

**The Effects of Journaling Strategies versus Traditional Strategies on Math Performance of  
5<sup>th</sup> and 6<sup>th</sup> Graders at a Selected After School Program**

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### Abstract

The purpose of this study was to examine the effects of journaling strategies versus traditional strategies on math performance of fifth and sixth grade students in an after school program. The sample consisted of 22 students (11 boys and 11 girls) randomly assigned to experimental and control groups. The control group was taught using traditional lecture-type strategies and the experimental group was taught using journaling strategies where students were asked to record mathematical notes, ideas, and problem-solving techniques. Both groups were taught for 20 minutes twice a week for eight weeks. After instruction, both groups were tested and scores compared using independent t-tests. The results indicated that there was no significant difference between the experimental and control groups ( $t(20) = 0.426, p > 0.05$ ). Also, no significant difference was found between genders when taught using journaling strategies. The results suggest further research and review of this topic.

Milligan College granted IRB approval on 10-27-2015.

IRB form has been removed due to privacy of information and has been archived separately.

## Chapter 1

### Introduction

In 2012, among the 34 Organisation for Economic Co-operation and Development (OECD) countries, the United States fell below average on the Programme for International Student Assessment (PISA) in 2012 with a ranking of 27<sup>th</sup>. This was great cause for alarm and concern for many United States citizens. Though the U.S. spends more per student than almost every other country and has students with parents more educated than in other countries in the OECD, this high spending and high educational level has not translated or materialized into superior performance. Even Massachusetts as the top performing state in America lagged behind China by more than two school years (OECD, 2012).

PISA is a triennial survey assessment given to 15-year-old students that evaluates application of knowledge. Not only does it measure student academic achievement, but it provides insights into global educational policy and practice and gauges trends in knowledge acquisition and skills. A particular U.S. weakness identified by PISA was in the performance of mathematical tasks that require higher order thinking and more cognitive demands (OECD, 2012). This fact offers an explanation for the media's serious and extreme focus on mathematical achievement (Vidor, 2013).

Many other countries have a nationwide standard of academic achievement for their students. Educational standards in the U.S. varied by state and district. The development of Common Core Standards was an outgrowth of and response to not having a standard across the U.S. as they have in other OECD countries. Even now, and with some improvement, there is still

a clarion call for better curricula and an improved teaching culture (Brown, A. S. & Brown, L. L., 2007).

One way to change the culture in the mathematics classroom is to promote mathematical literacy. The National Council of Teachers of Mathematics (NCTM) lists writing in mathematics as a significant component of mathematics literacy. They espouse that writing in mathematics assists students in understanding the subject. NCTM recommends mathematical journaling as a possible means of assessing students' thinking strategies about mathematical problem solving. Math journaling is writing and communicating mathematical ideas and techniques with words, symbols, drawings, and diagrams. Journaling records problem-solving techniques, ideas, and questions about math. It can also be written commentary as if a student were trying to help another student who might be struggling with the same topic. This record or log is kept in a notebook readily available for student use. In math journaling, depending on the level, students may recount, summarize, and dialogue mathematical thoughts and ideas and are able to clarify their thinking on problem solving. Journaling can also be used as a means of communication between the student and teacher or to simply illuminate the students' own thinking on a particular topic. Mathematics journaling can be used as a form of higher order thinking as students become creators and teachers of mathematical skills (Nickerson II, 2007).

Jason Gibson, one of the most popular and highly rated tutors of advanced math instructional DVDs, believes that one of the best tools to use for being successful in mathematics is to write. Gibson advocates that everything should be written down as this helps the person visualize and actively work towards thinking through tough problems. He recommends that students draw pictures and write as if they were teaching someone the basics (Gibson, 2015).

