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The Effects of The Math Daily 3 Structure on Student Achievement and Growth in an Elementary School Setting

An Action Research Report

By Lauren Ktytor and Kate Waechter

The Effects of The Math Daily 3 Structure on Student Achievement and
Growth in an Elementary School Setting

By Lauren Ktytor and Kate Waechter

Submitted on November 8, 2014
in fulfillment of final requirements for the MAED degree
St. Catherine University
St. Paul, Minnesota

Advisor_____

Date_____

Abstract

The purpose of this research project was to determine if The Math Daily 3 Structure would increase student achievement and academic growth in the domains of operations and algebraic thinking and number and operations in base ten. The study was conducted in second and fourth grade classrooms over a six-week period. The participants included 18 males and 17 females between the ages of 7 and 11. Data collection methods included a student self-evaluation, observational record, and baseline and summative assessments with a grading scale that measures end of the year expectations. In both second and fourth grade, the students showed growth from baseline to summative assessments. After reviewing our Observational Record, we noticed that students had a great need for math strategies that were integrated in interventions, small groups, and mini lessons. We concluded that using a math structure, such as The Math Daily 3, allows for independent learning, integration into language arts, and opportunities for choice. It increased student achievement and academic growth.

The purpose of this research project is to determine if The Math Daily 3 Structure will help with student achievement and academic growth for students in second and fourth grade. In researching math structures that support differentiation and interventions, we found that The Math Daily 3 model would best suit our needs. The Math Daily 3 structure supports all levels of learning while fostering independence. This structure allows for more one-on-one support in the classroom while providing students with the opportunity to learn through hands-on, independent activities, and cooperative learning.

The Math Daily 3, developed by Boushey and Moser (2014), is a structure similar to their Literacy Daily 5. The Math Daily 3 consists of a ten-minute focus lesson followed by student choice of either math by myself, math writing, or math with someone and teacher choices of individual conferring, guided groups, or assessing. This process repeats three times per day. The first focus lesson in a day is used to introduce a skill or concept. The teacher will use modeling and thinking aloud while students practice the skill with manipulatives and individual white boards. When the first focus lesson finishes, the teacher will let the students know who she will be working with in a small group and then the rest of the students need to check in with their first Math Daily 3 choice. When the students from the small groups finish, they check in with their choice while the teacher begins individual conferring. Once stamina, the length of time students can work constantly without being distracted, has broken, the teacher will have students put away materials before the next focus lesson. The second focus lesson is a continuation of the first lesson and involves gradual release and guided practice. When the lesson is over, students will check in for the second round of Math Daily 3 choices while some students are in small groups. After this round, there is one more focus lesson that consists of the “you do it” stage.

During this time, students practice independently or with a partner on the skill or concept of the day. They use this time to share their mathematical thinking and strategies.

Data was collected from four sources to measure the effects of The Math Daily 3 structure on student achievement for students in second and fourth grade classrooms. The four sources of data include baseline and summative assessments (see Appendix A), student self-evaluations (see Appendix B), and an observational record (see Appendix C). Data was collected before, during, and after implementation of the structure.

Baseline and summative assessments were given to students at the beginning and end of the project. The baseline assessments gave us an understanding of where our students were and so we could guide instructional/focus lessons for The Math Daily 3 accordingly. This assessment scaffolds differentiation opportunities in the form of flexible grouping. The summative assessments determined how well students understood the content towards the end of the project.

Students were asked to complete weekly self-evaluations regarding their participation and engagement during The Math Daily 3 time. This information told us what aspects of The Math Daily 3 were most engaging/enjoyable to students, where they felt most comfortable, where they felt least comfortable, and what they felt they needed more work on.

Anecdotal notes were taken for all students during times of small group work, one-on-one mini conferences, and partner work. These notes gave us a form of progress monitoring for students in all areas of The Math Daily 3 structure. We saw their skill development and instructional needs in these notes.

For this study, our subjects consisted of 18 males and 17 females between the ages of 7 and 10. We conducted our research in an elementary classroom setting. Within our subjects, we had students on 504 Plans and Individualized Education Plans as well as students receiving

additional services for intensive reading and for Gifted and Talented: Levels of Service. Both schools and all students involved in this study are referred to by pseudonyms rather than their actual names. Springfield Elementary School resides in a mid-western urban community while McKinley Elementary School is in a mid-western rural setting.

Description of Research Process

Our data was collected from four different instruments. We used this data to see the effects of The Math Daily 3 structure on student achievement and growth for second and fourth grade students. The data in the action research project was collected before, during, and after The Math Daily 3 structure was in place.

