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Will using the self-regulated development model improve math word problem solving skills for seventh grade students with learning disabilities?

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WILL USING THE SELF-REGULATED DEVELOPMENT MODEL IMPROVE MATH WORD PROBLEM SOLVING SKILLS FOR SEVENTH GRADE STUDENTS WITH LEARNING DISABILITIES

By
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ABSTRACT

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Master of Arts in Learning Disabilities

The purpose of this research was to determine if the Self-Regulated Development Model would improve word problem solving skills for seventh grade students. The participates were 17 seventh graders, one student classified as Specific Learning Disabled and two other students were in the process of evaluations. The students were given four word problems to solve over the course of week before they learned the Self-Regulated Development Model. After students became familiar with the Strategy, they solved the word problems again, using the Self-regulated Development Model. Students usually respond to word problems by leaving it blank or writing "I don't know." When they solved the word problems using the Self-Regulated Development Model, they showed improvement with their responses. Most of the students attempted to solve the word problems instead of leaving them blank or writing "I don't know." Only one word problem was answered correctly, the rest the students attempted to answer. The research showed that using the Self-Regulated Development Model over time, will improve the students performance on math word problems.

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Chapter 1 Introduction

In the past five years of teaching, I have noticed that many of the students have great difficulty solving math word problems. Every year in April, they are assessed on open-ended or problem solving questions that require more thought and understanding, than your typical equation questions. Since the district is in need of improvement and not meeting the requirements for passing the NJASK, the district focuses on strategies to improve the students' problem solving abilities.

In the beginning of the school year, when students are prompted to solve word problems, many of their responses include "I don't know", simply putting question marks or restating the problem. As they progress through the year, the same response continues. The students need help in this area and the strategies currently being used to not seem to work. As their teacher, I feel that I have failed them because they are unable to solve math word problems. However, I am unsure as to why they have such difficulty in this area. Could it be lack of comprehension and math skills?

The ability to solve these problems requires higher order thinking skills. Many seventh graders appear to be deficit in their higher order thinking skills. It is important to improve their knowledge and thinking capabilities. Students with Learning Disabilities are poor self-regulators, difficulty regulating their cognitive functions (Montague, 2008). These students have trouble thinking, reasoning or solving problems. I want to find a way

to improve the students' problem solving abilities that will continue through their educational career.

Will implementing cognitive strategy instruction, specifically The Self Regulated Strategy Development model, to solve math word problems improve 7th graders ability to comprehend and respond correctly? The self-regulated Development Model will help students with Learning Disabilities be active in their learning. This model will provide step by step instruction for students to follow when trying to solve word problems. After modeling the process and providing students with an outline, they should be able to develop their own self-regulating strategies.

I believe The Self-Regulated Strategy Development Model would improve the performance for the current seventh graders. This strategy would also be more effective if it were used it for previous classes. Cognitive strategy instruction emphasizes the development of thinking skills to enhance learning. The Self Regulated Strategy Development Model is being implemented at the University of Nebraska-Lincoln, based on Harris and Graham's (1996) model. This model helps students develop their metacognitve skills. Meta-cognitive skills focus on self-regulating, self-monitoring, and self-evaluation.

Solving math word problems has always been difficult. It is not a skill that comes naturally to you. The majority of my seventh grade students struggle with these types of problems. In fact, many seventh grade students would struggle with math word problems. It is important to come up with some strategies that will help them improve their skills. It requires more effort and thinking and in seventh grade their brains may not

be mature enough for higher order thinking skills. If we can develop a strategy that works, we can improve their thinking ability. Increasing their brain capacity can only help them in the future.

In summary, I am interested in finding a strategy that will improve students' ability to solve math word problems. Will implementing cognitive strategy instruction, specifically The Self Regulated Strategy Development model, to solve math word problems improve 7th graders ability to comprehend and respond correctly? I believe that it will improve the students' ability if you use cognitive strategies, such as The Self-Regulation Development Model. Teaching students how to monitor their progress and self-evaluate will enhance their performance on a variety of task. Math has no longer become just solving equations. Students are required to use more thought process and comprehension skills than before. It is important for those students to develop good strategies to problem solve. It will only help them succeed in the future. These strategies my enable their brain to start to develop higher order thinking skills. Hopefully, we will be able to find a solution to help most of students comprehend and solve problems. Through out this study I hope to find positive results that will improve classroom instruction and the students' ability to solve problems.

Research Problem: Will using the Self-Regulated Development Model improve Math word problems skills for Seventh grade students with Learning Disabilities?

Hypothesis: I believe that most of the students will improve their ability to solve math word problems by using the Self-regulated Development model.