Though not a new phenomenon, Teresa Banker, author and instructor at Kennesaw State University, states that journaling benefits students in a variety of ways. She states that it helps facilitate organization of math thoughts to help students communicate more coherently, assists them in learning the language of mathematics to express ideas, and offers reflection for a greater understanding of math topics. Banker proposes that mathematics is more meaningful, and the student more productive in understanding math concepts and the application of those concepts, when they journal. She suggests that students can use journaling to discover their mathematical weaknesses and aid them in viewing math from a different perspective, realizing that journaling can be a vital part of their success in math. She adds that students are not the only ones who benefit from journaling. When teachers review students' math journals, they are able to identify student misconceptions and correct them, so journaling serves as an ongoing measure of formative assessment. The teacher is able to provide students meaningful feedback, which helps them develop skill and self-confidence in math. Journaling also assists the teacher in planning and presenting instruction for more critical thinking (Banker, 2004).

### **Statement of the Problem**

While journaling has been accepted as a learning strategy in many subjects, it is difficult to find definitive research on its effectiveness as compared to that of traditional learning strategies. Therefore, the problem of this study was to investigate the effects of journaling strategies versus traditional strategies on math performance.

### **The Purpose of the Study**

The purpose of this study was to examine the effects of journaling strategies versus traditional strategies on mathematics performance of fifth and sixth grade students.

### **Significance of the Study**

Every mathematics classroom across the U.S. plays an important part in mathematics achievement for the nation. If every teacher is to do his or her part in successfully educating children, each teacher must start with effective classroom strategies and pedagogies that promote problem-solving ability, critical thinking, and cognitive growth (Tripathi, 2015).

The intent of this study was to examine the effects of journaling strategies versus traditional strategies on fifth and sixth grade students' performance in mathematics to assist teachers in making informed decisions regarding strategies to implement in the classroom for more effective teaching and learning.

### **Limitations**

1. This study was conducted with a small group of children and may not provide enough evidence to reach broad conclusions.
2. Assessment instruments used were designed by the researcher and not tested for validity and reliability.

### **Definition of Terms**

1. **Cognition:** mental activity and processes involved in knowing and comprehending which includes remembering, thinking, problem solving, and other higher level functions of the brain.
2. **Critical thinking:** rational and logical thinking that involves well thought out analysis and evaluation.



3. **Mathematical journaling:** a written record or log of mathematical knowledge, ideas, problem solving techniques, thoughts, observations, and experiences that may include words, symbols, diagrams, or drawings.
4. **Problem solving:** the mental process of defining, analyzing, and figuring out solutions to problems.
5. **Math performance:** for the purpose of this study, scores on unit tests
6. **Traditional Strategies:** customary teacher-centered, direct instruction techniques that mainly include lectures and that require students to listen, observe, and memorize by rote.

### **Overview of the Study**

The study consists of five chapters that evaluate the effects of the journaling strategy versus the traditional strategy on math performance. Chapter 1 includes the introduction, statement of the problem, purpose of the study, significance of the study, limitations, definition of terms, and an overview of the study. Chapter 2 contains a review of literature, and chapter 3 contains methodology, population, sample data collection instruments, procedures, and research questions and related hypotheses. Chapter 5, the final chapter, contains findings, conclusions, recommendations, and implications of the study.

## Chapter 2

### Literature Review

Writing is a vital and essential pedagogical tool. The simple natural act of writing shapes thinking because it is a physical activity that also involves thinking constructively during the writing process itself. Reading, writing, and thinking can be classified as active engagement in learning (Alharbi, 2015). Writing is one of the most powerful tools available for learning and is unique in that it allows learning to be graphically recorded. Writing involves full engagement of brain functioning as it uses both hemispheres of the brain in generating ideas and structuring them simultaneously. Since writing involves creation of a product for another person, the writer has to devote considerable time to conveying and clarifying thoughts for the reader (Freitag, 1997).

Writing processes also involve the senses. When a person engages in the activity of writing by hand, the brain receives a message or feedback from the hand (a motor action) from the touching sensation of paper and pencil. People learn by doing and experiencing activities. Activities that are actively experienced are more likely to be remembered and learned (Better learning through handwriting, 2011). The very act of writing itself compels the one writing to actively organize and script thoughts, and as such, writing can be a valuable meta-cognition tool for thinking, planning, and evaluating. Writing and journaling can be used to aid students in the entire problem solving process (Laitsch, 2005).

