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The effects of using the GoMath program on teaching computation skills for students with learning disabilities

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THE EFFECTS OF USING THE GOMATH PROGRAM ON TEACHING COMPUTATION SKILLS FOR STUDENTS WITH LEARNING DISABILITIES

by

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Dedication

I dedicate this manuscript to my family who supported me and gave me the strength to persevere.

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I would like to express my sincere appreciation to Professor Joy Xin for her knowledge and support in completing my thesis. Thank you for your expertise and dedication.

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Abstract

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The purpose of this study was to evaluate the effects on teaching math computation skills to students with learning disabilities (LD) using the GoMath program and to examine the teachers' and students' satisfaction with this program in their teaching and learning. Four, 3rd and 4th graders with LD were taught by one special education teacher in a resource room and participated in learning computation skills for 60 minutes, 5 days per week for 12 weeks, using the Go Math program. A multiple baseline research design with A B phases across students was used to evaluate their performance. The findings indicated that all of the participants increased their addition, subtraction and multiplication computation scores using the GoMath program, and the teachers and students were generally satisfied with the program and its' supplemental materials. The results of this study support the use of the GoMath program providing explicit instruction with a multisensory approach to teach math computation skills to students with LD.

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Chapter 1

Introduction

Statement of Problems

The ability to apply mathematical skills is important for students in their academic achievement and their daily lives, but challenging to understand certain mathematical concepts and to develop these skills. Students with learning disabilities (LD) often struggle in acquiring basic mathematical skills at the same rate as their typically developing peers (Heward, 2009). Math computation is a foundational skill that is necessary to solve mathematic problems. In order to be successful, students with LD often need additional support and modified instruction, such as using explicit instruction with a multisensory approach that includes the use of manipulatives and computer technology.

Explicit instruction refers to teacher directed instruction with a sequential order (Cohen & Spenciner, 2009). It involves teaching a concept, modeling the learning process, guiding students through applications, and extending practice until mastery is achieved. Explicit instruction includes direct explanation of concepts with examples demonstrated and skills clearly modeled without vagueness or ambiguity (Carnine, 2006). In such instruction, the teacher's language should be concise, specific, and related to the objective. It is also a visible approach which includes a high level of interaction between the teacher and students. Teachers plan for explicit teaching to make connections to curriculum content and to establish clear learning goals for each lesson. During the instruction questions are asked to continually check for student understanding, and instructional procedures are adjusted based on students' performance. In addition, teachers scaffold learning experiences to enable students to succeed and to be challenged to reach their developmental potential (Baker, Schirner, & Hoffman, 2006).

A multisensory approach refers to instruction using visual, auditory and tactile formats simultaneously. Students learn better when instruction is incorporated with multiple senses and movement (Wadlington &Wadlington, 2008). The use of manipulatives is considered as part of a multisensory approach because tangible objects are presented for students to better understand a concept. Manipulatives in mathematics refer to using a visual model to transform an abstract concept into a concrete example and allow students to form a basis to expand their knowledge (Burns, 2004). One example is to use base ten blocks as a visual model of the base ten number system. Blocks of different sizes represent each of the base ten place values and can be exchanged to represent the same value. A second example of the use of manipulatives is using fraction strips to help students compare and identify equivalent fractions. The strips provide a model to demonstrate the value of fractions. Another example is using an analog clock for students to view the time passage and manipulate a given time. Students with LD often have a difficult time understanding the passage of time until they physically move the hands of a clock. Concrete objects that resemble daily items should assist these students in making connections between abstract mathematical concepts and the real world (Brown, McNeil, & Glenberg, 2009). In addition, Instructional variables such as the perceptual richness of an object and the level of guidance offered to students during the learning process effect the efficacy of manipulatives (Carbonneau, Marley, & Selig, 2013). Manipulatives may not be effective if they aren't demonstrated explicitly by the instructor first and followed by guided practice with the teacher.

It is found that kinesthetic sensation and physical movement in the learning process can encourage students' participation in their learning activities (Nunn & Miller, 2000). The use of technology can also be considered as part of a multisensory approach involving the visual, auditory and tactile pathways. Using a computer, a visual model on the screen is presented and students can listen to the explanations and respond to questions simultaneously. To date, many school districts have been investing in different types of technology such as smart boards, laptop computers and iPads. Teachers are encouraged to integrate technology into instruction for students to better acquire new knowledge based on their prior learning experience, interests, and needs (Condie & Monroe, 2007). Computer programs are used in school to enrich students' learning activities. Technology can provide simulation and animation to present mathematical concepts in a format more appealing to students (e.g., Nusir, Alsmadi, Al-Kabi & Sharadgah, 2012). This opportunity allows teachers to make their instruction motivating and interesting. Students with LD often make procedural errors in basic mathematical computation and often possess poor organizational skills (Geary, 2004). Technology offers an opportunity for students to better organize information on screen with procedural steps incorporated (Bouck et. al., 2013). Virtual programs provide built in components to minimize the cognitive load experienced by students when solving mathematical problems (Suh & Moyer, 2008). Go Math is such a program aligned with the common core standards with various technology access including video presentations and online resources. The program provides manipulates, step-by-step lessons and enrichment activities such as a personal math trainer, videos presentations, tutorials, and printable resources for both students and instructors.

Significance of the Study

Teachers are facing a challenge to meet the needs of all students in class, especially those with LD (Carnine, 2006). Students' ability levels vary as well as their level of support needed. It is imperative to use an instructional program that includes resources to accommodate students with disabilities. Explicit instruction with clear explanations and models was suggested for teaching students with LD (e.g., Satsangi & Bouck, 2015; Sood, 2010; Davis & Jungjohann, 2009), as well as a multisensory approach with several sensory pathways presented simultaneously (e.g., Skarr, et. al., 2014; Flores, et. al., 2014; Mancl, et. al., 2012 and Sood, 2010). The use of technology can further enhance instruction by engaging students in a multi-sensory format on the computer screen as an alternate method of teaching. In the past, many studies were conducted to evaluate technology-based instruction and its effectiveness (e.g., Lee & Chen, 2015; Satsangi & Bouck, 2015; Burns & Hamm, 2011), while little research has been focused on a particular program. The present study is designed to examine the GoMath program and its supplemental materials to investigate whether this program is effective for improving math computation skills of students with LD.

Statement of Purposes

The purposes of this study are to: a) evaluate the effects of the GoMath program on math computation skills of students with LD, and b) examine the teacher and students' satisfaction with the GoMath program in their teaching and learning.

Research Questions

1. Do students with LD improve their math computation skills when the GoMath program is provided in math instruction?
2. Are teachers satisfied with the Go Math program?
3. Are students with LD satisfied with the Go Math program?

