



# Sumdog Effectiveness Study

United Independent Schools District, Texas

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# Abstract

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Sumdog is an educational website that motivates students to practice mathematics skills through online games. This study found that the length of time spent using Sumdog has a highly significant, positive impact on students' mathematics improvement.

Students who spent an average of 30 minutes per week on Sumdog progressed more than 2 times faster in mathematics than students who spent less than 3 hours in total on Sumdog over the 6 month study. Students and teachers observed an improvement in both mathematics ability and attitude towards learning mathematics since beginning regular Sumdog use.

## Introduction

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### Study Overview

The aim of this study is to determine whether there is a correlation between the length of time spent playing mathematics games on Sumdog and improvement in mathematics proficiency.

Dr. Afi Y. Wiggins, Senior Research Analyst at Texas State University is acting as an independent reviewer to validate the methodology of this study.

The study ran between the December 7, 2015 and June 2, 2016 with 98 third grade classes in United Independent Schools District, Texas. Participating classes were given a subscription to Sumdog's premium features. Students completed two diagnostic tests to determine their mathematics proficiency level at the start and end of the study. The total length of time they spent on Sumdog between these 2 tests was recorded.

Using ANCOVA and effect size, this study found that the more time students spend on

Sumdog, the greater their proficiency improvement in mathematics.

### Sumdog Overview

Sumdog is an educational website that motivates students to practice their mathematics and ELA skills through online games. All the mathematics questions on Sumdog are displayed in a consistent format. After selecting one of the 33 games, students are asked a multiple choice question with four possible answers. If the correct answer is selected, students can take part in the game. If students answer incorrectly, they are shown the correct answer and move on to the next question.

The majority of questions on Sumdog are automatically generated to ensure they are always different. At the end of the game students are shown corrections to any questions they answered incorrectly and for many of the skills, they can then watch a Khan Academy tutorial<sup>1</sup> to help them understand

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<sup>1</sup> Khan Academy ([www.khanacademy.org](http://www.khanacademy.org)) offers a world-leading library containing thousands of instructional videos. These videos are displayed directly within the Sumdog website.

the concept. Sumdog's adaptive learning engine monitors and guides students to ensure that the questions asked are always appropriate for each student's ability level.

All of the games have a competitive aspect. Students can choose to compete against a computer opponent, students from their class, or students from around the world. Because students are asked their own personalized questions during the games, students of all ability levels can compete against each other fairly.

To motivate students, Sumdog rewards both effort and progress. When students answer questions correctly, their effort is rewarded by earning coins to spend in their on-screen house. When students master new skills through demonstrating fluency in their answers, their progress is rewarded by earning new tricks for their on-screen pets and their proficiency level increases.

Teachers with a subscription to Sumdog can access detailed reports on each student's progress and they can also create activities and assessments to focus each student's learning. Sumdog's skills are correlated to several curricula worldwide including the Texas Essential Knowledge and Skills (TEKS) standards. The skills are ordered in line with the published outcomes for the standards. Teachers also have the option to adjust the order of these skills to match their teaching plan for the year.

## Method

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### Experimental Design

This study uses a quasi-experimental pre-test post-test design. The mathematics proficiency level of students was measured at the start of the study using Sumdog's diagnostic test which students complete through playing games on Sumdog.

The initial diagnostic test was available from the December 7, 2015. Sumdog continuously updates each student's proficiency level as they master new skills on Sumdog.

On May 2, 2016 the diagnostic test was reset for all students taking part in the study to re-assess their mathematics ability level and calculate their improvement in mathematics proficiency.

All teachers taking part in the study were asked to complete an online attitudinal survey in May 2016 to investigate the impact Sumdog had on their teaching. The survey questions were developed with the help of Dr. Afi Y. Wiggins.

### Usage Measurement

Teachers agreed to use the mathematics section of Sumdog for one hour weekly with their class between the December 7, 2016 and June 2, 2016 on computers or tablets, either at school or at home. To encourage usage, teachers were emailed weekly during the study with advice on how to use Sumdog effectively.

Some teachers did not have access to a computer suite in their school and only had a

few computers in their classroom. For students who do not have access to the internet at home, this made the suggested one hour weekly usage difficult.

On June 6, 2016, the total length of time students spent playing games on Sumdog between initial and final diagnostic test was calculated.

### Sample Selection

All Grade 3 classes in the United Independent Schools District (including composite classes) were invited to take part in the study with the help of Elouisa Diaz, Elementary Director.

Teachers who participated in the study were offered a free remote training course from Sumdog as well as a free subscription to all of Sumdog's premium features until the end of the school year for their class. Teachers agreed to use the mathematics section of Sumdog for one hour weekly with their students until the end of the school year, June 2, 2016.

A total of 103 teachers agreed to take part in the study which gave a sample size of 2,308 students. Students who did not complete the initial diagnostic test were not included in the study. This reduced the sample size to 1,768 students across 92 classes. The majority of teachers had not used Sumdog before.

Students who did not complete the final diagnostic test were also excluded reducing the sample size to 1,057 students. Finally, students who didn't have at least 21 days between their initial and final diagnostic tests were removed, reducing the final sample size to 1,027 students.

See Appendix 2 for full list of schools involved in the study and demographic information.

