

Kit Magic Maths: Assist in Enhancing the Mastering of Basic Multiplication

Muhamad Shahlyme Bin Abd Wahid, Suziyani Binti Mohamed

Universiti Kebangsaan Malaysia, Malaysia

E-mail: shahlyme@gmail.com

Abstract: Mathematical achievement of special recovery students (MPK) is still low compared to typical students. One of the factors is due to the basic mastery of the weak operation. The purpose of this study is to study the use of the Kit Magic Maths (KMM) in helping (MPK) to master the base of the multiplication. Researchers using quantitative approaches with Stephen Kemmis and Mc Taggart models carried out two rows. A total of two participants were selected through a sampling technique aimed at a school in the district of Kuala Pilah. Participants performed basic mathematical tests multiplied by 30 items at pre-test and post-test. The content of mathematical tests using the Testing Tables (JPU) is validated by three experienced teachers over 30 years in mathematics. Data findings were analysed using descriptive analysis by percentage. The findings show that KMM can help MPK master the basic skills of multiplication. Both participants pointed out the increase in pre-test score scores by 70% for participant A and 50% for participant B after the post-test. Therefore, it is hoped that KMM will be able to extend its use to teachers at the district, state and ministry levels as an effective learning aid to the learning and teaching of MPK. Consequently, the use of KMM is seen to help MPK increase the level of basic operation of multiplicity better than before, in addition to enhancing student's interest in mathematical subjects.

Keywords: Magic Math Kit, the base of multiplication, a special recovery student.

In the Education Development Plan of Malaysia, knowledge is the most basic stage in fulfilling the aspirations of each student. The mastery of the basic skills of reading, writing and counting becomes one of the areas of student success in eradicating school dropout rates. Hence, based on the aspirations of the Malaysian education system that emphasizes equity in equality of students and education for all, provides opportunities for poor students to explore the world of knowledge with more excitement and meaningful. Therefore, in order to ensure equality in quality education, the Special Recovery Program has been implemented by the Ministry of Education Malaysia (KPM) since the 1960s that serve to assist primary school students with learning problems, especially in learning to master the basic skills of reading, writing and counting (3M).

The failure of MPK to master the basic skills of reading, calculating and writing (3M) is a problem that concerns all parties since the implementation of the Integrated Curriculum of Primary School (KBSR) especially in basic mathematical multiplication skills. According to Margaret (2014) most MPKs are not particularly skilled in mathematical basics, especially the basic multiplication operation. MPKs also fail to fully understand the basic facts of multiplication, especially in calculations involving two or more digits (Woodward, 2006). Hence, the basic mastering of multiplication operations is very important to special recovery students (MPK) because besides contributing to achievement in the tests, this skill is also very

important in helping the MPKs solve mathematical problems especially those that involve daily activities. This is supported by Wells (2016) stating that the lack of knowledge of the basic principle of multiplication in the mathematical concept will cause many students to drop out as they grow up.

Multiplication skills are a basic skill that is difficult to master by primary school students. Therefore, students need to understand the concept of multiplication well before they can answer questions involving skills of multiplication. The use of manipulative materials can make it easier for students to understand the concept of multiplication while making the teaching and learning of teachers more effective, creative and successful. A creative and innovative teacher can ensure that teaching and learning sessions are more meaningful and effective. Creative teaching and learning directly empower the motivation of students to learn mathematics.

Among the studies that were conducted in improving the basic skills of multiplication operations are such as the study conducted by Crystal & Effandi (2017) the use of manipulative materials of *dabai* seeds and egg cantons as teaching tools in the classroom has a profound effect on the teaching and learning environment in the classroom by stimulating the interest and thinking skills of the recovery students. Test results showed students were at the very weak, weak and moderate levels in the pre-test while post-test showed students were at an excellent level. All the students have fully mastered the concept of

multiplication in which all progressive written test questions were answered correctly. However, there are differences in the level of achievement for the three respondents. Overall, the use of *dabai* seeds and egg cantons is one of the best methods of teaching recovery students in the teaching and learning of the concept of multiplication.