Chapter 2

Review of Literature

Students with learning disabilities (LD) often struggle in acquiring the basic mathematics skills that are important for their academic and real lives (Gersten, et. al., 2009). Understanding mathematics concepts and developing appropriate computational skills are challenging these students, while computation is a foundational skill necessary to solve mathematics problems. Students with LD often need additional support and adaptations because they don't acquire mathematics skills at the same rate as their typically developing peers (Heward, 2009). It is found that these students benefit from explicit instruction with a multisensory approach (Mancl, Miller, & Kennedy, 2012). The use of manipulatives and computer technology is suggested to enhance instruction to accommodate these students because the visual presentation of technology serves as visual aides to increase students' involvement in their hands-on activities (Nusir, Alsmadi, Al-Kabi & Sharadgah, 2012). This chapter reviews research articles about computer based instruction and explicit instruction, multisensory approaches in teaching computational skills for elementary students with LD.

Explicit Instruction

According to Gersten, et. al., (2009), students with LD learn better when explicit instruction is provided as compared to other instructional approaches. Unfortunately, many math programs do not provide demonstrations of target content, adequate structured practice, or procedures with immediate feedback (Doabler, et. al., 2012). Some lessons in mathematics programs did not include sufficient models or opportunities for students to practice and develop skills to reach proficiency (Bryant, et. al., 2008).

Mancl, Miller, and Kennedy, (2012), evaluated explicit instruction to teach subtraction with regrouping to students with LD. The participants were 2 male 5th graders, 1 male 4th grader, and 2 female 4th graders, ranging in age from 10 to 11. They were selected based on screening assessments designed to identify learning disabilities. All of the participants received 30 minutes of Tier-3 mathematics intervention in a resource room with a special education teacher who was experienced in explicit instruction. Baseline and intervention probes were used to measure student progress. These probes consisted of 10 computation problems with regrouping. A total of 11 scripted lessons were delivered including discourses following the script, an advanced organizer, modeling, guided practice, independent practice and problem solving practice. In addition, three-dimensional plastic base-ten blocks and place value mats were provided during the lessons to represent and solve subtraction with regrouping. The first five lessons involved concrete level instruction using the manipulatives, the following lessons were developed for a representational level using drawings of base-ten blocks, and the final three lessons were at the abstract-level using the strategies in the previous lessons. Each lesson included explicit teaching components to teach subtraction with regrouping. When the advance organizer was provided, the teacher introduced the upcoming lesson, explicitly stated the teaching components, and reviewed the previous lesson. When the modeling was applied, the teacher encouraged students to think about solving subtraction problems using base-ten blocks and drawings. During guided practice, the teacher provided verbal questions and cues to assist students. After all 11 lessons were complete;

the probe was administered to evaluate student learning outcomes. Results showed that all participants gained significantly compared to their baseline performance and scored 80% or above to reach their mastery level. It seems that explicit instruction is effective in teaching math computation skills to students with LD.

In Flores, Hinton, and Schweck's study, (2014), Strategic Instruction Model (SIM) was examined to teach students with LD multiplication skills. The participants were 1 male and 1 female 10 year old 4th grader, and 2 male 11 year old 5th graders. The instruction lasted for 25 minutes 3 days a week in a resource room and participating students were taught individually. A quiz of 25 multiplication problems was provided prior to instruction for baseline data. An instructional manual was developed to provide explicit instruction in scripts with seven lessons. These lessons included an outline of teaching steps, an advanced organizer, guided practice, independent practice and a post-organizer. In addition, student learning sheets were created for each lesson and base-ten blocks and place value mats were used. At the end of two weeks, the students mastered regrouping skills. Results showed that students' scored between 29% and 58% higher on the posttest than the baseline assessment, after the intervention. The study indicates that SIM is effective supplemental instruction for students with LD who need explicit instruction to follow steps directed by the teacher.

Skarr, Zielinski, Ruwe, Sharp, Williams, and McLaughlin, (2014), examined the effects of direct flashcard instruction on basic multiplication facts. The participants were one 3rd grade boy, one 5th grade girl and 5th grade boy with LD. The study took place outside of the general classroom for 20-30 minutes, twice a week. Students were required to correctly respond to questions relating target multiplication facts and products within 2 seconds. A pre-assessment of all 100 multiplication facts was given using flashcards, and incorrect responses were selected as target facts. In addition, participants were given 5 minutes to complete a written pre and posttest with100 basic multiplication facts in a mixed order. The same assessment was given to measure generalization because the intervention was only for statement of the math fact in response to the presentation of flashcards. The use of flash card procedure presented a systematic way to facilitate students' level of mastery and retention of basic facts. During direct instruction with flashcards, students presented an immediate increase of correct responses, and demonstrated increased confidence in their ability to solve problems of basic facts. It seems that each participant's improved performance was related to the use of the direct instruction with flashcards.

Sood's study, (2010), investigated the effects of explicit instruction for kindergarteners to learn number sense, one of the most important skills for children to succeed with basic mathematics computation. The participants were 101 children selected from five classrooms located in a suburban school district, of these three with LD. All participants were given an achievement test and a set of early numeracy-curriculum based measures and number sense assessment prior to the intervention. These children were randomly assigned to either the intervention or comparison group. The intervention group received explicit instruction based on the big ideas of number sense. The instruction included number relationships, spatial relationships, one more, one less, two more, two less, benchmarks of five and ten, and part-whole relationships. A combination of explicit instruction and cognitive strategies was provided including modeling, guided practice, and independent practice, focusing on the development of procedural and conceptual knowledge. The comparison group was taught with the district selected program called *Investigations in Number, Data, and Space,* organized into six units including number, data analysis, and geometry, for 3 to 6 weeks each. A posttest was given immediately after instruction, as well as a maintenance test, to both groups three weeks after instruction. The results showed that the mean scores of the intervention group were higher on the posttest than the mean scores of the comparison group on all measures. The findings evidenced that explicit instruction significantly improved young children's number sense skills. It seems that explicit instruction not only benefits students with LD, but also young children.

Explicit instruction in mathematics seems effective for teaching struggling learners and those with LD. It is important to explicitly teach every component of the lesson and provide feedback immediately. When introducing the new content, a link to previously learned material should be reviewed to build the connection. Models should be presented explicitly to include students' participation during class discussion. Instruction that includes the use of concrete manipulatives can assist students in understanding of math concepts. Teachers should explicitly support students during guided and independent practice by giving specific feedback until students gain mathematics skills to reach proficiency.

Multisensory Instruction

The use of manipulatives and technology can enhance instruction and accommodate students with LD. Students who manipulate a variety of objects may develop clear mental images to represent abstract ideas (Norhayati & Siew, 2004). Using multi-modal instruction is more effective than using one single mode (Mayer, 1997). Therefore, using a combination of concrete and virtual manipulatives as well as incorporating technology may make instruction more effective for students to become proficient in math computation.

