Effects of innovated flashcard drills in the mastery of multiplication facts among the grade 3 pupils of the University of Baguio Laboratory Elementary School

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Abstract

Mathematics is one of the subjects being ranked the lowest when it comes to assessment for quality primary education. As a teacher, the researcher has realized that Math should not be taken for granted, so it should be mastered as early as possible, particularly at the primary level. Having mastery or fluency of basic math operations will give the learners building blocks for higher-level math concepts. Therefore, this action research was conducted to determine the effectiveness of an innovative drill, which involves flashcard drills in the mastery of basic multiplication facts. The two sections of grade 3 pupils of the University of Baguio Laboratory Elementary School were the participants. The experiment used two different strategies in using the flashcards as a drill for the mastery of basic multiplication facts. A downloaded 100 item multiplication facts were used to research in determining the scores the pupils on their pretest and posttest. The study utilized the Statistical Package for Social Sciences (SPSS) to compute the mean, standard deviation, and t-test to test the hypotheses at the 0.05 level of significance. The results indicated that there is no significant difference between

the way of the difference of the scores in the pretest and posttest of grade 3 pupils in the mastery of basic multiplication facts using the innovated and traditional flashcard drill. Therefore, it could be concluded that sometimes, the conventional flashcard drill method is still a worthwhile teaching strategy, especially in math. They were using flashcard drills, whether the traditional or the innovative way, the learners will enjoy mastering their basic multiplication facts. Flashcard drill should be a part of the strategies of teachers in the mastery of basic multiplication facts. The result of the study will be shared with the participants. Likewise, the innovative way of flashcard drills used in this study will be shared with the researcher's colleagues.

Keywords: mastery, multiplication, traditional, innovated flashcard, pupils

Introduction

Mathematics is a field of different skills that needs mastery, which is one of the dilemmas the researcher has when it comes to Grades 5 and 6 learners. Many mathematical skills need proficiency, but the researcher would like to focus on multiplication. Why multiplication? There are many instances that the researcher is asking for the answer to a simple multiplication fact in other math topics, but it takes the pupils some time to answer, and only a few are answering. Learning multiplication facts take a lot of practice and repetition. There are many online games for learning basic multiplication facts. But, when electronic resources are not available, other means are used just like the flashcards.

Because the researcher believes that mastery of multiplication will help the learners in answering future math lessons that involve multiplication facts more accessible, she had been thinking about what should be done so that

there is the retention of the multiplication facts. This is for them to use and will not have difficulty in other math topics where multiplication is one of the prerequisites. Drills are the most used teaching strategies, so the researcher thought of some innovations for this drill, especially in using the flashcards where pupils can also get enjoyment out of learning the multiplication facts.

Knowing basic facts is critical for expediency in computational mathematics. By the time students reach the age of eleven, some teachers are finding that groups of students are still counting with their fingers or resorting to calculators, tricks with fingers, charts, or asking someone the answers to times tables. The question to be answered is why, after all the years at school, those students cannot remember simple facts? An intermediate school in New Zealand has been investigating ways to motivate the students to learn basic facts (Clarke, 2019). The researcher had the same sentiments as the researchers of this study. Action research is needed to improve pupils' basic facts, especially on multiplication as focused in this study.

Flashcard drills provide students with a means to memorize information such as sight words, math facts, state capitols, foreign language vocabulary, and equations (Browder, & Roberts,1993). Such skills included but not limited to number recognition and fundamental math fact problems. With flashcard drill and practice, learners frequently practice selected skills until they can respond to the issues automatically. Flashcard practice consists of the teacher showing a flashcard, prompting a response, and providing feedback. Regular use of this drill has been shown too positive in increased accuracy and fluency. Finally, the present results also gave significant insight concerning when students initially used flashcards and who taught students to use flashcards. Whereas written flashcards were learned primarily in high school from teachers/professors, computer flashcards were most often first used in college, and students learned about themselves. These findings likely partially reflect the increased use of computers by students in all aspects of college life. Since the present results indicate that using flashcards may impact exam performance, it could be argued that parents and teachers

should teach the use of flashcards (both written and computer) at an earlier time than indicated by the present results. Finally, the current results also gave significant insight concerning when students initially used flashcards and who taught students to use flashcards. Whereas written flashcards were learned primarily in high school from teachers/professors, computer flashcards were most often first used in college, and students learned about them themselves. These findings likely partially reflect the increased use of computers by students in all aspects of college life. Since the present results indicate that using of flashcards may impact exam performance, it could be argued that parents and teachers should teach the use of flashcards (both written and computer) at an earlier time than indicated by the present results

Flashcards are useful for teaching sight-word reading. To date, the most effective flashcard instruction method is incremental rehearsal (IR). This method involves the instructor interspersing unknown stimulus items into the presentation of known stimulus items. In the study of Kupzyk, Daly, and Andersen (2011), they compared IR to a modified IR procedure— strategic incremental rehearsal (SIR)—to determine whether the effects of IR might be improved by incorporating variables likely to increase word acquisition, (.The results of this study indicated that students read more words correctly with SIR than with IR.