Impact: The Self-regulated Development Model has been effective for the writing process; many teachers can use this for other subject areas. Students can also become self-regulators to improve their academics in school.

Chapter 2 Literature Review

The topic of Learning Disabilities in Mathematics has not been studied as extensively as other topics in this field. Much of the research being done is focusing on reading disabilities. The subject of math seems to have been pushed aside. I chose this topic because I am a math teacher and I see the deficits everyday that my students are facing. Their skills in math are lacking and I am interested to find out if Self Regulation Strategy Development Model will improve their word problem solving skills.

It has been noted that Math Disorders (MD) often occurs with Reading difficulties, but it can also occur independently. Bryant researched the prevalence of MD weaknesses in students with LD (FLPM). Bryant, Bryant and Hammill asked professionals who were instructors of LD students to identify whether each of the LD students who participated in their study had weaknesses in any of the six areas, (listening, speaking, reading, writing, mathematics and reasoning), they reported that 870 of 1724 (or about 50%) of the students had weaknesses in math. That is about half of the students who participated in the study. Math Disabilities are prevalent and seem to be quite common. Many researchers, including Bryant, have accepted that between six and seven percent of elementary and junior high school children suffer from a deficit in mathematics.

In many of the studies on math disabilities, researchers focused on specific areas of deficit in mathematics. Ten deficit areas were identified in a study that employed

grade six and above teachers in the southeastern US (McLeod and Armstrong, 1982). The teachers in the study were requested to take a written survey responding to general information regarding the nature of mathematic skills deficits exhibited by their students. In this survey, six commonly reported deficit areas were reported. The six common areas for middle and high school students are; upper level skills of division, basic operations involving fractions, basic operations involving decimals, percents, fraction terminology and multiplication of whole numbers. Again, these are the most common areas that many of my students are having trouble with, so are mathematics disabilities to broad? When many students are having the same problems, how do you determine if this is a learning problem? It could be the level at which the students are learning. If they don't have their basic operations down, then they will not be able to move on to higher level thinking skills.

These basic math operations begin early in a student's school career, so it would be extremely helpful if we could identify mathematics disabilities at an earlier age. Prior to conducting his research on identifying and defining Math learning disabilities Mazzocco looked at Geary's (1993) proposed subtypes in math based on children's performance on specific arithmetic tasks. The focus on these subtypes, besides knowing the specifics of the subtype, you have to be able to differentiate a math delay with a math disability before you set the necessary guideline for intervention need and strategies. They used this study to help distinguish between math delay and disabilities.

During the first year of this study 249 children were enrolled and a total of 209 continued in the study for four years, which consisted of students from seven different

participating schools of middle class suburban areas from Kindergarten through 3rd grade. The children participated for four years and were administered a core battery test annually that included standardization and experimental measures of basic math, reading-related and visual spatial skills (Annals of Dyslexia, 2003). The researchers also obtained a Full Scale IQ score the first and fourth year of the study to compare the discrepancy between the IQ and core battery test. They used both the restrictive criteria and a less restrictive criterion to determine MD in the participants. The more restrictive set of criteria included a standard 15 point discrepancy between current IQ and either the TEMA-2 or WJ-R Math Calculations subtest (Mazzocco, 2003). The least restrictive criteria just looked at standard scores. The total percentage of children who met either criterion ranged from 0 to 45 percent (Annals of Dyslexia). However this underrespresnts the number of children that met at least one of the MD criteria in Kindergarten and that over half met a single criteria at some point during the primary school years (Annals of Dyslexia). MD is prevalent in young children however the percentage of kindergartens with MD may decrease as they move through school. A child who is MD in Kindergarten may not have the same issues when they reach 2nd or 3rd grade. This is evidence that we can identify MD at an early age and start to form some strategies for the children.

Considerable amount of research has found that math disabilities are heterogeneous with a wide variety of causes (Dowker, 2005). This means that there is not one exact math disability, there are many and to help find the best ways to intervene it is important that we know this. For example, Dowker (1998) studied calculation and arithmetical reasoning in 213 children between the ages of 6 and 9. Her findings were

that individual differences in arithmetic are relatively marked and that arithmetic is not unitary and it is relatively easy to find a child with marked discrepancies between different components (Journal of Learning Disabilities, 2005). A child could remember all the number facts but not be able to carry out the procedures or vice versa. A common consensus among researchers is the children with MD are more consistently weak at retrieving arithmetical facts from memory than at other aspects of arithmetic. Many students have this problem, in fact I would say about 50 % of my students have this problem. It doesn't necessarily mean that they have MD. It could just mean that they don't have the strategies required for number retrieval and may need some extra help developing such strategies. Even though number retrieval seems to be most common it is very important to investigate other areas of weakness in mathematics.