Concrete and virtual manipulatives. Lee and Chen, (2015), evaluated the effects of worked examples using manipulatives on 5th graders' learning performance and attitude towards mathematics. A worked example is a step-by-step demonstration of how to perform a task or how to solve a problem (Clark, Nguyen, Sweller, 2006). The participants included 90 randomly selected 5th graders to explore the effects of different instructional approaches to learning equivalent fractions. All of the participants learned the basic concepts related to fractions, such as decimals, simple fractions, and unit quantity before the instruction was conducted. The concept of equivalence is fundamental in learning fractions and the basis for performing arithmetic operations (addition, subtraction, multiplication, and division) on fractions with different denominators. Equivalent fractions are the most challenging concept related to fractions because students are required to have flexible thinking processes and a willingness to solve problems by moving from concrete examples to formal operations (Lee & Chen, 2015). The majority of elementary students are at the age of concrete operations, thus providing concrete objects are often used in mathematics to make abstract ideas more meaningful and comprehensible (Durmus & Karakrik, 2006). In order for students to develop an understanding of concepts related to equivalent fractions, students need to split objects into different portions. The participants were divided into three groups of 30 each, according to the types of manipulatives used during the study. The 3 groups were categorized as traditional continuous examples (TCE); technology supported continues examples (TSCE) and technology supported mixed examples (TSME). Continuous examples refer to continuous problems of equivalent fractions. Mixed examples refers to examples that include examples of continuous equivalent fractions as well as non-routine examples; for example colored blocks that are not continuous in which the learner must first arrange the discontinuous blocks into continuous blocks and refer to the same fraction using different names through visualization, while ignoring the split line. The instructional approaches included traditional as well as technology supported instruction. Traditional instruction refers to the teacher explaining the concept of equivalent fractions using physical manipulatives in addition to providing students with opportunities to use manipulatives to practice the mathematics concepts. Technology based instruction refers to the teacher explaining the concept of equivalent fractions using virtual manipulatives and providing students with opportunities to use manipulatives to practice. A virtual manipulative is similar to a physical manipulative, but it has interactive features which are presented on a website to provide students an opportunity to construct mathematics knowledge (Moyer, Niezgoda, & Stanley, 2005). The virtual manipulatives in this study were "magic boards" and "fraction bars"; both are interactive tools to explore the concepts of fractions. These manipulatives enable students to split objects into different portions to learn concepts associated with equivalent fractions, an achievement test was provided to evaluate the learners' performance after the instruction, as well as a questionnaire to evaluate their attitudes toward mathematics including learning enjoyment, learning motivation and anxiety. The results showed that the students in the TSME group benefited more than those in the TCE or TSCE groups. These results are consistent with the findings of Lee and Chen's study, (2009), concluding that using non-routine examples can improve learning performance in equivalent fractions. At the same time, alternative instruction models should be integrated into the curriculum and students should be encouraged to use non-routine examples. It seems that using non-traditional examples is an effective means to engage students and capture their interest and curiosity, so that they could understand the reasoning process. It is noted that the difference of learning performance between the TCE and TSCE groups were not statistically significant. These findings are consistent with those of Yuan, Lee and Wang's study, (2010), indicating that using virtual manipulatives can be as effective as using physical manipulatives. According to Lee and Chen, (2015), Teachers should carefully plan for examples to include the non-traditional examples when utilizing either virtual or physical manipulatives regardless of the instructional approaches being used. The survey reported that students in the TSCE group had a more positive attitude toward learning mathematics compared to the TCE and TSME groups. These results are in line with those presented by Reimer and Moyer's study, (2005), in which the majority of students responded positively to the use of virtual manipulatives. However, students in the TSME group didn't present greater learning enjoyment than those in the TCE group. It may be due to the difficulty and complexity of non-routine examples compared with continuous examples (Lee & Chen, 2015).

Burns and Hamm, (2011), compared the effects of virtual and concrete manipulatives on student learning of fractions and symmetry. The participants included 91, 3rd and 54, 4th graders that were randomly assigned to 2 groups; one was a control and the other was the experimental. A variety of manipulatives were used for both the concrete and virtual manipulative groups. In the control group, students used websites to rename fractions using fraction squares and circles, with immediate feedback. The experimental group explored similar fraction activities using hands on fraction circles and bars, with the teacher's direction and feedback. Students were given a pre and posttest to compare their performance. The results showed that both control and experimental groups showed improvement from the pre to posttest and there was no statistically significant difference between the two groups. When comparing the 3rd grade scores, there was a slightly higher gain for the concrete manipulative group. The results indicate that using either concrete or virtual manipulatives or a combination of both types has reinforced the student learning of math concepts. Additional observations found that many of the students verbalized a desire to use the virtual manipulatives, on their comments, such as being fun with the website, and the options to change the symmetry shapes.

Virtual manipulatives. Satsangi and Bouck, (2015), evaluated virtual manipulatives for teaching the concepts of area and perimeter to secondary students with LD. The participants were 3 males identified as having LD in mathematics, placed in the general education setting. In the study, students were trained to use the virtual manipulatives to calculate the area and perimeter of a given shape using the laptop computer for 8 weeks and incorporated intervention, maintenance and generalization sessions. Event recording was used to measure the effectiveness of virtual manipulatives to accurately solve area and perimeter problems, as well as students' skill application to solve abstract problems. Examples of the concrete manipulatives include pattern blocks, fractions strips and geoboards, while the virtual manipulatives used computer technology allowing students to create three dimensional visual representations of shapes and objects. The results indicated that virtual manipulatives provided the students' an opportunity to practice on the computer, to remain focused, and learn at their own pace following the steps on the computer. It is found that students enjoyed different colors to separate the blocks that it helped them organize to avoid confusion. The virtual manipulatives play a role of an alternative to concrete manipulatives in which students are able to create and transform shapes better understanding each shape's dimensional properties. In addition, the visual presentation of virtual manipulatives provided greater cognitive support to students with LD in terms of organization of the multiple steps to solve the problem. However, explicit instruction including extensive modeling and guided practice before utilizing the virtual manipulative intervention should be considered. Also, the computer program could only construct blocks with 90-degree angles that might limit student's ability to calculate shapes containing a variety of angles.

