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Fun Learning with "Magic Maths" for Primary Students: An Action Research

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ABSTRACT

The purpose of this study was to determine the effectiveness of a STEM module named "Magic Maths" toward the mastery of multiplication tables among Year 2 students in a Malaysian primary school. This action research was based on Kemmis and McTaggart's model. Instruments used in this study included a set of questionnaires, an interview protocol, reflection and observation field notes on the teaching and learning (T&L) process. Five intervention sessions were conducted to these students. The intervention was eight-week long in which the students learnt to use "Magic Maths" to master multiplication tables 2 to 5 with songs. This method has attracted the students to learn mathematics in a creative and innovative way. Creative and innovative teaching activities could enhance the students' Higher Order Thinking Skills (HOTS). In addition, exploration activities in the CD was found to be useful in enhancing the students' mastery of the multiplication tables through self-exploration. The students were able to "build" multiplication tables 2 to 5 in less than 3 minutes with song as stimulus. The main finding shows that "Magic Maths" has improved the students' achievement of mathematics that being taught. Thus, "Magic Maths" was found to be effective for Year 2 students in enhancing their mastery of the multiplication tables 2 to 5 with fun learning.

Keywords: Action research, mathematics, Magic Maths, primary school, Malaysia

INTRODUCTION

Malaysian Education Development Plan 2013-2025 aims to produce educated and competitive citizens. This plan was designed to strengthen the vision and aspiration of the Malaysian government in the effort to improve the education system in the country. The plan also provides the direction, details and initiatives to achieve a holistic educational system (Kementerian Pendidikan Malaysia, 2012a). Specifically, the emphasis is on science and mathematics via STEM (Science, Technology, Engineering and Mathematics) as stipulated in the Malaysian Educational Blueprint (2013-2025) (Kementerian Pendidikan Malaysia, 2012b). One of the priorities identified in the blueprint is to enhance students' interests in STEM. STEM is an approach to enhance students S & T knowledge across subjects by incorporating fun learning and encouraging them to think in a more creative way in order to equipped them with the 21st century skills. In STEM, students are trained to use analytical skills of science and mathematics and to determine how to solve problems using technology that is available to them. STEM provides students with the opportunity to investigate an authentic problem provided to them in order to understand it based on their own experiences ─ also known as contextual learning. By allowing students to construct their own meaning is the strength of STEM (Kementerian Pendidikan Malaysia, 2016).

STEM also makes learning more relevant as students are exposed to the concept of what they want to learn using real-world examples. STEM, as a priority in our education blueprint, is a tool to nurture our younger generation to have a strong foundation to be digital citizens and future innovators in a rapidly evolving world. Hence, a quality of Science, Technology, Engineering, and Mathematics (STEM) education is vital for the future success of our students. STEM education embeds ways to make learning more connected and relevant for students. However, in a teaching context, there is a need for further research on how to effectively integrate STEM in a classroom (Kementerian Pendidikan Malaysia, 2018).

Teaching and learning in the 21st century is increasingly challenging for educators to nurture future generation that is competitive and creative (Idris, 2005). In the new millenium, teachers are encouraged to conduct action research to improve their pedagogical practices (Lebar, 2014). In addition, teachers should apply various authentic teaching strategies in order to enhance students' learning. Mathematics is a subject that is considered difficult by most students. Turning a difficult subject into a well-like course is a challenging task for a teacher. It requires a creative idea from a teacher. Malaysia's Vision 2020 is a fast-track agenda in advancing Malaysia to join industrial country club. To achieve such a lofty goal, Malaysia needs to harness these aspects ─ science and technological knowledge, high income per capita, quality education, efficient public infrastructure, good governance, transparency and democracy accentuation in administration of the governance and also to produce society that is creative and highly-competitive. The Vision is an aspiration in constructing a civilized society that is at par with advanced nations (Hussin, 2004).

The Malaysian Educational Blueprint 2013-2035 aims to produce a critical mass of graduates who are highly-educated, innovative and competitive. Education plays a pivotal role in ensuring the economical and the developmental growth of a nation. In the long run, Malaysians should not only be technology users but they are supposed to contribute in creating new knowledge and technology. Therefore, Malaysia needs a knowledgeable, innovative and competitive workforce (Mustapha, 2013). The national education system should be able to produce generation that will contribute to build a new Malaysia (Kementerian Pendidikan Malaysia, 2012). The National Education Policy targets 60 percents from the student population to be in the science and technology stream as opposed to the remaining 40 percent in the arts (Kementerian Pendidikan Malaysia, 2012a). Science and Technology plays important role in crystallizing the vision 2020. However, the ratio did not reflect the aspired target. According to statistics released by Ministry of Education (Kementerian Pendidikan Malaysia) from 1981 until 2010, the ratio for secondary school students in the science stream has never achieved 60:40 ratio (Kementerian Pendidikan Malaysia, 2012b). This scenario could jeopardize the government's efforts to enhance S & T capability and the economic transformation of the country. To become an advanced industrial country, a strong mathematical foundation of the workers is essential. Hence, the improvement in quality for mathematical education is very important. The curriculum in Malaysian schools offer three programs in mathematical education ─ mathematics for primary schools, modern mathematics and additional mathematics for secondary schools (Kementerian Pendidikan Malaysia, 2012).