In addition, according to Liong *et al.* (2017) there are previous studies that were carried out to reveal various methods of teaching multiplication in overcoming the difficulty of the students to master the basic facts of multiplication. Among the methods used include the *congkak* training method, the construction of basic fact tables, scanning cards, memorization, lattice methods, repeat additions, multiplication ladder, chorus reading of multiplication and creative formula techniques. However most of these studies were limited to mainstream or typical students. Nevertheless, the basic teaching method of multiplication operation using the multiplication is less in line with the characteristics of a special recovery student that prioritizes manipulative materials to master the mathematics concept of multiplication better. Therefore, the researcher has applied several relevant learning theories and strategies to study the difference in the level of achievement of the basic multiplication operations of many special recovery students before and after the use of Kit Magic Maths.

Special recovery students and learning and facilitating (PdPc) of basic Mathematics

Special recovery students have been classified as students with disabilities in achieving basic reading, writing and calculating skills (3M) as well as negative attitudes in learning compared to their peers. Generally, their failure in 3M skills demonstrates unsatisfactory performance in which they often make mistakes in answering questions in the test as well as examinations. Therefore, the Special Education Division (BPK) strives to assist students experiencing problems in mastering 3M skills through the Special Recovery Program (PPK) by developing a more flexible, attractive, focused and appropriate curriculum in line with the Education Act 1996.

The mathematical curriculum under KDP outlines 22 skills or subjects that each student must master in the mathematical learning and one of the components emphasized in the calculating skills is the basic of multiplication operation. Among the skills to be learned in multiplication operations such as: (a) understanding the multiplication operations in repeat addition process (b) multiplying any two numbers within the range 1-9 (c) recognizing the symbols (\times) and ($=$) (d) writing mathematical sentences for multiplication operations in the form of mathematical sentences and common forms (e) completing mathematical sentences (f) remembering multiplications and (g) solving daily problems.

Hence, learning aids (BBB) are the essence of facilitating teachers to smoothen and initiate lessons in order to facilitate students to understand the concepts and contents as well as facts in the teaching and learning process. According to Faridah & Zairinah (2014) BBB is the best way to help raise the level of knowledge and understanding of MPK while maintaining their learning interest consistently. This is because the use of concrete materials is appropriate to the age of 7 to 11 years old (Kail, 2016) to stimulate student understanding to better understand the calculation process in the basics of multiplication. In addition, the use of BBB is also a student-centred learning approach that can demand collaboration in planned activities and facilitate educators' teaching in providing explanations for the calculations to students (Lau & Roslinda, 2017).

Kit Magic Maths (KMM) Teaching Aid

A learning aid to learning mathematics in the basics of the multiply operation has been developed and studied by researchers whose contents comprise basic multiplication methods such as concepts of recurring additions, factual development of basic multiplication in the form of sentences and daily problem solving. KMM is specifically designed to help special recovery students with mathematical learning problems, especially for the multiplication of two numbers. This learning material is produced through a detailed study that referred to the cause of the topic learning problem and it is built in accordance with the standard contents of special recovery student learning.

Besides that, KMM consists of three essential items: (i) study boards, (ii) multiplication fact cards and (iii) sheet cards in addition to the use of supporting materials such as straws as counters and co-operative execution strategy. According to Effandi & Zanaton (2007), cooperative learning provides the best learning opportunities to students with learning difficulties to share and discuss in groups of diverse backgrounds of gender, race and ability to share knowledge in solving common mathematical problems. To introduce the basic concept of multiplication, teacher serves as a facilitator in giving clear and precise instructions on how to use KMM. Next, each group member should manipulate KMM together, and then the answer should be noted on the card as a consolidation activity. The implementation of KMM coincides with Slavin (1995) who introduced the Student-Team-Achievement-Division Model (STAD) model in which each group member must work together in a small group consisting of various backgrounds, incorporating elements such as discussion, presentation, teacher's help, quizzes and execution of tokens or rewards after the implementation of KMM. Additionally, rewards in the form of gifts or recognition at the end of the learning session are provided to enhance the interest of special recovery students in mathematical subjects, especially in the principle of multiplication operations.

METHOD

The study used an action research design through quantitative data collection that focused on solving the problems of mastering the basic multiplication operations faced by special recovery students. Pre-test and post-test were used to record the level of achievement of special recovery students in mastering basic multiplication operations before and after interventions using KMM. In addition, Model as a research guide consisting of four phases, namely planning, action, observation and reflection.