Using technology. Shin, Sutherland, Norris and Soloway, (2012), examined the effects of technology on elementary mathematics instruction. The participants included 41, 2nd graders, with ages between 7 and 8. They were selected from two classes attending a public elementary school in the Midwest. The study used a quasi-experimental control-group design with repeated measures to investigate two research questions. The first question asked how do students performances vary between a technology-based and paper-based game during a five week time frame, and the 2nd question is about student's performance when playing the game two times per week compared to playing more than three times during 13 weeks. The target school was currently using flash cards to teach arithmetic for second graders. The use of a GameBoy system was selected for considering the learning goals, cognitive processes and the skills of the targeted students. The cognitive processes of both the paper-based games and the technology-based games are comparable given that a student needs to calculate a correct answer using two numbers and an arithmetic sign without any support. The *Skills Arena* software program was used to play GameBoy (GB). Before giving the pretest, the 21 students practiced using the GameBoy for 15 minutes a day for 10 days. Most students had previous experience playing the games on the GameBoy, but some of them needed additional guidelines for playing the arithmetic game. Following the initial training, the GB students played *Skills Arena* for 15 minutes a day in their mathematics class, three times per week for 5 weeks. After this time period, they played the game for 15 minutes twice per week for 13 weeks. The second group of 20 students played addition and subtraction flash card games CG for 15 minutes in their mathematics class, three times per week for 5 weeks. Then, they played the GameBoy for the remaining 13 weeks of the semester. The CG students used the GameBoy for a minimum of three times a week and were allowed to play the game anytime they finished their other class assignments. Observations of the GB and CB classes were conducted twice a week to verify that both groups of participants played the games for the same amount of time and in an appropriate way. A test with 70 test items was developed to assess the students' arithmetic skills learned. It included 25 addition and 25 subtraction questions for basic skills, 10 addition and 10 subtraction for advanced skills to align with the mathematics standards of the second grade. The results revealed that students who played the technology-based game outperformed those without playing it. Comparing the final test scores to the initial 5-week data showed that students who played the technology-based game more than three times per week outperformed those who played the game only twice per week. In the first 5-week period, the GB students gained 11%; while the CG students increased only 4%. The results suggest that game-based technology might be effectively supporting students' learning of basic arithmetic facts. In the next 13-week period, the CG students increased 11% from the 5-week to the final assessment, but the GB students only increased 1%. Further research should be conducted in order to explore the lack of progress of the GB students from the 5-week to the final test, despite the 13 weeks of the game play. Perhaps the novelty of the game may be a factor to impact the students. Or possibly, although twice a week may be a sufficient amount of time to sustain the students' arithmetic scores; it may not be enough time to improve their skills. In addition, the students' final test scores could be related to their developmental growth rather than the effects of game play. In addition, a survey on students' attitudes toward mathematics was provided at the end of the study. The results indicated that 33% of the students reported that they had fun playing the game, 33% indicated that they liked the game because it helped with their learning and 35% reported that their favorite was game play features, which included a variety of game tasks, such as creating their own character with a learner's control. It seems that the technology-based game promoted positive attitudes toward learning and student motivation, due to the fact that such games provided various options for students to choose based on their individual needs. It is evidenced that game technology positively impacts elementary students' learning of arithmetic regardless of their ability level. Further study is necessary to generalize the results to a larger and diverse group of students.

Nusir, Alsmadi, Al-Kabi and Sharadgah, (2012), examined the effects of children's ability to learn basic math facts using multimedia interactive programs. The participants were 123 randomly selected first graders divided into 2 groups, one traditional and the other experimental. The traditional group was taught using direct instruction and a wipe board, and the experimental group was taught using a computer program specifically designed to teach basic math facts with multimedia elements including images, sound, and animation. As measured by test scores, the students in the experimental group formed significantly higher than the traditional. The results indicated a positive impact of using multimedia for teaching elementary mathematics.

It seems that using technology can be an effective tool to improve the students' mathematic performance because they can control their own learning when using a computer program at their own pace. In addition, technology can be entertaining while engaging students in learning; with the immediate feedback from the computer students' benefit for independent practice and homework. As indicated by Moyer et. al., (2002), computer manipulatives may be preferred because they are easier to manage without any need for distribution and clean up, they are readily available. Further research in the use of technology to teach mathematics computation is needed, especially for students with LD. Compared to concrete manipulatives, technology appears to be preferred by students and easier for teachers to implement in class. Despite the positive outcomes of technology-based instruction in math computation for elementary students, those with LD were not included in the studies reviewed. It is important to include a diverse population of students, especially with disabilities.

Conclusion

Learning mathematics computation, students with LD often need additional support and modified instruction. Research indicates that students with LD benefit from explicit instruction with a multisensory approach (e.g., Skarr, et. al., 2014; Flores, et. al., 2014; Mancl, et. al., 2012 and Sood, 2010). Explicit instruction provides teacher's direct instruction in a sequential order, modeling the learning process, guiding students through its application, and providing extended practice until the mastery level is reached. A multisensory approach includes the use of manipulatives and technology to demonstrate concepts with either concrete or virtual manipulatives. However, there isn't sufficient evidence to support using technology over traditional methods; but many students favor the animation, individual pacing, choices and organizational assistance a computer provides. Research has emphasized the importance of explicit modeling and correct procedures of using manipulatives as well as technology before assigning students these resources to apply independently. It is believed that teachers who provide explicit instruction with a multisensory approach are better equipped to meet the needs of students with LD and help them become successful in mastering mathematics skills (Mancl, Miller, & Kennedy, 2012). This present study attempts to provide the GoMath program in teaching elementary students with LD and evaluate its effects on teaching these students computation skills.

Chapter 3

Method

Setting

School. This study took place in a rural elementary school in Southern New Jersey. There were about 150 students enrolled, ranging from Pre-K through 5th grade, with one class in each grade level. It has been designated as a Title I school based on the economic status of the students' families in the community.

Classroom. The study was conducted in a resource room for students with disabilities. There were 4 students and one special education teacher in the classroom during instruction.

Participants

Students. Four, 3rd and 4th graders participated in the study. All of the students were classified as having a specific learning disability (SLD). Each student had an individualized education program (IEP) with goals and objectives in learning math. Their information is presented in Table 1.

Table 1

General Information of Participating Students

Students	Grade	Gender	Age	* SMI	** Lexile
A	3	F	8	330	132
B	3	M	9	340	463
C	4	F	9	390	298
D	4	M	10	425	487

Notes: *SMI: The Scholastic Math Inventory a math assessment with scores ranging between 220-420 for 2nd grade, 400-520 for 3rd grade and 470-720 for 4th grade.

**Lexile: a reading measurement with scores ranging between 1-299 for 1st grade, 300-499 for 2nd grade, 500-699 for 3rd grade and 700-799 for 4th grade. Both assessments were used by the school district for at risk students 3 times per year. They were used as one of the measures to determine instructional placement, as well as a measurement to monitor student progress.

Student A. Student A's lexile score of 132 placed her at a 1st grade reading level which was 2 years below grade level. Her SMI score of 330 was within a 2nd grade math level, one grade level behind. She received reading and math instruction with a special education teacher as well as additional word study instruction using the Orton Gillingham approach. Because she struggled in reading grade level material, she often needed word problems to be read and explained. In addition, she sometimes needed directions read or reworded in order to understand what was being asked. She demonstrated mild anxiety and needed a lot of support and reassurance during lessons.

Student B. The lexile score of 463 placed this student on 2nd grade level which was one grade level behind in reading. His SMI score of 340 was within a 2nd grade math level which was also one grade level behind. He only received mathematics instruction with a special education teacher and his reading instruction was in a general education classroom. He also demonstrated some anxiety and behaviors problems in class. In addition, he had a difficult time attempting new and more complex strategies because he preferred to use strategies he was already familiar and comfortable with. Although he was usually able to read word problems during math instruction, he sometimes needed the questions clarified.

