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# The Effect of Teaching 3rd Grade Students New Strategies To Raise Math Assessment Scores: An Emphasis On Addition And Subtraction

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The Effect of Teaching 3rd Grade Students New Strategies To Raise Math Assessment Scores:

An Emphasis On Addition And Subtraction

Tracy Strong

Southern Adventist University

## Introduction

When children begin learning the concepts of addition and subtraction they are often taught to count on their fingers to add and subtract. But what happens when they are required to add and subtract at a faster pace, or they are adding and subtracting numbers that require more than the amount of fingers they have? Often, they fall behind because they are not able to do the calculations using “mental math.” To truly master addition and subtraction, and to feel confident and competent, students must have strategies in their minds to call upon so as to not have to rely on using an external tool (i.e. their fingers) to compute addition and subtraction equations. This research study examines whether teaching new strategies for mental math will improve fourth students’ math scores, and additionally, help them feel more confident in addition and subtraction.

## Literature Review

Mental math is a vital concept for students to have and a skill that helps them perform at a level that is necessary for attaining math fluency (Heirdsfield, 2011), and as “the assessment of student response to research-based interventions, school-based professionals are increasingly tasked with identifying empirically based techniques for varied academic skill deficits, including mathematics” (Everett, Harsy, Hupp & Jewell, 2014) this study is important for the classroom teacher and this researcher to know what interventions will assist the students in gaining knowledge in the area of mental math. Counting is an integral part of mathematics curriculum and learning. If a student has difficulty in performing mental math his or her math scores may suffer in this classroom, so it is imperative that some new strategies be taught and that the student feel safe in “the process” not only “the product” (Heirdsfield, 2011). Understanding

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how to add and subtract mentally is a huge value to students. Additionally, knowing what students self-concepts are in regards to math competency is important (Bacon, 2012). When using a mathematics assessment tool such as a *FlashMaster*, knowing how to count mentally, without using fingers, it is imperative to gaining a passing score on a level and being able to move on to higher levels, as required in this 3<sup>rd</sup> grade class. Therefore, being able to count and subtract without the use of physical tools is imperative to gain accuracy and fluency in mathematics, and this is helped by making “sense of place value, and as a result, the standard addition and subtraction algorithms” (Whitacre & Nickerson, 2006). Using fingers in counting is a common tool used by children as they learn mathematics and it is encouraged by educators in early elementary years (Michaux, Masson, Pesenti & Andres, 2013) (Albayrak, 2010). When students begin counting larger numbers it is not feasible to use one’s fingers to calculate those types of numbers (Albayrak, 2010). Incorporating more personalized instruction may be of benefit to the students also (Bacon, 2012). This research will attempt to determine if there is a value to teaching non-finger counting strategies to raise FlashMaster scores. As far as subtraction was concerned, a useful strategy that can be employed by students is “subtraction by addition” (Torbeys, DeSmedt, Ghesquiere, & Verschaffel, 2012).

The setting for the study was in a private school in suburban Tennessee. The classroom was a 3<sup>rd</sup> grade class with 22 students. Four students were chosen for this study. The classroom teacher uses the mathematical tool *FlashMaster* to assess the students’ progress throughout the year. All students in this 3<sup>rd</sup> grade class are required to pass all levels on *FlashMaster* and the students chosen for this study were already far behind the classmates. The students in this study were having severe difficulty in mastering higher levels of the *FlashMaster* in addition and subtraction. The classroom teacher wanted to find interventions and strategies that would assist

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the students in reaching higher levels on their *FlashMaster*. Three of the students were female and one was male. The main concern was the students' strategy of using their fingers to count addends that they could not count mentally. When faced with a level on *FlashMaster* that required the equation to be solved in 3 seconds or less the students were unable to complete the level and move on as they did not have enough time to count on their fingers and input the answer before time ran out.

### Methodology

The methodology of this study included working with the students in a small group in the classroom during regular class time. The participants were willing to try new strategies to better be able to conduct mental math and improve their *FlashMaster* scores.

