, helpful in teaching students, motivating, and contributing to students' confidence and to their attitude about math.

July 2016



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The Mathseeds Effect: An Independent Study of the Effectiveness of Mathseeds on Student Learning in Kindergarteners

Background and Purpose

During the 2015-2016 school year, SEG Measurement and MarketingWorks conducted a study of the effectiveness of Mathseeds use with students in kindergarten. The primary goal of this study was to determine the extent to which students who used Mathseeds learn more math skills than comparable students who did not use Mathseeds.

About Mathseeds

Mathseeds is an online math instructional product developed by Blake eLearning that teaches kids aged 3-8 the core math and problem solving skills needed to be successful at school with fun, highly interactive and rewarding lessons. Mathseeds combines highly structured lessons with fun motivational elements that keep children engaged and keen to learn. The key features of Mathseeds, according to the publisher, are:

- The program features a wide variety of lessons and activities that have been created by educational experts. Each lesson is carefully structured to build early mathematical skills.
- Once a lesson is complete, it can be repeated as many times as needed.
- Mathseeds provides parents with a simple “dashboard” to show each child’s mathematical progress.
- Children can progress at their own level.
- Each child can create their own avatar/online character.
- Golden Acorns rewards can be used to add items to the child’s online treehouse or avatar.
- Children love collecting the Pets – a new pet hatches at the end of every lesson.
- Children receive a certificate after successfully completing the quiz at the end of every map.



Mathseeds lessons

Study Design

Both quantitative and qualitative methods were used to understand the impact of Mathseeds use on student learning. The research team used a quasi-experimental study comparing students in kindergarten classes using Mathseeds (Treatment Group) and students in comparable classes without access to Mathseeds (Control Group). In August and September of 2015, all of the participating students took a pretest of math skills. In May of 2016, all of the students took a posttest of math skills and were evaluated by their teachers using an observational assessment that covered number sense, operations, measurement, and geometry.

Posttest performance on the math assessment was compared between the Treatment and Control Groups while controlling for any differences in initial math ability at the beginning of the school year.

Teachers using Mathseeds were surveyed throughout the study to collect information regarding their use of Mathseeds and their perceptions of its effectiveness.

Data Collection

Student mathematics skills were measured using the Stanford Achievement Test Series published by Pearson. Specifically, kindergarteners took the SESAT 1 Mathematics assessment for both the pre and post measure.

In August/September 2015, we conducted the pretest. Teachers in the Treatment and Control Group classes were provided with the pretests and instruction for administration. Teachers were asked to administer the pretests during a class period and to encourage the students to do their best. The teachers were provided with materials and instructions to return the materials to SEG Measurement for processing. SEG Measurement entered and validated the student assessment data collected from the pretest.

During the same timeframe as the pretest, the teachers completed an online survey prior to starting their instruction.

In May 2016, we conducted the posttest. The same procedures were followed for the posttest as for the pretest administration. In addition to the administration of the Stanford Assessments, we asked the teachers to complete an observational assessment of each student. The observational assessment asked the teachers to evaluate their students' skills in number sense, operations, measurement, and geometry. Each of those domains included 1–3 grade-level-specific skills that were rated on a scale of 1–5, with 1 indicating that the student was struggling with the skill and a 5 indicating that the student was performing well beyond the level of the skill.

After the conclusion of their math instruction, the teachers in the Treatment Group completed an online post survey regarding their instruction, their use of Mathseeds, and their evaluation of the effectiveness of Mathseeds.

Fidelity of use of Mathseeds was monitored through usage data collected in the program.