Because writing is a slow process, it helps students figure out what they are thinking and increases retention of information. During this slow process, new information becomes attached to information already stored in long-term memory. Writing activities promote better learning than just reading alone. Writing helps improve student ability to analyze, evaluate, infer, and synthesize (Gere, 1985).

Writing is an activity that makes thinking visible. Writing can be called effective learning when it assists the student in making sense of a complex subject. Sometimes a student may only become familiar enough with a topic to have superficial and short-term knowledge, so writing has to be monitored by the teacher to facilitate a deeper student understanding of a topic. In other words, the teacher's job is to facilitate the student's ability to think and learn in the writing (Gere, 1985).

Teacher and writer Joan Countryman (1992) states that math journaling helps students make sense of mathematics. It integrates eye-hand-brain coordination, so that students are actively engaged in learning mathematical concepts. Journaling used effectively in the classroom allows teachers to get to know students and serves as means of formative assessment, replacing quizzes and other assessments. It also allows the teacher to actually see the thought processes of the student and can be used to monitor student progress and facilitate teacher-student communication. Math journaling allows the student to utilize cognitive skills. In math, words are tools used for thinking (Countryman, 1992).

Writing causes an individual to evaluate his own thought processes and to clarify his own thoughts and understanding (Higham, 1998). Writing causes a student to be an independent learner and helps him to obtain, organize, and analyze data and information. It enhances intellectual development and higher order thinking (Dahlke, 2008).

Writing used in mathematics promotes the value of quantitative learning for the student. The student creates value while learning math when writing in math. Writing adds variety to a course taught in the traditional method of lecturing and is a very versatile and utilitarian tool to enhance learning in mathematics. When writing, a student makes math his own idea. He captures his own thought processes on paper where he can re-read and then solidify the concepts or ideas in his mind (Sterrett, 1992).

Writing contributes to learning. Although writing tends to occur at a slower pace than reading, talking, or listening, it helps students become more aware of their own thought processes. Learners have to re-read and continuously evaluate their thoughts (Freitag, 1997).

According to Rowlands (2015), educator at California State University, writing has both associative and generative power. Associative power refers to the idea that one thought leads to another and generative power allows an individual to create and generate new ideas. Writing is a learning tool that can benefit everyone in all subjects (Rowlands, 2015).

Langer and Appleby (1987) cited a specific relationship between writing and learning and refer to writing as engaged thinking. The colleagues analyzed the classroom practices of seven high school educators from different disciplines whose lesson plans outlined writing intensive curriculums. Langer and Appleby (1987) found that writing helped students learn difficult content more thoroughly than any other technique examined in the normal classroom. The more content was manipulated and written about, the more learning improved. They believe that learning should have a significant role in pedagogy for all subjects. The more teachers help students learn how they think, the more the students can become lifelong and independent learners (Appleby, A. & Langer, J., 1987).

It is becoming increasingly important for students to understand how they learn and for teachers to prepare them for advanced learning. Many states grapple with strategies for improving the tenuous state of mathematics in the U.S. to achieve state standards, but a growing number of educators have found that one method that may be of great advantage in achieving increased achievement in mathematics is to employ writing as a tool for increasing learning and closing learning gaps in math. When a student can effectively render mathematical thoughts clearly in writing, he has increased his mathematical understanding. Great writing reflects clear thinking (Sterrett, 1992).

Educational researchers have found that, though math textbooks, curricula, and software proliferate, these items do not appear to be very helpful in increasing student proficiency in mathematics. Students have a tendency to learn to compute problems, but may not necessarily understand problems well enough to apply that knowledge and extend it to mathematical problem solving. However, cognitive growth that results from writing in math has been deemed helpful in increasing problem solving skills. Material or strategies that enhance cognitive growth are beneficial (Capraro, M., Capraro, R., & Rupley, W., 2011).

In response to Common Core and other standardized testing requirements, the mathematics curricula have been overhauled in K-12 public schools in many different states. Many of the questions on standardized tests are now of the constructed response type which require students to write and explain their answers. A constructed response question asks students to apply knowledge, analyze, evaluate, and/or synthesize information. Student responses to constructed response questions may take the form of an essay or graph or the steps to solving a mathematical problem.

