

# The Effectiveness of DAMATH in Enhancing the Learning Process of Four Fundamental Operations of Whole Numbers in Mathematics for Elementary Pupils

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**Abstract:** The study determined the effectiveness of Damath in enhancing the learning process of four fundamental operations of whole numbers in mathematics for elementary pupils in an elementary school in Marilao, Bulacan. The instruments used for gathering data were the improvised Damath board game and achievement from the DedEd Division of Bulacan modified by the researcher. The respondents of the research were grade four pupils in section C and D. These pupils were assigned into experimental and control group. The experimental group was taught with Damath while the control group was taught without Damath. To facilitate data analysis and interpretation, statistical measures used were the mean, standard deviation, t-test for independent sample and t-test of correlated sample. The result of the study revealed that there was a significant difference between the post-test scores of pupils with damath and pupils without damath. That there was a significant difference between the pre-test and post-test scores of pupils with damath. It means that the use of damath is effective. From the result of the findings that were revealed, the researcher made these recommendations. (1) Pupils should be encouraged to participate in damath competitions in their respective schools. (2) Damath should be taught as an enrichment activity or drill and practice of the four fundamental operations of whole numbers. (3) Teachers should undergo training on "How to Play Damath", so they will be able to utilize these games in their day to day teaching in mathematics, making this subject more fun and enjoyable to all pupils. (4) Administrators and Supervisors may implement the use of Damath in teaching and learning mathematics and to promote Damath competitions during celebration of Math month. (5) Damath games should be integrated and used in teaching other subjects such as Science.

**Keywords**—DAMATH, Four Fundamental Operations, Whole Numbers, Mathematics subject

## 1. INTRODUCTION

The advents of scientific and technological advances give birth to the use of calculators, computers, graphic models and other electronic information technology.

These advances brought forth changes in every individual undertaking even in his lifestyle. The information age clearly makes new demands on our educational system requiring radical changes in what and how people learn [1].

Despite this technological advancement there is one particular skill that every individual must possess and develop and that is his mathematical skills. Man cannot survive and make a sound decision without necessary skills in Mathematics whether he is a student, a researcher, a scholar, an educator or just an ordinary person.

Games can be used as a tool in the classroom to engage students. Games engage people psychologically and physiologically and the people engaged in the games can have emotional experiences. Games are the ideal tool for imparting education to students and are helpful in accommodating multiple learning styles and offer decision and interactive context [2]. Games are means for promoting the interaction, increasing motivation, and advancing students' thinking skills.

The use of Damath approach in Mathematics comes through the creation of DECS Memorandum Nos.230 and 363 series of 1994, institutionalizing the annual damath award for excellence in math and science. DAMATH is adaptation of the friendly recreational and indigenous dama board game. Its main objective is focused in the enhancement of the culture of

excellence in Mathematics and Science. This experience in Sci-Math activity aims to: (1) Promote Science and Mathematics consciousness from among the youth in particular and community in general. (2) Enhance hands on interactive analytical thinking skills in teaching Science and Mathematics. (3) Encourage wholesome interpersonal relation (value integration) among the learners through a friendly Damath games.

This situation prompted the researcher to conduct this study to find out the effectiveness of Damath in teaching four fundamental operations of whole numbers in mathematics of grade four pupils.

## 2. RELATED WORKS

Authors considered different levels of knowledge and viewed mathematical errors to be principally formed within surface levels of knowledge: as such, a child's response to a task is procedural and can be corrected by the teacher by providing correct alternatives [3].

When primary children were asked how they felt about making mathematical mistakes, they expressed strong feelings of anger, frustration, and disappointment [4]. In contrast, both reflect a growing view in the research evidence that mathematical errors can provide teachers a useful insight about child's thinking and understanding. An effective mechanism for assessment of learning can enable children to learn from mathematical mistakes [5].

Counting underpins early arithmetic concepts, it is important that teachers are able to provide appropriate

counting activities to support a child's learning. Having an awareness of the how-to-count principles will enable practitioners to understand the nature of counting and the potential difficulties that children may face during their journey to successful counting [6].