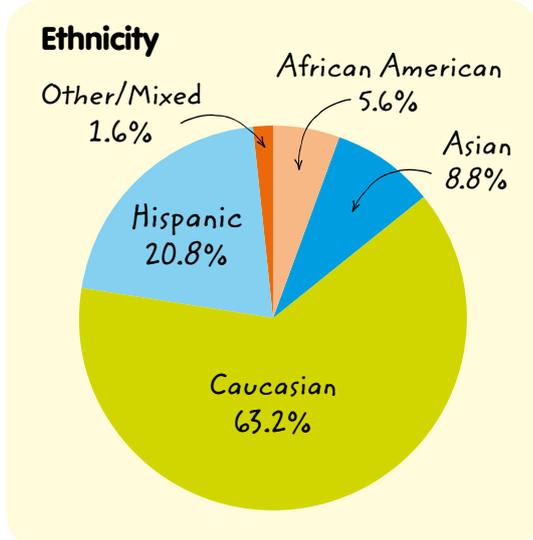
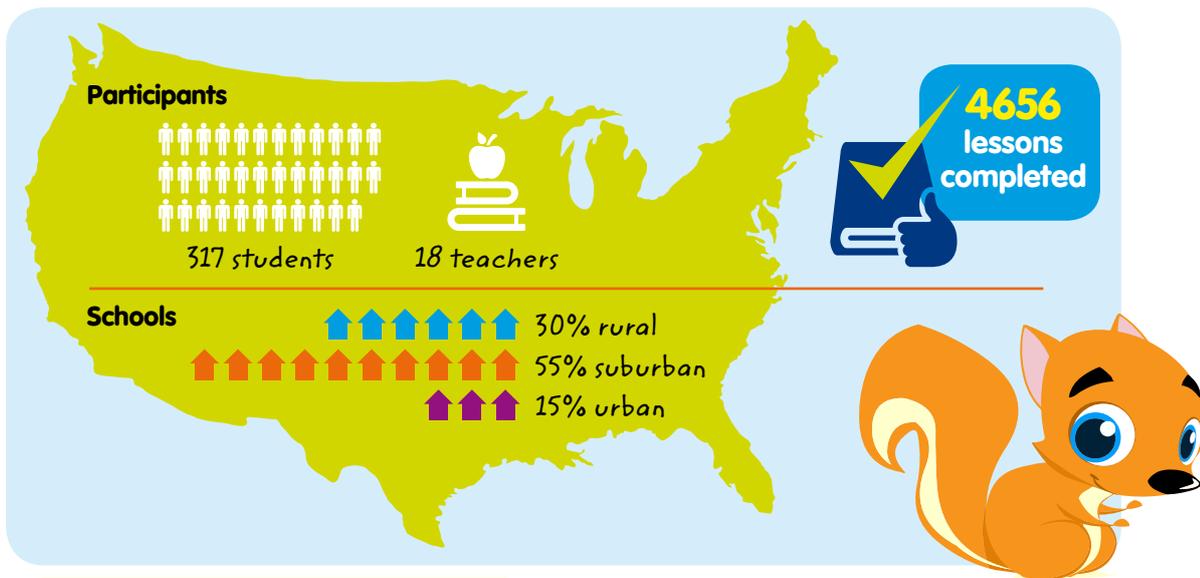


My kids are only five years old, and they are very engaged with Mathseeds—and that is saying a lot. It pulls them in and keeps them there. *Amy Watson, Aiken Elementary, Paris, TX*

Participants

A total of 18 teachers and over 300 students across six states participated in at least part of this study of Mathseeds effectiveness. Seven classes used Mathseeds (Treatment Group) and eleven classes did not use Mathseeds (Control Group). Students who took both the pretest in the Fall and the posttests in the Spring were included in the study. Classes who used Mathseeds with an average of at least 14 completed Mathseeds per student were included in the analyses as part of the Treatment Group. Classes that were assigned to the Control Group and reported not using Mathseeds were included in the Control Group for analyses.

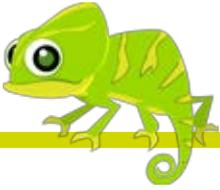
Three hundred seventeen kindergarten students had pre and post data and met the qualifications for their respective Treatment or Control Group. The Treatment Group consisted of 125 students and the Control Group consisted of 192 students. The profiles of the students and schools in each group are provided in **Table 1** and **Table 2**.



