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Utilizing the Touch Point Math Strategy to Increase Math Proficiency

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University Honors Capstone

College of Education, Health, and Human Sciences

University of Nebraska at Omaha

Senior Honors Project/Thesis

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Table of Contents

Appendix A: Touch Points

Appendix B: Willy's Collective Scores

Appendix C: Pre-Assessment

Appendix D: Post-Assessment

Appendix E: Exit Tickets

Appendix F: Observation Data

Abstract

This Capstone project reports the differentiated instructional strategies that were integrated throughout a math intervention unit with a student receiving special education services. The capstone reports the effectiveness of four instructional strategies and two assessment strategies that were integrated into a math unit that focused on the effectiveness of touch point math as an intervention. The unit had eight lessons taught over two weeks. I will elaborate on the instructional strategies and assessment strategies and the effects they had on the students' learning. I collected data throughout the implementation of lessons and found that the Touch Point math strategy, modeling, think-alouds, math manipulatives, observations, and exit tickets were effective instructional strategies. I also found that the assessment strategies positively impacted students' learning and growth.

Keywords: assessment, differentiated instructional strategies, special education, think-alouds, modeling, research based instruction, multi-sensory strategy, observation assessment, exit tickets, Touch Point math strategy

Background

My capstone project reports the instructional strategies and assessments that were integrated into a math unit to meet the needs of a student enrolled in the Elkhorn School District at West Bay Elementary School. West Bay's school mission is to create a collaborative and safe environment where students are encouraged to become responsible citizens and lifelong learners.

My cooperating teacher for clinical practice has served for five years as a K-5 special education teacher at West Bay. Following a review of my cooperating teacher's caseload it was

determined that I would provide one-on-one remediation for a second-grade male student on

her caseload.

A comprehensive evaluation was completed on Willy (pseudonym) during the fall

semester. Based on the scores from the evaluation he qualified for special education services

under the categorical label of Specific Learning Disability. His Individualized Education Plan (IEP)

was written to begin the spring 2023 semester. Willy receives service 5 days per week for 80

minutes a day in a pull out setting. For my capstone I worked with Willy one-on-one for 8 days

on math remediation.

Introduction

Prior to teaching any math skills, I administered a pre-test to assess his current level of

computation in math. At the end of the 8 day lesson intervention, a post-test was administered

to assess his growth in using the intervention of Touch Point math strategy, alongside other

instructional strategies. The pre-test and post-test consisted of 10 single and double-digit

addition problems. Throughout the implementation of this intervention, I integrated two

instructional strategies to determine if they would increase the student's learning and

proficiency. I also used two forms of assessment to collect data on Willy to determine if he was

understanding the content and to track his progress.

<div align="center">

Instructional Strategies

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Touch Point

The first instructional strategy that I integrated was the Touch Point math strategy. The

Touch Point math strategy is a multisensory teaching method for the operation of addition that

involves visual, auditory, and tactile learning. The strategy works well when students are

learning math computations. Calik & Kargin (2010) noted that this strategy is beneficial to students with learning disabilities. This strategy does not require the retrieval of stored facts from memory. Retrieval of facts is often an area that students with learning disabilities struggle with.

The strategy required Willy to learn and memorize a pattern of dot notations for numbers 1 through 9 (see Appendix A). I explicitly modeled to Willy where each 'Touch Point' positioned on a number. I then had Willy touch the points on the numbers in the correct pattern. My goal was for Willy to identify touch points with 100% accuracy.

The process of implementing the Touch Points math strategy follows a sequence. Students are taught to draw and use touch points when counting. Each number, one through nine has a certain amount of corresponding points that help children count without using their fingers. As children learn to count the dots on each number, their brain begins to assign a value to each number as well.

When learning the touch points on each number the student marks the touch points with a dot while looking at the number (visual). This action is in conjunction of counting the number out loud (auditory), while touching the number with a pencil or finger (tactile). After the student masters the placements of the touch points on each number, they apply the strategy to basic addition facts. When a student uses the strategy they would begin with the first addend and count all the touch points on that number. The student would then continue counting the dots on the second number to find the sum. Once a student has become proficient in the steps, they can then put the bigger addend in their head and count on from that number to find the sum.