Mathematics has always been regarded as difficult by most students. This perception needs to be changed. Teachers should be creative and innovative in teaching so that students are drawn to the subject. Learning mathematics by using information technology (IT) and also via interactive modes can also produce students who are IT-savvy. The application of mathematical logics based on Multiple Intelligences theory in mathematics is deemed necessary to be able to create a fun and meaningful environment while learning the subject. Students in the primary schools are drawn to sing-a-long sessions as well as fun activities. The application of infotainment within teaching-and-learning sessions can be implemented while the students sing and try to construct the multiplication tables. Teacher also plays an essential role as the catalyst and moderator as teacher also sings the song while teaching Magic Maths in the classrooms. Nevertheless, the achievement in science and mathematics for secondary school students has shown decrement if one were to compare with our counterparts such as Singapore (Kementerian Pendidikan Malaysia, 2012b).

The result from World Education Rankings by PISA in 2012 has shown that Malaysia was ranked within the bottom 30% in the position of 52 from 65 countries. The result released by PISA in 2009 (the first entrance for Malaysia) also exhibited unsatisfactory outcome as Malaysia was in 55th placing from 74 countries which clearly put Malaysia in the third most-behind group of participants (Kementerian Pendidikan Malaysia, 2012b). That is why it is critical and important for this study to be

conducted so that an alternative method in teaching mathematics for the primary school pupils is proposed.

PROBLEM STATEMENT

Schon (1987) describes reflective thinking as an ability to assess one's action so as to engage in the continuous learning. Dewey (1933) states a reflective thinking is the art of searching, discovering, inquiring and explaining an experience. In teaching, reflective thinking could be a crucial cognitive tool to inform teachers about the efffectiveness of their teaching. A teacher who reflects after her teaching is not just thinking about her past actions and events but she is focusing on the students' emotion and responses. A critical reflection is a cognitive process to make meaning of an experience. Nevertheless, empirical research in primary schools that used action research design is limited. The studies of mathematics are also largely concentrated in higher education and in secondary schools. Related studies on primary schools mathematics and mastering multiplication tables were few. Research on problem-solving skills using Higher Order Thinking (HOTS) is also scarce at primary school level. According to several studies, most students were unable to solve HOTS questions in their examination (Chick & Stacey, 2013; Jin Seo, 2008; Matthew, 2013; Sabri & Azwawi, 2006; Samsudin & Fatimah, 2004). Through the researcher's teaching experience in mathematics, specifically in multiplication and division, the researcher discovered difficulty in mastering multiplication tables by the weaker students. Previously, the researcher has used an ordinary method of memorizing multiplication tables as follows:

1 X 2 = 2, 2 X 2 = 4, 3 X 2 = 6

But after almost a week of implemention, only few students were able to memorize the multiplication tables. When the students recited the multiplication tables in a group, most of them did not have much problem, but, when the researcher asked one student at a time, he or she has difficulty in reciting the multiplication tables. They have to memorize numbers and of multiplication values up to 18 (multiplication table 2) and up to the number 50 (multiplication table 5). This weakness could be detected during the students learning of multiplication tables in the classroom. Due to the lack of mastery in multiplication, the students were unable to answer the multiplication and division questions mentally and in writing. The situation was worisome to the researcher because in examinations and monthly tests, no multiplication tables were provided. By any means possible, they have to memorize the multiplication tables. Hence, the researcher has made some brainstorming with some experience mathematics teachers and succeeded in building a simple method to memorize the multiplication tables by using English rhythms. The students sang multiplication tables 2 up to 5, and consequently multiplication tables 6 up 9. This method was named Magic Maths.

PURPOSE AND OBJECTIVES OF THE STUDY

The purpose of this research was to investigate the effectiveness of a STEM Module called Magic Maths in assisting Year 2 students to master multiplication tables and to solve multiplication and division problems. In particular, the objectives of the study were to:

1. determine the effectiveness of the STEM Module of 'MAGIC MATHS' with regard to problem-solving skills and the mastery of multiplication tables among Year 2 students.

2. improve of teaching practices in the classroom.

SIGNIFICANCE OF THE STUDY

This action research was designed to improve a mathematic teacher's teaching practices. The study was expected to contribute to the body of knowledge, especially in the field of mathematics education. Problem-solving skill is an important competency not only for mathematics, but also for all other subjects starting from primary to tertiary levels. Furthermore, the questions in the international tests such as TIMSS and PISA for secondary school students mostly consisted of higher order thinking skills

(HOTS). In Year 6 national examination (UPSR), about 20% of the examination items contained higher order thinking skills (HOTS) questions. Similarly, with the implementation of the Assessment for Form 3 (PT3) in 2014, the HOTS questions are embedded in PT3. This study was aimed to assist a teacher to identify and improve pedagogical activities appropriate to the level of students in the school by using a STEM module named Magic Maths. The findings of this study were also expected to assist the teacher to further streamline her planning and preparation in monitoring and guiding students, especially in solving the multiplication and division questions.