### Proficiency Measurement

Students completed a diagnostic test at the start of the study to determine their initial mathematics proficiency level. During this initial assessment, students answered up to 200 questions through playing games on Sumdog. The questions were automatically generated and gradually increased in difficulty depending on the answers selected by students.

After completing the diagnostic test, students were given a skill to focus on depending on the result of the test. Sumdog records the accuracy and answering speed for each question to determine when students have mastered a skill. Each time a student masters a skill, their Sumdog proficiency level increases and they are given a new skill to focus on. Sumdog also periodically asks revision questions to maintain fluency in easier skills.

The proficiency levels on Sumdog are calculated by determining the percentage of Sumdog skills a student has mastered. For example, for Grade 3 skills, the Sumdog proficiency levels range from 3.00 to 4.00.

A student with a proficiency level of 3.00 has not yet mastered any Grade 3 Sumdog skills, at 3.50 they have mastered 50% of the Grade 3 Sumdog skills.

The diagnostic test was reset for all students on May 2. Teachers were asked to ensure students completed this final assessment before the end of term. The students' mathematics proficiency improvement was then calculated by subtracting their initial diagnostic level from their final diagnostic level.

The data was analyzed by Dr. Afi Y. Wiggins using SPSS. ANCOVA and effect size were used to determine the relationship between time spent on Sumdog and improvement in

mathematics proficiency correcting for student's initial diagnostic level and the length of time between the two diagnostic tests.

## Results

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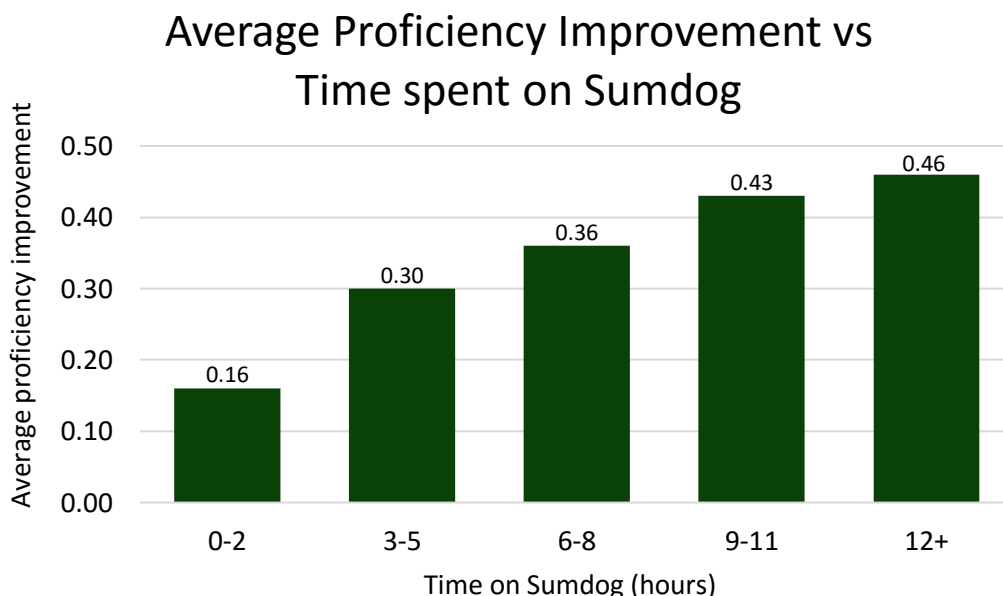
### Proficiency Improvement

Figure 1 shows the average improvement in mathematics proficiency between the initial and final diagnostic tests for students who spent increasing lengths of time on Sumdog.

As the length of time students spent on Sumdog increases, the average improvement in student's mathematics proficiency level also increases.

Improvement in mathematics proficiency was calculated by taking the difference between the initial and final diagnostic test results for each student in the study.

The average proficiency improvement was then calculated by taking the average of all student proficiency improvement values within each time interval. The number of students included in each of these time intervals is displayed in Table 1.



**Figure 1: Average mathematics proficiency improvement for students who spent increasing lengths of time on Sumdog. The time intervals are defined as follows:  $0-4 = 0 < t < 5$ , where  $t$  = time spent on Sumdog (hours).**

**Table 1: Number of students in each time interval**

Time spent on Sumdog (hours)	0-2	3-5	6-8	9-11	12+	Total
Number of students	182	295	173	137	240	<b>1,027</b>

On average, students who spent up to three hours on Sumdog over the course of the study (December 7, 2015 – June 2, 2016) experienced a proficiency improvement of 0.19 which is 19% of a grade.

Students who spent more than 8 and less than 11 hours on Sumdog over the course of the study (approximately 30 minutes per week) experienced a proficiency improvement of 0.43 on average which is 43% of a grade.

Students who spent an average of 30 minutes per week on Sumdog progressed more than 2 times as far in mathematics as students who spent a total of up to 3 hours on Sumdog over the course of the study.

A one-way analysis of covariance (ANCOVA) was conducted by Dr. Afi Y. Wiggins, Texas State University to determine whether time spent on Sumdog effects proficiency improvement in mathematics. Students' initial diagnostic test level and the time spent between initial and final diagnostic tests were used as covariates. This was to ensure students' initial mathematics level and the time between initial and final diagnostic tests do not confound or invalidate the results.