Approximately 6% to 7% of the school-aged population suffers from mathematics disabilities (Fuchs, Lynn and Fuchs, Douglas, 2002). Lynn and Douglas Fuchs reviewed two studies (Parmar, Cawley and Frazita (1996) and Russell and Ginsburg (1984)) that looked at mathematics performance beyond arithmetic story problems. Their review found that students grade 3 through 8 demonstrated difficulties when the problem consisted of irrelevant information, an addition of an extra step or the use of indirect language (Parmar, Cawley, and Frazit, 1996). Both students with learning disabilities and without learning disabilities had difficulty solving those problems. The data also illustrated that students with disabilities approached problem solving in an inflexible manner, when presented with irrelevant, additional or unpredictable information. Their non-disabled peers were able to at least transfer the story problem to skills they acquired.

Besides reviewing research on mathematics performance on word problems, Fuchs and Fuchs also conducted a study to describe the mathematical problem-solving profiles of students with mathematics disabilities with and without comorbid reading disabilities. The participants were 62 fourth graders from three schools in a southeastern city, that either had a standard score of 90 or higher on an individual intelligence test or their special education teacher reported that they had a math disability (Fuchs, 2002). These students were administered a series of standardized test to measure computational fluency and reading comprehension. Besides a series of standardized test, the participants were also exposed to three types of word problems, arithmetic story problem, complex story problems and real-world story problems. Their results showed that the disability status did not affect performance on arithmetic story problems, but the complex story problems and real world problems were affected for students with a learning disability. The MD only group scored higher on problem solving then the MD and RD group of students. As the difficultly level of the word problems increased, the percentage of correct responses decreased for both groups.

There are also many techniques that can be used to promote successful problem solving. Asha Jitendra and Yan Ping Xin reviewed several word problem solving strategies. One technique was a teacher/researcher-directed instructional technique; this consisted of representational techniques, strategy-training procedures and task variations (Jitendra and Xin, 1997). Representational techniques facilitated learning through pictorial, verbal or physical aids. Jitendra and Xin looked at a study using this technique with two group design. Both were taught a four-step strategy to solve word problems, one

was a traditional method and the other was the representational technique. This study showed no significant difference between the two techniques.

The second technique conducted by Montague and Bos, strategy training procedures, consisted of teaching the students an eight step strategy to promote problem solving. During this intervention students received strategy acquisition training over three 50 minute sessions, using modeling, verbal rehearsal and corrective feedback (Jitendra and Xin, 1997). The results of this strategy indicated that five of the six students' performance improved slightly.

The last technique they reviewed was task variation which refers to the manipulation of word-problem task. Silbet, Carnine, and Stein recommended that word-problem solving instruction be sequenced such that easy skills are taught before more difficult ones, to reduce student errors and frustration (Jitendra and Xin, 1997). This approach starts with relatively simple story problems that lead to phrase by phrase translation into more complex problems. Sixty-two students with learning disabilities were randomly assigned to three different treatment conditions; strategy only, sequence only, and strategy plus sequence. In the strategy only group, students were provided instruction on different math task and taught rules of math. They were then given seat work. The students in the sequence only group were introduced to first easy problems and moved into more complex problems. The strategy-sequence group was provided instruction on different math task and rules and also moved along with the difficulty level of word problems. The results indicated that the strategy plus sequencing group scored higher than the strategy only and sequence only groups. Therefore strategy teaching was

deemed to be the more effective of the two instructional components investigated (Jitendra and Xin, 1997).

Another approach to teach word-problem solving in Mathematics that has shown to be effective is cognitive strategy instruction. Using this approach, children learn how to construct mathematical knowledge by linking new learning to previously acquired concepts (Montague 1997). Children typically acquire mathematical concepts early through observation and spontaneous interactions with the environment (Montague 1997). Through these interactions they gain factual and declarative knowledge that allows them to become more proficient with computational procedures as they grow older. As they get older, they also develop strategic knowledge, which is a problem-solving strategy and is crucial in solving word problems. Strategic Knowledge should be acquired naturally as children get older, there are some children who do not develop this knowledge and therefore, problem solving is difficult.