Student C. Student C's lexile score of 298 placed her at a 2nd grade reading level which was 2 years below grade level. Her SMI score of 390 was within a 3rd grade math level which was one grade level behind in math. She is also dyslexic with a very difficult time reading word problems during math learning and usually needed directions read and reworded in order to understand the problem. She received reading and math instruction with a special education teacher as well as additional word study instruction using the Orton Gillingham approach. Despite her reading difficulties, she demonstrated fairly good reading comprehension skills. She worked at a very slow pace and often made procedural errors, even when she understood a concept. She often copied numbers incorrectly, with reversed orders in a written format.

Student D. The lexile score of 487 placed him on 3rd grade reading level which was one grade level behind. His SMI score of 425 was within a 3rd grade math level which was also one grade level behind. He only received mathematics instruction with a special education teacher while his reading class was in the general education setting. He had a difficult time staying focused and remaining on task. He often rushed through his work without reading the problems or directions carefully. The teacher's repeat instruction helped him to understand the lesson requirements. Although he needed to be redirected often, he was usually able to complete his work without additional support.

Teacher. One teacher delivered the entire instruction for 12 weeks. The teacher had eight years of experience in teaching students with learning disabilities in both inclusive and resource settings.

Instructional Materials

GoMath. This is a math curriculum with 9-12 Units per grade level. Each unit was divided into 7 to 12 lessons, including a teacher manual, student workbook organized following the lessons in the unit, and a unit assessment. Several resources were included in the program; all of which were computer accessible. These resources included an online reference book, tutorial videos, and a personal math trainer. The personal math trainer included a lesson for the students to follow, which was similar to the teacher's instruction. It also contained additional practice for students with immediate feedback. Each lesson included: vocabulary, models, examples, essential questions, guided practice, on your own problems, problem solving, homework, and a reteach page.

Measurement Materials

Weekly quizzes. Two quizzes were given at the end of each week. One included 20 addition/subtraction computation problems and the other included 20 multiplication problems. Each correct response was worth 5 points with a total of 100.

Assessment. At the end of every each chapter, there was an assessment including all concepts and skills taught during the chapter. Each assessment was developed based upon the unit skills being taught. It contained between 20-25 problems, including approximately 2 vocabulary questions, 15 computation problems and 3 word problems.

Survey. The students and teachers were asked to complete a questionnaire regarding their satisfaction with the Go Math program and resources. There was one survey for the students and another for the teachers. Each survey included six questions in a Matrix rating scale format, with 4 representing "almost always, 3 "usually", 2 "sometimes", and 1 "hardly ever".

Instructional Procedures

Before instruction, each student received a student reference book which included vocabulary words in each unit. Students were introduced to several other resources; all of which were computer accessible. They were given the login information and guided in navigating the online resources during lessons. These resources could be accessed by the students at home as well. During instruction, the level of support was adjusted based on the needs of the students. The students often needed directions read and sometimes needed repeated instruction. Many times, students were asked to restate the objective in order to ensure their understanding. The students usually required support when solving multi-step word problems; they needed to break the problems into smaller steps, organize the information, and determine the correct process to accurately solve the problems. For example, Student C required her work to be checked frequently, to make sure she copied the numbers correctly without reversals. The students were given their own workbook at the beginning of each unit. The first page of the unit gave the students several problems to complete, in order to determine if they were secure in the prerequisite skills for the unit. This page helped the teacher determine how much, if any, time needed to be spent reviewing these prerequisite skills. The next page of the workbook was a set of vocabulary cards presenting the meaning of the vocabulary words, with an example on the back of each card. Students could cut these out or leave them inside the workbook as a reference. Each lesson began with an essential question to highlight the skill being taught. The first part of the lesson was always teacher directed. The lessons were designed explicitly and included all of the components of Direct Instruction. After the teacher explained the skills and modeled the process and procedures, students were given several problems to complete for guided practice. During the guided practice, there were problem solving sections that walked students through the problem solving process. For example, it may have asked, "What do you need to find"? Then, "What information will you use"? Next, "What strategy can you use to solve the problem"? Finally, it asks for the problem solution. This format was used very often in the Go Math program. Another explicit method used was listing the problem solving process by stating each step and including the solution for each step sequentially until the problem was solved. After the guided practice section, students were given additional problems to complete independently (See Table 2 for instructional procedures).

In this particular study, the participants were provided with some level of support during independent practice. The level of support varied based on the students' needs and their performance while applying the skill. During the study, the students usually required support to complete the word problems and generally, only a couple of problems were attempted, due to time restraints. Progress monitoring notes were recorded in the teacher's notebook. It included comments on skills students mastered, as well as the areas for improvement. In addition, it included notes about strategies that worked for a student and/or strategies that were less effective. Each lesson included a homework page with several problems for students, as well as a reteach page for instruction. The participants were often given the reteach page as their homework assignment to reinforce their skills learned during the lesson. This page included an explanation, a model and example at the top of the page, followed by some problems for the students to practice on their own. All of students were given positive reinforcement during the lesson. For example, they were complimented for the problems completed correctly and encouraged to try their best for challenging problems. In addition, a sticker was provided at the end of class as reinforcement for giving their best effort during lessons and an additional sticker was given if they turned in their completed homework. After earning 10 stickers, a prize could be selected from the treasure box in class as an award.

Table 2

Instructional Procedures

Day 1	Day 2	Day 3	Day 4	Day 5
-Students complete "Show What You Know": (Prerequisite skills)				
-Students complete Vocabulary Builder	-Teacher Checks Homework	-Teacher Checks Homework	-Teacher Checks Homework	-Checks Homework
-Teacher asks Essential Question	-Teacher asks Essential Question	-Teacher asks Essential Question	-Teacher asks Essential Question	-Teacher asks Essential Question
-Teacher teaches Lesson/Instruction	-Teacher teaches Lesson/Instruction	-Teacher teaches Lesson/Instruction	-Teacher teaches Lesson/Instruction	-Teacher teaches Lesson/Instruction
-Teacher Models	-Teacher Models	-Teacher Models	-Teacher Models	-Teacher Models
-Students complete "Share and Show": (Guided Practice)	-Students complete "Share and Show": (Guided Practice)	-Students complete "Share and Show": (Guided Practice)	-Students complete "Share and Show": (Guided Practice)	-Students complete "Share and Show": (Guided Practice)
-Students complete "On Your Own" (Independent Practice)	-Students complete "On Your Own" (Independent Practice)	-Students complete "On Your Own" (Independent Practice)	-Students complete "On Your Own" (Independent Practice)	-Students complete "On Your Own" (Independent Practice)
-Students complete Problem Solving (Application)	-Students complete Problem Solving (Application)	-Students complete Problem Solving (Application)	-Students complete Problem Solving (Application)	-Students complete Problem Solving (Application)
-Students complete Personal Math Trainer Technology/computer	-Students complete Personal Math Trainer Technology/computer	-Students complete Personal Math Trainer Technology/computer	-Students complete Personal Math Trainer Technology/computer	-Students complete Personal Math Trainer Technology/computer
-Students complete Homework	-Students complete Homework	-Students complete Homework	-Students complete Homework	-Students complete assessment

Notes: The schedule was similar each week. Each lesson was about sixty minutes and all lessons were covered in two weeks. During the first week, the vocabulary and prerequisite skills were reviewed, while a review of vocabulary and strategies was provided during the second week.