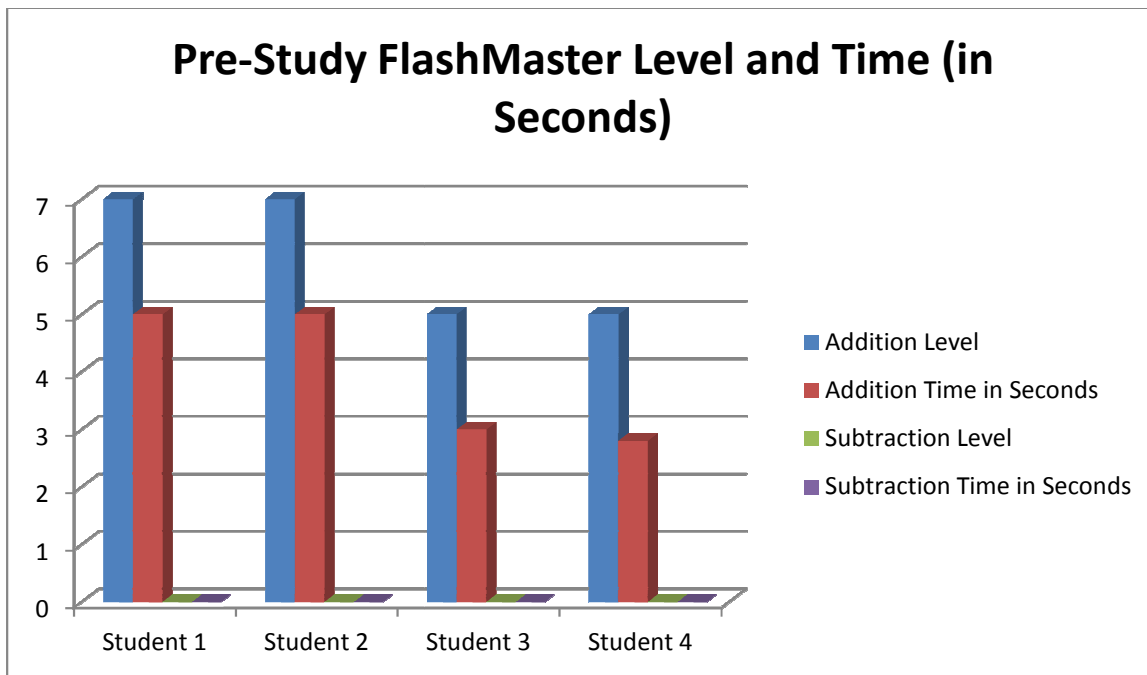
The students completed a survey to rate how they felt regarding addition and subtraction. The participants rated from 1-5 their feelings about addition and subtraction. To help the 3<sup>rd</sup> grade students understand the pre-and post-surveys they completed, scores were represented to them by sad faces to happy faces, which the researcher then translated into scores from 1 to 5. The survey also asked students to name the strategy they used when unable to add or subtract mentally. Each of the students in this study stated that they used their fingers to try to find the answers for addition and subtraction equations when they could not do it mentally. The researcher inquired of each participant of their current level on *FlashMaster*, and the time, in seconds, allowed on the level to record their answer.

Many of the strategies taught to the research group were from *Mastering the Basic Math Facts in Addition and Subtraction* (O'Connell and SanGiovanni, 2011). Other strategies taught included the following: using a number line to see the numbers and how many spaces are being