According to this model, students set goals that lead to construction of new knowledge, which leads to new goals. This continues into a spiral effect of learning. Children are becoming active learners in the mathematics classroom, particularly in solving word problems. However students with Learning Disabilities continue to be at risk for failing math. Cognitive Strategy instruction is an approach, which seems to be effective for students with Learning Disabilities. Solving math word problems involves several metacomponential functions that a student with Learning Disabilities could have difficulty (Montague 1997). Some of the processes include defining the task, developing a strategy and forming a mental representation of the task. A student with Learning

Disabilities might require cognitive strategy instruction to help them move from one process to the next. This thought process is considered to be metacognitive, which requires more advanced and abstract stages, which some students may not have. The Self-Regulated Strategy Development Model seems to be effective because it provides a guideline for students that have difficulty moving through more abstract stages.

Research has shown that students with LD are poor self-regulators and benefit from strategy instruction that incorporates self-regulation training (Graham and Harris, 2003; Wong, Harris, Graham & Butler, 2003). In the classroom, the teacher may notice the students are having difficulty keeping them on task and following with instruction. If a student can learn to self-regulate, they can learn to monitor what they are learning and how to guide themselves to learn. Swanson and Sachs-Lee conducted meta-analyses of 30 years of intervention methods for students with LD. From their research, they concluded that direct instruction and strategy instruction were the two most effective approaches. Of those two, strategy instruction appeared to be more effective in higher order learning, such as reading comprehension and mathematical problem solving.

Montage (2008) reviewed the research on the use of cognitive strategy instruction for mathematical problem solving. Seven studies were reviewed- five single subject design and two group design studies. The author developed benchmarks to follow to look for quality of research and evidence of strategy instruction working. The benchmarks for single-subject studies included, sufficient description of the participants and settings, measures and measurement of procedures, including interrater agreement, intervention and procedures for determining fidelity of implementation, baseline phase

and evidence of pattern prior to intervention and at least three demonstrations of experimental effect, explanations of how internal and external validity were controlled(Montague, 2008). An overall analysis of the studies as a group concluded that the practice-cognitive strategy instruction- is evidenced based and does improve mathematical problem solving for students with learning disabilities (Montague, 2008). The goal for cognitive strategy instruction is to teach multiple strategies to enhance the performance in an academic area.

In the research that was reviewed there are several models that the researcher for this project followed. One model was from Montague's cognitive routine, which consists of SAY, ASK, and CHECK routine. In this routine, students self-instruct, which helps the student identify and direct themselves as they solve the problem (Montague, 2008). The students are required to memorize the strategy and become familiar with self-regulation. For example, for SAY, the student would "Read the problem. If I don't understand it, read it again." There are seven stages to the SAY, ASK, CHECK model; read,

Now that we have some knowledge of MD and cognitive strategy instruction, we need to look specifically at interventions to help improve word problem solving skills. One strategy is The Self-Regulation Strategy Development Model. The SRSD model was developed mainly for students with learning disabilities. These students have difficulty with self-regulation, including organization (Harris, 2003). They might have difficulty comprehending task or using strategies to mediate performance. Even though

the focus was with students with disabilities, there are students who are not classified that may struggle with self-regulating strategies.

The SRSD model consists of six stages. These stages do not have to be followed step by step. They are more a guideline or format to follow. The six stages for SRSD model are: Develop and Activate Background Knowledge, Discuss it, Model it, memorize it, and Support it and Independent performance. During the first stage, develop and activate background knowledge, focus on any preskills (Multiplication, division, fractions). These skills should be developed enough so that they can move into stage 2 and 3. In the Discuss it stage, the teacher and student discuss the strategies to be learned, with the problem solving strategy being carefully explained. During stage 3, teacher or peer models the word problem strategy and select types of self-instructions while solving the problem. In stage 4, the students are required to memorize the steps in the problem solving strategy and the meaning of any mnemonics use either to represent the strategy steps or some part of the steps. Stage 5, Support It, this is like scaffolding, it provides support. Lastly, stage 6, students work independently and use self-regulations strategies on their own. Throughout this paper we will discuss other research that adopted this model to integrate in the math classroom.

For many students solving math word problems becomes difficult at the middle school level. Harris and Graham developed a Self-Regulation Development Model to improve writing instruction for students with Learning Disabilities (University Nebraska-Lincoln, 1996). Graham, Harris and their colleagues have been involved in the development and evaluation of self-regulation strategies among students with Learning

Disabilities (Harris, 2003). The SRSD model has been used in other academic areas, however most of the research focused on writing.