Table 2 shows descriptive statistics for the variables included in this analysis. Students had an average mathematics proficiency improvement of 0.34 points which corresponds to an average proficiency improvement of 34% of a grade. Students spent an average of 9 hours using Sumdog.

The results of the ANCOVA shown in table 3, show that time spent on Sumdog has a highly significant impact on students' proficiency improvement in mathematics,  $F(4, 1,020) = 7.499, p < .001$ .

The partial eta squared effect size statistic, .029, indicates the time spent using Sumdog effect size is small to moderate. Model results also show that there was a significant relationship between the covariates (initial diagnostic test scores, time between diagnostic tests) and proficiency improvement. This indicates that the choice of covariates was appropriate. The results may have been biased had the covariates not been included in the model.

The initial diagnostic level, time between diagnostic tests and time spent on Sumdog variables all have a highly significant impact on the proficiency improvement. The more time a student spends on Sumdog, the greater their improvement in mathematics proficiency.

Table 2: Descriptive Statistics

Variable	Mean	Std. Deviation	N
Initial Diagnostic Level	1.83	0.97	1027
Final Diagnostic Level	2.17	0.95	1027
Proficiency Improvement	0.34	0.89	1027
Time between diagnostic tests (days)	85	30	1027
Time spent on Sumdog (hours)	9.28	8.92	1027

Table 3: Time spent using Sumdog has a significant effect on student's proficiency improvement in mathematics

Source	Sum of Squares	Df	Mean Square	F-value	p-value	Partial Eta squared
<b>Corrected Model</b>	218.743	6	36.457	62.26	.000	.268
<b>Initial Diagnostic Level</b>	168.410	1	168.410	72.02	.000	.066
<b>Time between Diagnostic Tests</b>	12.972	1	12.972	287.61	.000	.020
<b>Time spent on Sumdog</b>	17.564	4	4.391	22.54	.000	.021
<b>Error</b>	597.264	1020	.586	7.50	.000	.029
<b>Total</b>	935.662	1027				
<b>Corrected Total</b>	816.007	1026				



## Attitudinal Survey

An attitudinal survey was sent to all teachers participating in the study to be completed in May 2016. See Appendix 3 for attitudinal survey questions.

Of the 87 teachers who participated in the study, 13 teachers responded to the survey; a 15% response rate. The attitudinal survey consisted of nine multiple choice questions followed by six longer questions. The responses to the multiple choice questions are shown in Figures 2 and 3.

92% of teachers who responded to the survey agreed or strongly agreed that the Sumdog training course prepared them to use the program. All teachers agreed or strongly agreed that they were able to support students to complete math questions when they are using Sumdog.

All teachers who responded to the survey agreed or strongly agreed that their students have a positive attitude towards math. Most teachers had seen an improvement in student engagement since starting to use Sumdog. 77% of teachers agreed or strongly agreed that their students' engagement in math increased since starting to use Sumdog. None of the teachers disagreed with this statement.

Teacher responses were very positive about Sumdog use outside the classroom. 85% of teachers agreed or strongly agreed that students have become more positive about math homework through using Sumdog. No teachers disagreed with this statement.

Figure 3 shows the responses to questions regarding IT access at school and at home.

92% of teachers agreed or strongly agreed that their students have access to IT in the classroom. No teachers disagreed with this statement. A later question in the survey allowed teachers to expand on computer access. Their responses revealed there had been some computer access issues.

Teachers were less positive about student access to IT at home, with 46% selecting neutral and 46% selecting agree or strongly agree. This indicates students' access to Sumdog is limited to their time at school.

No teachers agreed that students have more difficulties in learning math when they are using computers. and 70% of teachers disagreed or strongly disagreed with this statement.

The majority of teachers did not have to reorganize their classroom to accommodate using Sumdog; only 15% agreed that they had to do this, whilst 69% disagreed or strongly disagreed with this statement. This indicates that Sumdog is easily incorporated into the classroom. The responses to the longer survey questions are summarized below.

