Increasing Mathematical Computation Skills for Students with Physical and Health Disabilities

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October 2017

Submitted Fulfillment of

the Requirements for the Degree of

Specialists of Education

Mercer University

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Abstract:

Students with physical and health disabilities struggle with basic mathematical concepts. The purpose of this research study was to increase the students' mathematical computation skills through implementing new strategies and/or methods. The strategies implemented with the students was utilizing the ten-frame tiles and technology with the purpose of increasing their understanding of basic mathematical concepts. The methods applied was through individualized instruction to improve the students' abilities to calculate basic mathematical computations. After the instruction utilizing the ten-frame tiles and technology, the students did improve their understanding of basic mathematical computation, however, the gain was modest.

Key Words: orthopedically impaired, ten-frame tiles, mathematical computation, physical and health impairment

Introduction

Research Questions of the Empirical Research Study

The empirical research study will address the following questions:

1. What are the evidence-based effective instructional strategies for improving the students' mathematical computation skills?

2. To what extent will the integration of ten-frame tiles improve a students' mathematical computation skills?
3. To what extent will the integration of technology improve a students' mathematical computation skills?

Assisting a Student in Mathematical Computation

In a Special Student Services, there are students with physical and health disabilities, otherwise known as Orthopedically Impaired. The students qualify for special education services under the IDEA eligibility categories of Orthopedically Impaired and Other Health Impaired. The students can be in various grades, and have varying degrees of learning disabilities. Their cognitive abilities are greatly affected by their disabilities. Students with physical and health disabilities struggle with being able to do mathematical computations.

A student with Cerebral Palsy can struggle with basic mathematical computation due to the fact they are limited with their ability to manipulate objects to assist in understanding one-to-one correspondence as easily as their peers. A student with Leukemia misses many days of school so the student has missed many lessons which are important to their understanding of basic mathematical skills. Another student with Spina Bifida has limited "interaction with the environment and objects in the environment, which delays their cognitive abilities." (Bigge, Best, and Heller, p 38)

The purpose of this article is to identify through literature review the effective instructional strategies for improving the students' mathematical computation skills. Additionally, this article is to report a study examining the effects of using ten-frame

tiles and technology with students who are orthopedically impaired. Therefore, this research was chosen to research various types of strategies and technology which can impact the students' academic performance, namely in the area of mathematical computation. The goal of this research study is to finding research-based strategies to provide meaningful mathematical lessons for students who are orthopedically impaired. Therefore, various methods will be implemented to increase the students overall mathematical understanding and skills.

Definition of Terms

Orthopedically Impaired – refers to a severe physical impairment which adversely affects a child's learning and/or education performance

Ten-frame tiles – models the place value structure of the base-10 number system by bringing a physical representation to its properties, relationships, and applications (www.kpmathematics.com)

Mathematical Computation – involves mathematical research in areas of science where computing plays a central and essential role, emphasizing algorithms, numerical methods, and symbolic computations

Physical and health disabilities – also known as orthopedically impaired

Assumptions of the Researcher

The students with physical and health disabilities will improve their mathematical computation skills through the implementation of the ten-frame tiles and

technology application. Additionally, they will improve their skills through visually manipulating the dots on the ten-frame tiles. The goal is to increase the students' ability to add or subtract two-digit numbers by two-digit numbers with regrouping by the end of these lessons.

Delimitations of the Research

The main focus of this research is to improve the students' ability to increase their mathematical computation skills. The structure of the lessons will be to implement strategies to increase their mathematical computation understanding through utilizing ten-frame tiles and technology. The increase in mathematical computation is limited due to the fact it depends on the students being able apply their gained knowledge through the ten-frame and technology to add or subtract two-digit numbers by two-digit numbers with regrouping correctly by the end of these lessons.

Review of Literature

The students who are orthopedically impaired will improve their computation skills through the integration and modifications of mathematical lessons and activities. This will improve their overall academic performance. Technology is an excellent resource to utilize in improving the students' mathematical computation skills. Lastly, the lessons can be modified to improve the students' mathematical understanding with the integration of various intervention strategies.

Process of Planning Instructional Modifications and Accommodations

The students with physical and health disabilities have various limitations which affects their learning process. The students have learning disabilities and they "tend to be passive learners." (Lovin, Kyger, and Allsopp, 158) Some students struggle with manipulating objects due to their physical disabilities which affects their understanding of basic mathematical concepts. According to White, the "teachers are being called on to adapt their instructional methods to meet the special needs of a wide range of students" including students with physical and health disabilities in their classrooms. (117) The teacher's instruction needs to be modified to provide the students with the basic mathematical understanding, so they can progress to more challenging mathematical concepts. The students will benefit through strategies and differentiation which are tailored to meet their specific needs. This can be accomplished through planning of innovative activities, such as the use of technology and ten-frame tiles in the classroom.

The students need to learn strategies to promote their learning and understanding of mathematical concepts. In the article *Differentiation for Special Needs Learners*, it demonstrates the "need for students to be actively engaged in relevant learning situations which will allow them to build and expand their conceptual knowledge while giving them the support to develop necessary underlying skills." (159) The students with physical and health disabilities need to be encouraged to persist in gaining knowledge of the basic skills they need by using their strengths and interests for motivation. They will "benefit from a structured, consistent environment in which clear

expectations are communicated for learning and performing mathematical computations." (Lovin, Kyger, and Allsopp, 159) The students can succeed when they understand the basic skills needed to progress in mathematical computation.

Students with physical and health disabilities need to learn mathematics through other means, such as visuals and strategies which will promote their learning process. The students can be provided "a goal sheet which allows them to check off each idea as they complete it. This approach helps students attend to important ideas and promotes independent self-monitoring." (Lovin, Kyger, and Allsopp, 159) Another suggestion provided by Lovin, Kyger, and Allsopp is to use a "strategy sheet that provides enough structure and cuing which allows the students to independently make progress without doing the reasoning for them." (165) The students with physical and health disabilities require more individualized instruction. During this individualized instruction, the students will benefit from being taught metacognition, so they can think about their thinking while performing mathematical tasks and self-determining their area of weakness. The article *Differentiation for Special Needs Learners* portrays the importance of "teachers needing to teach the students how to be metacognitive learners by helping them become aware of the strategies they are using and monitoring the effectiveness of the strategies they choose." (160) The students with physical and health disabilities will benefit from the use of a goal sheet and a strategy sheet. Additionally, they will progress in their mathematical skills if they learn strategies to think critically about their thinking process while completing the mathematical tasks.

