
Effectiveness of Touch Math on the Learning Performance of Grade II Pupils in Mathematics

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ABSTRACT:

Touch Math is a multi-sensory approach in teaching students with special needs as well as those students in the regular class who have difficulty in retaining basic math facts. It is a multi-sensory approach in teaching mathematics using visual, tactile and auditory components.

This study, which employed one-shot experimental design with one pretest and one posttest, was conducted primarily to determine the effectiveness of touch math in the learning performance of Grade II-B pupils of DMMMSU Elementary Laboratory School on the least mastered fundamental operations in Mathematics. It used frequency count, percentage, weighted mean, and paired t-test as statistical tools. Results showed that after the intervention done, there was a marked increase in the performance of the tutored pupils on multiplication and division using touch math as seen in their scores in the posttest. This study proved that touch math is effective in enhancing the computation skills or learning performance of pupils in Mathematics.

Keywords: touch math, Grade II Pupils, learning performance, mathematics, effectiveness

INTRODUCTION

Special education is specially designed to satisfy the needs of students who have disabilities which results from having a disability and to help them learn information and skills that other students are learning. This education is also offered to help children with special needs so as their parents. Special education includes special instruction in the classroom, at home, in hospitals, institutions or in other settings.

Underachievement occurs when a child's performance is not appropriate to what is expected to him based on his ability. Underachievement in school is damaging because it affects students' self-esteem, which hinders the child to reaching his full potential. Some common signs of underachievement in children may include lack of motivation or disinterest in school activities and tend to make excuses in doing so. The student may daydream or socialize too much, make school work the lowest priority, receive failing grades, take no satisfaction or pride in school activities, see himself as having no chance to succeed, or seem to believe he is already defeated (Gearheart & Gearheart, 2010).

Some experts identified the causes of underachievement to be not easy to determine and complex. Some students tend to have low self-esteem in doing school work, lack of discipline in doing school activities, seek attention from parents and teachers, some of them

may be influenced by their peers or may have learning style which is not meet or accommodated in class so the tendency is they get absent and loss their interest in school which result to underachieving in some areas which they are not disabled.(Longsdon, 2012). Fortunately, it is still possible to help an underachiever to improve their learning performance and achieve their full potentials. Longdon (2015) states that early intervention helps underachievers to improve. Intervention could be more effective if the teachers include the parents in making IEP and have a meeting with them to discuss the problem of the child and sharing ideas on how to help the child, counseling the child could also help them and exploring the possibility of a behavior modification plan targeting academics and classroom behavior.

The researchers want to prove that in using touch math, all children will be able to have the chance to reach their maximum potential and master the basic fundamental operations in Mathematics. By becoming aware of the learning needs of children who are not fully-functional in school, teachers would be able to expand their horizons and be open to new strategies and techniques in exercising their profession, contributing to the general welfare of the society.

Touch math was developed by Janet Bullock in 1975 because she was concerned about her students who are having difficulty with math concepts (TouchMath.com, 2014). She decided that she needs to use other method in teaching her students basic math facts to improve their performance in the said subject. Her method was to place counting points on numbers in order to teach that a symbol represents a quantity. Her students had a lot of success with the method and she discovered a way of transitioning them from concrete to symbolic learning (Kramer and Krug, 2012). In the Touch Math system, each number from one to nine is represented by dots which serve as a reminder for students to count numbers visually. It also involves memorizing the location of each dots or touch points. The goal of touch math is for the students to internalize the touchpoints so that they may be no longer be needed in order to solve problems involving basic operations. The program is based on a report released by Kramer and Krug (2013). In this method of solving mathematical problems, dots were placed on numerals in a pattern modeled off of dice and dominoes. Kramer and Krug (2013) felt the Touch math system might be helpful for teaching computation to children with special needs. Scott (2013) continued the research and conducted a study to examine using a multisensory program to instruct students with mild disabilities in addition and subtraction concepts. Touch math was chosen for the study because it was not based on memorization of facts but was a technique for acquiring the facts (Scott, 2013).

According to some researches, traditional method of teaching remained insufficient in teaching different mathematics skills to students most specially those students with special needs. A multi-sensory teaching method was developed to cater their needs. Many researchers suggest using multisensory approaches for teaching mathematical skills (Vinson, 2014). In relation to that, Touch math is one of the multisensory approach in teaching number sense, basic math facts most specially those four basic operations which combines vision, movement, hearing and tactile components.