The sample of the study was composed of two special recovery students of Standard Two who had problems reading, writing and counting at a primary school in the district of Kuala Pilah using purposive sampling techniques from a group of specific samples to coincide with the objective of the study. The researcher had chosen a sample based on information gathering form which consisted of year-end examinations marks, numeracy scores, class teacher suggestions through behavioral observation reports, health records and frequency of attendance to school.

The research instrument consisted of pre-test and post-test. Pre-test was administered before the Kit Magic Maths (KMM) was used and post-test was administered after 16 hours of intervention involving two loop phases assisted by KMM. Test items contained 30 questions using the Testing Table (JPU). In order to obtain the validity of the content, the instrument was reviewed by three teachers with nearly 30 years of teaching experience in mathematics.

The process of data collection was started with pre-test administration. There are five sections in the pre-test and post-test papers. The questions included basic concepts of multiplication, basic facts and problem solving. The students were given one hour to answer the question paper. This test served as an initial test to determine the level of students' mastery level or basic knowledge of multiplication topics. Furthermore, the intervention process was conducted 16 times (one hour for each intervention) involving the implementation of KMM for 30 minutes and 30 minutes for the exercises. Data was recorded throughout the intervention. After the completion of the intervention, the researcher administered the post-test by modifying some of the contents of the test questions compared to the pre-test questions to see how far the students' understanding of the basic skills of multiplication and prevent them from memorizing answers from the pre-test.

Data from the pre-test and post-test were analysed using descriptive analysis aimed to measure the percentage of improvement of test scores before and after the intervention conducted on the study participants. The use of graphs was intended to display data clearly and systematically.

FINDING AND DISCUSSION

Findings

This action study was conducted for 8 weeks for 16 teaching session times within 60 minutes for one intervention session for two loop phases. The purpose of this study was to examine the level of achievement of the basic multiplication operations of special recovery students before and after the use of Kit Magic Maths (KMM).

Profile of study participants

The first study participant was an 8-year-old Malay female student, having positive behaviors like being active, highly confident and good communication with the teacher. However, the student was often absent from school and diagnosed with a high-level glare vision verified by medical practitioners, but the student did not wear spectacles due to socio-economic factors. This problem has contributed to the decline in academic achievement, especially basic mathematical skills in which the student received E grade in the final exam of 2016 and was nominated for a special recovery program for the 2017 session. Furthermore, the student was seen as hard to focus longer during the learning and teaching process and weak cognitive ability in understanding the basic concepts of mathematics such as addition, subtraction, multiplication and division became difficult if the student does not use real materials as learning aid.

The second study participant was an 8-year-old Malay male student, having a slightly different behaviour with the first participant such as quiet, passive, difficult to communicate with friends and teachers, and with very low self-esteem. The student was suggested by a mathematics teacher to follow the special recovery program due to lower academic achievement compared to other peers. Obtaining a D grade for mathematical papers in the final exam of 2016, had a low level of cognitive ability in counting one by one, slow in completing assignments and had family problems.

Achievement level of basic multiplication operations aided by Kit Magic Maths

Based on Figure 2, the difference in scores between the pre-test and post-test after 16 interventions clearly demonstrates that each participant saw a significant improvement. This clearly illustrates that these special recovery students understand the basic concept of multiplication operation after 16 intervening sessions were conducted with the help of KMM.