CONCEPTUAL FRAMEWORK

Figure 1 showed the conceptual framework of this action research. It was formed based on Kemmis and Mc Taggart (1988) model. This model was selected to make an initial review of a classroom situation as a basis for planning and action. This model was compatible with the objectives of the study. In conducting this study, the teacher started with an initial reflection, then review, planning and acting to solve the problem faced by the students. Then the teacher made the observation and reflection after each activity. Students' achievement were assessed through the pre- and post-test. This action research used one round or a cycle that involved four main steps – reflection, planning, action (implementation) and observation. This action research was implemented in the form of a loop or a cycle encompassing the following steps:

1. Step 1: Reflect and identify the problems related to practice.
   (to understand the problem)
2. Step 2: Plan the action.
3. Step 3: Implement the action.
   Observe and analyze data.
4. Step 4: Evaluate and reflect.
   (to assess the effectiveness of the teaching and learning)

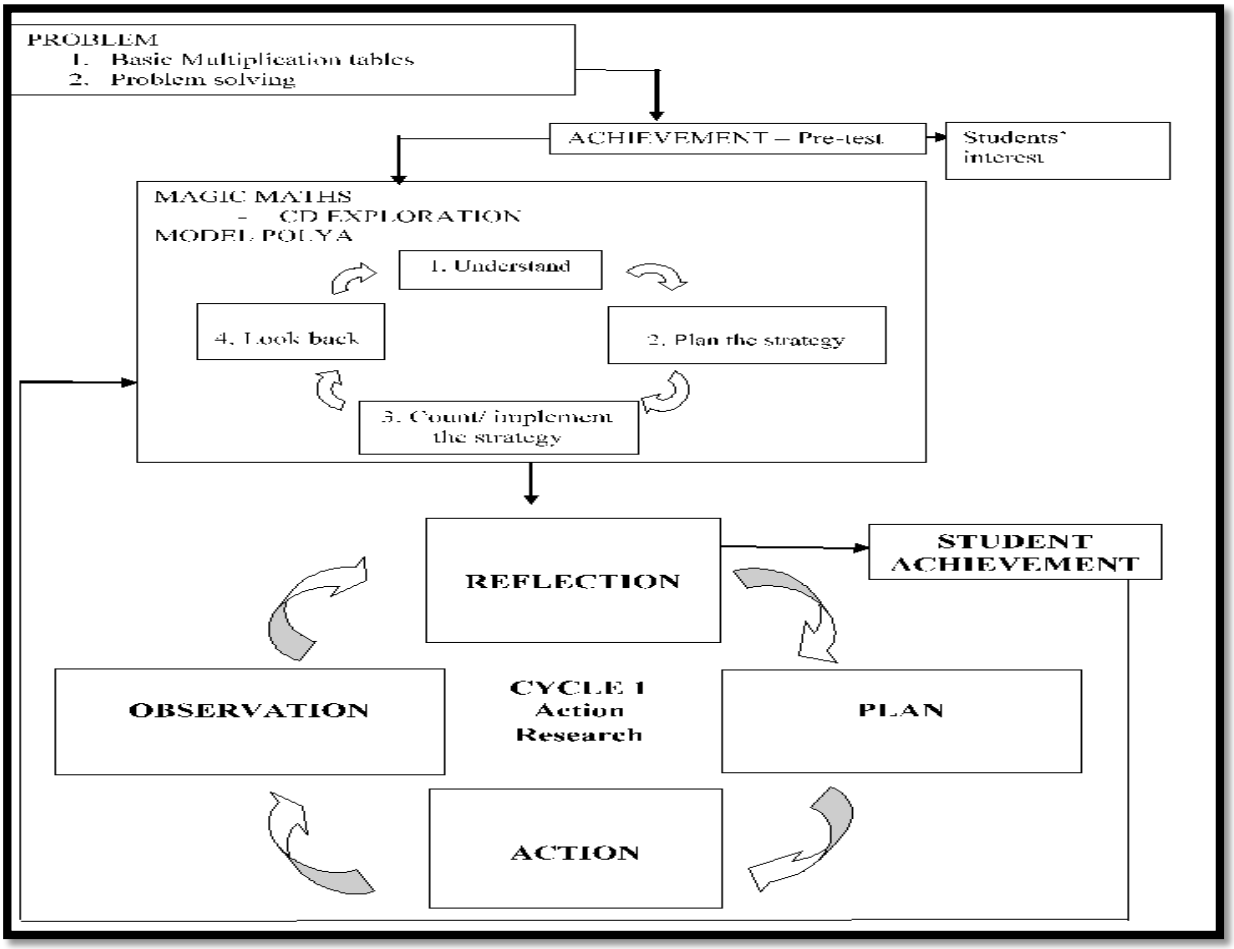


Figure 1: Conceptual Framework

LITERATUR R EVIEW

This section discussed about problem-solving, learning, and multiple intelligences theories and previous research.