Furthermore, touch math program is an appropriate techniques for “Number and Operations Standard” (Vinson, 2014) because it is a multisensory approach in teaching, there are points to help students in conceptual learning of numbers and the basic operation, it remediates

learning problems in a regular classroom setting, it could be used to varied types of students and it also supports remedial math instruction in high school and adult education classes. Furthermore, in using the touch math, each number has a dot or touch point. Each point can help students to see the conceptual meaning of its symbolic value. In addition, numbers 1 to 5 have single touch points as their number value while numbers from 6-9 have dots and a circle around it. These points with circles are read or counted twice by the students. Each points express a symbolic representation or image of numbers and help those students with special needs and those students who have difficulty in retaining basic math facts in reducing their difficulty in number abstraction. Most useful aspect of this technique for individuals with special needs is that it allows doing addition without finger calculation or having to keep numbers in memory (Miller and Mercer, 2012).

In the Philippines, Mathematics is perceived as a difficult subject and is hated by most students. Students are anxious about it and they do not see its significance (**Sun Star Baguio, 2013**). The results of the Trends in Mathematics and Science Study (TIMMS) administered in 2003 revealed low achievement scores in Science and Mathematics of selected Grade 4 and Grade 8 (Second Year High School) students from sample schools. The Philippines placed 23rd among 25 countries for both Science and Mathematics for Grade 4 and 42nd in Grade 8 Science and 41st in Grade 8 Mathematics administered among 45 countries. The preparations of Filipino students in TIMMS 2003 were similar to those in TIMMS 1999 and unfortunately ranked among the bottom in the same tests. Unfortunately, the Philippines did not anymore join the 2007, 2009 and 2011 TIMSS. The poor performance of students in Mathematics shows that students need to be provided various Math study tips that they can use to improve their academic performance in Math. Only if they understand the logic behind this subject and the principles applied in different problems, will they find that it is an interesting one. Mathematics becomes part of their life, not only as a subject that they need to study.

In order to help enhance the performance of students in Mathematics, the researchers chose this subject for intervention or touch math tutoring session and chose the two least mastered operations in Mathematics that were identified by the former teacher of the respondents in Mathematics and which were confirmed through a diagnostic test that was conducted on the opening of classes and through the pretest administered to them by the researchers.

To help the Grade II-B pupils in the Elementary Laboratory School to enhance their learning performance in Mathematics, tutoring using touch math was conducted from Monday – Friday every 3:00 to 5:00 in the afternoon from June 22, 2015 to September 22, 2015. Tutoring is a great way to help children learn. It offers an opportunity for group or one-on-one interaction which focused learning support for children's problem. It also serves as a welcome break from typical classroom situations.

Using the systems approach, the study follows Input-Process-Output framework. The input includes the least mastered fundamental operations in Mathematics and the pretest; the process includes tutoring or intervention program together with the posttest, and the outcome of the study is the enhanced learning performance of the Grade II-B pupils on the least mastered operations.

This research focused on how touch math affects the learning performance of the Grade II-B pupils in DMMMSU - Elementary Laboratory School for the S.Y. 2015-2016.

It is hoped that through this research, teachers will realize that they should try other innovative approach in teaching because students learn in many ways. Furthermore, all children should be provided equal opportunities and additional time and effort and teacher should teach students the way they learn.

OBJECTIVES

This study aimed to determine the effectiveness of touch math as an innovative approach in teaching basic math facts in the computation skills or learning performance of Grade II-B pupils of DMMMSU Elementary Laboratory School.

Specifically, it aimed to provide answers to the following objectives:

1. Determine the significant difference on the pretest and posttest score of Grade II – B pupils; and
2. Determine the significant difference on the pretest and posttest of Grade II-B pupils.

METHODOLOGY

This study used experimental design with one pretest and one posttest to gauge the effectiveness of touch math on the learning performance in the four fundamental operations in Mathematics of the Grade II-B pupils.

This also employed the use of an action research which is a practical approach to professional inquiry in any classroom or social situation. Stenhouse (2015) explained that ‘it is not enough that teachers’ work should be studied: they need to study it themselves’. The main goal of action research is to improve some practices that might not be going as we wish, and may need to implement a new initiative but are unsure how to do it effectively. To help enhance the respondents’ performance in Mathematics, the researcher used touch math as an innovative tool in teaching.

The study was conducted at the Elementary Laboratory School under the College of Education in DMMMSU – SLUC, Agoo, La Union. It is a laboratory school where student teachers carry out their in-campus practice teaching in addition to their off-campus practice teaching which is held in a public elementary school of their choice. Students in the ELS have to take Proficiency test and IQ test for admission to Grade I.

The result of the pretest was the basis of choosing the respondents of the study. The respondents were subjected to intervention using touch math for the purpose of seeing whether there is improvement of learning on the least mastered fundamental operations in Mathematics. Based on the result of their pretest, 27 in Grade II-B were identified wanting of additional learning support.

The researcher prepared 20 multiple-choice-question test items that were numbered 1,2,3 with four answer options as A,B,C, and D in Addition, Subtraction, Multiplication and Division. This tested students’ knowledge on the four fundamental operations. The researcher made sure that the level of difficulty of each question was appropriate for the students’ skill levels. After that, the researcher selected ten questions for each of the four fundamental operations and used them to assess the student learning performance. To ensure

that the results of the pretest and posttest are identified with the respective owner, each of them was provided name or ID number for both pretest and posttest.