## Teacher Attitudinal Survey Responses

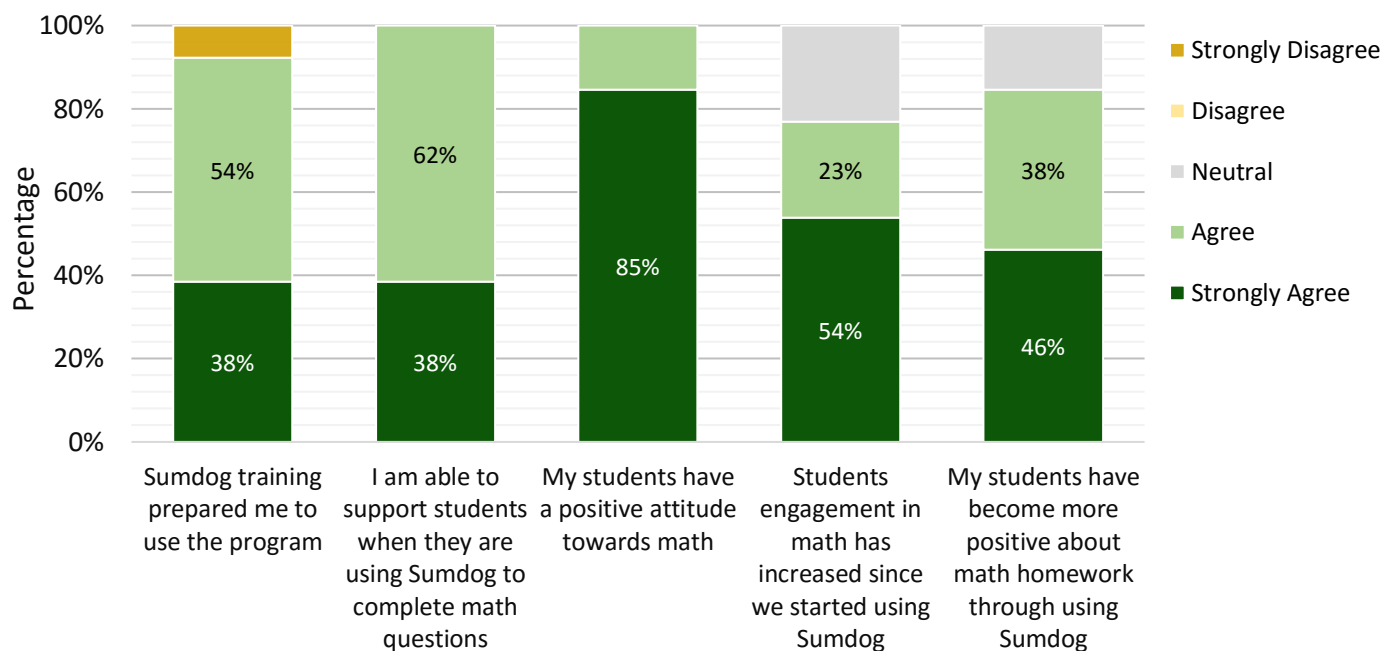


Figure 2: Teacher attitudinal survey responses 1-5

## Teacher Attitudinal Survey Responses

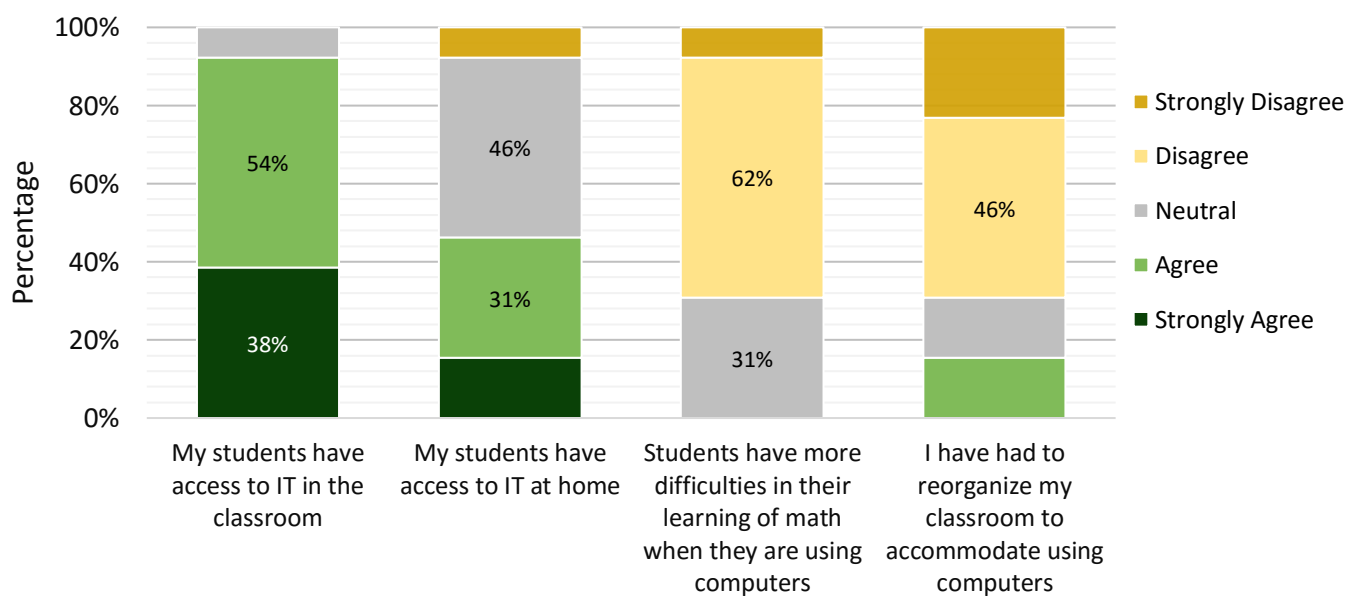


Figure 3: Teacher attitudinal survey responses for questions regarding IT at school and at home

Overall, do your students enjoy learning with computers?

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All 13 teachers who responded to the survey agreed that their students enjoy learning with computers.

***'They are highly motivated to use technology'***

- C. Ramirez, Bonnie L. Garcia  
Elementary

How have your students' attitude towards math changed since they started using Sumdog?

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All teachers who responded to the survey observed a positive change in attitude towards math since starting to use Sumdog with their class.