A study out found that many teachers regarded them as little more than fun, or a diversion from more traditional modes of teaching. It was also found that where teachers did not have a strong grasp of the concepts they were attempting to teach, the use of materials made little difference to children's understanding and learning [7][11].

Creative learning emerges when children are encouraged to question, to make connections and to see relationships. It is also based on an ability to speculate, to pursue a line of enquiry of flexibly. Several teaching strategies, techniques, and methods such as mathematical investigation, practical work, mathematical games, puzzles, enrichment activities, cooperative learning discovery approach, lecture and discussion had been used, developed, and others were tested to improve and facilitate effective teaching-learning in various aspects. While this study also looked into the significance of teaching strategies, specifically the use of mathematical games such as Damath board games [8][10].

### 3. STATEMENT OF THE PROBLEM

This study determined the effectiveness of Damath in enhancing the learning process of four fundamental operations of whole numbers in teaching Mathematics among the grade four pupils of an elementary school in Marilao, Bulacan, Philippines during SY 2020-2021. Specifically it attempted to answer the following questions:

1. What are the pre-test scores of the pupils attending classes with and without Damath activities?
2. What are the post-test scores of the pupils attending classes with and without Damath activities?
3. Is there a significant difference in pre-test scores between pupils with Damath and pupils without Damath?
4. Is there a significant difference in post-test scores between pupils with Damath and pupils without Damath?
5. Is there a significant difference between the pre-test and post-test scores of pupils without Damath?
6. Is there a significant difference between the pre-test and post-test scores of pupils with Damath?
7. How may the findings of the study be utilized for the improvement of Mathematics learning?

### 4. METHODOLOGY

This study used quasi-experimental design. It is one where the treatment variable is manipulated but the groups are not equated prior to manipulation of the independent variable [9]. The most common form of quasi-experimental study includes a pre-post test design with both a treatment group and a control group.

This study was conducted in an elementary school in the District of Marilao, School Division of Bulacan, Philippines who offered complete elementary curriculum with 1,172 sq. meter land areas. The total population of pupils is 1,330. It

is under the supervision of a principal with 31 regular permanent teachers, 3 teacher-aides, 3 kinder teachers, 1 clerk and 1 security guard.

The respondents of the study were all Grade IV pupils with a total number of two hundred thirty six (236) of an elementary school in Marilao, Bulacan, Philippines. Out of the total number, the researcher used ninety (90) pupils divided into two groups. Each group was composed of forty-five pupils.

In this study, the researcher utilized two instruments: The first one was modified Math Achievement Test prepared by the Mathematics Division Coordinators and Master Teachers. It would be 40 item multiple choice type of test. For item no. 1-7, 29, 30 and 35 the operation used was addition. Item no. 8-14 and 31-33 subtraction was used. For item number 15-23 and 34, 37, 40 multiplication was the operation used. And for item no. 24-28 and 36, 38, 39 division was used.

The second was the Damath Board Game; it was specifically design for addition, subtraction, multiplication and division of whole numbers. It is composed of chips, which signifies numbers, and a board similar to chess but with the basic mathematical symbol in it.

When playing Damath, they aim to get more points than the opponent. Capturing the opponent's dama chips is strategically such that a player would target a chip representing high number [13].

To establish the reliability of the modified math achievement test prepared by Mathematics Division Coordinator and Master Teachers, it was tried out to other section of the same school. The reliability of the data in this pilot study got a Cronbach's Alpha value of 0.940 [12]

### 5. RESULTS AND DISCUSSIONS

#### Pre-test Scores of the Pupils Attending Classes with and without Damath Activities

The data revealed that each group has 45 pupils. For the Damath, group the lowest score was 7 and the highest score was 25 with the mean of 14.60 and 5.21 of standard deviation. For the group without Damath, the lowest score was 5 and the highest score was 25 with the mean of 14.44 and 5.08 of the standard deviation. It reveals that the pre-test scores of pupils attending classes with and without Damath activities were equivalent to 73% of their proficiency level. It means that the mean of the two groups were almost the same.