In addition, the instrument for the pretest and posttest was subjected to the scrutiny of five teachers who are specialist in teaching Elementary Mathematics. Their suggestions and recommendations were integrated to improve the tool and to ensure that the given items for the pretest and posttest were considered representative of the four basic operations and that the given items can evaluate the learner's understanding of the fundamental operations well.

This study also employed the use of the test-retest reliability because the same test was administered twice and then the researcher correlated the scores. In concept, it is an excellent measure of score consistency because it allows the direct measurement of consistency from administration to administration (Pierangelo&Guiliani, 2012). The researcher had to provide enough time intervals to administer the same test because if the time interval of the test is short, some students may be overly consistent because they remember some of the questions and their responses. If the interval is long, then the results are confounded with learning and maturation.

After the pretest, intervention using touch math was conducted from Monday – Friday every 3:00 to 5:00 in the afternoon from June 22 to September 22, 2015. The researcher also used the 125-page worktext which she herself prepared and designed, and which was validated by some Math experts. The worktext entitled *Mathemagic: Touch Math 2*.

Also, the researcher followed some steps in the study. It started with the construction of test items, followed by validation by some experts in the field of Mathematics. After that, a pretest was conducted to determine the respondents of the study who were subjected to personal tutoring as an intervention. Posttest followed the intervention. After the posttest, data gathered were analyzed and interpreted. The pretest and posttest on the least mastered skills were analyzed on the basis of their relevance to the problems that the study intended to address using IBM Statistical Package for the Social Sciences (SPSS) version 20 to obtain accurate data for analysis and interpretation.

Problem 1 was answered through the use of simple frequency count and percentages. Corresponding interpretation was made to shed more meaning on the findings of the study.

Problem 2 was answered through the use of t-test to show the difference in the learning performance of the respondents before and after the intervention program. The p-value was also identified to ensure that the pretest and posttest are significant at alpha 0.05 level of significance.

RESULTS AND DISCUSSION

The Least Mastered Fundamental Operations in Mathematics

Using Mathematics as a subject for intervention, the four fundamental operations were pretested. Afterwards, these were checked and tallied for analysis. The results of the pretest are displayed in Table 1.

Table 1. Results of the Pretest of Grade II Pupils in Mathematics

Fundamental Operations in Mathematics	No. of Items	Mean Score	No. of Pupils who got 60% up	No. of Pupils who got 60% below
Addition	10	8.81	27	0
Subtraction	10	7.37	24	3
Multiplication	10	3.19	0	27
Division	10	2.07	0	27

Table 1 presents the pretest on the fundamental operations in Mathematics where students need improvement. Based on the pretest in the aforementioned operations, the pupils' mean score in Addition and Subtraction indexed the two highest means. The result was low in Multiplication, while Division indexed the least mean score. Based on the table, none of the respondents got 60 percent and above in Multiplication and Division.

The table also shows that the scores of the Grade II-B pupils in Multiplication and Division are low. This means that the respondents did not really master those aforementioned operations. It also further implies that the respondents did not have prior knowledge on those operations. The researcher learned from an interview with the previous teacher that they were only able to finish discussing the topics on Addition and Subtraction when they were in Grade I. These are part of four fundamental operations prescribed in their textbook. This may explain why the students do not have the basics needed to learn more complex topics in Mathematics.

The findings of the study strengthen the findings of some researchers that students have more difficulty doing operations on multiplication and division. Anghileri (2010) highlights the fact that multiplication, unlike addition and subtraction, is a 'binary' operation with two distinct inputs for the multiplicand and the multiplier. Nunes and Bryant (1996) also maintain that multiplication and division help improve children's thinking to a significant degree. Another reason for the difficulty of multiplication is the range of situations in which the concept of multiplication can arise. Related, Back (2011) explained that a lot of teachers experience difficulty teaching division to children. She also identified a number of factors contributing to this problem. Firstly, by the middle of Stage 2 there is a huge range of level of understanding of the concept of division and secondly the concept itself can be thought of as building on children's understandings of addition, subtraction, and multiplication. Division becomes complex because it operates on other basic fundamental operations such as subtraction and multiplication.

Pretest and Posttest Performance of the Grade II-B Pupils

After the pretest, an intervention was employed using touch math to enhance the learning performance of the respondents on the least mastered fundamental operations. After the three-month intervention program on multiplication and division, a posttest was administered to determine its effects on the learning performance of the respondents.

Table 2 presents the results of the posttest of the Grade II-B pupils on the least mastered fundamental operations. Based on the table, there is a marked increase in the scores of the

pupils in multiplication which is almost thrice the score they got in the pretest. The same is true in division, which is almost four times higher than their scores in the pretest.