Figure 2. Achievement levels of students A and B after KMM intervention

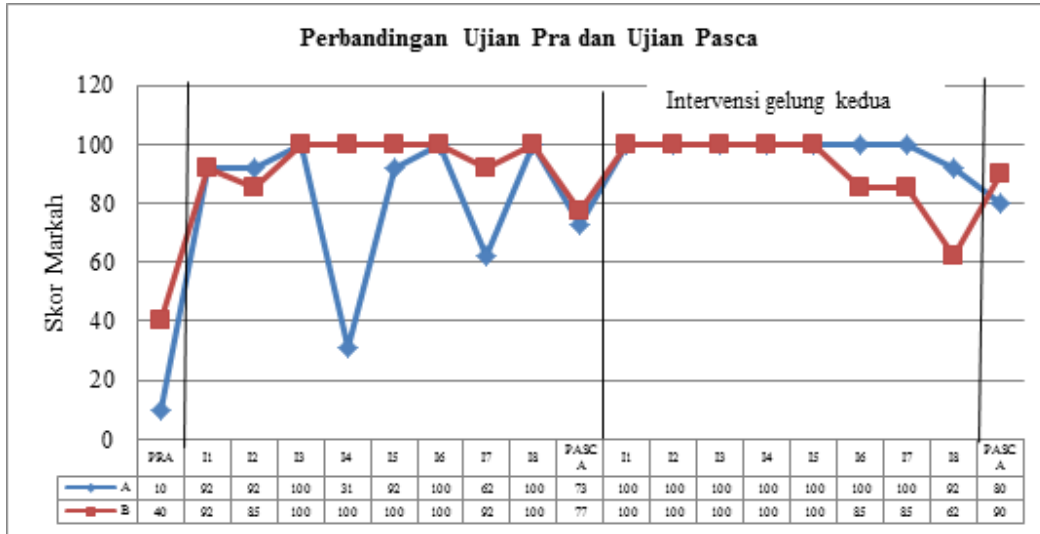
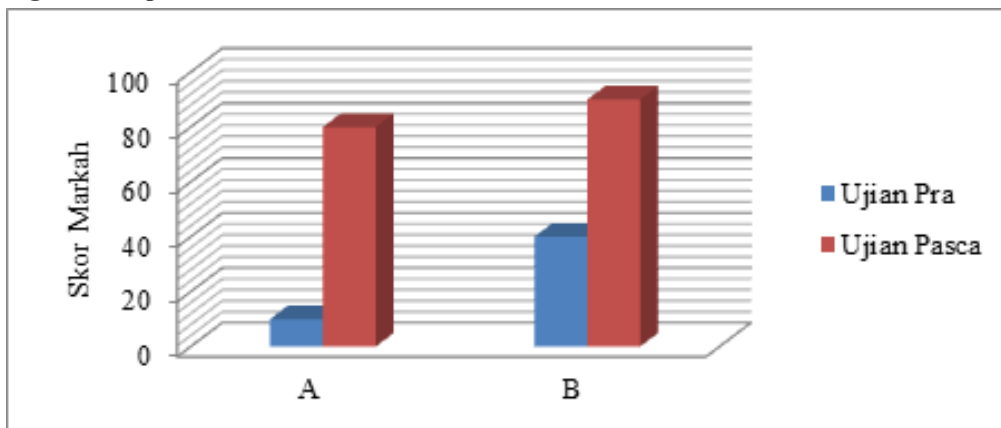


Figure 3. Improved Pre-test and Post-test Scores



When viewed from the results of the pre-test that was carried out, the scores obtained by student A was 10% and student B was 40%. This shows that both the students have weaknesses in the knowledge of the basic concepts of multiplication operation and have different backgrounds in terms of health and family socio-economic aspects.

As a result of the first loop intervention (I) conducted, student A showed a high score on intervention one I1 (92%), I2 (92%), I3 (100%) and decreased dramatically at intervention I4 which was (31%) due to physical readiness factor and increased again in session I5 (92%), I6 (100%), I7 (62%) and I8 (100%). For student B, in overall, showed consistent improvement compared to student A. Increased score of student B during intervention I1 (92%), I2 (85%), I3 (100%), I4 (100%), I5 (100%), I6 (100%), I7 (92%) and I8 (100%). After the intervention was carried out using KMM, the post-test was administered for one hour. The test analysis found that both students showed good achievements by obtaining a score of 73% for student A and 77% for student B.

Then, the researcher continued with the second loop phase after reflection on teaching and learning

using KMM. The findings of the second intervention (I) showed that student A obtained 100% full score from (I1) to (I7) and 92% in (I8). While student B also showed an impressive improvement with 100% score from (I1) to (I5) and moderately decreased at I6 (85%), I7 (85%) and I8 (62%). This is because the student made a mistake in writing a reverse written product. However, the post-test analysis showed a brilliant improvement for both students with a score of 80% for student A and 90% for student B.

Figure 3 below shows the change in percentage of scores obtained by each participant in the pre-test and post-test after using KMM. Based on Figure 2, the researcher can summarize each participant recorded similar score improvement in the post-test with a score difference of only 10%. However, participant A showed an impressive increase to 80% compared to the pre-test with only 10%. While participant B also showed a good improvement in basic skills of multiplication to 90% compared to the score obtained of 40% in pre-test. The increase in the scores is beyond expectation as both of these participants are special recovery students who have disabilities in basic skills of multiplication. This states that students can understand a basic concept

of mathematics through the use of manipulative materials that can stimulate the senses of children such as hearing, touching and listening effectively (Swan & Marshall, 2010).