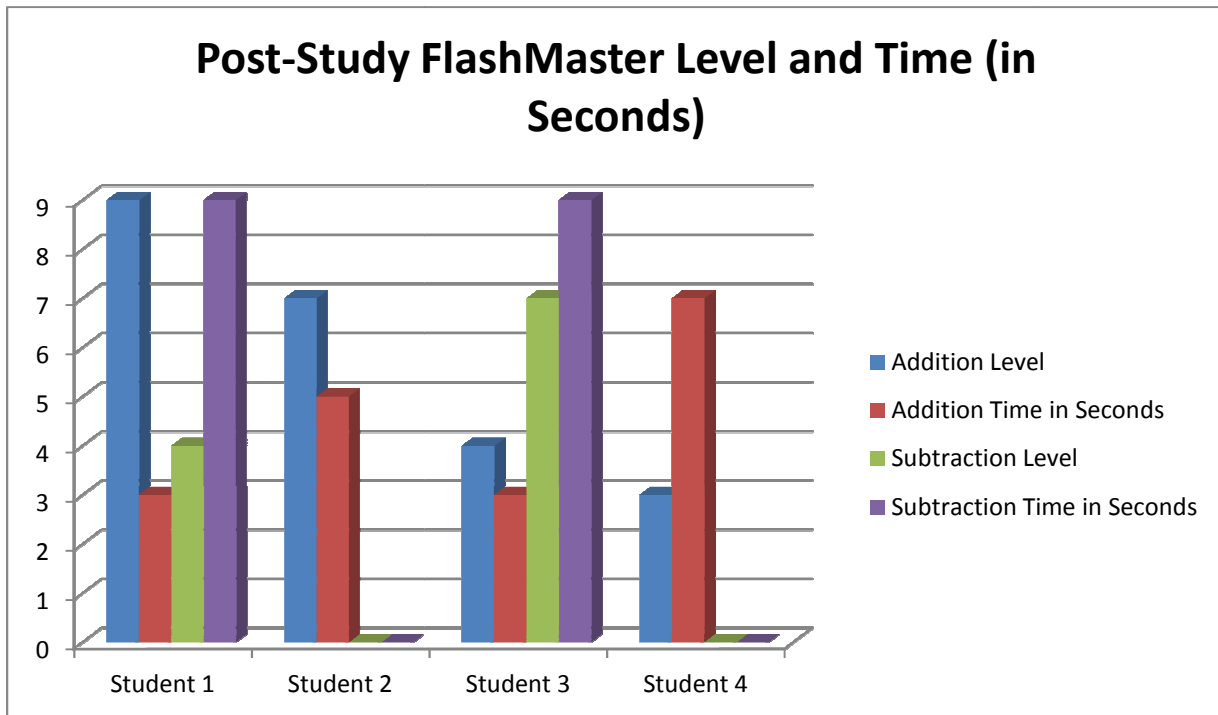
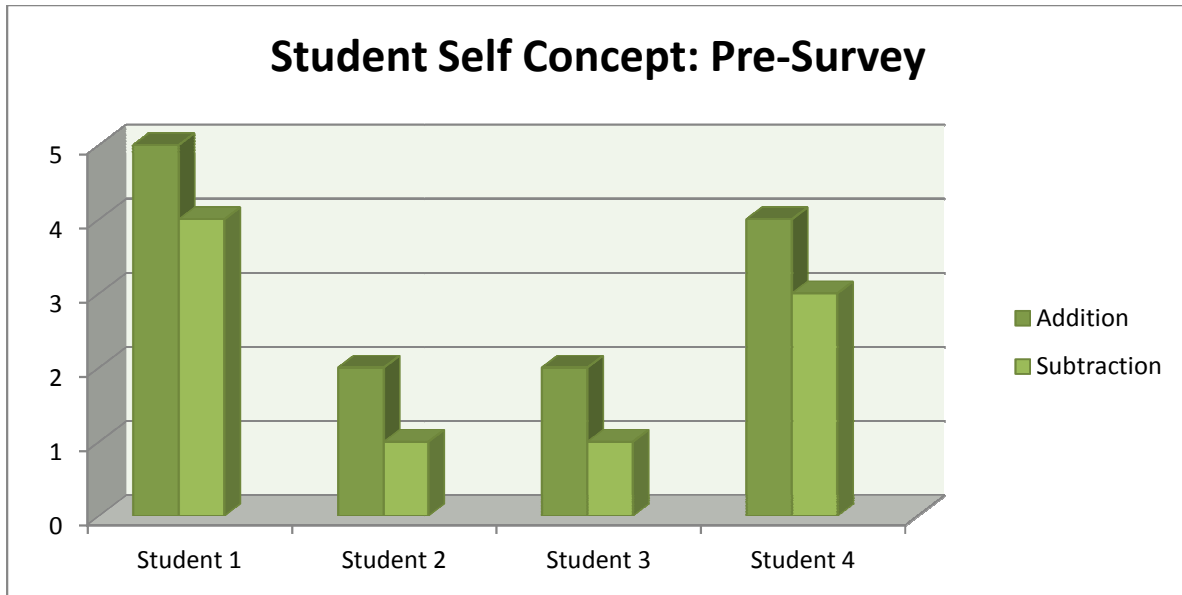
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carried forward or backward, knowing the “doubles,” (i.e.  $2+2$ ,  $3+3$ , etc.) , the “doubles + one” strategy (i.e. if  $6+6=12$ , then  $6+7=13$ )(Figure 3.), putting the larger number first and counting forward (i.e.  $3+8$  and changing it mentally to  $8+3$ ), and making ten (i.e. changing  $8+7$  to  $10+5$ ).

Strategies were taught one to four times per week for their *FlashMaster* levels were recorded again. The graphs below record the students’ progress, or lack of progress, and each student’s self-concept regarding their math competency in addition and subtraction.



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### Results

Working with a *FlashMaster*, the student begins at Level 1 and has 9 seconds to input their answers. They must answer 100% of the equations correctly to move to the next time

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frame, which is 5 seconds, then 3 seconds. When those times have been achieved they move to Level 2/9 seconds, then 5 seconds, then 3 seconds, and so on.