In the initial stages of introducing The Math Daily 3 structure, we felt it was necessary to give baseline assessments to better understand our students beginning knowledge of the subject matter. We first assessed the standards of fact fluency. At McKinley Elementary the fourth grade students were assessed on multiplication of a one-digit number by a one- or two-digit number. Students at Springfield Elementary in second grade were assessed on adding numbers between zero and twenty using mental strategies. Both of these assessments were timed tests and the students were given two minutes to complete the assessment. To enforce accurate timed assessments where students aren't allowed to continue to work after the time was up, we made sure tests were flipped over and students raised their hands when time was up. We also had a conversation with our students about doing their personal best on assessments. We stressed if a student doesn't perform well, that helps teachers know what to do to guide instruction. If a student does perform well, that helps us move on to other material.

The Math Daily 3 is a structure that will support best practices in a classroom. We taught all of our students using The Math Daily 3 structure regardless of their parents' decision to allow

their data to be included in our final action research project report. The expectations of both sets of students were exactly the same through this research period. No additional expectations in terms of activities, assessments, dialogue, or information gathering activities differed as a result of doing this research project.

The students at both McKinley and Springfield Elementary were given a second baseline assessment. This assessment was used to gather data on students' beginning understanding of place value. In fourth grade, the students were tested on reading numbers to one million, writing numbers to one million in standard form, word form, and expanded form, and comparing numbers to one million using the symbols: $<$, $>$, or $=$. The students in second grade were assessed on the same standard at their level. The second grade expectation was to read and write numbers to one thousand using base-ten numerals, number names, and expanded form.

After reviewing our data, we formed flexible, small groups. We grouped students with similar areas of need. We also used the baseline assessments to guide our instruction for mini-lessons. Groups ranged in size from two to five students for small group instruction.

After giving baseline assessments, we began to introduce each component of The Math Daily 3 structure. In order to maintain authenticity and fidelity to the structure, we instituted each aspect of the structure, along with our expectations for math by myself, math with someone, and math writing. This is achieved through teaching the ten steps of independence. The ten steps to teaching and learning independence are broken into three main sections. Section one is identifying what is to be taught, setting a purpose while creating a sense of urgency, and recording the desired behaviors on an I-Chart. When launching the Daily 3, we always started with only two behaviors. The second section is modeling the most desired behaviors. When teaching this in a mini-lesson, it is important that students have the opportunity to model these

behaviors to the class. It provides them with a sense of responsibility. After we model the most-desired behaviors, we go back and model the least-desired behaviors. It is important that students understand that these behaviors do not help them learn or become independent in their learning. We follow up with discussing the most-desirable behaviors again. This cements our expectations. The third and final section is actual practice. We begin with placing students around the room and practicing and building stamina. We discuss what stamina means and how we can increase it. The most important part of this section is for us to stay out of the way. The students must use this practice to become independent learners. Finally, we finish with a quiet signal and bring the group back together to discuss what went well, and what didn't.

Once our structure was in place and students were actively engaged in either math by myself, math in writing, or math with someone, we started taking anecdotal notes and recording our observations. Our observations included what we instructed, student strengths, goals, and steps to reach goals. The Observation Record form we used came from Gail Boushey and Joan Moser, the authors of *The Daily 5, Second Edition* (2014). The second edition of their book includes a chapter on The Math Daily 3 structure. The notes were taken during small group instruction, one-on-one mini conferences, and partner work. This data was vital in answering our research question to see if we noticed growth in our students through our observations.

Another component to our data collection process was student self-evaluations. We asked our second and fourth grade students to complete weekly self-evaluations every Friday to determine their participation and engagement during The Math Daily 3. In this self-evaluation, the students were to circle either a thumbs up, which means things are going well, thumbs in the middle, which is a neutral feeling, or thumbs down, which means things aren't going well. They rated the following statements: I stayed on task, I started right away, I worked the whole time, I

stayed in one spot, and I worked quietly. Each of those directives is a key component to The Math Daily 3 structure. At the bottom of the student self-evaluation, students were asked a few questions to answer in a sentence or two. The questions were as follows: What was something I did really well during The Math Daily 3 this week? What is something I need to work on more during The Math Daily 3? What is something I want my teacher to help me with next week? This information told us what aspects of The Math Daily 3 were most engaging/enjoyable to students, where they felt most comfortable, where they felt least comfortable, and where they felt they needed improvement.

The last component of our research process was the summative math assessments at the end of the study. These summative assessments provided essential information to answer our research question of whether or not The Math Daily 3 structure encourages student growth and achievement. The summative assessments are the same assessments as baseline assessments. The summative assessments exhibit whether the students have mastered the standards. By comparing the baseline and summative assessments, we look to see if our students reached goals and increased achievement during the structure.

Analysis of Data

For our study, we used data collection methods of student self-evaluations, teacher observations, on-on-one conferences, and small group instruction. The baseline and summative assessments included an addition test, a multiplication test, number sense, and reading and writing numbers. The baseline and summative assessments were identical for fourth grade and second grade, respectively.