#### Post-test Scores of the Pupils Attending Classes with and without Damath Activities

For the Damath, group the lowest score was 11 and the highest score was 37 with the mean of 26.73 which is the above average score of 20. For the group without Damath, the lowest score was 10 and the highest score was 28 with the mean 18.78, which is below the average score of 20. From this presentation, it is proven that the use of Damath game is effective which is equivalent to 84% of their proficiency level.

#### Comparison of Pre-test Scores between Pupils with Damath and Pupils without Damath

The data reveal that the significant (2-tailed) value of .886 is greater than 0.05 level of significance with 88 degrees of freedom. Thus, the null hypothesis is accepted which means that there is no significant difference between the pre-test scores between pupils with Damath and without Damath activities.

#### **Comparison of Post-test Scores between Pupils with Damath and Pupils without Damath**

The data reveal that the significant (2-tailed) value of .001 is lesser than the 0.05 level of significance with 88 degrees of freedom. Thus, the null hypothesis is rejected. It means that there is a significant difference between the post-test scores of pupils with Damath and without Damath activities. It implies that the use of Damath is effective considering the result of the post-test of Damath group which is 26.73 of mean compared to the result of the post-test of the group without Damath which is 18.73 of mean.

#### **Comparison between the Pre-test and Post-test Scores of Pupils without Damath**

The data revealed that the significant (2-tailed) value of .001 is lesser than 0.05 level of significance with 44 degrees of freedom; therefore the null hypothesis is rejected in favor of the research hypothesis. This means that there is a significant difference between the pre-test and the post-test scores of pupils without Damath activities.

#### **Comparison between the Pre-test and Post-test Scores of Pupils with Damath**

The data revealed that the significant (2-tailed) value of .001 is lesser than 0.05 level of significance with 44 degrees of freedom; therefore the null hypothesis is rejected in favor of the research hypothesis. This means that there is a significant difference between the pre-test and post-test scores of pupils with Damath. The result shows that the Damath group did much better in the post-test.

#### **Utilization of the Study for the Improvement of Mathematics Learning**

Since data revealed that the use of Damath is effective. Therefore, Damath board game could be taught as an activity, enrichment, drill and/or practice. Reviving of the Damath game competitions to make the learning challenging yet fun in different levels, schools, district, and division. Integrate and use Damath game in teaching Mathematics.

### **6. CONCLUSIONS**

Based on the findings of the study, the researcher arrived at the following conclusions:

1. The pre-test scores of pupils with Damath and pupils without Damath activities were both belong to 73% of proficiency level.
2. The post-test mean (26.73) of pupils with Damath is higher than the post-test mean (18.78) of pupils without

Damath activities. It means that, the used of Damath was effective.

3. There is no significant difference between the pre-test scores between pupils with Damath and without Damath.

4. There is a significant difference between the post-test scores of pupils with Damath and without Damath.

5. There is a significant difference between the pre-test and the post-test scores of pupils without Damath.

6. There is a significant difference between the pre-test and post-test scores of pupils with Damath.

### **7. RECOMMENDATIONS**

Anchored on the preceding findings and conclusions, it is recommended that:

1. Pupils should be encouraged to participate in Damath competitions in their respective schools.

2. The use of Damath games should be utilized by elementary teachers, especially in teaching the mathematical operations of whole numbers. Damath should be taught as an enrichment activity or drill and practice of the four fundamental operations of whole numbers.

3. Teachers should undergo training on "How to Play Damath", so they will be able to utilize these games in their day to day teaching in mathematics, making this subject more fun and enjoyable to all pupils.

4. Administrators and Supervisors may implement the use of Damath in teaching and learning mathematics and to promote Damath competitions during celebration of Math month.

5. Damath games should be integrated and used in teaching other subjects such as Science.

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