As can be seen in the Pre-Study FlashMaster Level and Time Chart, Student 1 was on Level 7/5 seconds, Student 2 was at Level 7/5 seconds, Student 3 was at Level 5/3 seconds, and Student 4 was at Level 5/5 seconds. These levels were far below the levels of the other students in the class. At the beginning of the study the students' progress was marginal, as strategies introduced seemingly made little difference in their scores. Soon, however, the levels the students were achieving in addition began to increase. Two of the students finished the addition level and moved to the subtraction level. The students that were not able to complete the addition level were able to achieve higher levels in addition. Overall, each student made progress in math. Were the strategies helpful? According to their Post-Study Survey some felt the strategies did not help. Some reported that they still use the "finger counting" method for addition, and subtraction.

Additionally, as seen in the Post-Study Survey, not all the students felt more confident in their math ability. Student 1 did not feel as confident in math after the strategies were taught. This student also still counted on his/her fingers as a strategy when faced with an addition or subtraction problem that was unknown using "mental math." The other three students felt more confident in their math abilities.

### Conclusion

Overall, the strategies taught to the study group seemed to have helped. Of the four students, three felt more confident in their math abilities at the end of the study, and that was one of the main goals of this research study. The two students that did not go forward and begin



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subtraction still made progress in addition and are on par now to finish all levels before the end of the school year. The two students that were able to move into subtraction will finish all levels sooner than expected.

It is possible that the students would have progressed to the current level without learning the strategies. These results may have been a result of normal growth of the 3<sup>rd</sup> grade year for each of these students. More research may be conducted to determine if teaching more mental math strategies will bring about better math scores.

### References

- Albayrak, M. (2010). An experimental study on preventing first graders from finger counting in basic calculations. *Electronic Journal of Research in Educational Psychology*, 8(3), 1131-1150. Retrieved from <https://ezproxy.southern.edu/login?url=http://search.ebscohost.com.ezproxy.southern.edu/login.aspx?direct=true&db=ehh&AN=62568296&site=ehost-live&scope=site>
- Bacon, A. (2012). *Mathematical student motivation* Online Submission. Retrieved from <https://ezproxy.southern.edu/login?url=http://search.ebscohost.com.ezproxy.southern.edu/login.aspx?direct=true&db=eric&AN=ED528937&site=eds-live>
- Everett, G. E., Harsy, J. D., Hupp, S. D. A., & Jewell, J. D. (2014). An investigation of the look-ask-pick mnemonic to improve fraction skills. *Education & Treatment of Children*, 37(3), 371-391. Retrieved

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from <https://ezproxy.southern.edu/login?url=http://search.ebscohost.com.ezproxy.southern.edu/login.aspx?direct=true&db=ehh&AN=98497430&site=ehost-live&scope=site>

Heirdsfield, A. M. (2011). Teaching mental computation strategies in early mathematics. *YC: Young Children*, 66(2), 96-102. Retrieved

from <https://ezproxy.southern.edu/login?url=http://search.ebscohost.com.ezproxy.southern.edu/login.aspx?direct=true&db=ehh&AN=60001546&site=ehost-live&scope=site>

Michaux, N., Masson, N., Pesenti, M., & Andres, M. (2013). Selective interference of finger movements on basic addition and subtraction problem solving. *Experimental Psychology*, 60(3), 197-205. doi:10.1027/1618-3169/a000188

O'Connell, S. & SanGiovanni, J. (2011). *Mastering the Basic Math Facts in Addition and Subtraction*. Portsmouth, NH: Heinemann.

Peters, G., Smedt, B., Torbeyns, J., Ghesquière, P., & Verschaffel, L. (2012). Children's use of subtraction by addition on large single-digit subtractions. *Educational Studies in Mathematics*, 79(3), 335-349. doi:10.1007/s10649-011-9308-3

Whitacre, I., & Nickerson, S. D. (2006). Pedagogy that makes (number) sense: A classroom teaching experiment around mental math. *Conference Papers -- Psychology of Mathematics & Education of North America*, 1. Retrieved

from <https://ezproxy.southern.edu/login?url=http://search.ebscohost.com.ezproxy.southern.edu/login.aspx?direct=true&db=ehh&AN=26974342&site=ehost-live&scope=site>

# MATH STRATEGIES ADDITION AND SUBTRACTION

Appendices

MATH STRATEGIES ADDITION AND SUBTRACTION

October 1, 2014

To Whom It May Concern:

I understand that Tracy Strong will be conducting a Research Study at AW Spalding and I give my permission and consent for this to occur.

\_\_\_\_\_  
Principal/Vice-Principal  
AW Spalding

\_\_\_\_\_  
Date

MATH STRATEGIES ADDITION AND SUBTRACTION

Survey 1

Circle the face that shows how you feel about Addition:



Circle the face that shows how you feel about Subtraction:



What do you do when you have a hard time adding two numbers?

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What do you do when you have a hard time subtracting two numbers?