Polya Model

The theory of problem-solving has been introduced and led by a Hungarian mathematician ─ George Polya, and the theory is called problem-solving model of Polya or Polya model. In 1945, George Polya published his book *How to solve it* that focused on solution findings based on problem-solving strategies. His books have been sold over a million copies and been translated into 17 languages. In this book, he introduced the four principles in solving mathematical problems. According Polya (1945), good problem-solving consists of four steps (a) understand the problem, (b) plan strategies, (c) implement the strategies, and (d) look back (reflection).

Learning Theory

Robert Mills Gagne (1977) stated that the primary role of a teacher is to teach students to solve problems, such as solving mathematical, physical, health, and social problems. Gagne (2005) introduced eight stages of learning. Each learning can only be achieved if the student has mastered learning at the earlier stage. The stages are: (1) study of signal (signal learning), (2) learning response (stimulus-response), (3) motor learning network (chaining learning), (4) family learning language (verbal learning association) (5) learning discrimination (discrimination learning), (6) learning concepts

(concept learning), (7) learning law (rule learning), and (8) learning problem-solving (problem-solving). Gagne also asserted that learning should start from the simple (basic level) to more advance level. Before teaching a higher skill, teachers must ensure that students have mastered the basic skill necessary. Teachers also need to be observant in identifying the skills and talents of the students in order to provide appropriate lessons for them

Multiple Intelligences

Multiple Intelligences Theory was introduced by Howard Gardner in 1983. According to Gardner (1983), the old method to measure the level of human intelligence, which is based on the IQ test is too limited. The definition of intelligence provided by Gardner (1983) is "An intelligence is the ability to solve problems, or to create products that are valued within one or more cultural settings" (Gardner 1983). Multiple intelligences proposed by Gardner (1983) accounted for nine domains of intelligence that are essential for the development of cognitive intelligence (IQ), emotional intelligence (EQ) and spiritual intelligence (SQ). Theory of Multiple Intelligences has a significant influence in education. At first, this theory consists of seven intelligences, but in 1999, two more intelligences were included in this theory. Nine domains in the Theory of Multiple Intelligences are: (1) Mathematical Logic, (2) Spatial/Visual Domain, (3) Linguistics, (4) Kinesthetics, (5) Music, (6) Interpersonal, (7) Intrapersonal, (8) Naturalistics, (9) Spirituality/Existentialism (Gardner, 2011). Mathematical Logic in the Theory of Multiple Intelligences has been applied in the Magic Math as its theoretical base. Students with high mathematical logic will demonstrate high interest in numbers, mathematic games and activities in the form of exploration. Teachers could make teaching more creative when teachers can identify the dominant form of intelligence possessed by the students. A variety of approaches and teaching strategies can be implemented in a classroom.

Howard Gardner (1983) defines a creative person as a person who from time to time seek to resolve the problem after problem, or trying to make something new which is useful in a particular field. Creativity is a lifelong trait. Creativity arises when someone does something for love of what he does. Normally, this creativity cannot be measured by a written test. Gardner asserts that to know if someone is creative is by observing his or her work for some time. How a person deals with a problem and how he or she solves it. From the observation, we can identify their creativity (Gardner, 2011).

Past Research

Action research was conducted by Hamzah et al. (2014) to assess the creativity of students in Polytechnic's Multimedia project . A total of 47 students, 21 students who took a Diploma in business management (e-commerce) from their cohort 1 and 26 students who are studying the same from their cohort 2. The findings indicating students' basic knowledge in using Adobe CS3 was very low, and they did not have skills in multimedia elements. Most students were not creative in producing multimedia projects. A visit to the National Film Board was made together with the development framework associated with the work of animation and constructive action reserach to overcome this problem. As a result this has been constructive action to increase students' creativity and confidence.

Mustapha and Abdul Rahim (2011) conducted action researches in a Malaysian Technical School which emphasized on to investigate problems faced by PKEE (Electric & Electronics Engineering) students in learning difficult topic about transistor, PBL (*Problem Based Learning*) was created in order to improve the understanding of students as well as to create the lessons as to be more meaningful and were based upon Kemmis and McTaggart Model (1988). The study also used Jigsaw method for the first and second rounds followed by the discussion tchniques in the third round, has found that the collaboration skills among the pupils were improved and the academic achievements also increased. Students' attitude towards PBL also becoming considerably positive. In the end, the students themselves told that they liked the collaborative work and the problem-solving activities (Mustapha & Abdul Rahim, 2011).