The study by Golding, Wasarhaley, and Fletcher (2012) on "Faculty Forum The Use of Flashcards in an Introduction to Psychology" gave valuable insight regarding students who initially used flashcards and who taught students to use flashcards. Whereas written flashcards were learned primarily in high school from teachers/professors, computer flashcards were most often first used in college, and students learned about themselves. Using flashcards may impact exam performance; it could be a reason that parents and teachers should teach the use of flashcards (both written and computer) at an earlier time than indicated by the present results. The study results revealed that 70% of the class used flashcards to study for one or more exams. Students who used flashcards for all three reviews had significantly higher

exam scores than those who did not use flashcards or only used flashcards on one or two exams—the reason why the researcher has emphasized the use of flashcards in the elementary, primary level.

One of the aims of the research of MarikNur (2013) on "Improving Students' Vocabulary Mastery Using Flashcard" is to know whether or not flashcards can improve the students" vocabulary mastery. The research findings showed that flashcards develop students' vocabulary mastery. The research was analyzed through observation, interview, field note, research diaries, photograph, pretest, and posttest.

These four studies showed that flashcards are handy and useful in improving learning. The researcher used flashcards as an intervention to see the effectiveness of innovative flashcard drills in the mastery of multiplication facts. Furthermore, it is one of the UBLES learning programs.

In the study of Woodward (2006), automaticity in math facts has been of considerable interest to special educators for decades. This experimental study contrasted an integrated approach (i.e., strategies and timed practice drills) with timed practice drills only for teaching multiplication facts.

Educators are sometimes reluctant to time tests for fear that it will be demotivational for students. Still, research shows that time trials improve accuracy and fluency, and students enjoy being timed (Miller, Hall, & Heward, 1995).

"The importance of drill on components [such as math facts] is that the drilled material may become sufficiently over-learned to free up cognitive resources and attention. These cognitive resources may then be allocated to other aspects of performance, such as more complex operations like carrying and borrowing, and to self-monitoring and control (Goldman & Pellegrino, 1986, p. 134)." Pupils at age eleven should have mastered their multiplication facts by having automaticity in responding to multiplication

equations. That is why the researcher preferred having the study in grade 3 so that by grade 5, they already have automaticity.

Revisiting multiplication concepts may be necessary for a few students. Without this improved recall of basic multiplication facts, working memory is consumed by the most fundamental of problems. Releasing working memory capacity allows students to tackle complicated tasks such as multi-step problems or questions demanding higher-order thinking (Wong and Evans, 2007).

In Kimmel (2011) study, he believes that his quantitative and qualitative data indicate that a student's fact fluency would increase by repeatedly using an online flashcard website to practice their knowledge of the multiplication time's tables. The study results showed that 18 out of 20 students in the classroom improved the number of facts they could recall, in one minute, when comparing their pre and posttests.

An action research project was conducted to determine effective math fact strategies for first graders. The traditional way of teaching math facts included using timed tests and flashcards, with most students counting on their fingers or a number line. Data sources included previous math grades, student journals, teacher observations with anecdotal notes, math fact pre and posttests, a parent survey, teacher interview, focus groups, and Ohio Achievement Test scores compared to third and fourth-grade math averages. Overall, the action research results showed the effectiveness of the new math fact strategies discussed, especially compared to the former way of teaching math facts (Boso 2011). Students practiced single digit multiplication facts 0 through 9 using various activities in math centers. The activities included computer games, card, and dice games, worksheets, flashcards, and timed tests. Students' progress was monitored through a pre/posttest, daily one-minute timed test, and weekly two-minute timed tests. Findings indicated that implementing multiplication fact review through the use of math centers did slightly increase fact fluency among the five participants (Steele 2006). From the study of Bystrom (2010), all the collected data through surveys,

interviews, classwork, student journals, personal journals, and three-minute timed tests, daily multiplication fact review did increase students' fact fluency. Having the students engaged and motivated enabled them to want to learn. The students enjoyed the technology along with the friendly competition of the flashcards and MAD minute drills. When the students worked with partners and timed each 21 other on flashcard drills, it gave the students a sense of independence and accomplishment.

The pretest and posttest data gathered and analyzed in the quantitative research study of Knowles, 2010 led to the rejection of the null hypothesis that implementing written, timed practice drills can be linked to students' increase in automaticity of bas c multiplication facts. Daily classroom use of the drills was shown to have a more positive influence than only weekly use. While the exercise tested here does require a small amount of class time each day, the benefit of the strategy is apparent when one compares the statistically significant results.