Another method looked at was by Graham and Harris, the Self-Regulated Development Model, which was designed in the early 1980's to improve writing. Case, Cassel and Reid designed their model on the basis of the SRSD model. Case, Cassel and Reid, used the six stages to help guide instruction. Case, developed a five step strategy; 1. Read the problem out loud, 2. Look for important words and circle them, 3 .draw pictures to help tell what is happening, and 4. Write down the math sentence and 5. Write down the answer. These results indicated that four students with LD progressed from learning. Cassel and Reid (1996), developed similar strategies, instead of 5 steps, it consisted of 9 steps; 1. Read the problem out loud, 2. Find and highlight the question, then write the label, 3. Ask what are the parts of the problem, and then circle the numbers needed, 4. Set up the problem by writing and labeling the numbers, 5. Reread the problem and tie down the sign, 6. Discover the sign, 7. Read the number problem, 8. Answer the number problem, and 9. Write the answer and check by asking if the answer makes sense. These two strategies are what the current research used to develop an 8 step process for the math class to follow. The results showed students in third and fourth grade reaching mastery level on several types of problems and maintained performance over time (Montague, 2008).

It is hopeful that Self-Regulated Development Model will help improve students' word problem solving skills. As we move forward in education, problem solving, higher order thinking skills is where we are focusing. Students need to learn how to respond to a

multi-step question and find the important information in the problem. This is an ongoing process, which will improve over time.

Chapter 3 Methodology

The subjects for this research project consisted of 17 students, who are in a seventh grade math class. Their age ranges from 12-14 years of age. A few of the students have either repeated seventh or sixth grade the previous year. The classroom comprised of 17 students from diverse ethnic backgrounds. Seven of the students are Hispanic, nine African American and one is Caucasian. Besides diversity in race, they are diverse in their learning ability. One student is classified as "Specific Learning Disabilities" and another student receives Speech/Language Services. Within the classroom, there are also two to three students that are currently being evaluated by the child study team. The remainder of students are non-disabled. N.K. is classified as "Specific Learning Disabled". He has a special education teacher that moves with him from class to class. During class time, N.K sits in the front of the room. He focuses during the lesson and gets most of his work finished.

They receive math instruction five days a week for 90 minutes. The students are working on general mathematics, which consist of percents, fractions, decimals, proportions, ratios, and geometry. The majority of students respond to word problems with the "I don't know" or "don't get it". It is common for them to give up and not even try the problem.

Setting:

The School is located in an urban, low-socioeconomic status district in southern New Jersey. The majority of the students receive free or reduced lunch. The school also receives supplemental education services because they are a school in need of improvement. The past several years, they have not met Annual Yearly Progress status due to state test scores; this is due to No Child Left Behind. The school is Pre-K to eighth grade, a family school. Students in grades six to eight switch classes, however it is not a true middle school setting. They receive Physical Education, Technology and Art. With the growing number of students, the school is running out of space for classrooms such as Art.

The classroom consists of a regular education teacher and a special education teacher for the 17 students. In the classroom, technology is used on a regular basis, with the use of a Smart board. There are also five working computers available. Besides the use of technology, there are many math manipulatives that the students have access to use for learning. During instruction, they sit in groups of three. Majority of the math instruction is direct instruction, scripted from a program titled "LL Teach". There are opportunities for the students to work independently and discover solutions on their own.

Method:

For this research project, the students worked with four word problems. The word problems were selected from a packet of problems the students could work on during the school year. The students had pencil, paper, calculator and any other math materials available. A poster was also posted with the process they used to help guide the students in solving the problem. Since the majority of the students write "I don't Know" for an answer to the word problems, completion of problem, correct responses and remembering the strategy steps were three items that were studied in the research. There were some variables that cannot be controlled such as behavior and absence. In this school absence is looked at on a daily basis and the school works hard to maintain their status of having 96% of the students attend daily. Behavior was another issue that truly affects the outcome of learning in the classroom. At this point, there were not any major behavior issues during math; however some students will miss class because they are suspended for another reason.

During phase one of this research project, the students completed four word problems. Day one, they completed one problem, Day two they completed another problem, Day three, the third problem and Day four the fourth problem. Each day, the solutions were reviewed to assess how many the students completed and if they solved the problem correctly. During Phase 2, the instructor introduced the strategy the class used to solve word problems. Word Problem solving strategies were placed on a poster displayed in the classroom. The instructor then utilized the Self-Regulated Strategy Development model (Graham and Harris,), which was discussed in Chapter two. The

instructor first activated the students' background knowledge and focused on the skills the students needed to solve the problems. The instructor modeled the strategy using a "think aloud" to demonstrate giving oneself instructions. The strategy also incorporated Cass, Cassel and Reid's (2004) adaption of the Self-Regulated development model. This model utilizes the following steps:

1. Read the problem out loud
2. Look for important words and circle them,
3. Highlight the question
4. Ask yourself what parts of the problem do you need, circle the numbers needed, and
5. Draw any pictures that my help solve the problem
6. Reread the problem and determine which math operations to use,
7. Solve the problem
8. Check to see if the answer makes sense.