Common Core mathematics standards also require students to describe outcomes, construct arguments and reasoning, and describe mathematical thought processes. Writing practice in math facilitates student accomplishment of these standardized testing directives. These improved writing skills relate to and demonstrate a student's capacity to learn. There is a definite relationship between writing and learning, and math students who have gained experience with mathematical writing have a greater understanding of content than their peers. Math education research supports writing as a viable tool in the math classroom. Writing aids the students in linking new ideas to relevant and current knowledge which encourages them to engage in conducting their own problem solving. Students become capable of transforming knowledge rather than just being able to reproduce it. Students allow themselves to engage in self-assessment as they write (Pugalee, D. & Schinck-Mikel, A., 2014).

Many educational leaders are adopting a writing-across-the-curriculum approach in all subjects as an initiative to improve achievement on Common Core tests fully expecting this to help improve critical thinking skills. Whether it is for college or for careers, students are not leaving high school prepared, and standardized testing reveals whether students are prepared or not. On these tests, students are required to show what they know and exactly how they know it, and many schools are taking efforts to teach students how to learn and how to properly demonstrate this learning (Daddona, 2013).

In a six-week quantitative study of 96 middle school math students, researchers found that integration of writing into the mathematics classroom increased students' problem solving skills. Higher levels of cognitive thinking are essential for increased problem solving skills. Integration of writing into the math class requires students to demonstrate and apply knowledge of mathematics. The results of the study indicated that the writing group of math students

outperformed the comparison group on a test of cognitive complexity. The writing process enabled students to analyze and interpret data to solve complex problems. Writing gave students a visual image of difficult problems (Bicer, A., Capraro, M., & Capraro, R., 2013).

Sometimes algebraic and geometric terms are too abstract for students. Writing compensates for the abstraction by allowing students to represent their own original mathematical thoughts. Good math problem solvers exhibit skills in problem representation (tables, graphs, pictures, words) and symbol manipulation necessary to carry out various mathematical and geometrical operations. Because students process problems according to their learning styles, students should have options for representing solutions to problems. Writing helps students represent math problems in a way that is meaningful to them personally (Bicer, A., Capraro, M. & Capraro, R., 2014).

The Northwest Regional Educational Laboratory discovered a study conducted by Lilyanne van Allen in 1992 on 10 Texas middle schools. Van Allen found that schools using a writing-across-the-curriculum approach to learning produced significantly improved results in writing ability over schools which did not. In 2002, Another study completed by the Academy for Educational Development assessed the writing of third and fourth graders and found that those who participated in a National Writing Project summer program showed strong achievement in writing across the curriculum showing 89% for 3<sup>rd</sup> graders and 81% achievement for 4<sup>th</sup> graders (Brewster, C. & Klump, J., 2004).

More recently Bangert-Drowns, Hurley and Wilkinson in 2004 conducted a meta-analysis of 45 studies. The researchers sought to determine conditions that boosted the learning effects of writing. The studies compared, in the same content area, normal classroom instruction to classrooms with writing-focused instruction. The studies were conducted on levels from

elementary through college in various subjects. The researchers evaluated research design quality, context of learning activities, intensity of writing and types of writing, and developed a common metric for effect size and examined relationships between study features. The result was that in over 75% of the studies, the students who wrote outperformed those in classrooms who did not write. It was found that when students who wrote were asked to reflect on their learning processes, their scores were higher, and the writing appeared to benefit because of the metacognitive effect on the learning process. The studies evaluated in the meta-analysis had quasi-experimental designs with a control group, and the analysis found that writing-to-learn programs had a small, positive effect on student achievement (Bangert-Drowns, R., Hurley, M., & Wilkinson, B., 2004).