Planning mathematical instruction for students with physical and health disabilities is a crucial process in the students' learning. Mathematical instruction needs purposeful "planning which focuses on both strengths and weaknesses" of the students and to "identify the potential barriers in the lesson's mathematics content and tasks." (Brodesky, Gross, McTigue, and Tierney, 148) The students' strengths can be capitalized on to improve their weaknesses pertaining to mathematical concepts. Teachers need to "think proactively about the kinds of difficulties the students may encounter in the lesson" to avoid misunderstandings with the mathematical tasks. (Brodesky, Gross, McTigue, and Tierney, 151) If the teacher is proactive in planning the mathematical lessons, it could prevent misunderstandings before the students attempt the task.

Strategies and Differentiation

The ten-frame is an activity to promote students' number understanding and the basic math facts the students need to develop so they can progress to more difficult mathematical computations. The article *Number Concepts and Special Needs Students: The Power of Ten-Frame Tiles* states the ten-frame model helps "develop basic number-to-quantity understandings where the students benefit most from models which provide a countable, visually distinct model for each number." (310) The ten-frame tiles are a visual display where students can "connect each number name and the quantity it represents." (Losq, 310) These ten-frame tiles can be implemented in several mathematical tasks. The students can participate in number talks where the students discuss the numbers they see without counting them directly. The students use their prior knowledge of number sense to determine the number displayed on the tile. The

"ten-frame tiles offer special needs students a rich, visual tool for developing understanding of numbers, place value, and mathematical computation." (Losq, 310)

Students with physical and health disabilities can have difficulties with understanding basic number concepts. They continue to fall behind due to the fact the curriculum keeps moving forward and the students have not mastered the basics in mathematics. Teachers struggle with "getting the students with special needs to understand the concept of groups of ten in the first place." (Losq, 312) The ten-frame tiles can display a number in various ways, such as the number seven can be shown as seven dots grouped together with six dots side-by-side and one left over or five on one side and three on the other. The students will benefit from using the "ten-frame tiles by developing mental images for numbers which will lay a flexible foundation for the intricacies of computation." (Losq, 312) The students will progress in their mathematical knowledge using the ten-frame tiles through the visual representation of numbers. This method provides them the with understanding basic number concepts which they need to be successful and progress to more challenging mathematical computations.

Technology to Improve Mathematical Computation

Technology is an innovative method to teach students with physical and health disabilities mathematical concepts. Suh, Johnston, and Douds state in their article "a technology-rich environment for mathematical learning influences five critical features of the classroom: the nature of classroom tasks, the mathematical tool as learning

support, the role of the teacher, the social culture of the classroom, and equity and accessibility" (235) which will promote the students' ability to learn mathematics without having to write on the paper. Some students with physical and health disabilities' time is consumed with writing the information during their instructional stage where they are missing important information where technology will provide another method to obtain the understanding of the information the students need to know. There are many technology applications to promote the students' learning of mathematics concepts. The internet provides games to promote mathematical learning. The iPad has apps for learning mathematical concepts as well.

The students who struggle with basic mathematical facts can benefit from the use of technology. A "learning environment which takes advantage of virtual manipulatives and apps offer a number of ways for students to develop their mathematical understanding," according to Suh, Johnston, and Douds. (241) The activities a teacher can plan into the lessons are unlimited with the use of technology applications. The teacher can display a hundreds chart on a Smartboard to teach money for one example. Technology is "an effective way to optimize the mathematical thinking opportunities presented by technology to plan the mathematics task which will focus on the five Process Standards. The Process Standards are problem solving, reasoning and proof, communication, connections, and representation." (Suh, Johnston, and Douds, 238) The students will progress in their understanding of mathematical concepts using technology due to the fact it provides the students who have physical and health

disabilities a method to manipulate or record their answers since they cannot manipulate objects as well as their peers.

Method

Overview of the Project

The literature review presented an abundant of insight as to the importance of teaching with the ten-frame tiles and the use of technology applications. The students with physical and health disabilities benefited from working with the ten-frame tiles. These were implemented with the students to promote addition and subtraction skills with the same tile. They visually observed the dots in a ten-frame tile. Then, the student discussed the number of dots they seen in the ten-frame tile and how they seen it. In the school system, it is called "Number Talks." The student stated how they determined the number of dots and the groups of numbers they seen to make the number. Next, the student stated how many more to make ten.

Technology was an excellent resource which was beneficial for the students with physical and health disabilities as well. Some of the technology the teacher did use was the computer and an iPad. The internet had numerous educational math games to promote mathematical skills the students needed to gain an understanding of the mathematical concepts. The iPad had many apps to promote their mathematical skills as well.

This research process has informed my practice through explaining the significance of implementing the ten-frame tiles with the students who have physical

and health disabilities while in a small group setting. The articles explained the effects and influences the ten-frame tiles has on students with special needs. The students have become familiar with the ten-frame tiles through utilizing it in the lessons to improve their mathematical computation skills. The students' goals in their IEP (Individualized Education Plan) are to add or subtract two-digit numbers by two-digit numbers with regrouping. The ten-frame tile strategy was utilized with the students for addition and subtraction with regrouping. The students have struggled with addition and subtraction with regrouping due to the fact they struggle with understanding the basic number concepts needed to perform the mathematical computation tasks successfully.

The students focused on the ten-frame tiles to improve their mathematical computation skills. The students discussed the number of dots they seen on a ten-frame tile. They communicated the numbers they seen which combined to equal the number of dots on the ten-frame tiles. Next, the students stated how many more dots were needed to total ten. This assisted in building the knowledge they need to be successful at mathematical computations skills. Technology was implemented in many of the lessons as well, such as math games on the internet and on the iPad.

Hypothesis

Hypothesis: The students' mathematical computation skills will increase through the implementation of the ten-frame tile strategy and technology.

Null Hypothesis: The students' mathematical computation skills will not increase through the implementation of the ten-frame tile strategy and technology.