Once the instructor modeled the process, the class completed a problem together using the SRSD strategy. Students wrote down the process on paper to have as a resource tool. The next class day, the students worked in groups of two, to model the strategy to each other and solve a different word problem. Before the students moved on to solving the last two problems independently, the teacher asked them to write down the step by step strategy. This allowed the instructor to determine if they are ready to move

on independently. The teacher also checked the two word problems they completed together and in groups of two, to see if progress was made.

Once the instructor felt the students could work independently, she gave them a word problem to solve using the strategy they worked on together. The teacher then assessed the students work for completion and correctness. If there was not much progress then the previous steps-modeling, group work and independent work-were repeated. This process was repeated for five weeks until some progress had been made.

Chapter 4 Analysis

In this study I investigated the use of the Self-regulated Development Strategy (SRDS) model with 7th grade students.. I hoped to find the students would do better on solving math word problems, once they understood how to use the SRDS. The students were given four different word problems throughout the course of the week. At the end of the week, the students were then introduced to the SRDS. As a group we discussed steps needed to help solve the word problems and what they needed on an individual basis. I modeled for the students how to use the strategy for three days. During day 4, as a class we worked through one of the word problems from the previous week. After we worked through one word problem together using the Self-Regulated Development Strategy, the students then worked on the other three word problems from the previous week. They worked on the problems over several weeks using the Self-Regulated Development Strategy. At the beginning of each class period, we reviewed the steps for the students to use and then they worked independently on the word problem.

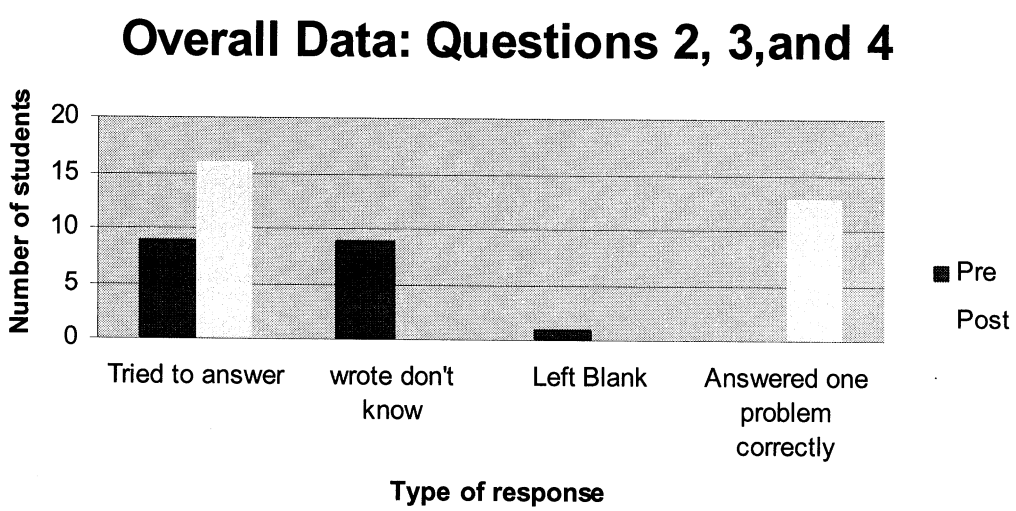

Figure 1: Overdata: Questions 2,3,and 4

Figure 1 displays how the students improved over time. The responses were broken into four sections (tried to answer, wrote don't know, left blank and answered correctly). From the results, you can see that nine students wrote "I don't know" for their answer before they knew the Self-regulated Development Strategy. After they learned how to use the strategy, not a single student wrote "I don't know". The results are similar for students who left the question blank. Before they learned the strategy, one student left the question blank and after they knew the strategy, no students left the answer blank. Nine students attempted to answer the word problems before they had the Self-Regulated Development Strategy to work with and they knew how to use the strategy, sixteen students tried to answer the question and of those sixteen students, thirteen answered one problem correctly.