In their STEM study, Wallen and Shelley (2010) found that enrollment in STEM has improved but there continued to be concern over students retention in STEM majors, especially of women and minority students. The purpose of that study was to find the factors that affect students retention among STEM or non-STEM majors. Six-year cohort retention/graduation outcomes were predicted for all students in STEM and non-STEM majors, and were adjusted separately for whether students remain in,

or shift into or away from STEM majors. Long-term retention/graduation was predicted significantly by cumulative grade point average, financial need, aid (work-study, loan, and gift), gender, ethnicity, years living on campus, high school rank (HSR), ACT composite, out-of-state residence, and STEM status. For students starting out in non-STEM majors, six-year graduation/retention was also predicted significantly by learning community participation and whether the student switches to a STEM major.

Stohlmann (2012) conducted research and found that, quality Science, Technology, Engineering, and Mathematics (STEM) education is vital for the future success of students. Integrated STEM education is one way to make learning more connected and relevant for students. There is a need for further research and discussion on the knowledge, experiences, and background that teachers need to effectively teach integrated STEM education. A model for teaching integrated STEM education comprised support, teaching, efficacy, and material (s.t.e.m) was developed through a year-long partnership with a middle school. The middle school was implementing Project Lead the Way's Gateway to Technology curriculum. The s.t.e.m. model is a good starting point for teachers as they implement and improve integrated STEM education.

From various theories as well as the findings from previous research, it can deduced that teachers play pivotal role in the process of teaching and learning. Teachers who practice constructivism, students-oriented lessons are able to trigger positive impacts to the students. Motivation, interest, attitudes and the academic achievement results would improve when the students enjoy the lessons in the classrooms.

RESEARCH METHODOLOGY

This action research was adapted from Kemmis Model Mc Taggart (1988). The aim of this research was to examine the achievement of students in problem-solving skills and mastery of STEM Module 'MAGIC MATHS'. The students' achievement was measured using pre and post-test. Observation, reflection, and interview were used in every cycle. After the first cycle completed, researchers began the second cycle and made modification and improvement in teaching and learning activities. Then in the second cycle ─ the process of action and observation began. Kemmis and McTaggart (1988) model used action inquiry in a form of self-reflection conducted by the teachers in classroom situation with the aim to improve their teaching practices. McNiff (2013) explained that action research is an approach to improve or enhance the quality of education through changes that encourage teachers to become more aware of their own practices and to became critical of their practices and ready to change. Each loop in action research based on Kemmis and McTaggart (1988) contains the following measures:

Step 1- Reflection / Identification of the issue or probblem

Step 2- Plan

Step 3- Action

Step 4- Observation

Target Group

This study involved 17 Year 2 students in a primary school in Hulu Selangor, Malaysia. However, only 10 average and weak students were selected.

Research Implementation

In the implementation of this study, the teacher distributed the questionnaire to determine the interest of the students toward the mastery of multiplication tables, multiplication and division topics and thus the subject of mathematics itself. The teacher also made observation in the classroom during the teaching and learning. The findings of the preliminary survey found that Year 2 students were interested in mathematics and they felt learning mathematics was easy (71%) measured by items 1 and 2. A total of 59% of the students stated they could construct multiplication tables 2 to 5, while 41% of the students

cannot construct the tables (item 3). Most of the students (71%) did not like the conventional technique (item 4), only 29% of the students like it. Majority of the students (88%) asserted that they wanted to construct multiplication tables in a fun way (singing) and they also loved to see their teacher sing a song (items 5 and 6). A total of 65% (item 7) of the students always completed their mathematic homework and 59% of the students felt that division was easy (item 8). Regarding item 9, 48% of the students stated that the topic of multiplication was easy and only 35% of the students (item 10) asserted that they knew how to build multiplication tables and could apply them while as many as 65% of the students stated they did not know how to build and use the multiplication tables. To overcome the problem, the reseachers created MAGIC MATHS.

MAGIC MATHS

STEM Module 'MAGIC MATHS' is a tool to construct multiplication tables 2 until 5 by using infotainment technique which was designed to construct suitable multiplication tables based on Gardner's Multiple Intelligences Theory – mathematical and musical logics. Creative and innovative teaching is critical to make the lessons more enjoyable. According to Ainon and Abdullah (1997), creativity is a potential. The potential lies in each and every individual. Creative people are people who use potential confined in them. In MAGIC MATH, the elements of creativity and fun are embedded. Below are the steps for MAGIC MATHS construction beginning with Multiplication Table 2 until Table 5:

MULTIPLICATION TABLE 2

In order to build Multiplication Table 2, students are to sing 0, 2, 4, 6, and 8. The same rhythm is being repeated 0, 2, 4, 6, 8 and put at the right side. Students will sing 0, 0, 0, 0, 0 which is that 0 is uttered 5 times and continued with 1, 1, 1, 1, 1 where 1 is uttered 5 times and put at the left side. In reference to the pattern of the multiplication table, originally the teacher did not put the number 0 at the beginning of the multiplication table but in order to get the same rhythm, the numbers 0 are put by the teacher at the beginning so that the same rhythm will be resonated in each time the singing repetition is conducted.