Seven Treatment Group and eleven Control Group teachers met the criteria to be included in the quantitative analyses. Treatment Group teachers needed to have students that completed both pre and post assessments and that had an average usage of at least 14 Mathseeds completed during the school year. The profile of the teachers with classes of kindergarteners participating in the study is summarized in **Table 3**.

I LOVED MATHSEEDS!!! Just like Reading Eggs, this is a fun and educational program that is productive. It's a great program. I like that the kids are learning while they think they are playing games. They are challenged, and I can see improvements in my students. Thank you for taking the time to create it and test it. I saw great results from my students from the pretest to the posttest.

Mary Benner, Shell Knob School, Shell Knob, MO



Quantitative Results

When comparing outcomes, it is critical to establish initial comparability of the groups being compared. The starting math ability (as measured by the Stanford 10 SESAT 1 in August/September 2015) of the Treatment (Mean=455) and Control (Mean=453) classes was confirmed to be comparable ($F=.088$, $p=.767$). These means were similar to the publisher's reported mathematics mean score for kindergarteners in the fall (Mean=460).

Kindergarten students using Mathseeds showed greater improvement in a composite of mathematics skills than the comparable group of students who did not use Mathseeds, when comparing student pretest performance to the end-of-year assessment of student math skills. The comparison was first conducted for a composite of the SESAT posttest score and all the math domains measured in the observational assessment using MANCOVA. There was a statistically significant difference found between Treatment and Control (Pillai's trace, $F=13.02$, $p<.01$). Further examination of the individual domains found that the difference in Treatment and Control Group performance was found in every score included in the composite. These results are summarized in **Tables 4 and 5**.

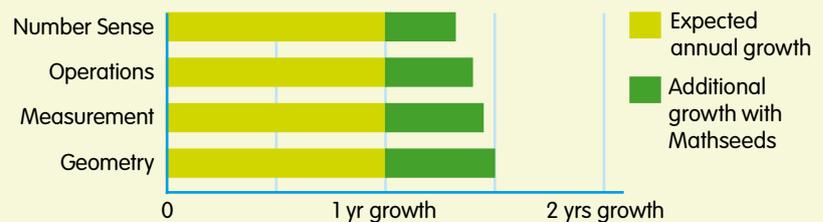
For reference, according to the publisher of the SESAT 1, the average Mathematics score for a representative sample of Kindergarteners in the spring is 491.9.

The effect sizes for these differences found in performance between the Treatment Group and Control Group range from .42 to .66 standard deviations and the associated percentile gains range from 16 to 25, as shown in **Table 6**. Students in kindergarten who used Mathseeds outperformed the comparable classes that did not use Mathseeds on every measure.

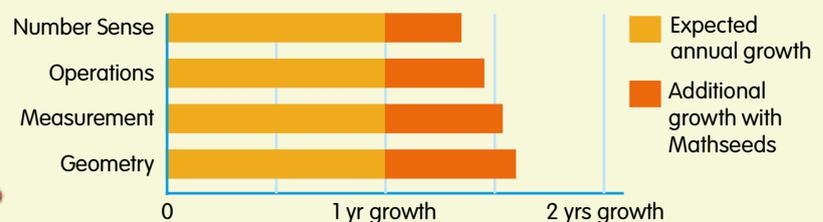
Effect Sizes		
Measure	Effect Size	Percentile Gain
SESAT 1	0.48	18
Number Sense	0.42	16
Operations	0.55	21
Measurement	0.58	22
Geometry	0.66	25