Mehtap (2018) conducted a study to set a goal to determine the effect of the Touch Point math strategy on students with special needs academic achievement in math. The 34 participants of the study included students with intellectual disabilities, Down Syndrome, autism, hearing disabilities, learning disabilities, and physical disabilities. The study concluded that the Touch Point math strategy had an average of 94.68% effectiveness in the academic success of children with disabilities performing additional operations. The high percentage of effectiveness in this study revealed that the Touch Point math strategy can increase student's academic success in learning math computations.

I integrated the Touch Point math strategy consecutively throughout every lesson that was taught to Willy. I found that this math intervention provided a multi-sensory strategy for him to use when solving math computations. As I taught Willy the strategy I observed that he enjoyed using the strategy to solve math problems.

Modeling

The second instructional strategy that I implemented into my unit was modeling. Wei & Guo (2022) noted that modeling mathematics is an effective way for students to acquire the skills to solve a math problem. The goal of strategy is for students to eventually execute the math skill modeled by the teacher independently. Mathematical modeling is described as a person's insight on how to carry out all parts of a mathematical procedure. Wei & Guo (2008) also noted that in mathematical modeling teachers model identifying variables, the problem-solving process, generalizing models, and representing and communicating one's findings. When teachers model to their students, the students are then able to make connections to develop their own mathematical critical thinking skills.

In summary, explicit modeling increases the development of students' independence in mathematical, critical thinking, and communication skills. There was evidence throughout the unit taught that Willy benefited from my modeling of instruction. By the end of the intervention, Willy was able to use the Touch Point math strategy independently. He also made connections to other areas in math where he could use this strategy.

Assessments

Assessments were implemented and data was collected throughout the implementation of the intervention with Willy. I utilized the researched based assessment strategies of observations and exit tickets to collect data on Willy's growth and understanding of the intervention.

Observation-Based Assessment

Observation-based assessment is a vital form of assessment in the field of education, especially in special education. Peterson (2020) noted that "the process of gathering information about people, objects, and events using senses of sight, smell, sound, touch, and taste, noticing specific details or phenomena that ordinarily might be overlooked" (p.7). Peterson found that observing students as an assessment can be incidental. Observation-based assessment is a strategy utilized while observing students. This strategy is used not as a planned occurrence but used incidentally when observing students during the lesson. In the natural setting the teacher watches individual students learning and gathers information about their learning processes. The opposite of incidental observation is planned observation. Planned observation involves planning by the teacher to observe a set of specific learning outcomes from a student.

Observation as assessment strategy is crucial in education. To understand students, we must watch and listen to them and record the observations. Teachers can assess the observations and derive meaning from them. How a student is engaged in a lesson can provide information that the teacher uses to assess the student skills. The notes from the observation help teachers make decisions on how to best support their students.

Puspita (2020) conducted a study in two primary schools in Tuban, East Java. Four teachers were asked to give their views about observation as an assessment tool. In the study one teacher stated that 90% of a teacher's information and knowledge of a student comes from observing them. It was found that students' personalities, skills, strengths, and weaknesses can be observed, recorded, and then analyzed. Observing can be used as an assessment tool to acquire information about students learning and interactional patterns in and out of the classroom.

Exit Tickets

I also used exit tickets as an assessment strategy. A teacher would use an exit ticket following a lesson to assess student understanding of the lesson objective(s). Students are prompted to write a short-written response to a teacher's question(s). The exit ticket provides the teacher with immediate feedback to assess where a student is at in understanding content. The exit ticket can also provide the teacher with insight on a student's thinking process. Exit tickets are used as a formative assessment and do not affect students grades. Exit tickets provide all students in the classroom a voice that informs the teacher if students are understanding the lesson or activity.

Exit tickets can also provide information to help teachers identify the students who may not understand a concept or skill. Exit tickets provide an opportunity for less vocal students an opportunity to share. Exit tickets create a chance for teachers to receive immediate feedback and modify their teaching if need be. Fowler et al., (2019) noted that exit tickets are an informative assessment for teachers and students. It was found that after collecting data from exit tickets that teachers are then better, "prepared to meet diverse students' needs—through differentiation and adaptation of teaching to achieve a greater equity of student outcomes" (p.19).