Table 2. Pretest and Posttest of Grade II Pupils

Fundamental Operations	Pretest (10 items)	Posttest (10 items)	Paired t - value
Multiplication	3.19	8.22	13.521*
Division	2.07	8.04	18.248*

* Significant at 0.05 level

The scores on the pretest and posttest were significant with (13.52) t-value in multiplication and (18.24) in division. This means that touch math proved to be effective in enhancing the learning performance of pupils on multiplication and division. This implies that they have finally learned the basics on the least mastered operations which could help them to cope with the lessons. In addition, they can now confidently participate in the discussions on the third and fourth grading during which those topics are taught. The results of the study further imply that if the pupils were given more time and attention by and more resources from the teacher, they improve their learning and performance (Ysseldyke & Algozzine, 2012).

The claims of this study strengthen the findings of Fulk (2012) that students with special needs or difficulties need help to improve their retention, and maximize their engagement in school activities. They also need unexpected introduction and various other attention grabbers to stimulate students' interest in the lesson (Campbell-Rush, 2014). Moreover, as stated in the paper of NCCA (1999), the efforts shown by teachers in their differentiated instruction, the strategies they use, and the additional time they give to children who are underachievers make a lot of difference. Blumenfeld (2015) also stressed the importance of tutoring and new methods of teaching in the learning process of the child. According to him, there is a greater need for tutors nowadays than ever because public education is mass education, and there are a lot of students who need individual or one-to-one attention if they want to be successful in their schoolwork. The mass educational setting is not conducive to good work for many students who have learning difficulties (Blumenfeld, 2015). Furthermore, public school education is deficient in some ways that many children of average intelligence are not learning what they should (Engelbrecht & Snyman, 2010). Blumenfeld (2015) also warned parents that most of them still wait until their child is having some difficulties at school or cannot cope with the lesson before they think of providing remediation. Sometimes the child fall far behind, becomes unable to reason out or to think clearly, and feel exasperated by not learning fast in the first two grades and worse if the remedial programs seem to be too long and too hard (Datta, 2015). However, proper tutoring at the preschool level or in the first two grades, as a preventive measure, can assure that the child has the foundation on which to build achievement (Blumenfeld, 2015).

Sadiq (2011) also recommends some teaching strategies in teaching underachievers. One is repetition which could help underachievers to make the concept more concrete. Another is differentiated instruction or tutoring which can help fill out gaps in basic skills and help a student caught up in the class discussions. And still another is the peer tutoring which could be one of the effective strategies for underachievers. Gordor (2013) also sees tutoring as an effective tool for education and beneficial for future generations of learners.

In addition, this study supports the theory on multiple intelligences and learning styles. Students have different abilities and learning styles and it was found out that there could be higher gains in achievement on posttest if there is an additional learning support services and letting them engage in a more enjoyable and challenging activities through tutoring that combine songs, games, and other cooperative learning strategies as compared to learning Math only through textbook (Burns, 2007). Guohua (2012) also stated that by using traditional methods in teaching Mathematics could make the students feel that the aforementioned subject is pointless and has a little value in their daily life. Furthermore, the findings of this research strengthen the finding of Josue (2013) on the impact of varied adjunctive therapeutic teaching techniques in the learning process of children with special needs using games, play, music, drama, and arts and incorporating the secret ingredient which is fun as a key player in each learning of the child. The first in the list of the therapeutic teaching in her research is part of every child's language – play. Through play children can work with their peers in answering such activities. Through play children are able to test out various situations and behaviors in a supportive environment. In addition, acceptance and positive regard make the children feel safe enough to be able to explore their inner selves without censorship and able to develop trust, improved self-esteem and self-efficacy (Bratton, 2015).

Out of the multisensory approach in teaching Mathematics which was found to be effective in enhancing the learning performance of Grade II-B pupils, a work text in Mathematics entitled *Mathemagic: Touch Math 2* which focused on Multiplication and Division was developed. To ease learning, all exercises were designed and integrated with meaningful pictures that can attract children, encourage them to interact and help kindle their love for Mathematics. Hence, according to Asuncion (2016) that quality education through proper pedagogy leads to students' holistic development and not to deteriorate the good learning qualities of the students.

CONCLUSION

Based on the findings of the study, the following conclusions are drawn:

1. Multiplication and Division are the least mastered fundamental operations. Diagnosis of students' skills should be the starting point before any intervention is done to improve student learning. ; and
2. Touch math is effective in enhancing the learning performance of Grade II pupils. This will ensure that students will be more motivated to do the tasks because these are fun and easy to do. The usage of Touch Math for teaching and learning enhancement in the fundamental operations, reinforcement and/or strengthening of other competency skills in all subject areas is highly recommended

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