The fourth grade students at McKinley Elementary took a timed multiplication facts test twice during this six-week study. The first assessment was a baseline assessment given before

any information was taught. The last assessment was the summative assessment, which gauges the students' knowledge of the content. The two assessments were identical and consisted of 24 questions. Of these multiplication facts, the answers were all between 1 and 100. The students were to use mental strategies to answer the questions. The students were given two minutes to answer all 24 questions, which means they had five seconds to answer each question. The entire assessment is designed to measure what students are expected to know by the end of the year.

Sixteen out of seventeen students showed growth from the baseline to the summative assessment. The average score from the baseline assessment was 44% and the average score from the summative assessment was 73%.

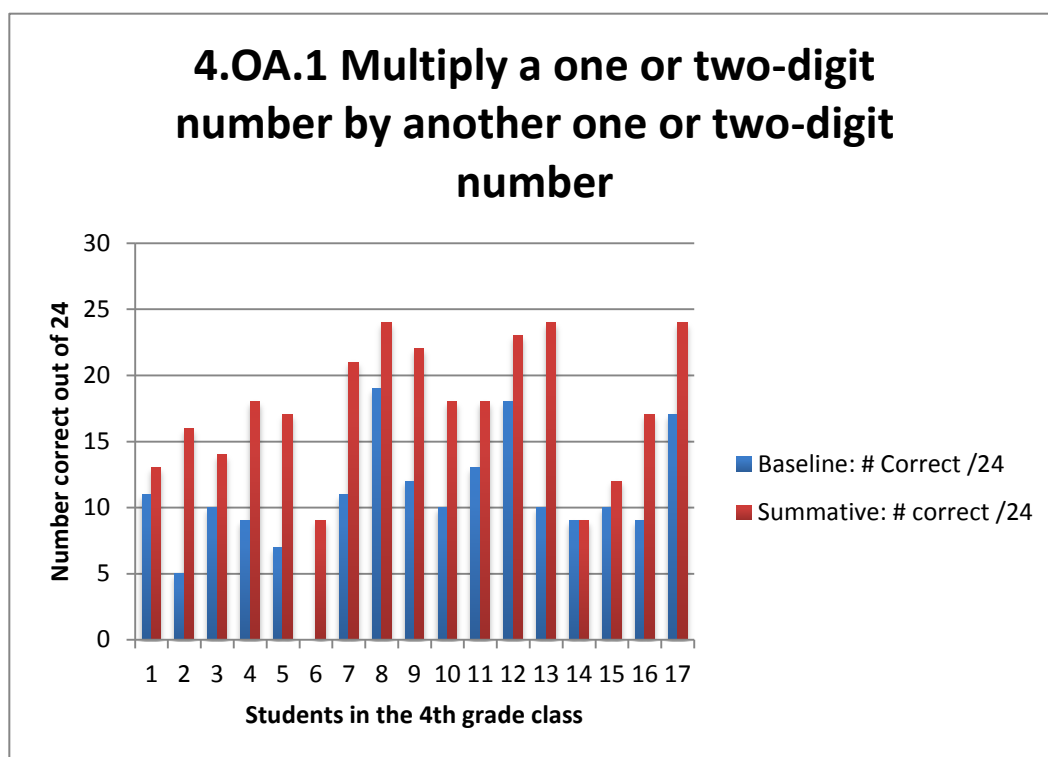


Figure 1. Baseline and summative scores for fourth grade students at McKinley Elementary School.

The fourth grade students at McKinley Elementary took two assessments on reading and writing numbers. The assessments had students read and write numbers to 1,000,000 using base-

ten numerals, number names, and expanded form. The assessment had five skill sets. The first skill set had the students read three different numbers to the teacher. The next skill set had the students write three different numbers in standard form. The third skill set gave students two numbers that they compared using $<$, $>$, or $=$. The fourth and fifth skill sets had students write numbers in word form and expanded form. The rubric also used the standards based grading scale.

Most of the fourth grade students showed growth from the baseline to the summative assessment. The average score from the baseline assessment was 68% and the average score from the summative assessment was 81%.