Goal of the Capstone

For the capstone I worked with Willy one-on-one to increase his math proficiency. I created my lessons and intervention on one of Willy's IEP goals. The IEP goal stated: By January 2023, when given grade-level math concepts and application probes over previously taught skills, Willy will be able to score 90% accuracy on ⅘ opportunities. To align with the goal the following objective guided my instruction: Following one-on-one instruction on the Touch Point math strategy, Willy will use touch points to count-up and add to find a sum of two single digit addends. Throughout the intervention, I utilized multiple assessment strategies to assess Willy's math proficiency. I collected data to evaluate the effectiveness of integrating the following research-based instructional strategies for increasing Willy's math proficiency: modeling, think-alouds, collaborative learning, as well as hands-on learning with manipulatives.

Guiding Questions:

- Does the Touch Point math strategy increase a student's efficiency and accuracy of completing additional problems?

- How beneficial is modeling and think-alouds for the student's understanding when teaching touch points?

- Do manipulatives (hands-on materials) help a student to generalize a concept?

- Are exit tickets and observation data enough to see the students' progress in seeing if all the instructional strategies are beneficial to the student?

- How will I adjust instruction throughout the unit? How will I differentiate it to my student's abilities and involve them in hands-on learning?

Participant

To adhere to confidentiality, I will use the pseudonym, Willy. Willy met eligibility criteria for special education services under the category of Specific Learning Disability. Willy performs below his expected range of function. More specifically, Willy's academic scores fall within the below-average to low ranges in basic reading skills, written expression, and math computations.

When tested, Willy's Intellectual Quotient was measured in the below-average range for math concepts and applications. His IEP noted his present levels of performance. It was noted that Willy is: (A) unable focus on one skill at a time independently, (B) unable to demonstrate several skills required for a task, (C) incapable of following multiple-step directions, (D) incapable of completing more than one skill needed for the work assigned, (E) confuses multi-step skills and incapable of completing steps in the correct order, (F) rushes through his work which results in errors, (G) works hard, but miscalculates problems when completing his work, (H) misuses strategies that he has been taught in the past, and (I) needs direct instruction in math computation to broaden his ability to apply math skills to grade-level curriculum.

Methods and Materials

The math unit aligned with the Nebraska State Standard MA 2.1.2 which states that students will demonstrate the meaning of addition and subtraction with whole numbers and compute accurately (NDE, 2015, p.8). To assess Willy's current level of performance without the use of the Touch Point math strategy, I administered a pre-test. The pre-test consisted of 10 single- and double-digit addition problem. Using the pre-test data, I then created the goals for my student. The targeted goal for Willy was to achieve a 90%, (9/10) accuracy on the assigned exit tickets and post-test.

Throughout eight days, Willy was taught the Touch Point math strategy and how to apply the strategy to addition problems. On day one, I administered a pretest to collect data to determine Willy's current level of performance without the use of the Touch Point math strategy. On day two, Willy was taught touch points for numbers 1, 2, and 3. I modeled where each touch point was positioned. I drew the touch points as well as using marker pieces to assist Willy in visualizing the touch points. I modeled and demonstrated the strategy and Willy was to repeat exactly what I modeled. The objective of this task was for him to recall the pattern in which the points were placed to long term memory. He was given time to practice placing the touch points in the correct place in his touch point workbook. I then modeled the instructional strategy 'think aloud' which demonstrated to Willy how to use the Touch Point math strategy to solve additional problems. Willy would then be asked to find the sum of additional problems with the use of touch points. The last step was for Willy to independently solve problems on an exit ticket.

On day three, I reviewed previous touch points 1-3 and be taught Willy touch points for numbers 4 and 5. The same steps as listed above were repeated as the student solved additional problems on my computer whiteboards. On day four, touch point 6 was taught. The same procedure was used, and he was assigned a worksheet. On day five, touch points for numbers 7 and 8 were taught. I observed Willy complete the and he completed an exit ticket that I used for assessment. On day six, touch points for the number 9 was taught and all of the numbers were reviewed. Assessments were conducted via observations and exit tickets. On day seven, Willy collaborated with a 2nd grade peer who also just learned touch points. Willy was asked to apply the touch point strategy to double digit addition. Lastly, on day eight, Willy was given a post-test that had single-digit and double-digit addition problems to solve.