MULTIPLICATION TABLE 3

The construction of Multiplication Table 3 begins with students to do three (3) vertical lines. Students will first sing the song in accordance to the sequence of the number 1, 2, 3, 4, 5, 6, 7, 8, 9 beginning from the first column up above. After that, the pupils will sing 0, 0, 0 where 0 is uttered 3 times 1, 1, 1 where 1 is uttered 3 times and 2, 2, 2 which is 2 is uttered 3 times and put at the left side to the right side of the numbers.

MULTIPLICATION TABLE 4

Multiplication Table 4 is constructed via the starting of singing 0, 6, 2, 8, 4. The same rhythm is repeated 0, 6, 2, 8, 4 beginning from the right side from the lower part, up above. And then, 0, 0, 1, 1, 2, 2, 2, 3, 3, 4 is sung and is put at the left side of the numbers. If one sees the numerical pattern at the left side, it is crystal clear that repetitions of first and second numbers occur, when the third number is uttered, there is no repetition of number occurring like the rhythm of the number beneath it.

MULTIPLICATION TABLE 5

For Multiplication tables 5, students sing 5, 0, 5, 0, 5, 0, 5, 0, 5, 0 which are that the number 5 and 0 are uttered 5 times and put at right side. After that, then it is sung 0, 1, 1, 2, 2, 3, 3, 4, 4, 5. If one sees the numerical pattern at the right side, all numbers are repeated except for 0 and 5.

The teacher used the pronunciation in English as the English pronunciation was easier to use. If one uses the Malay Language, the pronunciation is somewhat longer, for example the pronunciation for *nine* in English whereas in Malay Language: *Sembilan*. In this STEM Module of 'MAGIC MATHS', students were only to pronounce single digit numbers from 0 until 9 in comparison to the ordinary multiplication tables where students were to pronounce bigger numbers until 50 which derives from 1 x 50 = 50. To assist the students to solve questions involving multiplication and division, after doing the multiplication tables, students need to put the numbers at the left side to the answers in the multiplication table. In this way, not only that students were able to construct multiplication tables, but

they also knew how to apply them in order to solve multiplication and division questions. Table 1 shows MAGIC MATHS (Multiplication tables 2 to 5):

Multiplication table 2 Down (Right): 0, 2, 4, 6, 8 (2X) Down (Left) : 0, 0, 0, 0, 0, 1, 1, 1, 1, 1 Pronunciations (song): * 0, two, four, six, eight (2X) ** 0, 0, 0, 0, 0, one, one, one, one, one	** | * 0 | 0 0 | 2 0 | 4 0 | 6 0 | 8 1 | 0 1 | 2 1 | 4 1 | 6 1 | 8
Multiplication table 3 Beginning from left to right = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 From left vertical = 0, 1, 2, 2, 3, 4, 4, 5, 6 Pronunciation (song)= COUNT UP ONE, * one, two, three, four, five, six, seven, eight, nine ** 0, 0, 0, one, one, one, two, two ,two	** 0 3 0 6 0 9 1 2 1 5 1 8 2 1 2 4 2 7 *
Multiplication table 4 Up (right) : 0, 6, 2, 8, 4 (2X) Down (left) : 0, 1, 1, 2, 2, 2, 3, 3, 4 Pronunciation (song)= * 0, six, two, eight, four (2X) ** 0, 0, one, one, two, two, two, three, three, four	** 0 | 4 0 | 8 1 | 2 1 | 6 2 | 0 2 | 4 2 | 8 3 | 2 3 | 6 4 | 0 | *
Multiplication table 5 Down (right) : 5, 0 (5X) Down (left) : 0, 1, 1, 2, 2, 3, 3, 4, 4, 5 Pronunciation (song) = *five, 0 five times = five, 0, five, 0, five,0, five,0 five, 0 **0, one, one, two, two, three, three, four, four, five	** | * 0 | 5 1 | 0 1 | 5 2 | 0 2 | 5 3 | 0 3 | 5 4 | 0 4 | 5 5 | 0

Figure 2: MAGIC MATHS (Multiplication table 2 to 5)

Pre-test

The teacher also made a pre-test to assess the students' multiplication tables mastery level. All 17 students took the pre-test. However, the teacher only chose 10 students (weak and average students) in the class. Table 3 showed an analysis of the students' achievement in the class Year 2 Sunbeam.

* 10 students for intervention session.