Reilly in his mixed methods study of 293 middle school students found that students' knowledge of mathematics was enhanced as a result of their writing in the math class, and their writing demonstrated a positive change in the understanding of mathematical concepts over time (Reilly, 2007). According to Koirala (2002), math journals and writing have been implemented in many schools in various locations, and that implementation has resulted in improved critical thinking. Since problem solving is so integral to the study of mathematics, journaling helps the student hone skills in reviewing his own thought processes and in improving his analytical abilities and constructive learning (Palmer, 2011).

Writing to learn is a pedagogical approach that espouses that writing positively influences student understanding (Brewster, C. & Klump, J., 2004). Only by writing in a discipline can students communicate effectively in that discipline. Organization, summary, and synthesis become easier, and more understanding results when students can communicate their learning and thinking. Writing reinforces content and inquiry. Students should write to learn and



write to demonstrate that learning. Writing causes a student to personalize their thinking and learning (Writing Across the Curriculum). Also, writing in mathematics assists students in becoming autonomous learners where students can be responsible for their own learning. (Overview of principles and standards for school mathematics, 2005).

As reflected in the book Roots in the Sawdust: Writing to Learn Across the Disciplines (Gere, 1985), writing has a learning function in that it fosters abstract thought. Even though most writing is done to show learning through assignments and tests, writing can be used to learn, but Gere, the editor, cautions that the mere mechanical act of writing itself is not what constitutes writing to learn. The teacher has to monitor students' writings to ensure that learning is occurring. Also, there is no "right" way to learn through writing, the teacher has to be willing to implement different writing-to-learn strategies (Gere, 1985).

Research on writing and journaling in mathematics is largely favorable, but many students usually hate the idea of writing in mathematics and many have a negative attitude towards it, especially those who may be weak in writing already. This could make a student feel even more inadequate, that is, until he sees the benefits for himself. However, this is the normal response that one would expect from students- a pushback from what may be perceived as additional work.

Palmer (2011) in his qualitative and quantitative analysis to assess whether journals were effective found that journals provided a considerable difference in gains in math pre- and post-test scores for third graders, but explained that the impact was not statistically significant. However, this in no way detracts from the success that the integration of writing into the mathematics curriculum has had in other classrooms.

Despite evidence that relates writing to learning, Leydens and Santi (2006) mention that there are still many barriers that remain to writing across the curriculum, many of them resulting from normal challenges and struggles that both students and faculty face as part of the educational process. Though the value of writing has been recognized by many in many fields, mathematics teachers may not readily embrace the idea. Many math teachers feel that they absolutely do not have the time, considering all of the topics they have to cover in the short school year, or they may not feel qualified to teach writing. Adding a writing component to the curriculum can place big demands on a teacher's already full day, mainly due to the time necessary to give feedback to each student (Palmer, 2011).

Most of the challenges with writing implementation across the curriculum arise from teachers and faculty, those who are supposed to help students become critical thinkers. This may indicate a greater need for training and professional development. Fulwiler (1984), in his article on writing across the curriculum, evaluated this phenomenon and mentioned some of the challenges that occur when schools elect to adopt the practice of writing in various content areas. He related that many teachers challenge writing in their content areas with active resistance, turf wars, and resentment over who has the right to teach writing, and other valid and invalid concerns. He suggested that the success of writing in various content areas will, over time, speak loudly and proudly for itself (Fulwiler, 1984).

Also, many math teachers opine that they are not English teachers, but instructors do not have to be experts in English to have students write about mathematical thoughts and concepts, especially when the writing is simply being used to help the student learn a topic. Disciplines do not exist in isolation of each other, and each of them, at some point, connects with the other. Students need to know both how to write math in English and how to write English in math.

For the teacher who will use writing in math, but is not sure how to get started, ideas and prompts online are creative and endless. Writing in math can also foster in the student an appreciation for the subject itself. Just as is the case for other subjects, mathematics has a varied, interesting, and rich history and has contributed much to life as it is known today. Math has played a significant and essential role in advances in technology, engineering, architecture, and medicine (Smith, 2014) .

Many researchers, however, tout that the struggle of including writing in mathematics is well worth the benefits. A student's ability to write in a subject is related to his understanding and ability to apply knowledge in that subject. His written expression is his comprehension (Freitag, 1997).