Measurement Procedures

Weekly quizzes. Students were given two quizzes, each with 20 questions, at the end of each week for progress monitoring. The students were given a worksheet with 20 computation problems to complete within five minutes. When completed, the teacher collected the quiz and recorded their scores. Each correct response to the questions was worth 5 points with a total of 100.

Assessment. At the end of every chapter, an assessment developed based upon the learned unit was given to each student. This assessment contained 20-25 problems, including approximately 2 vocabulary questions, 15 computation and 3 word problems. During testing, the teacher read directions and word problems when requested and students were prohibited to use additional resources, such as their student reference book and workbook. Their responses were calculated into scores, and notes were taken to document progress and identify areas for re-teaching.

Survey. The students and teachers were asked to complete a questionnaire regarding their satisfaction with the Go Math program and resources. There was one survey for the students and another for the teachers. The 4 participating students completed the student survey and 6 teachers took the teacher survey. Only one teacher was involved in the study, the other 5 who used the GoMath program in their instruction were also invited for the survey to expand responses. The instructional teachers as well as 5 additional teachers were invited to complete the teacher survey in order to expand the data collection. Both teachers and students were asked to complete the survey anonymously using a computer with an internet based program called Survey Monkey. Their responses to determine the overall satisfaction with the Go Math program were calculated automatically by the Survey Monkey Program.

Research Design

A multiple baseline research design with A B phases across students was used in the study. During Phase A, the baseline, the participating students were given an assessment to measure their basic mathematics skills, as well as a weekly quiz for 10 weeks. The students' scores were recorded as baseline data. During Phase B, the intervention, each student had 60 minutes of mathematics instruction using the Go Math program, 5 days per week, for 12 weeks. Same tests were given to evaluate their performance, and scores were compared to those of the baseline.

Data Analysis

Means and standard deviations were calculated and presented in a table. A visual graph was developed as a chart to compare the difference between phase A and B to evaluate each student's performance in learning math.

Chapter 4

Results

Student Performance

Students were given a weekly quiz for 12 weeks to evaluate the GoMath program and its supplemental materials for improving their math computation skills. The students' scores were calculated and presented in Table 3.

All of the participants increased their math scores in the area of computation. Comparatively, their scores in the area of multiplication were higher than addition/subtraction. For example, student A's mean score was 50 on her multiplication quizzes during the baseline, increased to 83 during the intervention using GoMath. In addition and subtraction her mean score was 73 in the baseline, increased to 87 in the intervention. Student B's mean score was 28 on his multiplication quizzes during the baseline, increased to 84 during the intervention. In addition and subtraction his mean score was 54 in the baseline, increased to 76 in the intervention. Student C's mean score was 36 on her multiplication quizzes during the baseline, increased to 72 during the intervention using GoMath. In addition and subtraction her mean score was 48 in the baseline, increased to 73 in the intervention. Student D's mean score was 62 on his multiplication quizzes during the baseline, increased to 79 during the intervention. In area of addition and subtraction his mean score was 58 in the baseline, increased to 79 in the intervention using GoMath. Individual students' quiz scores of addition/subtraction and multiplication present in Figure 1.

Table 3

Means and Standard Deviations of Student Quiz Scores

	Addition/Subtraction		Multiplication	
Measure	M	SD	M	SD
Student A				
Baseline	73	2.9	50	15
Intervention	87	9.2	83	10.3
Student B				
Baseline	54	7.5	28	17.1
Intervention	76	8.1	87	10.9
Student C				
Baseline	48	5.7	36	8.9
Intervention	73	10.4	73	14.4
Student D				
Baseline	58	6.1	62	8.2
Intervention	79	5.6	79	6.9

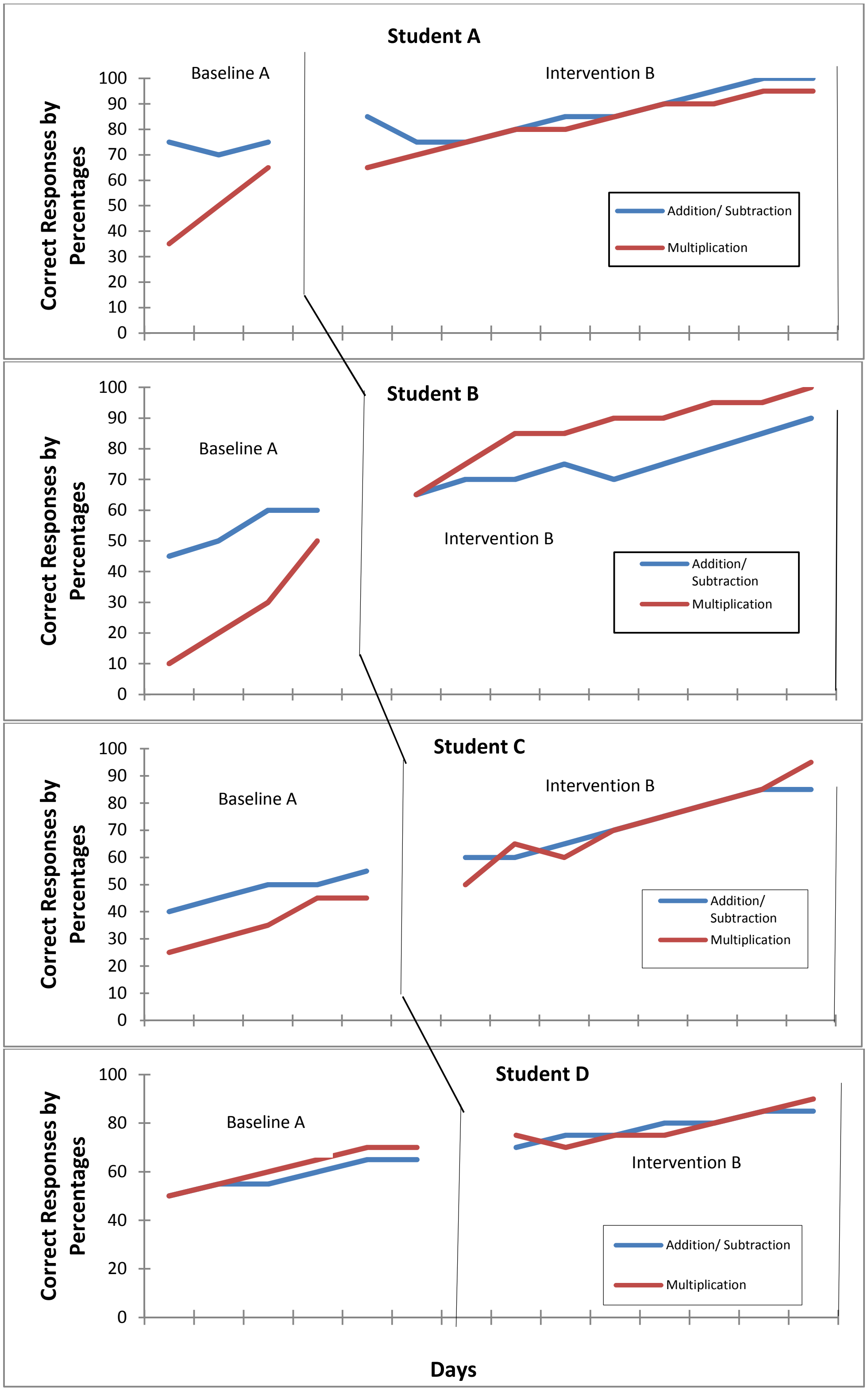

Figure 1. Individual student performance on addition/subtraction and multiplication across phases.