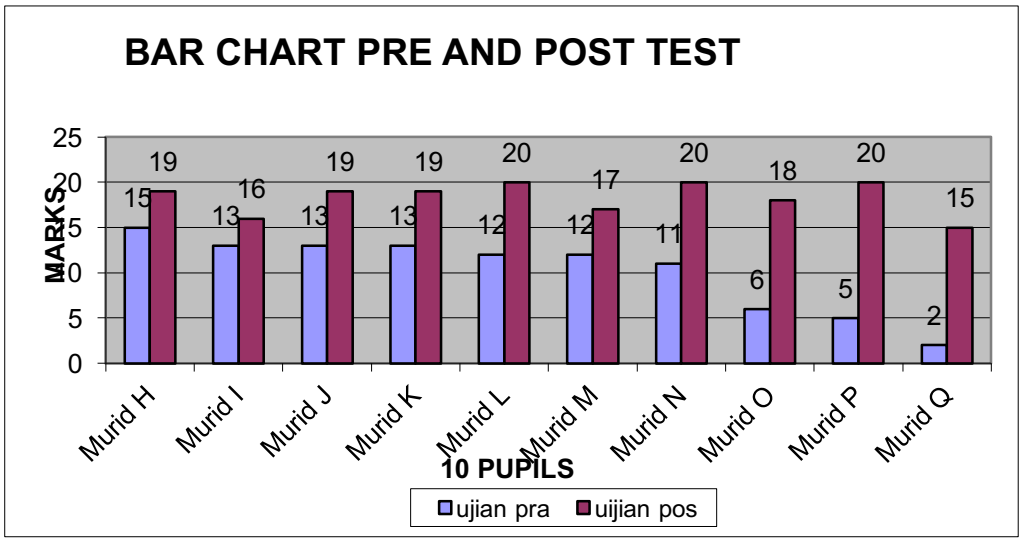
The criteria for the selection.

1. High : 16-20 marks
2. Average : 8-15 marks
3. Weak : 1- 7 marks

Table 3: Pre-test for Year 2 Sunbeam

No	NAME	Score (Pre-test)
1	STUDENT A	20/ 20
2.	STUDENT B	20/ 20
3.	STUDENT C	20/ 20
4.	STUDENT D	20/ 20
5.	STUDENT E	18/ 20
6.	STUDENT F	16/ 20
7.	STUDENT G	16/ 20
8.	STUDENT H	15/ 20 *
9.	STUDENT I	13/ 20 *
10.	STUDENT J	13/ 20 *
11.	STUDENT K	13/ 20 *
12.	STUDENT L	12/ 20 *
13.	STUDENT M	12/ 20 *
14.	STUDENT N	11/ 20 *
15.	STUDENT O	6/ 20 *
16.	STUDENT P	5/ 20 *
17.	STUDENT Q	2/ 20 *

Bar chart 1 showed a significant improvement for 10 pupils in a class of Year 2 Sunbeam. Overall, students could answer most of the questions correctly. Three students managed to obtain full marks (20/20). While one student who initially obtained 2/20 in the pre-test has scored 15/20 on the post-test. A substantial improvement by that student.



Bar Chart 1: Pre and post-tests

Observation activity 1

I observed that my students began to show positive reaction to constructing the multiplication tables. I also taught them how to sing while creating multiplication tables 2 to 5. Most of them were interested to use MAGIC MATH. Figure 3 showed the students could complete the multiplication tables in less than 3 minutes.

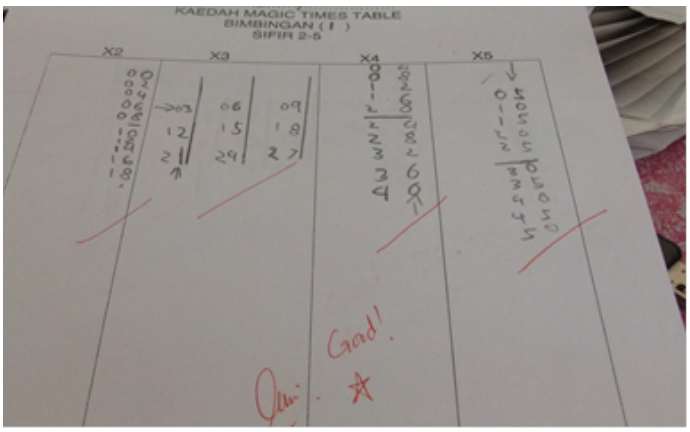


Figure 3: Multiplication tables 2 to 5

Reflection

I am very happy when my students can build multiplication tables (2-5). They not only can build the multiplication tables, they also know how to use them in solving multiplication and division questions. My students are more confident in learn mathematics, they are eager to learn how to construct multiplication tables and to solve mathematical problems.

Implementation activity 2

Exploration CD

Exploration CD was designed as an assistive tool to help the students to build the multiplication tables in a fun way. The aims of this exploration CD were to help pupils to sing the song, to construct the tables, and to solve multiplication dan divison problems. In the school's computer lab, the students were trained to use the CD. After knowing the basics to use the CD, the students could explore the CD by themselves. Furthermore, the teacher let the students to take home the CD so that they could explore more on their own. In a nutshell, the activities in the exploration CD were designed to strengthening the students' ability to construct the multiplication tables 2 to 5. The drills provided in the CD could assist the learners to sing the song while building the multiplication tables. My observation showed that the students could eventually solve the multiplication and division questions by practicing the exploration CD. Figure 4 showed the examples of the exploration CD in the MAGIC MATHS.