***'They love playing the program and appear to be more excited towards math.'***

- Grade 3 teacher, Dr. M.E. Malakoff  
Elementary

***'The students' attitude towards math have improved greatly, especially because they are having fun while learning.'***

- E. Cantu, Matias de Llano, Jr.  
Elementary

***'They love math. Math has become their favorite subject.'***

- L. Yancy, R.C. Centeno Elementary

***'They are more motivated since they started Sumdog and grades have improved.'***

- C. Ramirez, Bonnie L. Garcia  
Elementary

***'They love playing the games on Sumdog. Sumdog makes math fun.'***

- J. DeLeon, Col. Santos Benavides  
Elementary

How has your enjoyment of, or success in teaching maths changed as a result of using Sumdog with your students?

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12 of the 13 teachers found their enjoyment or success in teaching mathematics was improved by using Sumdog. One teacher observed no change.

***'It has allowed me more flexibility during stations to target those fluency skills that are low without boring the children with a paper drill.'***

- R. Gutierrez, Borchers Elementary

***'Sumdog has been very positive in motivating my students to love math.'***

- L. Yancy, R.C. Centeno Elementary

***'I like the fact that the students come in eager to work on math problems by using Sumdog and the fact that they have to solve problems in the classroom in order to obtain allotted time for Sumdog.'***

- Grade 3 teacher, Dr. M.E. Malakoff  
Elementary

***'It's nice to have a variety of ways to teach and this makes it fun for both teacher and students.'***

- M. Perales, Kazen Elementary

***'I enjoyed watching their excitement when they would see our class ranking throughout the math competitions.'***

- L. Martinez, Col. Santos Benavides  
Elementary

How easy is it for your students to access IT while at school? Are there any particular issues that may prevent you from making more use of computers?

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7 teachers experienced no issues in IT access at their school. 3 teachers stated they experienced technical difficulties including internet connection issues. 3 teachers were limited by the number of devices available to their class.

***'No problems in the school computers, students were able to access without any problems. The only problem is that we only had 3 computers that students could use and access easily.'***

- H. Castro, Nye Elementary

How have you had to undertake changes to classroom organization and management as a result of using Sumdog?

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10 teachers did not make any changes to classroom organization and 4 of these teachers commented that using Sumdog had a positive impact on their classroom management.

***'I did not have to reorganize since students have their iPads. It helped with classroom management since some students were rewarded extra time (aside from their morning time required) before the end of the day for good behavior.'***

- C. Ramirez, Bonnie L. Garcia  
Elementary

***'The students knew that the program could be used as soon as they had completed the classwork, and this motivated the students to finish and complete a task. Great learning incentive!'***

- H. Castro, Nye Elementary

***'None, at all. In fact this has made my skill drill station easier and lessened the amount of paper we use.'***

- R. Gutierrez, Borchers Elementary

3 teachers stated they planned lessons around computer time.

***'Sumdog was used in class 10 students at a time while others did classwork; rotation basis helped.'***

- L. Martinez, Col. Santos Benavides  
Elementary

Compare the type of homework you assigned before using Sumdog to the type of homework you assign now. How have your math homework assignments changed as a result of using Sumdog?

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3 teachers stated they now assign homework online using Sumdog.

***'Sumdog was an enrichment for homework.'***

- L. Martinez, Col. Santos Benavides Elementary

***'Well, I can honestly say that my students look forward to an hour of Sumdog homework! They enjoy the homework.'***

- E. Cantu, Matias de Llano, Jr. Elementary

***'Yes, with technology available, students would rather work on problems online than on paper.'***

- H. Castro, Nye Elementary

10 teachers made no change to their homework assignments.

***'The homework hasn't really changed but the motivation has. The students are more motivated to completing assignments.'***

- Grade 3 teacher, Dr. M.E. Malakoff Elementary

***'They haven't, Sumdog is not used in place of homework, but rather as a supplement to it'***

- R. Gutierrez, Borchers Elementary

Overall experience of Sumdog

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***'My students love Sumdog. Great motivation for them. My students have become awesome mental math problem solvers. Thank you Sumdog.'***

- L. Yancy, R.C. Centeno Elementary

***'Students got motivated with the different games and activities in Sumdog'***

- Grade 4 teacher, Kennedy-Zapata Elementary

***'The students loved using Sumdog. Our district required us to have the students use it for at least 30 minutes a day during the school year. It was difficult to do that due to the number of computers in our classrooms. The students could access it on our iPads, but were not able to access everything through the iPads.'***

- J. DeLeon, Col. Santos Benavides Elementary

***'Sumdog is a great way to motivate students to learn math skills daily.'***

- C. Ramirez, Bonnie L. Garcia Elementary

## Case Study

After an initial analysis of responses to the attitudinal survey, questions for a teacher interview and for a student survey were developed with the help of Dr. Afi. Y. Wiggins to create a case study with one class.

The teacher interviewed taught a third grade class at Colonel Santos Benavides Elementary. The response from this case study was very positive with the classroom teacher emphasizing both the students' love of Sumdog and the positive impact she had observed in their math ability.

The students were asked to complete an attitudinal survey online to investigate their experiences using Sumdog. Feedback was also received from students through letters which outlined their opinions on Sumdog. See Appendix 1 for the Colonel Santos Benavides Elementary case study.