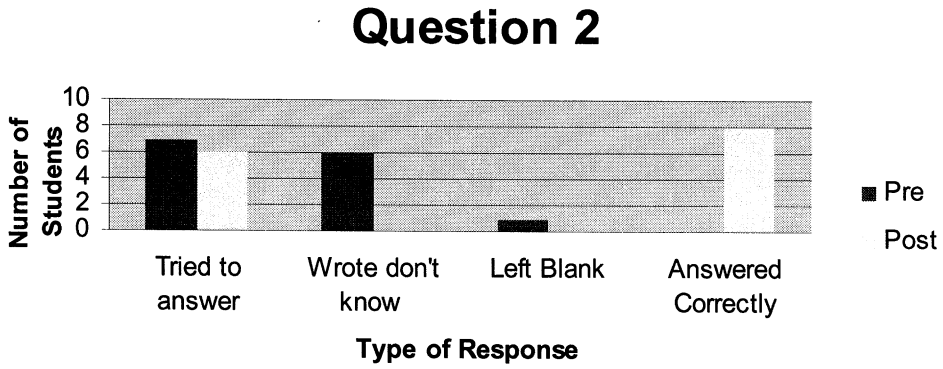

Figure 2: Question 2

The students started working independently on question two. Question two required the students to find how many ounces of decaffeinated coffee they would have to drink to get the equivalent amount of caffeine found in one small cup of regular coffee. The word problem told the students that a cup of decaffeinated coffee was 96% caffeine-free. Before the Self-Regulated Development Strategy was introduced, six students wrote "I don't know", seven students tried to answer the problem, one student left it blank and zero answered correctly. The results changed for the better after they applied the strategy. On this question all the students improved. They either answered correctly or more of them attempted to answer the problem. Eight students answered the question correctly and six students tried to answer it. No one left it blank or wrote "I don't know".

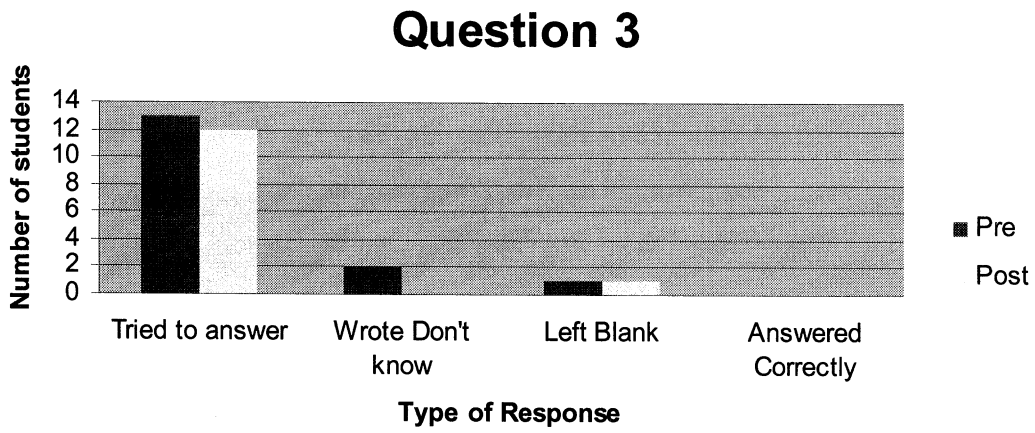

Figure 3: Question 3

As we moved through the questions they become harder for the students. Question three required the students to find out what percent discount a person received on a package of softballs. The students were given the original cost of the item (36.00) and what the person paid for it (32.13), including the 5% sales tax. On Question 3 before the Self-Regulated Development Strategy, thirteen tried to answer, two wrote "I don't know" and one left blank. After they had the strategy in place, they answered the same question. While none of the students answered the question correctly, there were also no students who wrote "I don't know", this is an improvement. Twelve students also tried to answer this question, while two students left it blank.

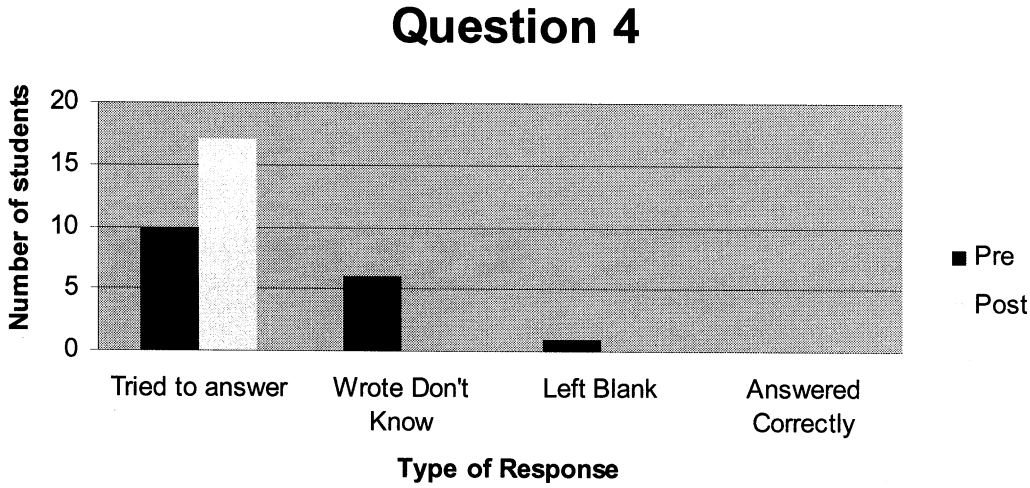

Figure 4: Question 4

Question four had similar results, as the students moved on the questions became harder. Question four; In a survey of 756 high school students, 70 percent more students preferred cell phones to landline phones; How many students preferred landline phones? Before the strategy, ten students tried to answer, six students wrote "I don't know" and one left blank. After the strategy was developed, the students improved. All seventeen students tried to answer question four. Not one student wrote "I don't know" or Left blank. Even though no one answered correctly there still was improvement.