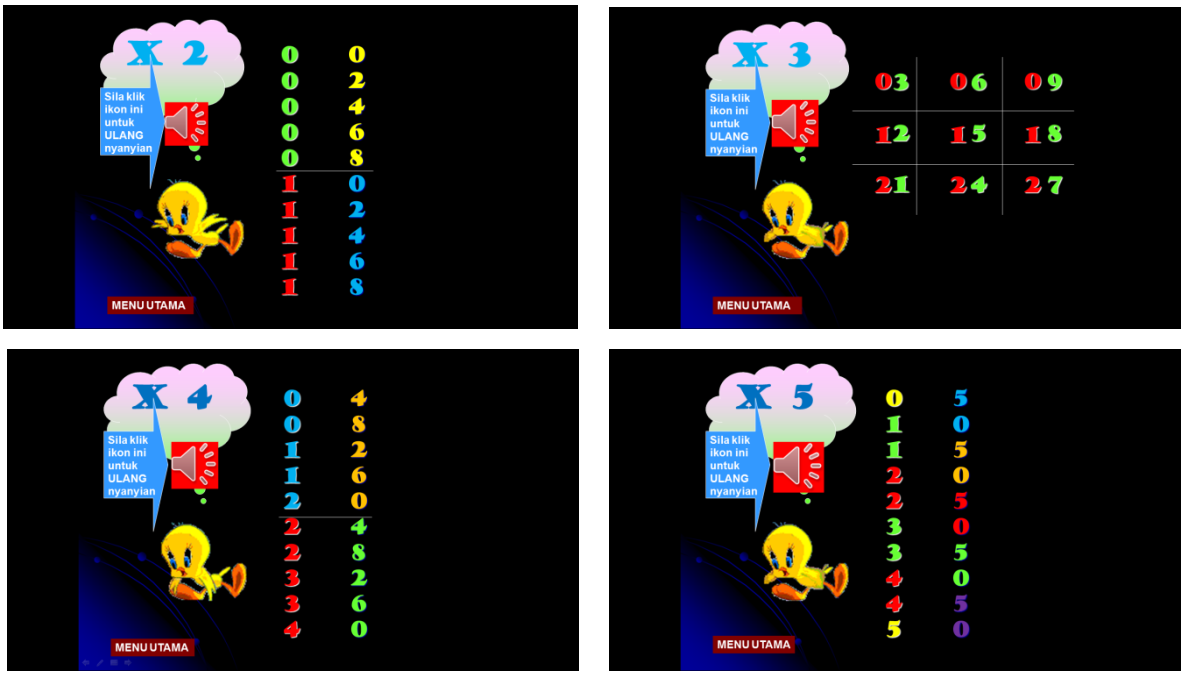


Figure 4: Examples of CD Exploration in MAGIC MATHS

Observation in activity 2

I found that my students enjoyed the exploration CD. They were very excited. For those students who were not yet able to memorize the songs, they could repeat the songs using the CD while constructing the multiplication tables. They learned how to build the multiplication tables and did the exercises to solve multiplication and division problems interactively. I saw that my students were mesmerized in singing while constructing the multiplication tables, especially when I was offering a gift or a reward for those who could construct the multiplication tables correctly. I saw that most of them were able to construct the multiplication tables in a relatively short period of time.

Reflection

I am happy and overly joy by looking at the development of my students' potential in learning mathematics. In addition, the students use the computers efficiently despite they have to share several students per computer because the number of computers in the computer lab is limited. Some students sing according to the rhythm on the CD and the other try the multiplication and division questions. I observe that my students are eager to try especially when I offer a prize to the students who successfully build the multiplication tables in shortest period of time. I am proud that that they are able to master the multiplication tables and they know how to apply the tables to solve multiplication and division questions.

CONCLUSION

The purpose of this study was to assess the effectiveness of a STEM Module 'MAGIC MATHS' in the mastery the multiplication tables for Year 2 students at a primary school. The study found that students in Years 2 were able to build multiplication tables 2 to 5 in a relatively fast mode and they knew how to apply them. Furthermore, students were able to solve basic multiplication and division questions. After the implementation of the MAGIC MATH, the weak and average students have started to show their ability to build multiplication tables 2 to 5 and they also knew how to apply them to solve mathematical questions. The primary students in the MAGIC MATH class have shown interest in learning mathematics through singing and they saw it as a fun learning. The STEM module MAGIC MATH was found to be effective in enhancing the students' multiplication competence. It was also observed that MAGIC MATH is fun and easy to learn. In MAGIC MATH, a variety of problem-solving techniques were used by the teacher to attract students' attention and interest to be involved in learning basic mathematics. By applying MAGIC MATH, it is hoped that the teachers could nurture students to use higher-order thinking skills (HOTS) and to excel in mathematics. The study also found that teacher's reflection was a critical element in helping the teacher to make continuous improvement in her classroom. As an implication, mathematic teachers should teach the subject in a creative and fun way because the subject is considered difficult and boring by most students. Creative and innovative pedagogy in teaching and learning (T&L) should be applied in order to attract students to learn mathematics.

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