Description of Participants

Two children with physical and health disabilities were selected to participate in this research study. There is a 11-year-old girl (SW) who is in the 4th grade and she has Spina Bifida. The other participant is a 10-year-old boy (AM) who is in the 3rd grade and he has Leukemia. The schools the students attend are Title 1 schools. The students are in inclusion classes with a regular educations teacher and an interrelated teacher. The students have an IEP (Individualized Education Plan) with mathematical goals to be met through an Orthopedically Impaired Itinerant Teacher. The methods used to provide instruction with the students was the pull-out model for more individualized instruction.

Instrument

The students were pre-assessed at the beginning of the implementation of the strategies and technology to determine their current functioning pertaining to their mathematical computation skills. This furnished me insight as to the current functioning of the skills the students need assistance in improving their understanding of mathematical concepts. Therefore, strategies and technology were implemented to focus on their specific needs which will attempt at improving their mathematical understanding of numbers.

Data was collected data through the pre-assessment, work samples, anecdotal notes, reflection, and post-assessment. The post-assessment is the same assessment as

the pre-assessment which helped to determine their growth in mathematical computation. This data collected from the pre-assessment and the post-assessment provides the teacher a method to track a students' mathematical computation to determine the students' progress.

Design

This research study used a qualitative research design. It is a case study utilizing a mixed-method approach. The research describes the benefits of ten-frame tiles and technology to improve the students' mathematical computation skills. This study will compose interpretations of the ten-frame tiles and technology to provide a student the basic number understanding. The proof of their improvement on mathematical computation will be exhibited by their growth from the pre-assessment to the post-assessment on addition and subtracting with regrouping of two-digit numbers by two-digit numbers.

Procedures

The research study was conducted from the beginning of the school year. The study duration commenced for one-hour sessions for the students for three times during the week. The subject under the research study is the mathematical computation. The students who were subject of the research study have physical and health disabilities. The research study began with the pre-assessment (see Figure 1, 2, 3, and 4 for assessment scores) on addition and subtraction with regrouping of two-digit numbers by two-digit numbers. SW scored a 0 on her pre-assessment for both the

addition and subtraction. AM scored a 28 on his addition pre-assessment and a 0 on his subtraction pre-assessment. Next, the lessons progressed with implementing the ten-frame tiles and discussing each number on each tile (see Figure 5 and 6 for task analysis). The task analysis demonstrates the skills the students focused on each date shown and the number of correct responses. Additionally, the lessons would apply technological applications to develop the mathematical understanding through engaging activities on the internet or the iPad. Finally, the post-assessment was given to determine the students' growth from the beginning of the research study (see Figure 1, 2, 3, and 4 for assessment scores). The students gained in the assessment scores after the lessons were complete with the ten-frame tiles and technology. SW scored a 75 on her addition post-assessment and a 100 on her subtraction post-assessment. AM scored an 86 on his addition post-assessment and a 71 on his subtraction post-assessment. The students' scores demonstrate their growth through utilizing the ten-frame tiles and technology.