As a result teachers can expect

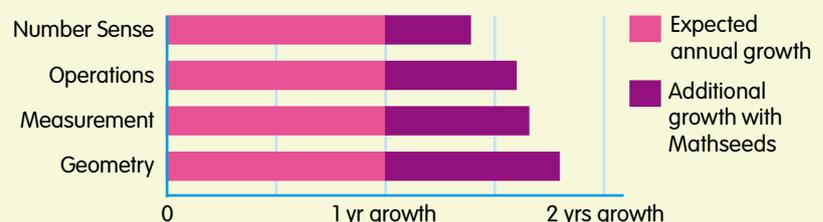
Children in the Bottom 10th Percentile



Children in the Bottom 25th Percentile



Children in the Bottom 50th Percentile



I'm very happy with what I see. I like that Mathseeds follows the Common Core and that it's very interactive. Kids love when it's their turn on Mathseeds. *Deb Freed, Northwest Elementary, Lincoln, IL*

Qualitative Results

During October 2015, 10 Kindergarten Treatment Group teachers participating in the Mathseeds efficacy research were individually interviewed by telephone about their use of Mathseeds and their opinions about it. In November, these same teachers completed an online survey about their use of Mathseeds; and in May 2016 they completed a concluding survey about their yearlong experiences. The qualitative results from these interviews and surveys are described below.