In conclusion, writing is indeed a tremendous pedagogical tool, and when utilized effectively, enhances learning. The complex, versatile human brain is up to the challenge it was designed for – creative and critical thinking!

Past studies and research suggest that writing in mathematics can be immensely effective. The union of writing and mathematics is not new, but that union has not found a place yet on the shelves of commonplace. If the writing and journaling strategy in math can be used to promote, enhance, and enrich student learning, additional research on its adoption and implementation may prove valuable in improving both the way teachers provide instruction and in the cognitive development and critical thinking ability of students. Any improvement in academic achievement and successful learning could be of great benefit to all, especially in this current era of increased standardized testing.

### **Chapter 3**

#### **Methodology and Procedures**

##### **Population**

This research took place in an after school program in Northeast Tennessee for students in 1<sup>st</sup> through 6<sup>th</sup> grades. The program registered 202 economically disadvantaged students. The population of the program is quite diverse. Seventy-two per cent of the students were White, 21% African American, 6% Hispanic and <1% of Asian/Pacific Island descent. Boys comprised 64 % of the population and girls 36 %.

##### **Sample**

The sample for this study was drawn from the fifth and sixth grade combination class of 22 students. Fourteen students were Caucasian, six were African American, and two were Hispanic. There was no student of Asian/Pacific Island descent. Of the 22 students in this class, 11 were boys and 11 were girls. The class was comprised of ten and eleven year olds developmentally on schedule and of a normal ability level. The sample was randomly split into control and experimental groups with 10 children in the control group (5 girls and 5 boys) and 12 children in the experimental group (6 girls and 6 boys).

### **Data Collection**

Data were collected considering student math topics required by Tennessee Ready standards for 5<sup>th</sup> - 7<sup>th</sup> grade. One unit of geometry was selected for the study. The experimental group was taught using journaling strategies, whereas the control group was taught using traditional strategies. Journaling strategies consisted of techniques that required students to listen to instruction and also write out and log mathematical ideas, thoughts, and observations, including problem solving techniques, with words, symbols, and/or diagrams. Traditional strategies consisted of customary teacher-centered, direct instruction techniques that mainly included lectures and that required students to listen, observe, and learn by rote. Instruction was provided for 20 minutes twice a week over an 8-week period. The posttest was given after eight weeks of teaching the groups using the two different methods. Performance on the posttest was compared for both the control and experimental groups.

### **Procedure**

Before the study was conducted, permission was sought from the director, program manager, and the site coordinator of the after school program and from the Milligan Institutional Review Board. Permission was also sought from parents of participating students. When all permission was granted, a sample was randomly selected. Control and experimental groups consisted of 10 and 12 students, respectively. One unit of geometry was selected for the study. The experimental group was taught using journaling strategies, while the control group was taught using the traditional methods. After the students were taught for 20 minutes twice a week for eight weeks, the students were administered a test. The scores for both the experimental and the control group were compared. The geometry topics covered were the same for the

experimental group as they were for the control group to evaluate the effectiveness of the journaling strategy on student achievement in geometry.

### **Research Questions and Related Hypotheses**

**Research Question 1:** Is there a difference between student scores when they are taught using journaling strategies and when they are taught using traditional strategies?

Research Hypothesis 1: There is a difference between student scores when they are taught using journaling strategies and when they are taught using traditional strategies.

Null Hypothesis 1: There is no difference between student scores when they are taught using journaling strategies and when they are taught using traditional strategies.

**Research Question 2:** Is there a difference between the student scores of boys and girls when they are taught using journaling strategies?

Research Hypothesis 2: There is a difference between the student scores of boys and girls when they are taught using journaling strategies.

Null Hypothesis 2: There is no difference between the student scores of boys and girls when they are taught using journaling strategies.

## **Chapter 4**

### **Data Analysis**

The purpose of the study was to examine the effects of journaling strategies versus traditional strategies on mathematics performance of a fifth and sixth grade combination class of students in an after-school program.