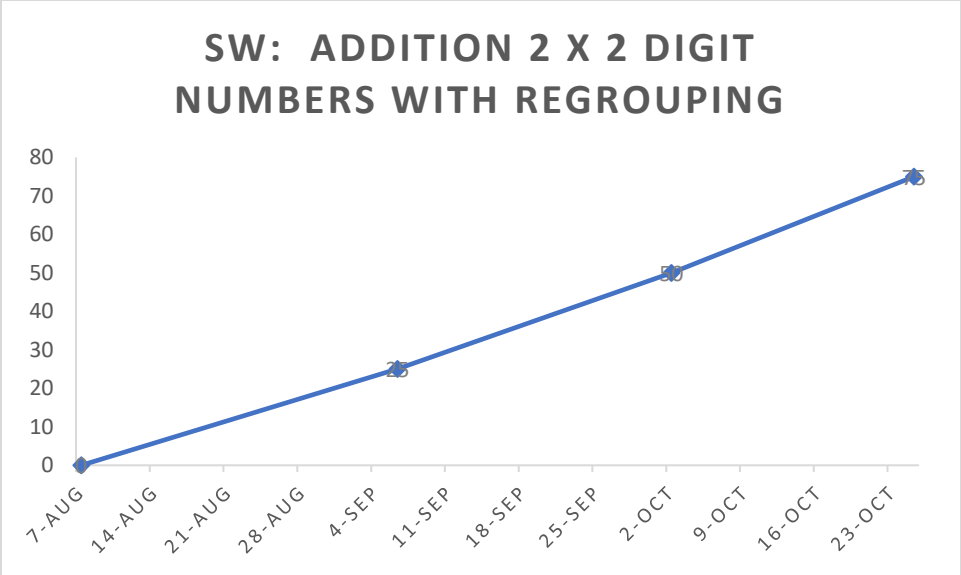


Figure 1: Data of the math assessment scores for SW

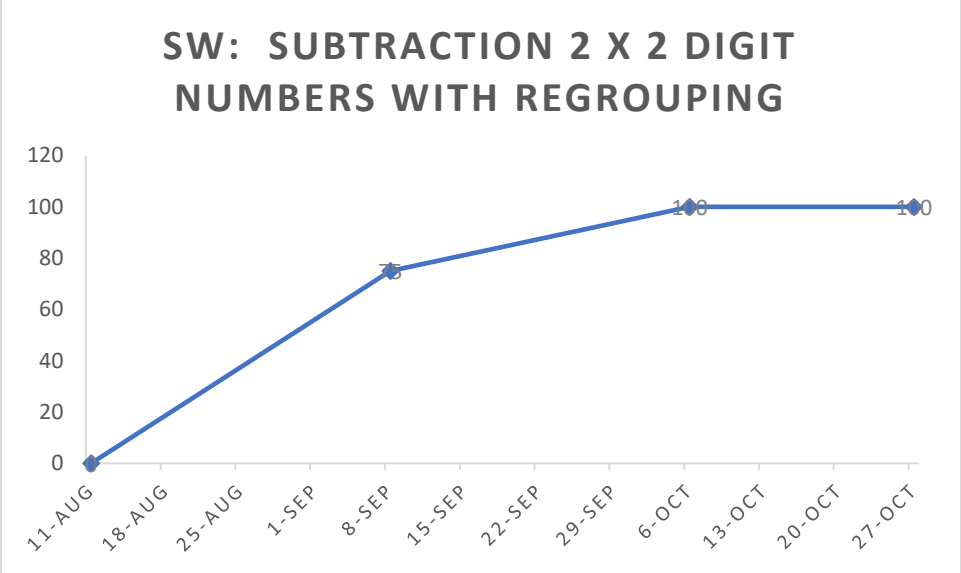


Figure 2: Data of the math assessment scores for SW

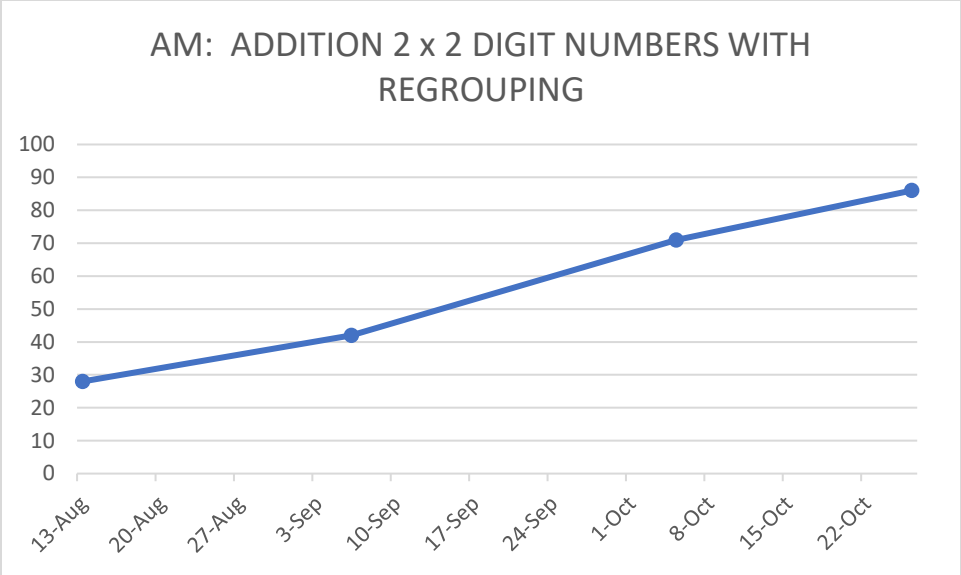


Figure 3: Data of the math assessment scores for AM

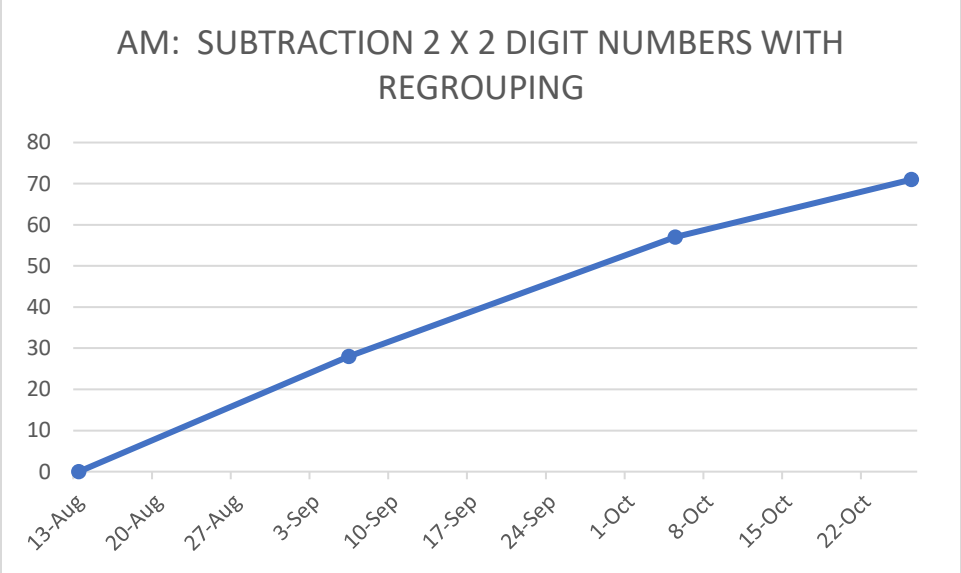


Figure 4: Data of the math assessment scores for AM

Data Analysis

The students utilized the ten-frame tiles and technology to increase their mathematical computation skills. The hypothesis was to determine if the implementation of the ten-frame and technology would increase the mathematical computation understanding. The data demonstrates the students gained understanding of mathematical computation through the implementation of the strategies. The hypothesis was confirmed to increase the students' mathematical computation understanding through the implementation of the ten-frame tiles and technology. Their assessment scores demonstrate their gains in mathematical computation.

The ten-frame tiles were visually manipulated by the student to state the number of dots, an addition sentence and a subtraction sentence of each tile. The addition sentence is how many dots make up the total dots on the ten-frame tile, such as 3 dots + 4 dots = 7 dots. The subtraction sentence is how many more dots needed to be added to make ten from the number of dots present on the ten-frame tiles, such as 10-frame – 7 dots = 3 dots more needed to make ten.

The student with Spina Bifida (SW) could successfully state the number of dots on the 1 – 10 ten-frame tiles in three trails independently with a 67% accuracy. For the addition sentences, SW had an accuracy of 67% on stating an addition sentence assistance and an accuracy of 33% independently. SW could state the subtraction sentence with an 83% accuracy with assistance and a 17% independently. Additionally, SW utilized technology through math games which assisted in increasing her

mathematical computation understanding. SW has made improvement in her ability with number sense which assisted her in improving her mathematical computation skills.

The student with Leukemia (AM) could successfully state the number of dots on the 1 – 10 ten-frame tiles in three trails independently with a 47% accuracy. For the addition sentences, AM had an accuracy of 50% on stating an addition sentence assistance and an accuracy of 27% independently. AM could state the subtraction sentence with a 63% accuracy with assistance and a 33% independently. Additionally, AM utilized technology through math games which assisted in increasing his mathematical computation understanding. AM has made improvement in his ability with number sense which assisted him in improving his mathematical computation skills.