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*'My class used to think math was very difficult, but now I hear them say "math is my favorite subject!" I would recommend Sumdog to all teachers - it has motivated my students and they have learned to love math through this program. '*

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- L. Martinez, Col. Santos Benavides Elementary

## Conclusion

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This study found that the length of time students spend on Sumdog has a highly significant, positive impact on their improvement in mathematics proficiency. The more time a student spends on Sumdog, the greater their improvement in mathematics proficiency.

Students who spent an average of 30 minutes per week on Sumdog experienced a proficiency improvement of 43% of a grade in the TEKS-aligned assessment. This corresponds to 2 times the improvement of students who spent a up to 3 hours on Sumdog over the course of the study.

The feedback from the teacher attitudinal surveys suggest that teachers have seen an improvement in both the mathematics ability of their class, as well as an improvement in student attitude towards learning mathematics since they started to use Sumdog regularly.

There was also a very positive response from students in the case. The majority of students found learning mathematics at school more enjoyable when using Sumdog.

## References

Common Core of Data public school district data for the 2014-2015 school year, National Center for Education Statistics full dataset available here: <http://nces.ed.gov/ccd/districtsearch/>

Prepared by Helen Le-Mar, Research Manager, Sumdog

Reviewed by Dr. Afi Y. Wiggins, Senior Research Analyst, Texas State University

# Appendix I: Case Study

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## Colonel Santos Benavides Elementary United Independent Schools District, Texas May 2016

Lisa Martienz's Grade 3 class at Colonel Santos Benavides Elementary began using Sumdog in October 2015 to take part in the United Independent Schools District Sumdog effectiveness study.

After using Sumdog for approximately one hour a week for six months, Sumdog interviewed Lisa Martienz and her class to investigate their experience using Sumdog over the course of the study.

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*“I would encourage all teachers to try Sumdog. Sumdog has motivated my class and they have learned to love math through this program.”*

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- Mrs. L. Martinez, Col. S. Benavides



Mrs. L. Martinez's Grade 3 class



As part of the effectiveness study the class was given access to all of Sumdog's premium features which include class and individual progress reports, personalized student assessments and challenges, and premium games.

The class had used several online math programs before the start of the study including 'Study Island'. However, Lisa found Sumdog more successful than any of the other programs she had tried due to students' engagement with the program. *"The kids enjoyed Sumdog from the start and they stopped using other programs as they weren't as fun. Students were eager to play Sumdog in class as they enjoyed competing against friends"*

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*"I like Sumdog because its a fun way to learn about multiplication and division and subtraction and adding. I also like playing with my friends and decorating my home. I think it's the best learning game."*

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- Amiee, aged 10

Lisa found that using technology to aid her math instruction enhanced students' attitudes towards math and boosted class motivation, especially during contests. *"Our class entered a national Sumdog contest and this really motivated the class. They were eager to ensure they answered the maximum 1000 questions over the contest week and were very excited to track the class ranking as they rose to 6<sup>th</sup> place."*



**Students competing against friends**

*"The students used Sumdog in class, 10 students at a time, since we only had 7 iPads and 3 computers. During computer lab days, which were every other week, all students had access to Sumdog which they loved. Our lab time was 40 min and it was never enough time. My students always felt that time went by too fast, so if there wasn't another class waiting for us to leave, I would allow them another 5-10 minutes of Sumdog time."*

### **Student attitude towards math**

Lisa observed a significant improvement in her students' attitude towards math when they started to use Sumdog regularly. *"They used to think math was very difficult, but now I hear them say 'math is my favorite subject!'"*

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*"My favorite game is Diner Defense, I think it's fun. I learned how to times fractions and now math is easier for me."*

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- Scarlett, aged 8



It was clear that the class enthusiasm for Sumdog also continued outside of school hours. *“I assign Sumdog as homework, especially during the contests. The class doesn't see it as homework - I hear them say 'we don't have homework' and I say 'you need to use Sumdog' and they say 'yes, but that's not homework!’”*

*“At the end of term I asked my class what they had enjoyed about 3rd Grade and they said using Sumdog for math time!”*



**Students can use tablets to access Sumdog**

## Student Survey

Eighteen students in Lisa Martinez's third grade class completed an online survey to investigate student opinions of math and Sumdog.

Figure 1 shows the responses to the first four questions in the survey. The majority of the class was happy or very happy to learn math using computers; with 17% selecting OK and 11% selecting unhappy.

56% of the students feel very happy when learning math, and 89% of students feel very happy when learning math using Sumdog. This suggests that using Sumdog improves students' attitudes about math.

Figure 2 shows the responses to the final three questions of the survey which investigate the class attitude towards math homework.

The majority of students selected OK when asked if they would like more math homework, with just 28% selecting either happy or very happy. However, when asked if they would like to learn more math using Sumdog at home, 89% of students selected happy or very happy, suggesting Sumdog has

a positive impact on students' feelings about math homework.

These responses back up the positive comments from Lisa Martinez regarding increased attitudes and engagement in math and in math homework when using Sumdog.