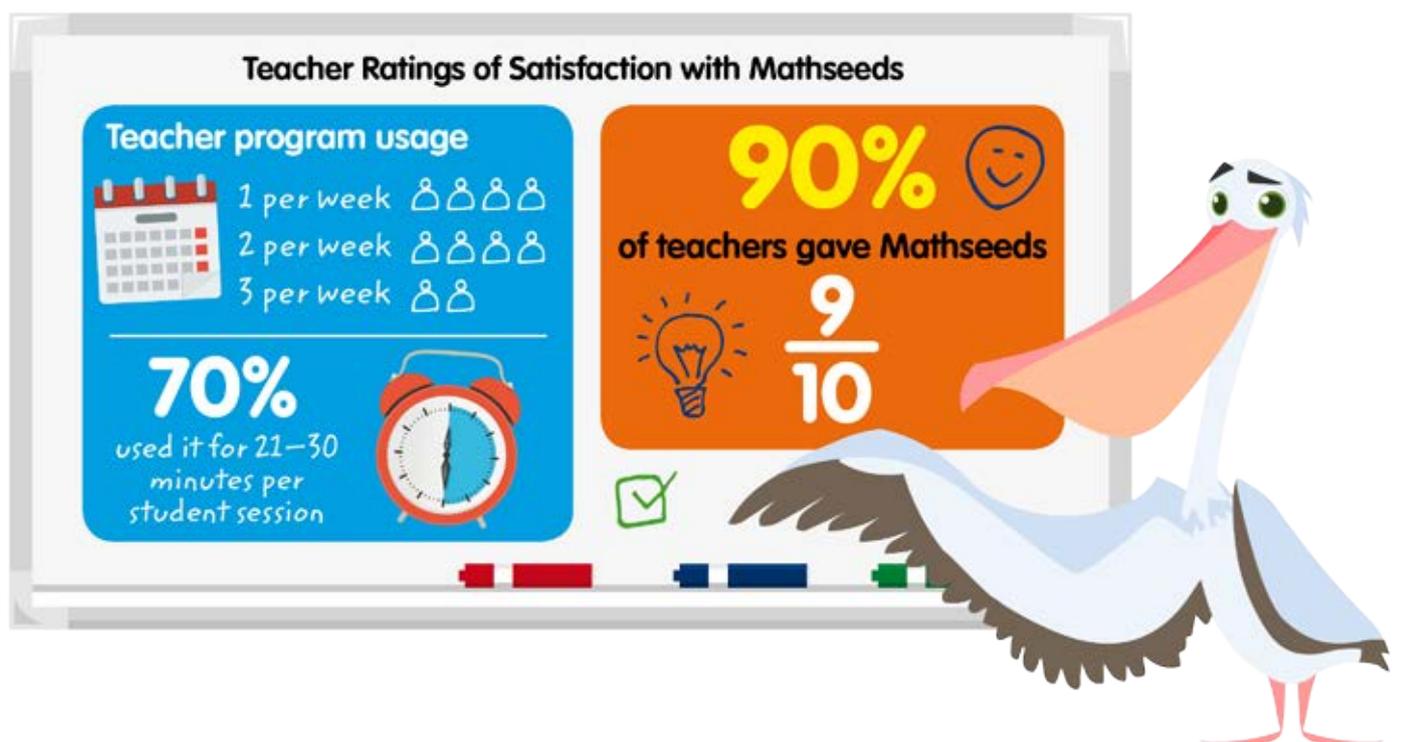
Usage

The Treatment teachers reported consistency in their usage of Mathseeds across the entire school year in the online surveys they completed in November and May. Eight teachers reported using the program either once (4) or twice a week (4), with two reporting usage more than three times a week. Most (7 out of 10) used it for 21–30 minutes per student session (with two teachers using it for less than 20 minutes per session and one for more than 30 minutes).

Almost all teachers reported that students used Mathseeds on their own (either entirely or after a whole-class session). About one-quarter sometimes used Mathseeds with just the teacher leading a whole class or with small groups of students working together. Only three or four teachers said they were assigning Mathseeds as homework consistently throughout the year.

Satisfaction with Mathseeds

Reflecting the strong ratings seen above, all teachers said they would be extremely likely (6 teachers) or very likely (4 teachers) to recommend Mathseeds to other teachers in their school or other schools who teach Kindergarten. And all said they would be extremely likely (9 teachers) or very likely (1 teacher) to use Mathseeds next year if they are teaching Kindergarten.



In the end-of-year survey, instructors reported that satisfaction among students was exceptionally high, with Kindergarten teachers rating students' satisfaction with Mathseeds an average of 9.2 on a ten-point scale. All teachers rated student satisfaction as an 8, 9, 10 on a 10-point scale.

Mathseeds is one of their choices for free time, and they often choose it. It is student friendly; while playing they are learning.

Mary Benner, Shell Knob School, Shell Knob, MO

I like Mathseeds a lot. It is pretty easy for the kids to maneuver. It is colorful and entertaining along with academic. They always are happy to have their turn at Mathseeds. I see the children excited about using it.

Deb Freed, Northwest Elementary, Lincoln, IL

Many times students were able to relate to my math lessons because of what they were doing in Mathseeds.

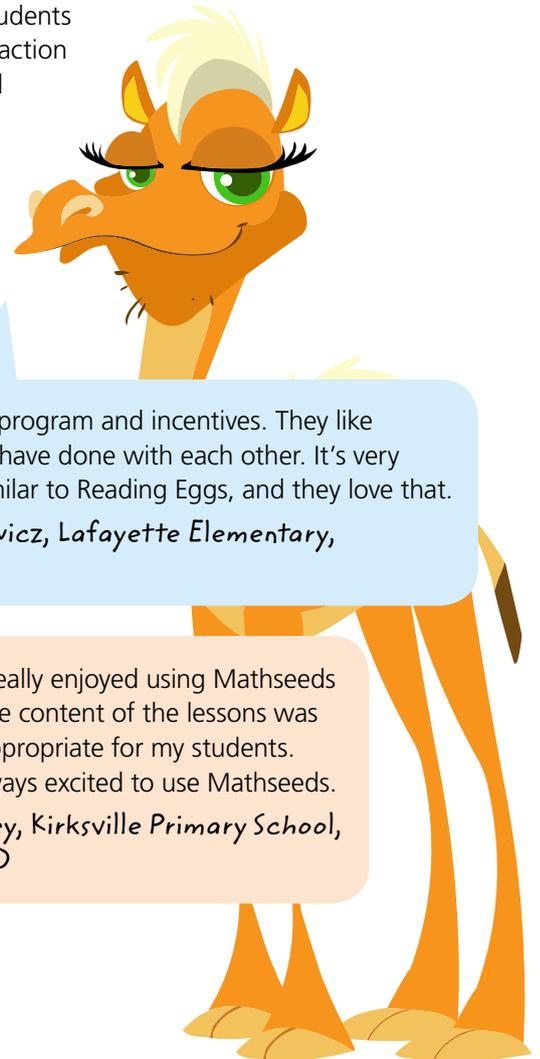
Mary Benner, Shell Knob School, Shell Knob, MO

Students enjoy the program and incentives. They like to share what they have done with each other. It's very engaging—very similar to Reading Eggs, and they love that.