Instructional Methods

During my instruction, I utilized four research-based instructional strategies to determine if they were helpful to the student's understanding and growth. The four strategies I implemented included the Touch Point Math Strategy, modeling, think-alouds, and math manipulatives. When implementing the Touch Point Math Strategy, the other methods of instruction complemented the over-arching Touch Point math strategy.

Touch Point Math Strategy

I first introduced Willy to the Touch Point math strategy and explained to him that the purpose of learning the strategy was to increase his math computation accuracy and proficiency in addition. I then explicitly modeled to him new numbers and their touch points each day. I used the following steps during instruction. First, I drew the numbers that we were going to learn that day. I modeled placing the dot manipulatives where each touch point on the

number would go. I explained to Willy that each number received as many touch points as its value. I shared that the touch points are placed in a specific pattern on the number. I then had Willy observe me touch each counter and count aloud as I touched each touch point. I would have Willy place the counter dots on the number and touch and count aloud until he mastered the pattern with the manipulatives. The manipulatives helped Willy understand the concept before generalizing it to paper and pencil.

I then transitioned to writing the number on a whiteboard. I modeled how to draw touch points on the given number. I would touch each touch point and count aloud. Willy would then try drawing the touch points on the given number and touch and count aloud until he mastered the placements of each touch point. When I observed that he had mastered a number, I would have him independently draw touch points on the specific number/s that he learned that day in his workbook.

After teaching touch points on the numbers for that day, I then modeled and used the instructional strategy of think-alouds to show Willy how to apply the Touch Point math strategy to addition problems. I verbally walked through my thought process of how I solved the addition problems using the Touch Point math strategy. I wanted to set him up for success when solving addition problems on his own. I wanted to ensure that was confident on how to do each step of solving the equations.

Collaborative Learning

I also included the instructional strategy of collaborative learning in my unit. After teaching all the touch points, I wanted to see if Willy could generalize the skill to second-grade math. During our one-on-one time the class was learning how to solve 2-digit addition. To

assess Willy's knowledge, I had one of his classmates come and join him for the lesson. His

classmate was also receiving direct instruction for the Touch Point math strategy. This strategy

is called 'teach-a-friend.' I gave both Willy and his classmate a different two-digit addition

problem to be solved independently using the Touch Point math strategy. Once they solved the

problem, I asked them to teach one another how they solved their problem. This interaction

was a positive way for Willy to feel confident in his math abilities. I believe if a student can

teach another student how to do the operation, they have demonstrated their understanding

the concept.

<div align="center">**Assessment Strategies**</div>

Exit Tickets

I used two forms of research-based assessment strategies in my math unit. These

strategies included exit tickets and observation-based assessment. At the end of each lesson,

Willy was given an exit ticket with 10 single-digit addition problems that included all the

numbers he knew touch points for on that given day. He was encouraged to use the Touch

Point math strategy on each exit ticket. The exit tickets were collected and used as data to track

his progress. I used the results to determine if the skill needed reteaching.

Observation-Based Assessment

The second form of assessment that I used was observation-based assessment. As

Willing was learning the touch points I would observe him as he completed the math problems.

I would provide guidance and feedback as he solved the problems and provide corrective

feedback. Following practice on the assigned problems Willy would then complete an exit

ticket independently. After each lesson, I recorded my observations (see Appendix F) of Willy. I

used the notes the from the day's lesson to guide my planning of the next lesson.

Post-Test

At the end of the unit, Willy was given a post-test consisting of the same questions as

the pre-test. I analyzed the data to determine his growth and proficiency. I reviewed the data to

determine if the instructional strategies impacted the students learning.

Results/Data Analysis

Appendix A includes a visual of Touch Points, Appendix B includes all of Willy's collective

scores over the course of the implementation. Appendix C shows the pre-assessment, Appendix

C post-assessment, Appendix D includes examples of Willy's exit ticket work, and Appendix F

includes observation data collected.