### **Data Collection**

Data were collected from 22 students enrolled in an after-school program. The students were randomly selected for experimental and control groups. The experimental group consisted of 12 students, six boys and six girls. The control group consisted of 10 students, five boys and five girls. The experimental group was exposed to journaling strategies while working on math, and the control group was exposed to traditional strategies while working on math. At the end of the study, data were collected and analyzed.

The data collection instrument was a teacher-made test consisting of multiple choice questions that required calculations to be shown. Each group was taught the same unit of geometry for 20 minutes twice a week for eight weeks. The control group was taught using traditional strategies of teacher-centered, direct instruction techniques that mainly included lecture where students were required to listen, observe, and memorize. The experimental group was taught using journaling strategies where students were asked to record mathematical notes, ideas, thoughts, problem-solving techniques, and observations with words, symbols, diagrams, or drawings. At the end of the eight weeks, both groups were given the same summative assessment. The demographics of the participants are displayed in Table 1.

Table 1.

**Demographic Profile of Participants**

<b>Gender</b>	<b>Frequency</b>	<b>Percentage</b>
Males	11	50 %
Females	11	50%
<b>Total</b>	<b>22</b>	<b>100%</b>
<b>Ethnic Group</b>		
Caucasian	14	64%
African American	6	27%
Hispanic	2	9%
<b>Total</b>	<b>22</b>	<b>100%</b>



### **Research Questions and Related Hypotheses**

The study was guided by two research questions. All data were analyzed using a 0.05 level of significance.

**Research Question 1:** Is there a difference between student scores when they are taught using journaling strategies and when they are taught using traditional strategies?

To answer the research question, the mean scores for students taught using journaling strategies (experimental group) and those taught using the traditional strategy (control group) were compared. The mean score for the experimental group was 70.00, and the mean score for the control group was 67.00 with a mean difference of 3. The research question was associated with one research hypothesis.

Research Hypothesis 1: There is a difference between student scores when they are taught using journaling strategies versus when they are taught using the traditional strategies.

In order to determine whether there was a significant difference between the two groups, an independent t-test was conducted. The Levene's test indicated that variances were assumed equal. The results for the t-test indicated that there was not a significant difference between the means of the experimental group and the control group. The variances were assumed equal ( $t(20) = 0.426, p > 0.05$ ). Therefore, the null hypothesis was retained. The results are displayed in Table 2. It was not necessary to conduct Cohen's d effect size.

Table 2

**Independent Samples T-test on Scores of Control and Experimental Groups**

<b>Group</b>	<b>M</b>	<b>SD</b>	<b>df</b>	<b>t value</b>	<b>Sig level (two-tailed)*</b>
Control	67.00	15.670	20	-0.426	0.675
Experimental	70.00	17.056			

**Research Question 2:** Is there a difference between the student scores of boys and girls when they are taught using journaling strategies?

To answer research question 2, the mean scores of boys (M= 70.00, sd= 17.89) and girls (M= 70.00, sd= 17.89) were compared. There was virtually no difference between the mean for boys and the mean for girls.

The research question was associated with one research hypothesis.

Research Hypothesis 2: There is a difference between the student scores of boys and girls when they are taught using journaling strategies.

To determine if there was a significant difference, an Independent t-test was conducted and the results indicated that the difference between the two groups was not significant ( $t(10)=0.00$ ,  $p=1.00$ ). The variances were assumed equal. Therefore, the null hypothesis was retained. No significant difference between the scores of boys and girls taught using journaling strategies was noted through data analysis. It was not necessary to conduct the Cohen's d effect size. The results are displayed in Table 3.

Table 3

**Independent Samples T-test on Scores of Males and Females Taught Using  
Journaling Strategies**

<b>Group</b>	<b>M</b>	<b>SD</b>	<b>df</b>	<b>t value</b>	<b>Sig level (two-tailed)*</b>
Males	70.00	17.88854	10	0.00	1.00
Females	70.00	17.88854			

\*Note:  $p < 0.05$

## Chapter 5

### Summary of Findings

This chapter contains a summary of findings, conclusion, recommendations for future study, and implications for practice from the data analysis and literature review.