Elizabeth Iwaszewicz, Lafayette Elementary, San Francisco, CA

My students really enjoyed using Mathseeds very much. The content of the lessons was mostly very appropriate for my students. They were always excited to use Mathseeds.

Becky Yardley, Kirksville Primary School, Kirksville, MO



At the end of the year, all teachers felt that Mathseeds complemented their regular math lessons either extremely well (4 teachers) or very well (6 teachers). Teachers commented on the fact that Mathseeds went in-depth and gave students more opportunities to practice and that the program was useful as a supplement to state-adopted programs as it follows most of the important skills.

The type of content teachers named as fitting particularly well with the curriculum was place value, shapes, money and number.

Reflecting the strong ratings seen above, all teachers said they would be extremely likely (6 teachers) or very likely (4 teachers) to recommend Mathseeds to other teachers in their school or other schools who are teaching in Kindergarten. And all said they would be extremely likely (9 teachers) or very likely (1 teacher) to use Mathseeds next year if they are teaching in Kindergarten.

It is extremely likely that I will use Mathseeds again next year. It was an excellent addition to our math program.

Becky Yardley, Kirksville Primary School, Kirksville, MO

I'm extremely likely to use Mathseeds next year. If I am able, I will use it.

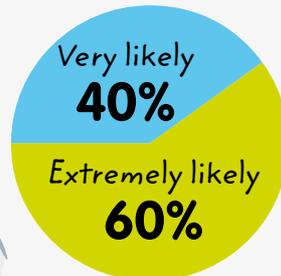
Amy Watson, Aiken Elementary, Paris, TX

Teacher Satisfaction

Benefits of Mathseeds:

- High motivation
- Engaging
- Active participation

Likelihood to Recommend Mathseeds



90%
Extremely likely to use Mathseeds in the future



9 out of 10 teachers reported students were more confident with math.



How Well Mathseeds Meets the Needs of **Average** Students



How Well Mathseeds Meets the Needs of **Less Able** Students



How Well Mathseeds Meets the Needs of **More Able** Students



The repetition in Mathseeds was so good for my most struggling students. The more able did very well; it provided a challenge for them.

Becky Yardley, Kirksville Primary School, Kirksville, MO

It is a great program and kids seem to improve on it. It picks up the gaps where they are missing. I think it satisfies all my student's needs. It's challenging yet doable.

Amy Watson, Aiken Elementary, Paris, TX

Meeting Student Needs

All ten Kindergarten teachers said that Mathseeds' content met the needs of their average students either extremely well (3 teachers) or very well (7 teachers). Teachers felt similarly about how well Mathseeds met the needs of their other students, with all saying it met the needs of their more able students either extremely well (7 teachers) or very well (3 teachers). There was some disagreement about how well Mathseeds met the needs of less able students, with two saying extremely well, five saying very well, and three saying somewhat well.

Table 7 shows the ratings that Kindergarten teachers gave to a variety of statements about Mathseeds' impact on students, using a 10-point scale, with 1 indicating total disagreement and 10 indicating complete agreement. Overall, teachers agreed strongly that Mathseeds was easy for students to use, engaging, helpful in teaching students, motivating, and contributing to students' confidence and to their attitude about math.