Since my data consisted of the accuracy of touch points for specific numbers, I

represented the data collection on a bar graph (see Appendix B). Each bar on the x-axis

represents either a test or collection of data for specific numbers that I taught the placement of

touch points. The y-axis represents the number of points scored out of 10.

I administered a pre-test of 10 questions that included single-digit addition with a

couple include exact numbe3r of double-digit addition. Willy scored 8/10 on the pre-test. I

utilized the formative assessment of exit tickets at the end of each lesson (see Appendix D). The

exit tickets had 10 addition problems that included only the numbers that he was taught touch

points for that day.

The red bar represents his score on the accuracy of addition problems with numbers 1-3

(10/10 points). The yellow bar represents his score on the accuracy of addition problems with

numbers 1-5 (10/10 points). The pink bar represents his score on the accuracy of addition

problems with numbers 1-6 (10/10 points). The pink bar represents his accuracy of addition

problems with numbers 1-8 (9/10 points). The purple bar represents his score on the accuracy

of addition problems with numbers 1-9 (5/10 points). The blue bar represents his post-test,

which included the same 10 problems as the pretest and he received a score of 7/10, and the

mint bar represents his ability to apply the touch point strategy to 2 digit-addition problems

that they were practicing in the classroom. He received a score of 8/10.

Discussion and Conclusions

Overall, the data that I collected shows that Willy demonstrated his understanding of

the Touch Point math strategy. Additional practice was required for number 9. His post-test

(7/10) was lower than the pre-test (8/10). I believe his post-test score was due to feelings of

fatigue. I observed during the post-test that he did not consistently apply the Touch Point

strategy.

Willy met the learning target of 90% computation accuracy on 4/6 lessons. Although

there wasn't an increase of score on his post-assessment, when I reviewed the data with his

classroom teacher she noted that she had observed improvements in his math scores.

Following the intervention, I observed Willy independently working on math problems and he

utilized the Touch Point math strategy which has led to him computing accurately and

efficiency. I would conclude that the Touch Point math strategy was a beneficial instructional

strategy to assist Willy in solving single-digit and double-digit math problems.

Willy was aware of the steps of adding numbers. During my observations I noted he was

prone to making mistakes. I observed that he rushed through completing problems which lead

to miscalculations. During the one-on-one instruction, I encouraged Willy to slow down when placing the touch points on the numbers to reduce errors.

A big part of implementing the Touch Point math strategy was assisted by many instructional strategies which included modeling, think-alouds, and manipulatives. I modeled where each of the touch points would go on a number and in the correct pattern with counter dots. In addition to modeling, I utilized the think-aloud strategy to demonstrate to assist in helping Willy add two single digits together. The think-aloud strategy allowed Willy to verbally state his problem-solving process. I observed that when utilized the think-aloud strategy his accuracy in computing the addition problems improved. I also found that integrating manipulatives (i.e., counter dots, writing on the dry erase board) helped Willy conceptualize where each of the touch points should be placed on a given number. When Willy applied the strategies learned his accuracy improved.

I found that exit tickets and observation-based assessments were useful to capture Willy's progress throughout the unit. Having daily exit tickets provided data that I was able to review and determine if Willy was meeting the level of proficiency. During observations of Willy utilizing the touch points I was able to immediately identify errors and reteach as needed. For example, Willy struggled with learning how to place the touch points on number 9. I observed that he did not perform the touch point placement correctly. Based on inaccurate placement of the touch points for the number 9 his answers to the problems were incorrect. I would immediately intervene and provide additional instruction to remediate the error. I would then have Willy complete three additional problems until he placed the touch points on the correct location.

Following review of the pre and post data, it was noted that Willy did not improve. I reviewed the data with his second-grade teacher and she reported that his math skills are improving in the general education classroom during addition computation lessons. Following an analysis of the data collected, I believe the Touch Point math strategy was beneficial in improving Willy's math computation skills. I would conclude that the Touch Point math strategy is an effective instructional strategy to assist students who are struggling with math computations.