Survey Responses

Teacher survey. Six teachers who used the GoMath program in their instruction took the survey at the end of the intervention; their responses were calculated by percentages and presented in Table 4. Results showed 5 of the teachers (83%) indicated that they usually found the teacher's manual helpful for their instruction, while one (17%) reported they almost always did. Two (33%) of the teachers found the student workbook was almost always effective for practicing skills, 2 indicated (33%) the workbook was usually effective and 2 found (33%) they sometimes do. Three teachers (50%) reported that they usually found assessments helpful for monitoring progress, while 2 indicated (33%) the assessments were almost always helpful and one (17%) reported only sometimes. Four teachers (67%) indicated that the manipulatives provided in the GoMath program were usually effective for instruction, one found (17%) they were almost always, another (17%) reported only sometimes. Four (67%) teachers found that the online resources were sometimes easy to navigate, 2 indicated (33%) they were usually and none of the teachers found they were almost always easy to navigate. All of the teachers (100%) reported they were usually satisfied with the GoMath program overall. It appears that the teachers were generally satisfied with the GoMath program and its' supplemental materials, with the majority indicating the online resources were not usually easy to navigate, and the teacher's manual, student workbook and assessments were effective most of the time.

Table 4

Teacher Responses to the Survey by Percentages

Survey Questions	Almost Always	Usually	Sometimes	Hardly Ever
Teachers' Manual Helpful	17	83	0	0
Student Workbook Effective	33	33	33	0
Assessments Helpful	33	50	17	0
Manipulatives Effective	17	67	17	0
Online Resources Easy to Use	0	33	67	0
Overall Satisfied with program	0	100	0	0

Student survey. All participating students took the survey; their responses were calculated by percentages and presented in Table 5. In general, the students didn't rate the GoMath program and materials as high as the teachers did. Results showed, 2 of the students (50%) reported they almost always enjoyed math class, while one (25%) indicated usually and one (25%) sometimes. All four students varying opinions about the student workbook, as one (25%) reported almost always, one (25%) usually, one (25%) sometimes and one (25%) hardly ever liked using the workbook. Only one student (25%) almost always enjoyed using the personal math trainer, one (25%) usually and 2 (50%) sometimes enjoyed the math trainer. Similarly, one student (50%) almost always used the online resources, one (25%) usually does, and 2 (50%) sometimes used the online resources. One student (25%) found the online resources almost always helpful, 2 (50%) usually and one (25%) sometimes helpful. All four students reported different opinions about the student reference book, as one (25%) almost always, one (25%) usually, one (25%) sometimes and one (25%) hardly ever finding the student reference book helpful. It appears that the students were generally less satisfied with the GoMath program than their teachers.

Table 5

Student Responses to the Survey by Percentages

Survey Questions	Almost Always	Usually	Sometimes	Hardly Ever
Enjoy Math Class	50	25	25	0
Like Using Workbook	25	25	25	25
Enjoy the Math Trainer	25	25	50	0
Use the Online Resources	25	25	50	0
Online Resources Helpful	25	50	25	0
Reference Book Helpful	25	25	25	25

Chapter 5

Discussion

The purpose of the present study was to evaluate the effects on teaching math computation skills using the GoMath program to students with LD and to examine the teacher and students' satisfaction with this program in their teaching and learning. A multiple baseline research design with A B phases across students was used with baseline and intervention scores compared to evaluate their performance. Means and standard deviations were calculated and examined to assess each student's performance in learning math computation skills.

The ability to apply mathematical skills is important for students in their academic achievement and their daily lives. Math computation is a foundational skill necessary to solve mathematic problems. Students with LD often need additional support such as using explicit instruction with a multisensory approach that includes the use of manipulatives and computer technology. It is imperative to use an instructional program that includes resources to accommodate students with disabilities. It is believed that teachers who provide explicit instruction with a multisensory approach are better equipped to meet the needs of students with LD and help them become successful in mastering mathematics skills (Mancl, Miller, & Kennedy, 2012).

This study was conducted in a resource room for students with learning disabilities. Four, 3rd and 4th graders students participated with one special education teacher in the classroom during instruction. Students were taught computation skills and had 60 minutes to practice using the Go Math program, 5 days per week for 12 weeks.

The same quizzes were given to evaluate their performance, and scores were compared to those of the baseline prior to instruction.

The findings indicated that all of the participants increased their addition, subtraction and multiplication computation scores using the GoMath program. Overall, the teachers were generally satisfied with the program and its' supplemental materials. The students were satisfied too, but their response scores were not as high as their teachers.

The first research question asked if students with LD improved their math computation skills when the GoMath program was provided in math instruction. Results showed that students' quiz scores consistently increased and none of the participants failed to improve their quiz scores during the intervention. The GoMath program was designed to explicitly teach the skills needed to accurately compute math problems. Such explicit instruction with clear explanations and models was suggested for teaching students with LD (e.g., Satsangi & Bouck, 2015; Sood, 2010; Davis & Jungjohann, 2009). Lessons in the GoMath program provided teacher's direct instruction in a sequential order, modeling the learning process, guiding students through its application, and providing extended practice until the mastery level is reached. In addition, the GoMath program included many supplemental resources to support teachers' instruction, such as the use of technology to further enhance instruction by engaging students in a multi-sensory format on the computer screen as an alternate method of teaching. One of the components included in the GoMath program was an online personal math trainer. It was an additional lesson students could follow to practice the skills they learned in the lesson. The personal math trainer for each lesson in the unit provided students opportunities to search the online program and independently practice the skills. This additional resource could have helped the students improve their math computation skills because it provided students with the opportunity to reinforce the skills they practiced during instruction. An additional benefit of the personal math trainer was to provide students with immediate feedback, and gave students the correct process for solving the program when their response was incorrect. It also demonstrated the skill and several models before students were asked to solve problems on their own.