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Do you think learning different ways to add would help you? Yes\_\_\_\_\_ No\_\_\_\_\_

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Do you think learning different ways to subtract would help you? Yes\_\_\_\_ No\_\_\_\_

Survey 2

Circle the face that shows how you feel about Addition:



Circle the face that shows how you feel about Subtraction:



After learning new strategies for Math, now how do you feel about Math?



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Did learning new ways to do Addition help you? Yes\_\_\_\_\_ No\_\_\_\_\_

Did learning new way to do Subtraction help you? Yes\_\_\_\_\_ No\_\_\_\_\_

What do you do when you have a hard time adding two numbers?

---

What do you do when you have a hard time subtracting two numbers?

---

### Child Assent Form

I am a student at Southern Adventist University. I am doing a study to figure out if teaching you new math strategies for addition and subtraction will help raise your Flash Master scores. I am asking you to be in the study because you I want to see if I can teach you ways of counting and subtracting without using your fingers, and if that will help you get better Flash Master scores.

For the study I may ask you some questions about how you feel about math, and I may record your answers. After the study in done, I will destroy the recordings and no one will be able to see them. Only people working on the study will see them. I will not tell anyone about your answers to those questions. I will not show them to your teacher, your parents/guardians, or anyone else.

You should know that:

- You do not have to be in the study
- If you decide not to be in the study you will not be in any trouble with AW Spalding, the principal, your teacher, your parents, or anyone else.
- You can stop being in the study at any time.
- Your parents have been asked if you can be in this study. Even if they say it is okay for you to be in the study you do not have to be in it.
- You can ask me questions now and if you have questions later your parents can contact me at [ttracystrong@southern.edu](mailto:ttracystrong@southern.edu).

Sign this form if:

- You understand what you will be doing in this study.
- Agree to be in the study.

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Your Signature

Date

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Researcher Signature

Printed Name

Date

## **Parental Permission for Children Participation in Research**

**Research Study Title:** The Effect of Teaching 3<sup>rd</sup> Grade Students New Strategies to Raise Math Assessment Scores: An Emphasis on Addition and Subtraction

### **Introduction**

The purpose of this form is to provide you (as the parent/guardian of a prospective research study participant) information that may affect your decision as to whether or not to allow your child participate in this research study. Read the information below and ask any questions you might have before deciding whether or not to give your permission for your child to take part. If you decide to let your child be involved in this study, this form will be used to record your permission.

### **Purpose of the Study**

If you agree, your child will be asked to participate in a research study about strategies to raise math assessment scores in addition and subtraction. The purpose of this study is to determine if learning new strategies will help improve their math scores in addition and subtraction.

**What is my child going to be asked to do?**



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If you allow your child to participate in this study, they will be asked to:

- Be a participant in a small research group
- Complete a survey regarding their attitude about addition and subtraction
- Be interviewed regarding their comprehension of addition and subtraction
- Learn new strategies for addition and subtraction
- Take a pre- and post-assessment in addition and subtraction
- Possibly be audio and/or video recorded.

### **What are the possible benefits of this study?**

Your child may learn new strategies that could benefit them by raising assessment scores in addition and subtraction.

### **Does my child have to participate?**

No, your child's participation in this study is voluntary. Your child may decline to participate or to withdraw from participation at any time. Withdrawal or refusing to participate will not affect your child's standing in class. You can agree to allow your child to be in the study now and change your mind later.

Additionally, your child must agree to participate in the study. Your child may change their mind later if they no longer wish to be in the study.

### **How will your child's privacy and confidentiality be protected if s/he participates in this research study?**

Your child's name will be changed in the research and your child's privacy and the confidentiality of his/her data will be protected. If audio/video recorded all data will be erased following the completion of the study. Any written data will be shredded after the completion of the study.

### **Whom to contact with questions about the study?**

Prior, during, or after your participation you can contact the researcher, Tracy Strong, by sending an email to [ttracystrong@southern.edu](mailto:ttracystrong@southern.edu) for any questions.

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## Signature

You are making a decision about allowing your child to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow them to participate in the study. If you later decide that you wish to withdraw your permission for your child to participate in the study you may discontinue his or her participation at any time. You will be given a copy of this document.

\_\_\_\_\_ My child **MAY** be **audio and/or video** recorded.

\_\_\_\_\_ My child **MAY NOT** be **audio and/or video** recorded.

\_\_\_\_\_  
Printed Name of Child

\_\_\_\_\_  
Signature of Parent(s) or Legal Guardian

Date\_\_\_\_\_

\_\_\_\_\_  
Signature of Researcher

Date\_\_\_\_\_