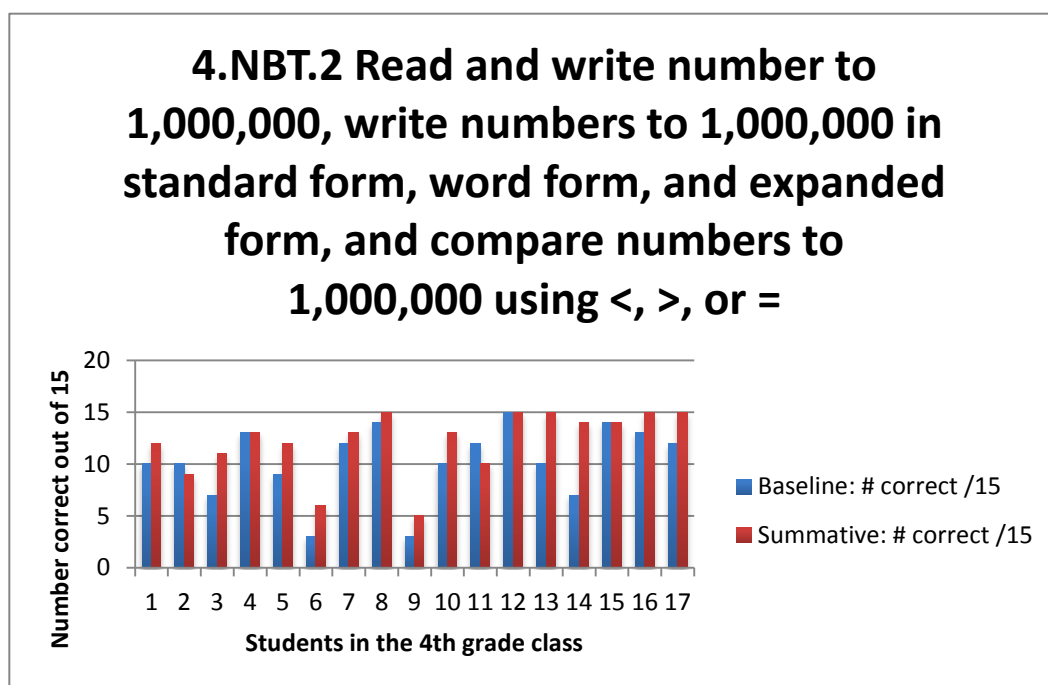


Figure 2. Baseline and summative scores for fourth grade students at McKinley Elementary School.

The second grade students at Springfield Elementary took a timed addition facts test twice in this six-week study. The first assessment was a baseline assessment which was the test given before any information had been taught. The last assessment was the summative which

gauged the students ending knowledge of the content. The assessment consisted of 24 questions. Of these addition facts, the answers were all between 1 and 20. The students were to use mental strategies to answer the questions. The students were given two minutes to answer all 24 questions, which means the students had 5 seconds to answer each question. The entire assessment was designed to measure what students are expected to know by the end of the year.

The second grade students, with the exception of one student, showed growth from baseline to summative assessments. The baseline average score was 36% and the summative average score was 42%.

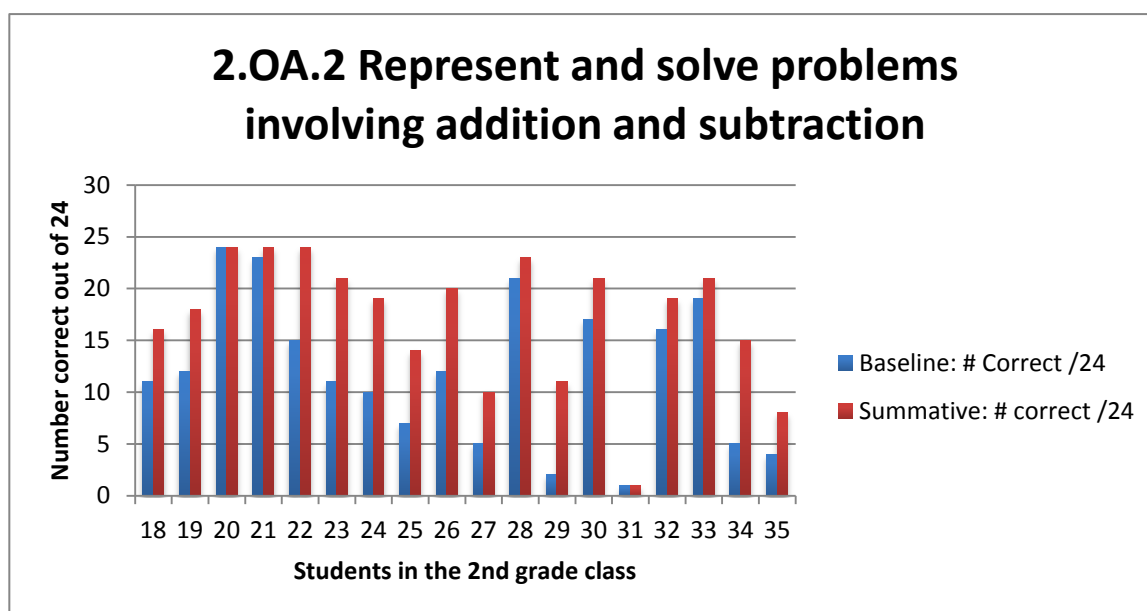


Figure 3. Baseline and summative scores for second grade students at Springfield Elementary School.

The second grade students at Springfield Elementary took two assessments on reading and writing numbers. The assessment had students read and write numbers to 1,000 using base-ten numerals, number names, and expanded form. The assessment had four skill sets. The first skill set had the students read six different numbers to the teacher. The next skill set had the

students write three different numbers that were read to them. The third skill set gave students a number and they were asked to write that number in word form and in expanded form. The last skill set had students think of their own number and write it in word form and expanded form. The rubric also uses the standards based grading scale.