Chapter 5 Discussion

This project studied the Self-Regulated Strategy Development Model and its effects on solving math word problems. Seventeen students in seventh grade participated over the course of five weeks. One student has a classification of Specific Learning Disabled and two other students were in the process of being determined eligible for special services. Before the students were introduced to the SRSD model, they were given four word problems to solve over the course of a week. Typically, the students would leave the word problem blank or write "I don't Know", then turn in the paper. After they worked on all four word problems, the following week, the teacher introduced the Self-Regulated Strategy Development model to the class.

The students and teacher developed steps they would use to solve the word problems that they previously worked on. As a class they created a poster displaying the steps. Then the teacher modeled how to use the SRSD model, to solve the first word problem. Once the students saw how the steps were modeled, they were given three more word problems to work on over the next few weeks. The students worked independently to solve the problem, using the SRSD model.

Overall results show that students did make some progress. A total of 9 students wrote "I don't know" on the pre-question, this number decreased to zero on the post-question. The students just needed some guidelines to help them solve the word problems. Of the three problems that the students answered independently, 13 students answered at least of one of them correctly. This also is a huge improvement for the group

of students who participated. The majority of the students improved on word problem number two. The reason that most of the students answered this question correctly could be due to the fact, that is was a skill they were currently working on in class. The students also improved in the area of trying to answer the word problems. That number of students increased from 9 to 16. Since the students now had a guideline to follow they were confident that they could solve the word problems. For Questions 3 and 4, the students showed improvement. Unfortunately, no one answered these two questions correctly. This could be due to the questions becoming harder and the students were not familiar with the skill being used. Instead of writing "I don't know" or leaving it blank, all the students tried to answer the post-question. The participants knew the skill being asked, but it was not something they were learning at the moment. They seem to do better on word problems that focus on the skill they were learning at that time.

The Self-Regulated Strategy Development model, would work in the classroom. Research developed by Case, Cassel and Reid, using a Self-Regulated Strategy development model showed improvement in third and fourth graders (Montague 2008). They reached mastery level and maintained performance overtime. Swanson and Sachs-Lee also conducted a meta-analysis of 30 years of intervention methods for students with Learning Disabilities and they concluded that strategy instruction is the most effective in the classroom. The results from this research project show slight improvement from the seventh grade participants. The seventeen students who participated in this study, all struggle with solving math word problems. Most of them, would not even read the problem when given to them. After they developed a guideline, they seemed excited to try answering the questions. Each student diligently went through the problems,

highlighting questions, crossing out what didn't belong and writing math sentences. The results would have been greater, had there been more time to collect data.

A problem encountered with this research project was data collection. The researcher had limited amount of time to collect data. Due to medical reasons, the researcher did not have access to her sample size after December 19th. Since she was away from the classroom, the principal would not allow her to return just to collect data. The data collection began mid November and ended December 17th. The month of November had very few school days because of the Teacher's convention, Election Day and Thanksgiving. Since there were limitations on the number of days data was collected, it may have affected the results of the study. Data should have been collected over a period of at least two months.

This project would be more effective if the strategy was introduced in September before the students started word problems. The SRSD model should start out as a lesson on the first or second day of school and continue with the teacher modeling the strategy through September and October. Starting in November, the teacher and students would work on the strategy and word problems together until winter break. When students return from winter break, they should be able to work independently using the SRSD model. If this routine was followed, the researcher would most likely see significant results. It is an easy strategy to implement into the classroom.

In summary, this research showed some improvements for the students when they used the Self-Regulated Strategy Development Model. For most of the seventh grade students they would leave their paper blank or write "I don't know", when they were

asked to solve a word problem. After the strategy was introduced, more students tried to answer the problems. The amount of students who tried to answer the questions almost doubled. For the group of seventh graders who participated in this study, that is an improvement. They appeared to have more confidence when they tried to answer the word problems. Overall this research project had positive results for the students and teacher. Hopefully, in the future, other teachers will use this strategy.

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