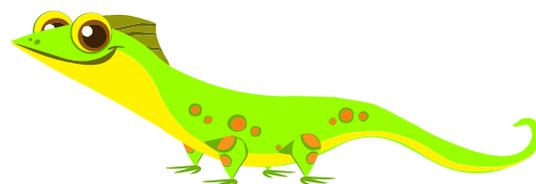
Satisfaction with Mathseeds Components and Features

Teachers said that Mathseeds was highly effective in teaching the four domains of math that it covers: Number Sense, Operations, Measurement, and Geometry as seen in **Table 8**. The effectiveness of each domain was rated from 1 (highly ineffective) to 10 (high effective), with average ratings ranging from 9.2 to 9.7.

At the end of the year, all but one teacher were using the lessons in Mathseeds, 9 of the 10 used the Placement Test, and 7 of the 10 managed the class. Other features reported to be used by half or more of the teachers were Reporting and Assessment (9), the Playroom (7), Uploading Class Function (7), Log-in Printout (7). Less used features were Parent Letters (7), Awards (6), Arcade (6). Least used were Apps (3) and White Board lessons (2).

Teachers rated the usefulness and appeal of almost every feature they were using very highly, with average ratings of 9 or more (out of 10) among the 10 teachers for Lessons, The Playroom, Treehouse, Buddy's Shop, Arcade, Big Books, Apps, Placement Test, Reporting and Assessment, Parent Letters, and Log-in Printout as shown in **Table 9**. Lowest average ratings, though still relatively high at 8.0, were given to White Board Lessons and Awards.

Teacher Satisfaction with Mathseeds Components





Summary and Conclusion

During the 2015–2016 school year, over 300 students and 18 teachers participated in an effectiveness study of Mathseeds in kindergarten. The primary research question was to investigate whether students who used Mathseeds showed more math skills growth than comparable students who did not use Mathseeds. Student growth in math skills was compared using Multivariate Analysis of Covariance with the posttests as the outcome and the pretest as the covariate to control for differences in the groups.

The quantitative study results showed that Kindergarten students who used Mathseeds showed significantly higher math growth than comparable students that did not use Mathseeds. These findings were consistent for both the SESAT 1 assessment and the teacher observational assessment. The effect size for the difference on the SESAT 1 mathematics assessment was .48 and the effect sizes for the math domains on the observational assessment ranged from .42 to .66.

In addition to the quantitative study, surveys and interviews were conducted throughout the school year. The purpose of this qualitative study was to learn more about the specific implementations of Mathseeds and to methodically collect information regarding the teachers' evaluation of product effectiveness.

The qualitative study results showed that the teachers found Mathseeds to be effective in helping students learn math skills. The overall satisfaction rating for teachers was 8.9 out of 10 and for students was 9.2 out of 10. Teachers agreed strongly that Mathseeds was easy for students to use, engaging, helpful in teaching students, motivating, and contributing to students' confidence and to their attitude about math. All teachers said they'd be extremely or very likely to recommend Mathseeds to others teaching Kindergarten and to use Mathseeds next year if they were teaching that grade themselves.

This study was conducted by MarketingWorks and SEG Measurement, independent educational research firms.



Appendix

Table 1: Profile of Participating Students

	Treatment (%)	Control (%)
Gender		
Female	49.6	49.0
Male	49.6	50.0
Not Reported	0.8	1.0
Ethnicity		
African American	5.6	7.3
Asian	8.8	5.7
Caucasian	63.2	68.8
Hispanic	20.8	15.6
Other/Mixed	1.6	2.1
Not Reported	0.0	0.5

Table 2: Profile of Participating Schools

	Treatment (%)	Control (%)
School Location		
Rural	28.6	36.4
Suburban	57.1	18.2
Urban	14.3	45.5
School Size (Number of Students)		
Very large (601 or more)	0.0	9.1
Large (401-600)	71.4	36.4
Medium (201-400)	14.3	36.4
Small (100 or fewer)	14.3	18.2