The second graders all showed growth, except for one student. The average baseline score was 31% and the average summative score was 55%.

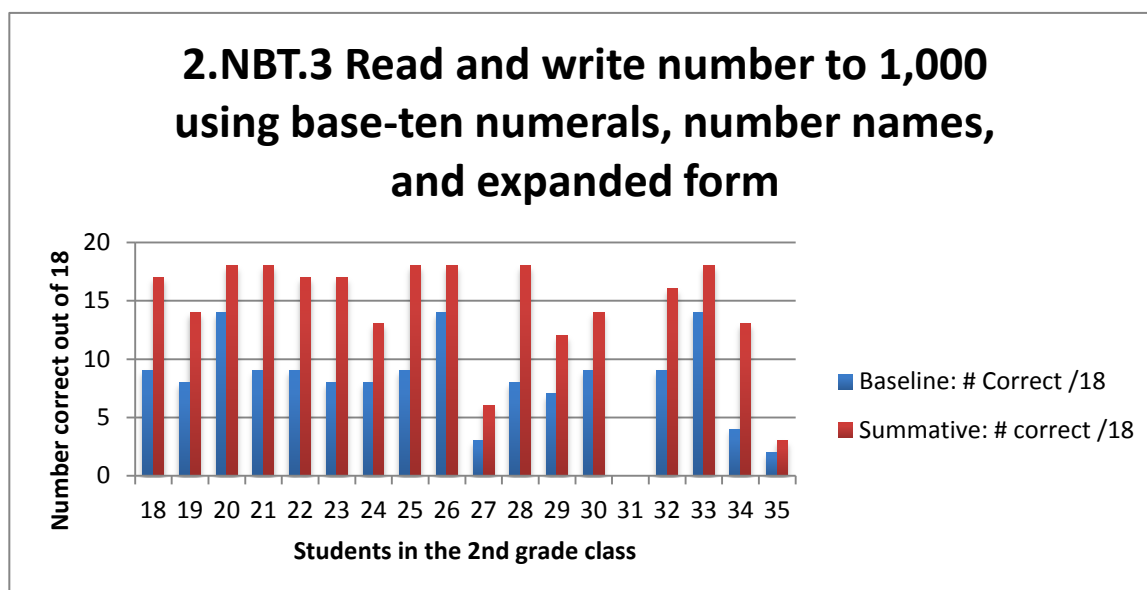


Figure 4. Baseline and summative scores for second grade students at Springfield Elementary School.

After we analyzed our data, we saw a few students either didn't grow at all or their scores fell from the baseline assessments. Some students who have special needs and are on modified curriculums contributed to the dropped class average. For example, Brayden scored a "1" out of 24 and a "0" out of 18 for the assessments due to a modified curriculum based on his individualized education plan. John, a 4th grader from McKinley Elementary, is on medication for ADHD. We were notified that he missed a dose the morning of the summative assessment and performed poorly as a direct result.

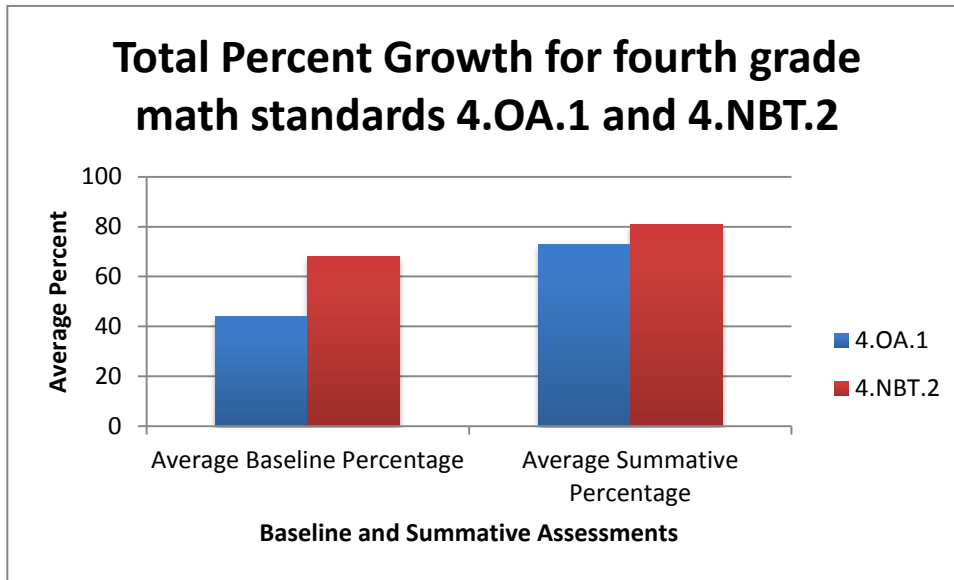


Figure 5. Total percent growth for 4th grade students at McKinley Elementary School.