Regarding research question one concerning whether there was a difference between student scores in mathematics when they were taught using journaling strategies and when they were taught using traditional strategies, it was found that, though the mean score of the experimental group was slightly higher than the mean of the control group, the results indicated that there was no significant difference between them ( $t(20) = 0.426, p > 0.05$ ). Therefore, the null hypothesis was retained. The results suggest that there was no significant difference in the learning styles, though this was not consistent with most of the literature. However, the mean score of students taught using the journaling strategies was slightly higher than the mean score of those taught using the traditional strategies (mean score of 70 versus 67). This deliberate, additional thought and exercise required to write out mathematical concepts tended to enhance the learning process and benefit student understanding.

Although the literature review on the use of journaling strategies in mathematics was largely favorable, Palmer (2011) in his qualitative and quantitative analysis conducted to assess whether journals were effective, found that journals provided gains in math performance, but the results were not statistically significant. According to Palmer, student attitudes towards writing and their perceived math abilities affect performance as does age and maturity level. Sometimes, the extra time required to incorporate journaling into course content makes the strategy

prohibitive for teachers if it is not already embedded into the lesson plan. Palmer also mentioned that, over time, journaling in mathematics does produce significant results.

A meta-analysis of 45 studies steered by Bangert-Drowns, Hurley, and Wilkinson in 2004 established that writing to learn programs had a small, positive effect on student achievement which was also demonstrated by this research. Reilly (2007) found in a study of 293 middle schools that, over time, students' knowledge of math was enhanced as a result of writing in math class. Often students tend to have a negative view of writing and mathematics, but this is a normal reaction until they get used to the process and experience benefits from the activity.

Regarding research question two concerning whether there was a difference between the student scores of boys and girls when they are taught using journaling strategies, the data analysis ( $t(10)=0.00$ ,  $p>0.05$ ) reflects that there was no difference between the mean scores of boys and girls which both equaled 70. Therefore, the null hypothesis was retained. However, regardless of the gender, students benefitted from the journaling strategy as the mean score for the boys and girls taught using the journaling strategies was higher than the mean score of the control group.

Generally, at younger ages, boys tend to outperform girls in spatial reasoning and girls tend to outperform boys in computational skills. However, during the ages of 10 – 11, the cognitive development of girls and boys are very similar. Since geometric math problems require both computational and reasoning skills and the cognitive development of boys and girls are comparable at this age, this may explain the similarity of scores between the genders (Weiman, 2001).

### **Conclusion**

The purpose of this study was to determine whether journaling strategies versus traditional strategies affected math performance of fifth and sixth graders in an after-school program as measured by a teacher-made summative assessment. The results indicated that there was no significant difference between the scores of those taught using journaling strategies and those taught using traditional strategies. Also, the results did not indicate a difference between scores of girls and boys taught using the journaling strategies.

### **Recommendations**

Based on the results of this study, the following recommendations are suggested.

1. Future research regarding use of journaling strategies on math performance should be conducted using a larger sample population to determine if the same results would be attained.
2. Research using journaling strategies should involve older students (over age 12) and multiple grade levels to determine if journaling strategies play an important role in mathematical performance.
3. Research on use of journaling strategies should be conducted using a longer instructional time and held during the school day as opposed to after school.
4. Researchers should consider using more assessments and/or standardized assessments over a longer period of time to evaluate achievement of students taught using the journaling strategies.

5. Future research should be piloted to determine whether gender together with the journaling strategy may have an effect on math performance.

### **Implications**

Although this research did not find significant results, based on the literature review, the following implications are suggested below.

1. Teachers should consider using or continue using journaling strategies as a valuable pedagogical tool to enrich, engage, and facilitate mathematical learning for students.
2. School administrators should actively facilitate attainment of Common Core math standards by promoting a positive environment that fosters writing and journaling in the mathematics curriculum for both learning and teaching processes.
3. School administrators should plan professional development for mathematics educators on use of journaling techniques that can be employed in the classroom to help prepare students for constructed response questions such as those found on standardized math tests.

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