Table 3: Profile of Participating Kindergarten Teachers

Variable	Treatment (%)	Control (%)
Teaching Experience		
1 - 3 years	0.0	9.1
4 - 10 years	0.0	18.2
More than 10 years	100.0	72.7
Highest Degree		
Bachelor's	28.6	54.5
Master's	71.4	36.4
Other	0.0	9.1
Gender		
Female	100.0	100.0
Male	0.0	0.0
Ethnic Background		
Asian or Pacific Islander	0.0	18.2
White/Caucasian	100.0	81.8
Experience with Technology		
Very experienced	14.3	0.0
Fairly experienced	71.4	90.9
Not very experienced	14.3	9.1
Not at all experienced	0.0	0.0

Table 4: Tests of Between-Subjects Comparing Treatment and Control Means

Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Significance
SESAT 1	32541.285	1	32541.285	24.748	<.01
Number Sense	83.664	1	83.664	16.877	<.01
Operations	90.646	1	90.646	29.765	<.01
Measurement	67.184	1	67.184	31.527	<.01
Geometry	26.144	1	26.144	40.573	<.01

Table 5: Adjusted Posttest Mean Scores by Domain

Measure	Treatment		Control	
	Mean	Standard Deviation	Mean	Standard Deviation
SESAT 1 (Range 273-600)	542.32	38.12	521.44	44.18
Number Sense (Range 1-15)	13.74	1.81	12.68	2.83
Operations (Range 1-10)	8.27	1.63	7.17	2.11
Measurement (Range 1-10)	8.31	1.65	7.36	1.54
Geometry (Range 1-5)	4.55	0.68	3.96	0.95

Table 6: Effect Sizes and Associated Percentile Gains

Measure	Effect Size	Percentile Gain
SESAT 1	0.48	18
Number Sense	0.42	16
Operations	0.55	21
Measurement	0.58	22
Geometry	0.66	25

Table 7: Teachers' Evaluation of Mathseeds

	Minimum Rating	Maximum Rating	Mean	Std. Deviation
Students found it easier to use than other programs they have used in the past.	5	10	8.7	1.6
Students were more engaged in math than they'd otherwise have been.	8	10	9.1	0.7
Students learned more than they otherwise would have.	7	10	8.5	1.1
Students learned difficult or confusing concepts more easily than they would have otherwise.	5	10	8.3	1.6
Students received scores and feedback that were appropriate, helpful, and of high quality.	5	10	8.5	1.7
Students were more focused on the areas where they needed the most help.	6	10	8.6	1.3
Students developed a more positive attitude toward math.	7	10	8.9	1.0
Students were motivated to do their work.	8	10	9.1	0.7
Students gained confidence about their math abilities.	8	10	9.3	0.7

Table 8: Teachers' Evaluation of the Effectiveness of Mathseeds Within Five Domains

Domain	Minimum Rating	Maximum Rating	Mean	Std. Deviation
Number Sense (e.g., counting and comparing numbers)	9	10	9.7	0.5
Operations (e.g., adding and subtracting)	9	10	9.5	0.5
Measurement (e.g., comparing sizes and lengths of common objects)	8	10	9.4	0.7
Geometry (e.g., identifying and sorting shapes)	8	10	9.2	0.8

Table 9: Teachers' Evaluations of the Usefulness of Mathseeds' Features

Feature	Number of Teachers Using Feature	Mean	Std. Deviation
Lessons	9	9.6	0.5
The Playroom	7	9.7	0.8
Treehouse	5	9.4	0.9
Buddy's Shop	4	9.5	1.0
Awards	6	8.0	3.5
Arcade	6	9.3	1.2
Manage Class	7	8.7	1.1
Lesson Plans	5	8.8	0.8
Worksheets	6	6.8	2.5
Big Books	5	9.0	1.4
White Board Lessons	2	8.0	0.0
Apps	2	9.5	0.7
Placement Test	9	9.4	0.7
Reporting and Assessment	9	9.0	1.1
Parent Letters	5	9.8	0.4
Login Print Out	7	9.6	0.5
Uploading Class Function	7	8.9	1.1