Results and Conclusions

The purpose of this research study was to research strategies to improve the mathematical computation understanding of the students who have physical and health disabilities. The students with physical and health disabilities utilized ten-frame tiles to visually manipulating the dots to determine the number through a base-ten application. This visually manipulating of the dots did improve their mathematical computation understanding. The goal of the research study was to increase the students' ability to add or subtract two-digit numbers by two-digit number with regrouping accurately by the end of the lessons.

The results of this research study can make a significant difference in a students' mathematical computation skills. In the article *Teaching Mathematics to Special Needs Students*, it demonstrates the importance of "teachers needing to adapt their instructional methods to meet the special needs of a wide range of students" including students with physical and health disabilities. (White, 117) The students made improvements in their mathematical computation skills demonstrated through their increase in assessment scores (see Figure 1, 2, 3, and 4 in appendices).

The research study influenced my professional practice through extending the knowledge of the challenges students with physical and health disabilities have with mathematical computation. Numerous intervention strategies were implemented throughout the lessons. The students had exposure to the ten-frame tiles. Additionally, they interacted with technological mathematical games which assisted in improving their mathematical understanding. The students successfully computed the addition and subtraction sentences. The lessons significantly depended on the calculation errors in the pre-assessment phase of the research study to determine their areas of weakness. During the research study, the findings demonstrated utilizing the ten-frame tiles and technology did improve the students' mathematical understanding. All applicable steps were taken to assure this research study met the ethical standards for education research.

The recommendations for further research studies are to investigate if this research study can be replicated for students with mildly or moderately intellectually disabled students to improve their understanding of mathematical computation. The

students who are mildly or moderately intellectually disabled struggle with understanding number concepts which is essential to understanding mathematical computation. The future research recommendation is to utilize the ten-frame tiles and technological applications to improve the students' number concepts; therefore, they could progress to more challenging mathematical computation.

The research study was as anticipated by the growth the students made from the pre-assessment to the post-assessment. The students could state the number of dots on the ten-frame tiles as demonstrated on the task analysis. The student did perform well on their post-assessment as the graph demonstrates their growth of mathematical computation skills. The students were engaged in the activities as they were presented to them with enthusiasm. Additionally, the students enjoyed the math games on the internet and on the iPad. The combination of the ten-frame tiles and the use of technology assisted in their understanding of mathematical computation which contributed to their growth.

The process of the research study informed me of the various engaging, research-based strategies available to assist students in expanding their understanding of mathematical computation. The strategies were the application of the ten-frame tiles and technology. The research of the ten-frame tiles has informed me of the different views the students see the number of dots differently; however, they still were able to state the correct number of dots. An example was "I see 3 dots and 4 dots to make up 7" for one student and the other student stated, "I see 5 dots and 2 dots to get 7." Additionally, the research of math games through technology provided many

engaging activities for the students. This utilization of technology was so the students' interests could be capitalized upon to increase their mathematical computation understanding. Students with physical and health disabilities need other methods to increase their understanding of numbers through engaging, research-based strategies. The students with physical and health disabilities are not able to manipulate objects as well as their peers who gain an understanding of number concepts early in their education career through manipulatives which assist in mastering mathematical computation.

Reference List

Bahr, D. L., & Bahr, K. (2017). Engaging All Students in Mathematical Discussions. *Teaching Children Mathematics, 23*(6), 350. doi:10.5951/teacchilmath.23.6.0350

Bay-Williams, J. M., & Kling, G. (2014). Enriching Addition and Subtraction Fact Mastery through Games. *Teaching Children Mathematics, 21*(4), 238-246. doi:10.5951/teacchilmath.21.4.0238

Betts, P. (2015). Counting on Using a Number Game. *Teaching Children Mathematics, 21*(7), 430. doi:10.5951/teacchilmath.21.7.0430

Bigge, J. L., Best, S. J., Heller, K. W. (2001). *Teaching Individuals with Physical, Health, or Multiple Disabilities*. 38.

Bray, W. S., & Blais, T. V. (2017). Stimulating Base-Ten Reasoning with Context. *Teaching Children Mathematics, 24*(2), 120. doi:10.5951/teacchilmath.24.2.0120

Brendefur, J. L., Strother, S., Rich, K., & Appleton, S. (2016). Assessing Student Understanding: A Framework for Testing and Teaching. *Teaching Children Mathematics, 23*(3), 174. doi:10.5951/teacchilmath.23.3.0174

Brodesky, A. R., Gross, F. E., McTigue, A. S., and Tierney, C. C. (2004, October). Planning

Strategies for Students with Special Needs. *Teaching Children Mathematics*, 146-154.

Edwards, M. T., Quinlan, J., & Strayer, J. F. (2016). Reverse and Add to 100: Explorations in Place Value. *Teaching Children Mathematics, 22*(7), 404. doi:10.5951/teacchilmath.22.7.0404

Kazemi, E., Gibbons, L. K., Lomax, K., & Franke, M. L. (2016). Listening to and Learning from Student Thinking. *Teaching Children Mathematics, 23*(3), 182. doi:10.5951/teacchilmath.23.3.0182

Losq, C. S. (2005, February). Number Concepts and Special Needs Students: The Power of Ten-Frame Tiles. *Teaching Children Mathematics,* 310-315.

Lovin, L., Kyger, M., and Allsopp, D. (2004, October). Differentiation for Special Needs Learners. *Teaching Children Mathematics,* 158-167.

Morin, J., & Samelson, V. M. (2015). Count on It: Congruent Manipulative Displays. *Teaching Children Mathematics, 21*(6), 362. doi:10.5951/teacchilmath.21.6.0362

Pace, M. H., & Ortiz, E. (2016). Get the Goof! *Teaching Children Mathematics, 23*(3), 138. doi:10.5951/teacchilmath.23.3.0138

Sci, E., Kircher, K. S., & Shook, H. (2016). Complex Counting in Kindergarten. *Teaching*

Children Mathematics, 22(7), 434. doi:10.5951/teacchilmath.22.7.0434

Suh, J. M., Johnston, C. J., and Douds, J. (2008, November). Enhancing Mathematical Learning in a Technology-Rich Environment. *Teaching Children Mathematics,* 235-241.