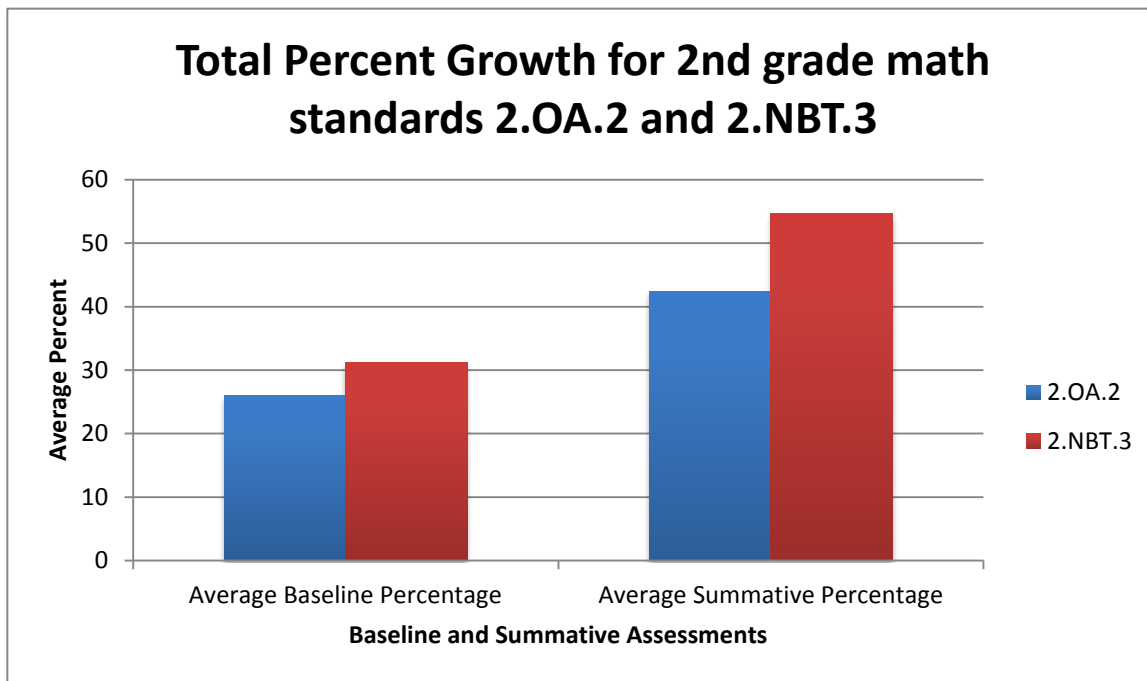


Figure 5. Total percent growth for 2nd grade students at Springfield Elementary School.

From the initial self evaluation, the second graders were fairly honest in answering the questions, based upon teacher observation and the score they gave themselves. Most of the second graders didn't know how to answer the bottom three questions, so they either left them blank or wrote that they were on task, started right away, worked the whole time, stayed in one spot, or worked quietly. About half of the students gave thumbs up for all of the steps to independence (staying on task, starting right away, working the whole time, staying in one spot, and working quietly) on the first evaluation. As the year progressed, the students understood how the self-evaluations worked and began to write specific examples of things they did well or things they needed to work on. Students wrote they wanted help with time, subtraction, addition, and place value. They also wrote that they either needed help working towards independence or that they had been successful in working towards independence. Towards the end of the study, most of the second grade students gave all thumbs up for the steps to independence.

For the fourth graders, their initial self evaluation showed a disparity between the way students viewed themselves and the teacher's perception through her observations. They gave themselves a lower grade than what was observed by the teacher. When grading themselves on staying on task, starting right away, working the whole time, staying in one spot, and working quietly, most students felt they scored either a thumbs down or thumbs in the middle. Only three students out of 17 gave themselves all thumbs up on those qualities. Towards the end of the research process, the students tended to spend less time filling in the correct "thumb," and spent more time on the written portion. Over half of the students gave themselves all thumbs-up for each criteria. For the written portion, the students didn't quite seem to know how to answer initially. They used it specifically to discuss their behavior at each of the rotations rather than discussing actual skills or strategies that they found to be difficult or easy. On the final self-

assessment, students began to list specific skills that they needed to work on outside of the classroom and were answering in complete sentences rather than just one or two words.

Observing students at the beginning of our research, during one-on-one mini conferences and in small groups, we noticed the second graders were all using their fingers to add. In second grade, students work on being accurate and efficient mathematicians and using fingers is neither an accurate or efficient way of solving problems. After working very hard on addition strategies like combinations of ten, doubles, neighbors, fast nines, and fast tens, the second graders began answering math facts efficiently and accurately in their one-on-one conferences. Most students had a beginning understanding of place value but could not read numbers or identify ones, tens, and hundreds from a three digit number. The second graders spent time working on and mastering addition facts, place value, writing and reading numbers in standard form, word form, and expanded form during The Math Daily 3 structure in interventions, small groups, and rotations.