One of the primary aims in the study of Dizon, and Tang (2017) was to find if there were substantial differences in receptive and productive L2 vocabulary improvements between students who used Paper Flashcards in conjunction with 3 VLSs – dropping, association, and oral rehearsal – and those who used the DF tools Quizlet and Cram. The result of the study revealed that both groups made significant improvements in receptive and productive vocabulary. However, the difference between the gains was not substantial, which contrasts with past comparison studies of Digital Flashcards and Paper

Flashcards and highlights the importance of Vocabulary Learning Strategies. Results in the study of Nist, & Joseph (2008) revealed that incremental rehearsal was the most effective method for students as a group. In contrast, the traditional drill and practice was the most efficient method for reading performance.

Preceding studies resulted in a positive effect of having drill as part of the review and mastery of math facts. Traditional strategies for instructions are still being used, but with the new ways or methods of teaching have helped pupils to improve their learning and fluency in math. Different strategies were presented or used to see their effectiveness in enhancing math fluency, something the researcher has used to see the impact of having innovations, especially on the use of flashcards. The experiment was used to see the differences in such math methods or strategies. As based on these studies, a quantitative process of research was conducted, especially on the comparison of means of the pretest and posttest results of the investigation. The researcher now has action research as a basis for instruction and improvement of math fluency.

The purpose of this study is to see the effect of innovated flashcard drills in the mastery of the basic multiplication facts. For this to be achieved, the researcher conducted an experiment on two sections for about two weeks. The experiment used two different strategies in using the flashcards as a drill for the mastery of basic multiplication facts. The research questions that directed this study are as follows:

1. What is the mean of the difference of the scores in the pretest and posttest of grade 3 pupils in the mastery of basic multiplication facts using the innovated and traditional flashcard drill?

2. Is there a significant difference between the mean of the difference of the scores in the pretest and posttest of grade 3 pupils in the mastery of basic multiplication facts using the innovated and traditional flashcard drill? Null Hypothesis: there is no significant difference between the difference of the difference of the mean scores in the pretest and posttest of grade 3 pupils in the mastery of basic multiplication facts in the posttest using the innovated and traditional flashcard drill?

Methodology

Research Design

This study is descriptive as it sought to describe the increase of scores from pretest to posttest results on the mastery of the basic multiplication facts of two sections in grade 3. It is also correlational as it indicated the significant differences in the use of traditional and innovative flashcard drills in the mastery of basic multiplication facts.

Population and Locale

This study was participated in by two sections of Grade 3 of the University of Baguio Laboratory Elementary School with a population of 64 pupils during the second grading of the school year 2019-2020.

The participants in this study were from the two sections of the grade three pupils of the University of the Baguio Laboratory Elementary School. They were evaluated in their mastery of the basic multiplication facts. All the respondents authorized by their parents took the pretest and posttest of the research.

Data Gathering Tools

The primary tool used in the gathering of data was a test that consists of the 100 basic multiplication facts; the multiplication table of 1-10. The test was downloaded from an online worksheet generating site.

Data Gathering Procedure and Ethical Considerations

The researcher sought permission and clearance from all the relevant authorities, especially the Vice President for Academic Affairs and the principal through a letter, and parents during a scheduled orientation. The researcher oriented the parents on the objectives of the study and answered questions regarding the survey. The pupils who were included in the study were also oriented, and the researcher distributed the letter of assent and consent.

Ethical considerations were followed in the conduct of the study.

On the first day of the conduct of the study, pupils who were allowed by their parents and voluntarily liked to join in the activity were re-oriented of the research aside from the orientation given during the giving of consent forms to their parents. Likewise, the learners from the two sections took their 100 items pretest. Participants were given 5 minutes to answer the given pretest and posttest. Scores were measured on the number of correct answers. The next eight school days were the review drills. Each class had a schedule on the kinds of drills used. For section A, they used the traditional flashcard drill while for Section B, the innovated flashcard drill.

Traditional flashcard drills were considered those used since the researcher's childhood days and the researcher's parents. These drills are the Choral Recitation, Individual Answering, and the Giant Steps.

Oral Recitation is when the pupils read together with the flashcard and likewise answer it together. Individual Answering is when a pupil is called to answer a particular flashcard. And the Giant Step is when participants will stay in the back part of the room; whoever gives first the correct answer to the flashcard shown will be moving forward through giant steps until the participants reached the finish line before considered as the winner.

Innovated Flashcard Drills pertain to the drills renovated with different instructions adopted from various games. These games converted to drills are called as "Game kanaba?", "Paubusan," and Silent Answer.

"Game Ka Na Ba?" drill is just the like the TV game show and almost the same with the giant step but with a twist. Participants stay at the back part of the room then answer the shown flashcards. Whoever answers rst moves forward, but they are given a "power," the power to let their opponents move backward or the Power for them to move forward twice.