Wagganer, E. L. (2015). Creating Math Talk Communities. *Teaching Children Mathematics, 22*(4), 248. doi:10.5951/teacchilmath.22.4.0248

Welcome to KP Mathematics. (n.d.). Retrieved October 28, 2017, from http://www.kpmathematics.com/

White, D. (2004, October). Teaching Mathematics to Special Needs Students. *Teaching Children Mathematics,* 116-117.

Appendices

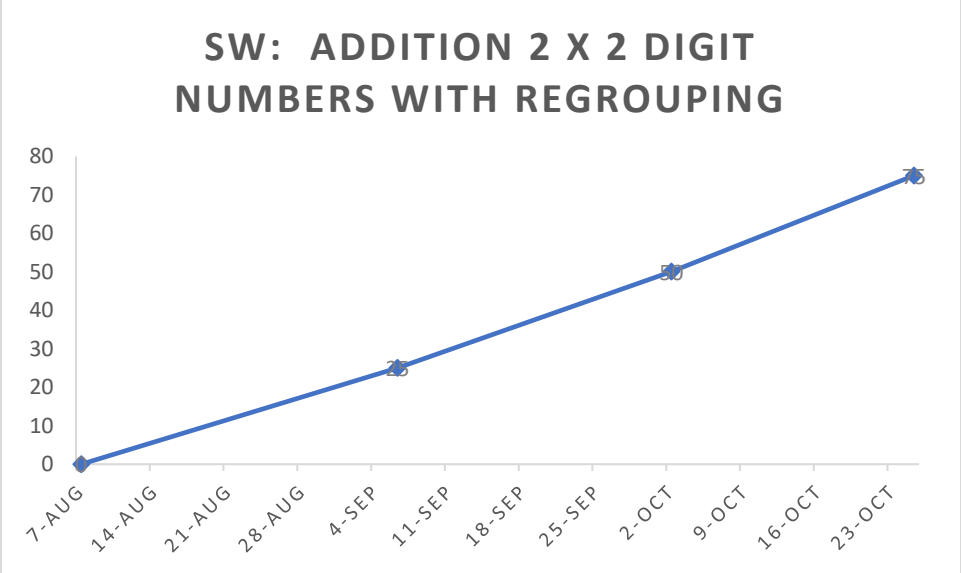


Figure 1: Data of the math assessment scores for SW

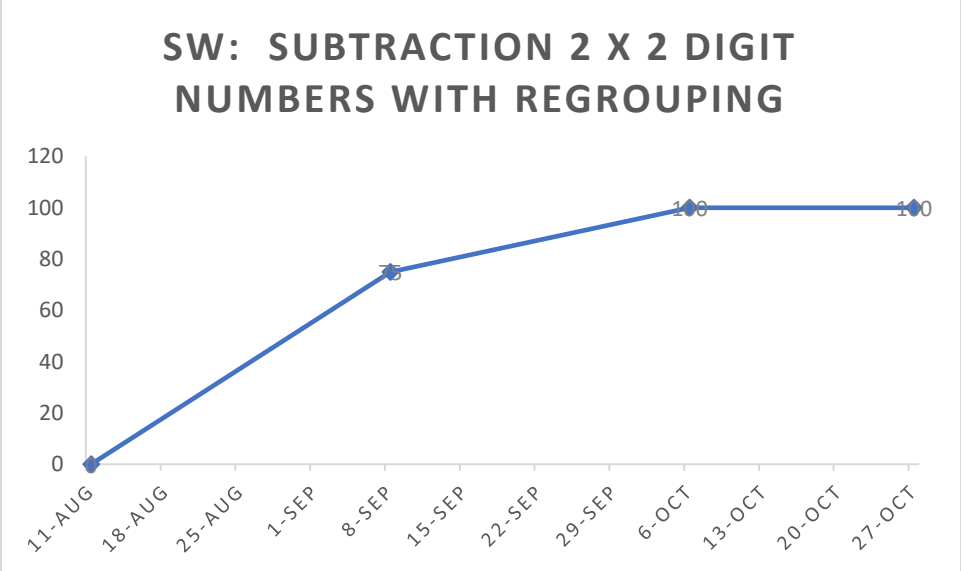


Figure 2: Data of the math assessment scores for SW

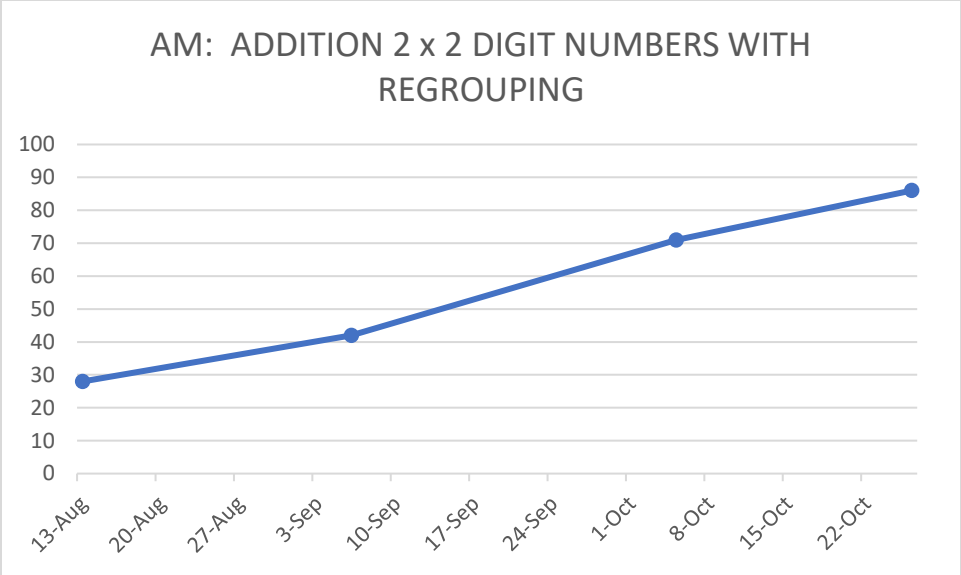


Figure 3: Data of the math assessment scores for AM

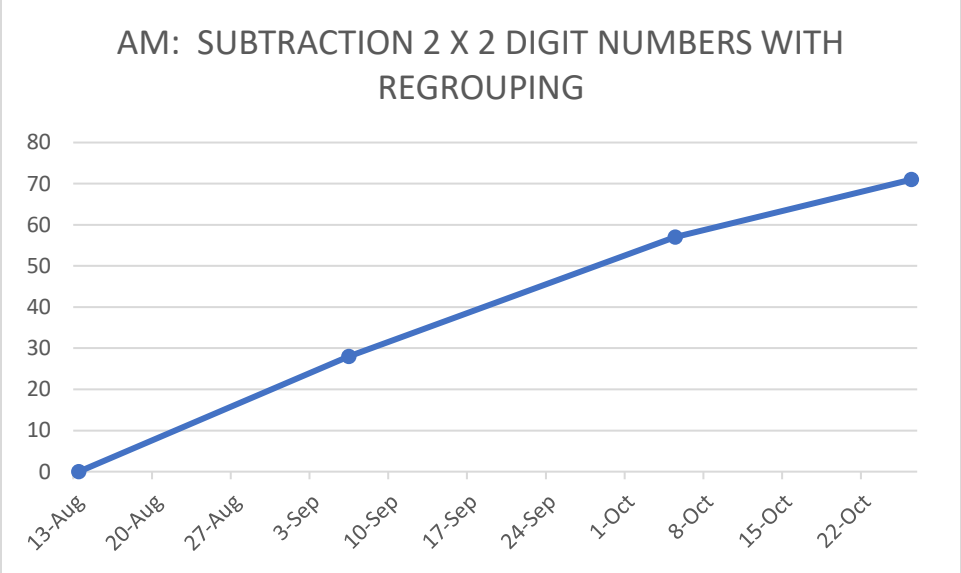
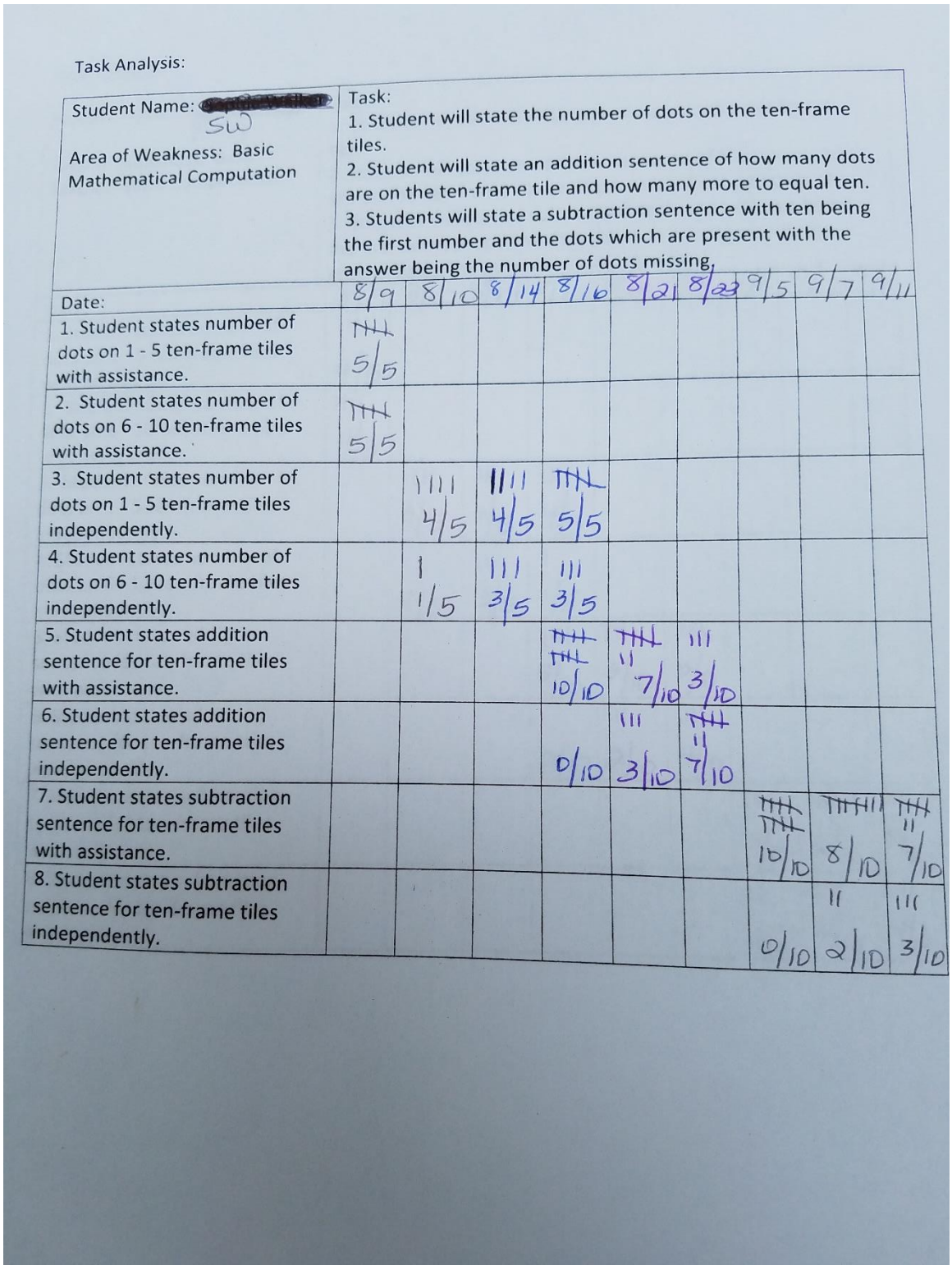