In fourth grade, the initial one-on-one conferences and small groups showed that many of the students were relying on drawing out “groups of” or arrays and using their fingers to count to determine the answer to a multiplication combination. Most of the students did not have much prior knowledge of multiplication combinations and did not know any other strategies for solving problems. Some students used the “finger trick” to figure out the answer to any 9s combination, which is quicker and more efficient than drawing an array and counting boxes within that array. Many students felt that they needed to spend more time at home practicing their multiplication flash cards so they could have the more difficult combinations (the 12s) memorized. By the end of the second week, all students had a better understanding of the concept of multiplication and were able to verbalize a story problem involving a multiplication

combination of their choice. Through weekly observations, the fourth graders who studied their multiplication flash cards in their free time were more efficient in answering the combinations quickly. The concepts of comparing numbers, using standard, word, and expanded form, and reading numbers aloud was a review for most fourth grade students. The select students that could not remember expanded form at the beginning of the research process improved through daily practice in the form of a “warm-up” math problem as part of a daily mini-lesson. The majority of the students felt that the number sense portion was “easy.”

Action Plan

This research has benefited us as teachers and our students as learners. Before beginning Action Research, we looked for a more effective way of structuring our math block. In previous years, our students have shown a lack of accountability, engagement, and participation during math block time. It was also challenging to differentiate for all learners, especially when students come to us at such various ability levels. Math block was typically spent in a whole group setting that didn't allow for one-on-one conferencing with all students. It was obvious to us that most of our students' needs were not being met.

Now that we have completed our Action Research Project, we have found a structure that fits our needs as teachers and fits our students' needs as learners. We found that The Math Daily 3 Structure does aid in student achievement and growth for students in second and fourth grade. This structure supports both differentiation and interventions, and gives students the opportunity to be independent in their learning.

In our general teaching practices, we now make sure to incorporate strategies from The Math Daily 3 that benefit student learning and engagement. For example, we will be using more student choice in all content areas, especially in literacy and math. By giving students more

choice, it enables students to be independent in their learning. It also gives them a sense of responsibility and enjoyment in learning.

We plan to integrate other skills and content areas within the math curriculum. When students were given the opportunity to explain their mathematical thinking in math writing, they were effectively using writing skills. This approach to teaching can be used across all curricular areas; teaching science and writing in a lesson is just one example of content integration.

By using flexible grouping, based on our observational records and mini-conferences with students, we were able to give explicit instructions individually to meet each student's needs in small groups. The student self-evaluations ensured that students took responsibility in their learning; the evaluations also assisted the teacher in preparation for lessons and helped students in achieving success.

The data shows there is a possibility for an increase in student achievement and test scores for the district and state assessments directly related to math content. Since our math structure included math writing and students verbally explaining their thinking, there could be an increase in student achievement in writing and speaking skills as well.

Student choice was given throughout the math structure; students were interested and engaged in their learning and kept a positive attitude towards math content. Students have also seen their own growth and achievement which could have boosted confidence and helped students feel empowered in their learning. This could bring about a shift in attitude towards learning in general.

The Math Daily 3 structure worked so well in the math content area, we would be interested to see if structures similar to this one could be used in other content areas at all grade levels. The structures could be tweaked to fit the needs of all learners. We wonder if it would be

beneficial to use a daily or even weekly structure for each content area. We are thinking it could be easier to plan for each content area when the structures are all similar. If the structures are similar, students may follow the schedule and daily routines with ease. This helps with typical daily behavior interventions, too. If students know what is expected of them consistently, they can meet those expectations. Other potential investigations could focus on student attitudes when incorporating student choice to examine if students generally like content areas more and are more active in their learning by having more choices.

We are also intrigued to research other math structures to discover if they have had similar successes on student achievement and growth. In our research, we looked at testing several different math structures that would aid in achievement and growth, along with options for differentiation and interventions, but decided upon the Daily 3 based on our experience with the Literacy Daily 5. We wonder whether other teachers have tried math workshops or other math structures and have found different or similar results.

Based on our research, we have concluded that a well-defined math structure is important in reaching high student achievement and growth. By allowing our students to learn math content through choice, writing, peer activities, and one-on-one conferences with the teacher, we have seen rapid growth and an increase in student achievement. We have also noted a positive change in our students' attitudes towards math in general. Our research has indicated successes in math, and has the potential to expand across all areas of teaching.

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Appendix A
Quantitative Data in the Form of Baseline and Summative Assessments

2nd Grade Addition Facts Timed: 2 Minutes
(BASELINE / SUMMATIVE ASSESSMENT)

Name _____ Date _____ / 24

2.OA.2 I can add within 20 using mental strategies.