"Paubusan" is played with groups. Participants from each group will answer, and whoever answered first sits down, and the others continue to respond, whichever group whose members have all answered first is considered the winner.

Card Draw is like the Gun Draw. The participants will have sets of flashcards and show each other. Whoever answers first once the flashcard is shown to each other at the same time, is considered the winner.

After all, interventions were done, the learners took their posttest. The researcher, without any bias, checked the papers and had the subject head in Math counterchecked. The results/findings of the study were disseminated to the participants as well as to their parents through a note. The participants' worksheets were returned to them and put in their portfolio signed by their parents. They were given appreciation and award cards for participating and additional awards for improved scores, and likewise to the parents who have allowed their child to be a participant. The researcher ensured the confidentiality of the results, and it will not affect the grades of the pupil participants.

Treatment of Data

The data were analyzed with the Statistical Package for Social Sciences (SPSS) using mean differences, and t-test to test the hypotheses at 0.05 level of significance.

Results and Discussion

The researcher believes and hopes with Kimmel (2011) that the learners will generally master automaticity in answering basic multiplication facts by repeatedly using the flashcard drills and continue making gains as they go higher grade level. There was an increase of mean from pretest to posttest in both strategies because of the repeated use of flashcard drills.

The difference between the mean of the difference of the scores in the pretest and posttest of pupils who used traditional flashcard drills from those who used the innovated flashcard drills in the mastery of their basic multiplication facts is revealed in table 2. This shows that there is a good improvement or gains in the scores in both sections. The mean for the increase in the scores for those who used the innovative flashcard drills is higher by 5.1563 than those who used the traditional way. The group who used the innovative flashcard drill has shown a higher rate of improvement. The use of the innovative flashcard drill had influenced the learners to do better and participate more in the acquisition of learning the basic multiplication facts.

In accordance with Knowles (2010), his study proved that the use of daily written timed practice drills helped to improve the automaticity of basic multiplication facts, but this time with third graders. The use of such drills does not take up much class time because it serves as a review drill; thus, it would not be difficult for teachers to integrate them daily. Learners who have difficulty retrieving basic math facts have difficulties in solving real-life application problems, as identified in some research. The researcher relies on the fact that flashcard drills help improve whether it would be innovative or traditional.

The T-test for independent samples revealed that there is no significant difference between the mean of the difference of the scores in the pretest and posttest of grade 3 pupils in the mastery of basic multiplication facts using the innovated and traditional flashcard drill, $t\ (62) = -1.527$, $p\ (.132) > .05$. The learners who used the innovative flashcard drill has a higher mean of a difference than those who used traditional, the difference is not significant in the mastery of the basic multiplication facts when you use innovated flashcard drill. Both strategy have helped the learners in the improvement of the basic multiplication facts. The participants who used the traditional way still enjoyed the drill since it was their practice since grade 1; thus, they are used to it and always longing to have the flashcard drill even if it's the traditional way. On the other hand, the participants who

used innovated ways also enjoyed the drill because it's something new. They also enjoyed the traditional way because they are used to when they were in grades 1 and 2. The participants in both sections were motivated to master their multiplication table to get by with flashcard drills that they have in their classrooms. The result shows that a traditional flashcard drill is still efficient in classroom instruction. Nist, & Joseph,(2008) would agree with the current study that traditional drill and practice was the most efficient method on reading performance.

In contrast to the study of Dizon, and Tang (2017), there were significant differences in receptive and productive L2 vocabulary improvements between students who used Paper Flashcards in conjunction with dropping, association, and oral rehearsal those who used the Digital Flashcard tools Quizlet and Cram; but agrees with the result that both groups made significant improvements. Likewise, disagrees with Boso (2011), wherein his study showed the effectiveness of the new math fact strategies discussed, especially in comparison with the traditional way. While there were no significant differences in the present study, the innovative way or approach is equally effective in the traditional way.

Conclusion and Recommendations

Since the result was to accept the null hypotheses entailing that there is no significant difference between the difference of the difference of the mean scores in the pretest and posttest of grade 3 pupils in the mastery of basic multiplication facts in the posttest using the innovated and traditional flashcard drill, the researcher then highly believes that using flashcard whether traditional, innovated have impact in the automaticity learning process of learners particularly in the basic multiplication facts.

The results of this study will be used as a basis by the researcher in conducting seminars or sharing the strategy to the academe. It will influence other teachers to make innovations in their strategy but should not do away

with traditional ways that are still useful in improving pupils' learning these days. The inclusion of a teacher's innovations and creativity is an essential factor to motivate pupils to learn and have good study and learning habits. With the generation that we have, pupils need more creative, modernized, and fun learning activities in their instructions.

The researcher still recommends this study to be improved; to use a different population/respondents, particularly in the intermediate level, to be applied in a different subject where recognition is emphasized, and the automatic response is needed.

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