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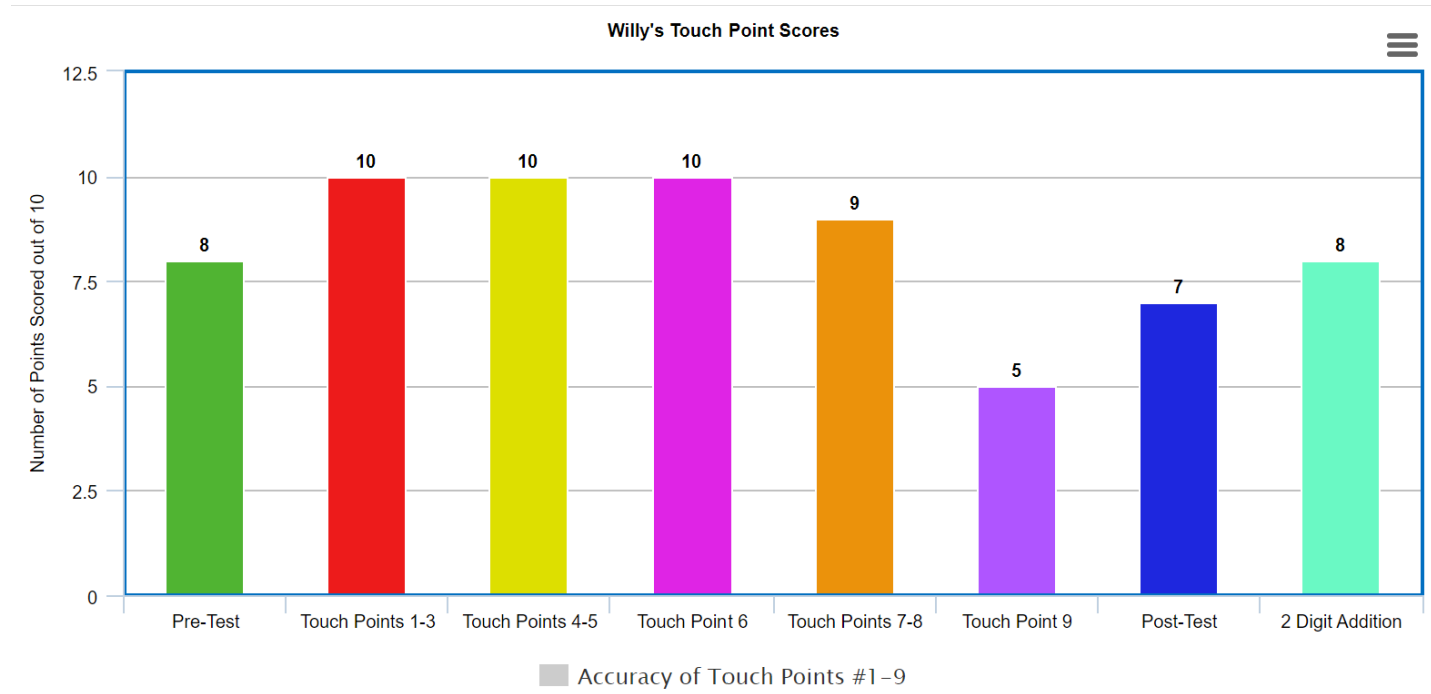
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Appendix

Appendix A: Touch Points

Note. Touch Point math strategy touch points.

Appendix B: Willy's Collective Scores

Note. Willy's collective touch point scores.

Appendix C: Pre-Assessment

1/12/23

Touchpoint Pre-test   time: 1:44
                                    min   sec

Name:

1. $14 + 8 = 16$

2. $8 + 9 = 17$

3. $36 + 5 = 41$

4. $3 + 7 = 10$

5. $22 + 12 = 40$

6. $11 + 1 = 12$

7. $6 + 6 = 12$

8. $55 + 4 = 50$

9. $9 + 5 = 14$

10. $7 + 2 = 1$

Appendix D: Post-Assessment

Time: 2:08

Post

Touchpoint Pre-test

Name:_

1. (14) + 8=

2. 8 + 9= 17

3. (36) + 5= 41

4. 3 + (7)= 10

5. (22) + 12= 34

6. 11 + 1=

7. 6 + 6= 14

8. 55 + 4= 59

9. 9 + 5= 15

10. 7 + 2= 9

Appendix E: Exit Tickets

#s 1, 2, 3 touch points
Exit Ticket   Date: 1/13

Name:

1. $2 + 2 = 4$ 9. $0 + 1 = 1$

2. $3 + 1 = 4$ 10. $0 + 0 = 0$

3. $2 + 3 = 5$

4. $1 + 2 = 3$

5. $0 + 3 = 3$

6. $1 + 1 = 2$

7. $2 + 0 = 2$

8. $3 + 3 = 6$

Touch Points 4 & 5   1/17/23

Name:

1. $3 + 4 = 7$

2. $5 + 1 = 6$

3. $4 + 4 = 8$

4. $2 + 6 = 7$

5. $5 + 4 = 9$

6. $1 + 4 = 5$

7. $3 + 5 = 8$

8. $5 + 5 = 10$

9. $4 + 2 = 6$

10. $5 + 0 = 5$

Touch Points 7 and 8

Name: 1

1. 6 + 7 = 13   9. 8 + 2 = 10

2. 8 + 3 = 11   10. 7 + 5 = 12

3. 5 + 8 = 13

4. 7 + 4 = 11

5. 2 + 7 = 8

6. 8 + 8 = 13

7. 7 + 8 = 15

8. 1 + 7 = 8

Touch point #9

Name: _____

1. $9 + 8 = 17$

2. $2 + 7 = 9$

3. $8 + 9 = 17$

4. $5 + 9 = 14$

5. $6 + 7 = 15$

6. $9 + 7 = 15$

7. $3 \cdot 9 = 21$

8. $4 + 8 = 12$

9. $3 + 9 = 12$

10. $8 + 21 = 27$

Appendix F: Observation Data

Date and content:	Number of addition problems correct out of 10	Observations
1/12/23 **Pre-test**	**8/10**	Time it took to take- 1:44 • Took him a bit to get started • Used pound and count strategy with fingers • Sometimes he would lose count on his fingers resulting in the wrong answer • There were a few problems he knew from memory like #s 3 and 10 • Two, 2 digit adding on problem #5 troubled him
1/13/23 **#s: 1, 2, & 3**	**10/10**	Willy did such a good job with the numbers 1,2,3 and got the touch point strategy pretty quick. He counted aloud correctly most of the time. During instruction there were times I gave him an additional problem like 3+1= he would say 1,2,3,1 and then I needed to instruct him to count on like 1,2,3, and say 4 as he put one dot on 1. I also taught him to put the bigger number in his head like in 3+1= He would circle the 3 and put it in his head and say 3, 4.
1/16/23 **#s: 4 & 5**	**10/10**	Willy remembered touch points 1, 2, and 3 that were taught to him last week and was able to apply those to the additional problems that I gave him. When teaching touch point 5 to him he would often forget to put the 4th dot on 5. I had him practice 5 numerous times so that it is in his memory. When solving math problems he would circle the biggest number and then count using his touch points! Whoo-hoo! For instance, if the problem was 5+2, he would circle 5 and say five and then do 2 touch points on two while counting on 5,6.
1/17/23 **#s: 6**	**10/10**	Willy tackled number 6 head-on and was able to correctly place the touch points where they belong on the number while solving addition problems on his whiteboard

1/17/23 **#s: 7&8**	**9/10**	Willy learned two tough digits today! He could use more practice with both of these numbers as he would sometimes mess up on the placing of dots on 8. I had him practice, practice, practice. On his worksheet with 7 and 8, he got confused on 8+8 as he lost count while counting on from 8.
1/18/23 **#s: 9**	**5/10**	Touchpoint 9 is the hardest touchpoint for students to conceptualize and it showed through Willy's performance. It took him lots of practice to get the touch points on number 9 correctly as it has a weird starting point. When he would count from the number her circle and add on 9 he would miscount as he would get ahead of himself when circling and counting aloud which then resulted in miscalculation. I needed to remind him to take his time when counting as he is circling. On his exit ticket that he did alone, he missed a lot as he would lose track of his counting. After he completed the exit ticket, we went back and re-did the problems that he missed together.
1/19/23 **Post-test**	7/10	Although the touch point strategy helped him he seemed to rush and make simple errors on computations because at times he chose not to use the strategy

Note. Anecdotal notes of the observations of Willy.