*“I would encourage all teachers to try Sumdog. Sumdog has motivated my class and they have learned to love math through this program.”*

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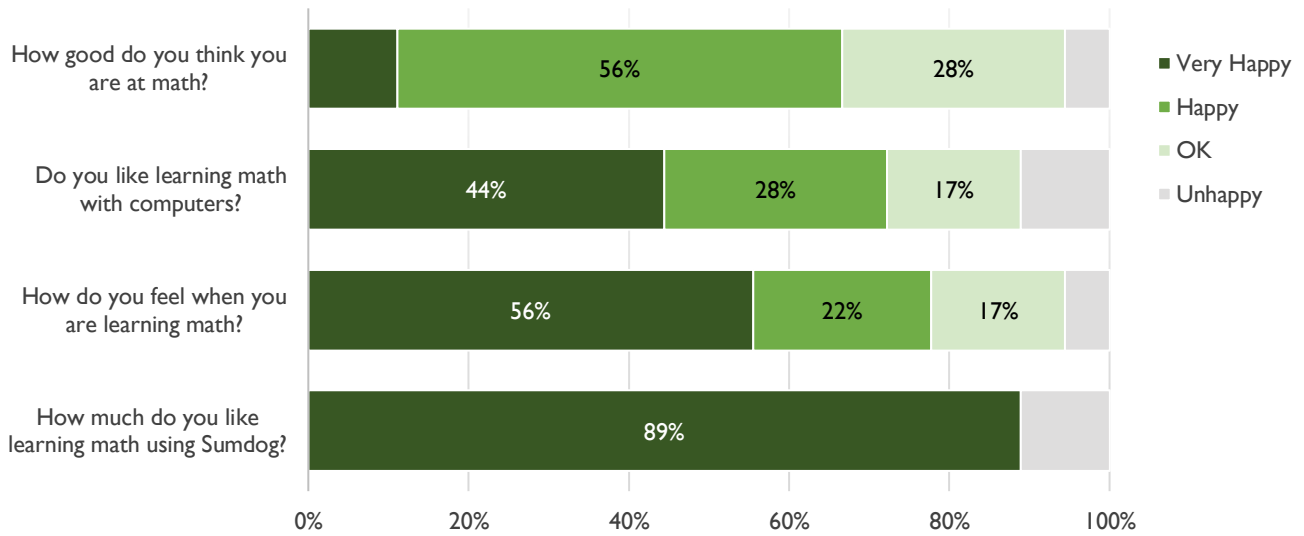
*“I learned the times tables very well and I learned division too. I like math now because of Sumdog. Sumdog is fun so it makes math fun!”*

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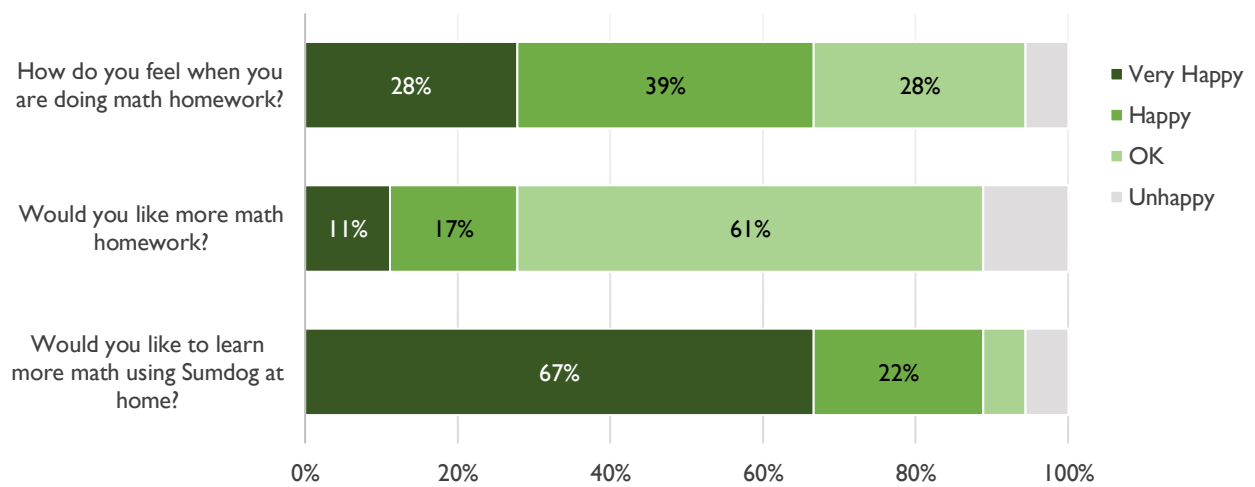
- Rosario, aged 9

# Student Survey Responses

**Figure 1: Student responses to the first section of the online attitudinal survey**



**Figure 2: Student responses to questions regarding homework in the online attitudinal survey**



## Appendix 2: School Demographics

List of all schools who signed up to take part in the study. Demographic information is from the Common Core of Data public school district data for the 2014-2015 school year, National Center for Education Statistics.

Students were not included in the final sample unless they had completed both the initial and final diagnostic tests, and there were at least 21 days between these two tests.