Discussions

In general, this study focused on the use of Kit Magic Maths (KMM) on the basic mastery of multiplication operations amongst special recovery students. The issue of mastering the basic skills of multiplication operations is often a problem for all students in primary schools. Traditional approaches that only emphasize on memorization methods often applied by teachers in helping students master the skills are no longer relevant. This is because for students with intellectual disabilities to remember and adhere to the basic facts of multiplication, they will continue to drop out and think mathematics is a difficult subject to learn. Accordingly, a study by Mariani and Ismail (2013) stated that creative teaching practices are influenced by competent teachers to create an exciting and fun learning environment and to stimulate students' creative and critical thinking.

In addition, KMM implements a student-centered learning strategy that demands interaction between participants in solving a problem in mathematics. The two-way interaction between the students indirectly helps to build a conceptual understanding of the basics of multiplication operations and, at the same time, enhances the students' ability to resolve the basic facts of multiplication well. This is in line with the opinion of Carbonneau *et al.* (2013) where teaching methods using manipulative materials indirectly give students the opportunity to interact with the materials to obtain information and understand a situation in learning mathematics interestingly.

Besides that, KMM applications are closely related to the interest of the students to actively engage in the teaching and learning process. Hence, active involvement of students with learning aids is an important element in improving the achievement and understanding of special recovery students on the basic skills of multiplication operation. This is in line with the findings of Roslinda (2015) that stated the active involvement of students when manipulating objects or models will provide concrete experience in developing mathematical knowledge contextually.

The researcher also found that the KMM have real characteristics such as can be touched, held, viewed and manipulated directly that can stimulate more senses of students to learn an abstract concept especially the concept of multiplying two numbers. Therefore, the development of KMM using learning aid materials (BBB), printed cards, and concrete objects such as straws and other additional materials facilitates students to understand a mathematical

concept during the teaching and learning process. According to a study by Haryanti & Azrina (2015) teachers prefer to use printed BBB with a percentage of 80% and followed by the use of Basic Number Kits by 77.5%. The findings of Jasmi *et al.* (2011), showed that Mathematics teachers preferred the BBB application using printed materials such as existing modules, textbooks and cards as support in the teaching and learning process because the BBB was easy to use for students in developing Mathematical concepts during the process of teaching and learning Mathematics. This is supported by a previous study that the use of materials and hands-on activities can encourage more stimulation of the senses and, thus, increase the ability of students to master a concept permanently and not by memorization method that is the commonly used by the teachers (Othman, 2004).

The findings of this study found that special recovery students demonstrated a remarkable performance on the mastery of basic multiplication operations after the intervention of KMM. However, the extent to which a student's understanding of the learned skills can survive remains a question to the researcher because special recovery students have a behavioral problem that is short memory. This is confirmed by the Ministry of Education Malaysia that recovery students are those with learning difficulties in certain skills, are negative in learning and have behaviors that affect learning and lack self-confidence and positive attitudes towards learning. As such, it is important to refer to the characteristics of the special recovery students themselves to facilitate the teachers to plan and implement the teaching method that is fitting to the students' ability on a topic. Researchers suggest that improvements to KMM can be implemented for further research purposes in the future.

CONCLUSION

The use of Kit Magic Maths (KMM) as a learning aid in teaching the basics of multiplication operations is seen as a student-centered approach demanded in 21st century teaching practices. Hence, appropriate teaching strategy should be in line with the needs of students especially those having difficulties mastering the reading, writing and calculating skills. According to Faridah & Zairinah (2014), children with learning difficulties need different teaching and learning methods than normal children.

Overall, the findings of this study show that the KMM application on the basic operation of multiplication for special recovery students can have a positive impact. The appropriate use of KMM in line with the students' learning level makes teaching of basic skills of multiplication operation achieve the objectives set by the researchers. Elements implemented in KMM such as cooperation, communication and rewards

create the attractiveness and interest for students to use this material optimally to understand the concepts they want to learn. Hence, the development of KMM in the form of real materials with the integration of attractive and coloured materials as well stimulate senses can help alter a child's learning of an abstract concept to a concrete concept more effectively.

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