Figure 4: Data of the math assessment scores for AM

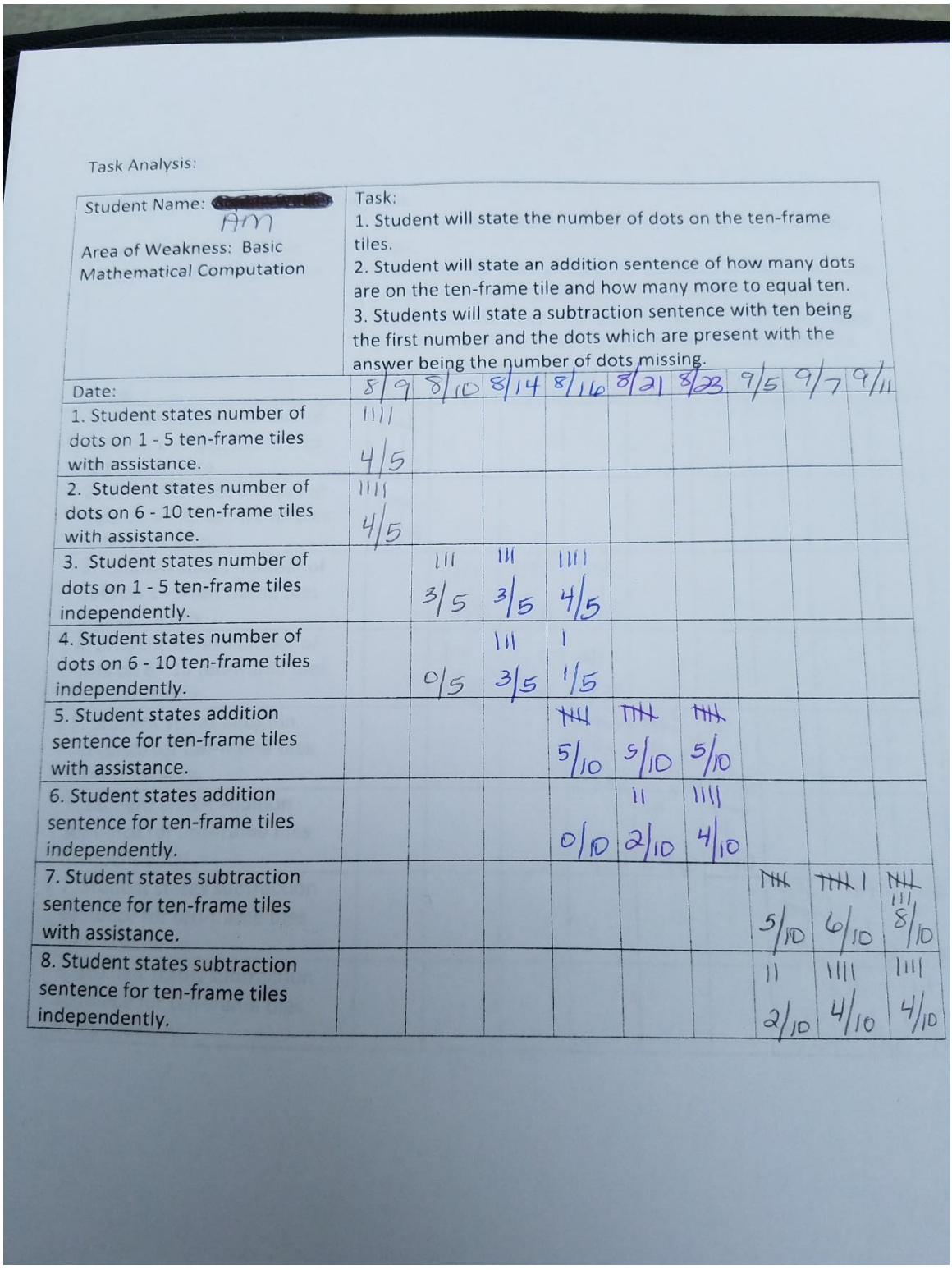


Task Analysis:

Student Name: [redacted] SW Area of Weakness: Basic Mathematical Computation	Task: 1. Student will state the number of dots on the ten-frame tiles. 2. Student will state an addition sentence of how many dots are on the ten-frame tile and how many more to equal ten. 3. Students will state a subtraction sentence with ten being the first number and the dots which are present with the answer being the number of dots missing.

Date:	8/9	8/10	8/14	8/16	8/21	8/23	9/5	9/7	9/11
1. Student states number of dots on 1 - 5 ten-frame tiles with assistance.	5/5								
2. Student states number of dots on 6 - 10 ten-frame tiles with assistance.	5/5								
3. Student states number of dots on 1 - 5 ten-frame tiles independently.		4/5	4/5	5/5					
4. Student states number of dots on 6 - 10 ten-frame tiles independently.		1/5	3/5	3/5					
5. Student states addition sentence for ten-frame tiles with assistance.				10/10	7/10	3/10			
6. Student states addition sentence for ten-frame tiles independently.				0/10	3/10	7/10			
7. Student states subtraction sentence for ten-frame tiles with assistance.							10/10	8/10	7/10
8. Student states subtraction sentence for ten-frame tiles independently.							0/10	2/10	3/10

Figure 5: Task Analysis for SW



Task Analysis:

Student Name: [redacted] AM Area of Weakness: Basic Mathematical Computation	Task: 1. Student will state the number of dots on the ten-frame tiles. 2. Student will state an addition sentence of how many dots are on the ten-frame tile and how many more to equal ten. 3. Students will state a subtraction sentence with ten being the first number and the dots which are present with the answer being the number of dots missing.									
Date:	8/9	8/10	8/14	8/16	8/21	8/23	9/5	9/7	9/11	
1. Student states number of dots on 1 - 5 ten-frame tiles with assistance.	IIII 4/5									
2. Student states number of dots on 6 - 10 ten-frame tiles with assistance.	IIII 4/5									
3. Student states number of dots on 1 - 5 ten-frame tiles independently.		III 3/5	III 3/5	IIII 4/5						
4. Student states number of dots on 6 - 10 ten-frame tiles independently.		0/5	III 3/5	I 1/5						
5. Student states addition sentence for ten-frame tiles with assistance.				~~HH~~ 5/10	~~HH~~ 5/10	~~HH~~ 5/10				
6. Student states addition sentence for ten-frame tiles independently.				0/10	II 2/10	IIII 4/10				
7. Student states subtraction sentence for ten-frame tiles with assistance.							~~HH~~ 5/10	~~HH~~ I 6/10	~~HH~~ III 8/10	
8. Student states subtraction sentence for ten-frame tiles independently.							II 2/10	IIII 4/10	IIII 4/10	

Figure 6: Task Analysis of AM