	School	Students	Title 1 School	Free Lunch	Reduced price lunch	% Free or reduced lunch	Alaskan	Asian	Black	Hispanic	White	2+ races	Number of students signed up for study	Number of students with data used in final sample
1	Amparo Gutierrez Elementary	655	Yes	418	41	70%	0	5	0	645	5	0	20	0
2	Alicia Ruiz Elementary	975	Yes	787	80	89%	0	0	0	975	0	0	44	17
3	Barbara Fasken Elementary	976	Yes	479	160	65%	0	2	3	953	15	3	86	31
4	Bonnie L Garcia Elementary	965	Yes	720	82	83%	0	0	0	962	3	0	101	47
5	Charles Borchers Elementary	902	Yes	301	71	41%	0	5	1	865	30	1	142	74
6	Col. S. Benavides Elementary	988	No	213	60	28%	0	21	4	938	24	1	163	72
7	Henry Cuellar Elementary	668	Yes	565	37	90%	0	0	1	665	2	0	82	39
8	Dr Malakoff Elementary	872	Yes	370	59	49%	0	12	2	834	24	0	153	92
9	Finley Elementary	542	Yes	424	34	85%	1	1	0	539	1	0	93	52
10	Franklin D Roosevelt Elementary	749	Yes	700	20	96%	0	0	0	749	0	0	84	54

	School	Students	Title 1 School	Free Lunch	Reduced price lunch	% Free or reduced lunch	Alaskan	Asian	Black	Hispanic	White	2+ races	Number of students signed up for study	Number of students with data used in final sample
11	Julia Bird Jones Muller Elementary	854	Yes	556	91	76%	3	1	3	819	27	1	23	6
12	Kazen Elementary	591	Yes	447	74	88%	0	1	2	585	3	0	78	18
13	Kennedy Zapata Elementary	486	Yes	456	14	97%	0	2	0	483	1	0	49	6
14	Matias De Llano Elementary	621	Yes	275	57	53%	0	5	4	602	7	3	97	88
15	Newman Elementary	609	Yes	441	39	79%	0	2	0	602	5	0	85	60
16	Nye Elementary	796	Yes	462	45	64%	0	5	1	781	9	0	65	20
17	Prada Elementary	784	Yes	707	27	94%	0	0	0	779	5	0	112	79
18	Radcliffe & Sue Killam Elementary	840	Yes	638	64	84%	0	7	1	832	0	0	112	18
19	Rodolfo C Centeno Elementary	903	Yes	808	32	93%	0	0	0	903	0	0	109	81
20	Salinas Elementary	831	Yes	603	79	82%	0	3	2	825	1	0	45	16
21	Judith Zaffirini Elementary	1130	Yes	922	79	89%	0	0	0	1125	4	1	100	47
22	Trautmann Elementary	798	Yes	306	61	46%	2	1	0	776	16	3	136	28
23	Sigifredo Perez Elementary	1100	Yes	980	61	95%	0	0	0	1098	2	0	92	55
24	Veterans Memorial Elementary	Data Not Available											138	57

## Appendix 3: Attitudinal Surveys

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### Student Survey

1 How do you feel when you are learning math? \*

			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Very happy	Happy	OK	Unhappy

2 How good do you think you are at math? \*




			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Very good	Quite good	OK	Not good

3 How do you feel when you are doing math homework? \*

			
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Very happy	Happy	OK	Unhappy





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4 Would you like more math homework? \*

 <input type="radio"/> Very happy	 <input type="radio"/> Happy	 <input type="radio"/> OK	 <input type="radio"/> Unhappy
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5 Do you like learning math with computers? \*

 <input type="radio"/> Very happy	 <input type="radio"/> Happy	 <input type="radio"/> OK	 <input type="radio"/> Unhappy
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6 How much do you like learning math using Sumdog? \*

 <input type="radio"/> Very happy	 <input type="radio"/> Happy	 <input type="radio"/> OK	 <input type="radio"/> Unhappy
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7 Would you like to learn more math using Sumdog at home? \*

 <input type="radio"/> Very happy	 <input type="radio"/> Happy	 <input type="radio"/> OK	 <input type="radio"/> Unhappy
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## Teacher Survey

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### Sumdog Survey for Elementary Teachers involved in Sumdog partnership

We would like to know how you feel about using Sumdog with your students to learn math. Your responses will help us know how we can get better at supporting you and helping your students learn.

Thank you for taking the time to give us your contribution to the survey.

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1 Please select the response that best corresponds to your experiences with Sumdog.

a. Sumdog training prepared me to use the program \*

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- N/A

b. My students have access to ICT in the classroom \*

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- N/A

c. My students have access to ICT at home \*

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- N/A

d. My students have a positive attitude towards math \*

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- N/A

e. My students have become more positive about math homework through using Sumdog \*

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- N/A

f. I am able to support students when they are using Sumdog to complete math questions \*

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- N/A

g. Students have more difficulties in their learning of math when they are using computers

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- N/A

h. I have had to reorganize my classroom to accommodate using computers \*

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- N/A

i. Students engagement in math has increased since we started using Sumdog \*

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
- N/A



**Part 2**

Please provide more details about your experience with Sumdog by answering the following questions

2 Overall, do your students enjoy learning with computers? \*

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3 How have your students' attitude towards math changed since they started using Sumdog? \*

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4 How has your enjoyment of or success in teaching math changed as a result of using Sumdog with your students? \*

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5 How easy is it for your students to access ICT while at school? Are there any particular issues that may prevent you from making more use of computers? \*

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6 How have you had to undertake changes to classroom organization and management as a result of using Sumdog? \*

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7 Compare the type of homework you assigned before using Sumdog to the type of homework you assign now. How have your math homework assignments changed as a result of using Sumdog? \*

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8 What is the name of your school? \*

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9 Full Name

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10 Please add any additional comments about Sumdog

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