$10 + 2 = \underline{\quad}$

$9 + 2 = \underline{\quad}$

$7 + 4 = \underline{\quad}$

$5 + 10 = \underline{\quad}$

$8 + 3 = \underline{\quad}$

$9 + 4 = \underline{\quad}$

$10 + 8 = \underline{\quad}$

$9 + 3 = \underline{\quad}$

$7 + 5 = \underline{\quad}$

$7 + 7 = \underline{\quad}$

$5 + 6 = \underline{\quad}$

$8 + 6 = \underline{\quad}$

$6 + 6 = \underline{\quad}$

$7 + 8 = \underline{\quad}$

$9 + 5 = \underline{\quad}$

$10 + 10 = \underline{\quad}$

$6 + 7 = \underline{\quad}$

$8 + 5 = \underline{\quad}$

$9 + 9 = \underline{\quad}$

$8 + 9 = \underline{\quad}$

$9 + 6 = \underline{\quad}$

$8 + 8 = \underline{\quad}$

$8 + 4 = \underline{\quad}$

$9 + 7 = \underline{\quad}$

4th Grade Multiplication Facts Timed: 2 Minutes
(BASELINE / SUMMATIVE ASSESSMENT)

Name _____ Date _____ / 24

4.OA.1 I can multiply a one or two-digit number by another one or two-digit number.

$10 \times 2 = \underline{\quad}$

$9 \times 2 = \underline{\quad}$

$7 \times 4 = \underline{\quad}$

$5 \times 10 = \underline{\quad}$

$8 \times 3 = \underline{\quad}$

$9 \times 4 = \underline{\quad}$

$10 \times 8 = \underline{\quad}$

$9 \times 3 = \underline{\quad}$

$7 \times 5 = \underline{\quad}$

$7 \times 7 = \underline{\quad}$

$5 \times 6 = \underline{\quad}$

$8 \times 6 = \underline{\quad}$

$6 \times 6 = \underline{\quad}$

$7 \times 8 = \underline{\quad}$

$9 \times 5 = \underline{\quad}$

$10 \times 10 = \underline{\quad}$

$6 \times 7 = \underline{\quad}$

$8 \times 5 = \underline{\quad}$

$9 \times 9 = \underline{\quad}$

$8 \times 9 = \underline{\quad}$

$9 \times 6 = \underline{\quad}$

$8 \times 8 = \underline{\quad}$

$8 \times 4 = \underline{\quad}$

$9 \times 7 = \underline{\quad}$

2. NBT.3 Read and Write Numbers (BASELINE/SUMMATIVE) Name: _____

2.NBT.3 I can read and write numbers to 1000 using base-ten numerals, number names, and expanded form.

Read these numbers to your teacher.

36

93

245

861

601

470

Write the numbers your teacher says.

Write the missing numbers or words to complete the chart.

Number

Word Form

Expanded Form

52

519

737

Write your own 3-digit number.

Number

Word Form

Expanded Form

4.NBT.2 (BASELINE / SUMMATIVE)

Name _____

I can read numbers to 1,000,000. I can write numbers to 1,000,000 in standard form, word form, and expanded form. I can compare numbers to 1,000,000 using $<$, $>$, or $=$.

<p>Read this number to your teacher.</p> <p style="text-align: center;">5,105</p>	<p>Read this number to your teacher.</p> <p style="text-align: center;">29,082</p>	<p>Read this number to your teacher.</p> <p style="text-align: center;">387,140</p>
<p>Write this number in standard form.</p> <p>Eight thousand, seven hundred forty-nine</p> <p>_____</p>	<p>Write this number in standard form.</p> <p>Forty-two thousand, five hundred seventy-four</p> <p>_____</p>	<p>Write this number in standard form.</p> <p>One million</p> <p>_____</p>
<p>Fill in the blank to make the equation true.</p> <p>_____ $>$ 6, 988</p>	<p>Compare the numbers using $<$, $>$, or $=$.</p> <p>86,962 _____ 89,662</p>	<p>Compare the numbers using $<$, $>$, or $=$.</p> <p>710,459 _____ 701,494</p>

Write this number in word form.

22

5,274 _____

Write this number in word form.

97,618 _____

Write this number in word form.

866,805 _____

Write this number in expanded form.

7,508 _____

Write this number in expanded form.

42,753 _____











Write this number in expanded form.

353,026 _____

Appendix B

Qualitative Data in the Form of Self-Evaluations

Math Daily 3 Student Self-Evaluations

I stayed on task.			
I started right away.			
I worked the whole time.			
I stayed in one spot			
I worked quietly.			

1. What is something I did really well during Math Daily 3 this week?

2. What is something I need to work on more during Math Daily 3?

3. What is something I want my teacher to help me with next week?

Appendix C

Qualitative Data in the Form of Observational Record

Goals		Strengths
DATE	OBSERVATION AND INSTRUCTION	NEXT STEPS TO MEET GOAL



Math

NAME