Research indicated that students with LD would benefit from explicit instruction with a multisensory approach (e.g., Skarr, et. al., 2014; Flores, et. al., 2014; Mancl, et. al., 2012; Sood, 2010). A multisensory approach was considered to include manipulatives and technology to demonstrate concepts in a concrete or virtual way. Students learn better when instruction is incorporated with multiple senses and movement (Wadlington &Wadlington, 2008). According to Mayer (1997), the use of manipulatives is considered as part of a multisensory approach because tangible objects are presented with multi-modal instruction. Therefore, using a combination of concrete and virtual manipulatives as well as incorporating technology may make instruction more effective for students to become proficient in math computation. In addition to the online resources, the GoMath program provides several types of manipulatives to enhance instruction. For example, the base ten blocks included in the program gives a visual and concrete representation, which may be effective for modeling the process of regrouping during both addition and subtraction. Thus, using the GoMath program, students are provided with additional practice using technology and manipulatives to enhance their learned skills which may have contributed to their improved performance as shown in their increased quiz scores.

The second research question asked if teachers were satisfied with the Go Math program. Overall, the teachers were more satisfied than the students with the resources provided in the program. They reported high satisfaction with the teachers' manual, student workbook, assessments, and manipulatives. The only concern as teachers indicated was that the online resources were not always easy to navigate. It appears that the teachers find the program effective overall, though they indicated some dissatisfaction with the ease of using the online resources and reported the student workbook was only helpful sometimes.

The last research question asked if students were satisfied with the Go Math program. Although most of the students reported that they enjoyed the math class, their responses did not show a strong satisfaction with the components of the GoMath program. The highest levels of their satisfaction included the online resources and personal math trainer. Students also reported that the online resources were helpful in learning their math skills; which may support the use of technology in math instruction. The student workbook and reference book were not as preferred or helpful as the online resources. This finding is consistent with the previous study by Nusir, Alsmadi, Al-Kabi and Sharadgah (2012), indicating that using computers in school could enrich students' learning activities by providing simulation and animation to present mathematical concepts in a format more appealing to students.

When comparing these results with Mancl, Miller, and Kennedy's study (2012), similar findings were found when explicit instruction with a multisensory approach was provided to teach subtraction with regrouping to students with LD. The increase of quiz scores demonstrated that the students gained computation skills when direct instruction and manipulatives were provided to enhance teaching. The results showed that all participants gained during the intervention compared to their baseline performance. It seems that explicit instruction with a multi-sensory approach including the use of manipulatives is effective in teaching math computation skills to students with LD.

Similar to Burns and Hamm's study (2011), the present study used a variety of manipulatives with the concrete and virtual hands-on activities to practice computation skills. The results indicated that using either concrete or virtual manipulatives or a combination of both reinforced the student learning of math concepts. Additional observations found that many of the students verbalized a desire to use the virtual manipulatives. This finding is similar to the previous study (e.g., Burns & Hamm, 2011), as it supports the use of both concrete and virtual manipulates, but students may simply prefer technology over concrete manipulatives.

Limitations

The small number of participants involved in the study makes it difficult to generalize the findings to a larger population. A second limitation was in determining the satisfaction of the program based on limited student experience in other programs. The participants utilized the GoMath program for their math instruction for the last four years and do not have experience with any other math programs. Whereas, most of the teachers who completed the survey had prior experience with a number of math programs, including Everyday Math, which might give them a broader understanding of how math programs are designed and a larger assortment for comparison. In contrast, the student responses could only reflect their general feelings about mathematics, workbooks, and resources, as opposed to the GoMath program specifically.

Conclusion

Overall, the results of this study support the use of the GoMath program and its supplemental resources to teach math computation skills to students with LD. The combination of explicit instruction with a multisensory approach within the program helped meet the needs of the students with LD and supported them in mastering mathematics skills. Given the limitations of this study, future studies should consider a larger sample of participants. Based on the results of this study, the least preferred component of the GoMath program as reported by the teachers and students was the student workbook. Further studies should include investigating the reasons for the lack of satisfaction in the student workbook. It is suggested that the teachers implementing the program could form a committee to look further into this finding, such as discussing concerns and comparing observations to determine if there is a possible solution. Specifically, investigating why most of the students did not find their workbook helpful and only some teachers found it effective sometimes when practicing math skills. In addition, this same committee could serve as a consulting group to help teachers become more skillful and comfortable in navigating the online resources, which was the second concern indicated by the teachers in their survey responses. By addressing these issues, it is my hope to improve instruction to support students with LD in learning math using the GoMath program.

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Appendix A

Addition/Subtraction Quiz

1/7/2016 Student Curriculum-Based Assessment Multiple-Skills Math Probe

Curriculum-Based Assessment Mathematics
Multiple-Skills Computation Probe: Student Copy

Student: Date: ____________________

748 +92	75 −22	33 −16	39 +95
88 −11	35 −17	234 +86	23 −13
52 −13	487 +64	79 −47	63 −34
66 +668	82 −52	26 −18	39 +78
74 −33	94 −36	89 +658	63 −52

http://lefthandlogic.mmaweb.net/servlet/mathProbe 1/2

Appendix B

Multiplication Quiz

Curriculum-Based Assessment Mathematics
Multiple-Skills Computation Probe: Student Copy

Student:

Date: ____________________

38 x 1	56 x 7	24 x 1	12 x 5
46 x 1	32 x 2	23 x 2	76 x 3
20 x 4	37 x 9	11 x 2	64 x 2
19 x 1	45 x 8	13 x 3	34 x 6
35 x 1	86 x 7	30 x 2	82 x 7

Appendix C

Teacher Survey

1. Do you find the GoMath teacher's manual helpful when teaching lessons?

Almost Always ◯ Usually ◯ Sometimes ◯ Hardly Ever ◯

2. Is the student workbook effective for practicing skills?

Almost Always ◯ Usually ◯ Sometimes ◯ Hardly Ever ◯

3. Do you find the assessments helpful for monitoring progress?

Almost Always ◯ Usually ◯ Sometimes ◯ Hardly ever ◯

4. Are the manipulatives provided effective for teaching skills?

Almost Always ◯ Usually ◯ Sometimes ◯ Hardly Ever ◯

5. Are the online resources easy to navigate?

Almost Always ◯ Usually ◯ Sometimes ◯ Hardly ever ◯

6. Overall, how satisfied are you with the GoMath program?

◯ Very satisfied

◯ Moderately satisfied

◯ Slightly satisfied

◯ Not at all satisfied

Appendix D

Student Survey

GoMath Student Survey

1. Do you enjoy math class?

Almost Always	Usually	Sometimes	Hardly Ever
○	○	○	○

2. Do you like using the workbook?

Almost Always	Usually	Sometimes	Hardly Ever
○	○	○	○

3. Do you enjoy using the personal math trainer?

Almost Always	Usually	Sometimes	Hardly ever
○	○	○	○

4. Do you use the online resources?

Almost Always	Usually	Sometimes	Hardly ever
○	○	○	○

5. Do the online resources help you understand the skills you are learning?

Almost Always	Usually	Sometimes	Hardly ever
○	○	○	○

6. Is the student reference book helpful?

Almost Always	Usually	Sometimes	Hardly ever
○	○	○	○

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