

Bar Model Kit Innovation To Solve Hots Problem Solving Questions In Maths For Year 6 Pupils

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Abstract- This study aims to evaluate the effectiveness of using Bar Model Kit innovation for problem solving in Higher Order Thinking Skills (HOTS) questions in mathematical teaching and learning activity for year 6 pupils. The study involved 31 pupils from years 6 class at SK Bukit Bandaraya. The focus of the study is to examine the effectiveness using Bar Model Kit innovation to understand and answer HOTS questions for primary school pupils. This is a qualitative quasi experimental research without control group and the effectiveness of this method will be analyzed through the findings from pre and post-test questions, interviews and observations of the researchers in the actual classroom. Discussion of the findings of this study are based on pupils perceptions through interviews, result from the pretest and posttest also the observation in a real classroom. The results of this study findings been analyzed by using SPSS version 22 for pre and posttest results. The results of the pre and post show differences in average mean scores of 32.84 to 63.03. This finding shows that the Bar Model Kit innovation is effective for the pupils that can improve their understanding in order to answer HOTS questions.

Keywords: Bar Model Kit, Problem Solving, Higher Order Thinking Skills (HOTS)

I. INTRODUCTION

Innovation in teaching and learning is needed to discover new challenges in education. In order to achieve high aspirations in an environment of intense global competition, transformation is important in delivery of teaching and learning process (Nasarudin, 2014). Approaches and new strategies needed so that pupils are able to master the skills in line with the development of science and technology to meet the challenges of the 21st century. Mathematics education requires a changes or transformation in terms of purpose, content, approach and evaluation. As an educator, we need to do changes in method of teaching and learning to increase knowledge of our pupils in mathematics.

As a human being, we think spontaneously but it does not mean that our thinking is as effective as we think. When we teach pupils to think, we really mean that we want to improve the quality of their thinking. We want to teach them to think more deeply, more consistently, more productively, more effectively than they otherwise might.

Everyone is able to think on low-level thinking but proper exposure, adjustment, guidance and encouragement enable us to think at a higher level of thinking (Rajendran, 2017). Malaysia is competing globally in order to achieve a high aspiration in the global world, transformation in the field of teaching and learning. Focus should be given in new aspects of implementation and approach and strategy, so that individuals can master the skills needed to meet the challenges of the 21st century. Today the context of education world is extremely challenging, that the younger generation who are knowledgeable able to think critically and creatively are able to communicate effectively on a global level should be shaped by the education system in Malaysia (Marzita et. al, 2017).

Higher Order Thinking Skills (HOTS) application in teaching and learning not only meet the National Education Philosophy to produce a balanced and harmonious individual intellectually, spiritually, emotionally and physically, but also it is a humanitarian responsibility by teachers to pupils (Curriculum Development Centre, 2012). The role of teachers is very important in producing well-balanced pupils, accordingly, HOTS should be applied in all points of subjects. Therefore, mastery in HOTS is very important to be applied in learning and teaching in all subjects in order to prepare pupils to be able in dealing with complex life (The Examination Board of the Ministry of Education, 2013) and be able to have a high level of reasoning as well as helping pupils to answer questions with high-level thinking. In this current era, pupils are facing difficulty to understand and solve HOTS questions. Rajendran (2017) state that individuals can be trained to master thinking skills by providing systematic and continuous training. In other word, HOTS can be trained among pupils through a well-planned method. This can be achieved through a cognitive learning by associating new learning with existing schemes in pupils. Learning by memorizing without proper understanding does not help in learning for long term and in real live so much.

The Bar Model Method using Bar Model Kit Innovation plays an important role in the primary school mathematics curriculum in Singapore since it's introduced by the Ministry of Education in the 1980s. This method is an innovation in teaching and learning (Kho, Yeo & Lim, 2009), to address a national problem in the 1970s where pupils were not achieving basic numeracy skills and were not able to solve word problems sufficiently well. There are two main types of bar models. Pupils draw either the part-whole model or the comparison model to represent the quantities given in a word problem. By using this Bar Model Kit

Innovation, visual representation using this kit gives the pupils a better idea of how the known and unknown quantities in the word problems are related, making the understanding of word problems more accessible to pupils. This innovation can help pupils understanding of a problem in problem solving questions. Pupils can convert the problems to bar visualizations using the kit and get a clear understanding of problems given.

II. PROBLEM STATEMENT

The TIMSS International Results in Mathematics presents extensive information on student performance in mathematics, including trends over the five assessments since 1995. TIMSS also included are data on performance in the mathematics content domains and on competence in managing the problem solving challenges in these mathematical contexts. In addition, the TIMSS 2011 report contains vital information on key curricular, instructional, and resource-related factors that can impact the teaching and learning process. These data on student achievement trends and the contexts for teaching and learning mathematics will ensure that TIMSS continues to set the standard for studies of this type and be regarded as a fundamental source of information for educational policymakers, planners, and researchers alike (Hans Wagemake, 2012).

We have a huge gap in TIMSS for Mathematics compared to our neighboring country Singapore in terms of scores. Malaysia's average score in year 2003 was 508, in year 2007 was 474, in year 2011 was 440 and in year 2015 was 465. As for Singapore, average score in year 2003 was 605, in year 2007 was 593, in year 2011 was 611 and in year 2015 was 618, MOE Report (2016). In year 2015 Singapore ranked 1st place while Malaysia was not even able to achieve the average score which has been set.

Therefore, the teaching style of teachers in implementing HOTS for Mathematics is very important to train pupils to think in higher order. Tuan Salwani (2014) said that the ability to understand what is learned is the key to the success of the mathematical learning process. This clearly shows pupils understanding are very important in the learning process. An innovative way or technique is essential in mathematics teaching and learning in order to encourage pupils to learn and apply HOTS effectively. Visual plays a very important role in order to enable pupils to understand problem solving questions involving HOTS better and in deep (Azrul, 2017). Bar Model is a problem solving strategy using visualisation which will encourage pupils to learn effectively

III. RESERCH OBJECTIVE

This study is to determine whether using this Bar Model Kit Innovation can be an alternative method to solve HOTS question in Mathematics. The researcher also wants to investigate whether there is a change from negative to positive attitude of learning among the pupils.

IV. RESEARCH METHODOLOGY

This study was to examine the effectiveness of visualisation methods using this Bar Model Kit Innovation to resolve HOTS questions for pupils in year 6 DLP class in SK Bukit Bandaraya, Bangsar, Kuala Lumpur. To see the effectiveness of Bar Model Kit Innovation, experimental testing methods through pre-test and post-test without control group was carried out. There are five HOTS questions in the pre and posttest. The pretest need to be answered by the pupils before the Workshop using this Bar Model Kit Innovation for HOTS questions and the post-test is after the Workshop ends. The findings of the pre and post-test were analysed by using SPSS software version 22 to see the differences between the pre and posttests, the average changes and the average percent changes. Therefore, T test was used to analyse the data.

Observations made by the researcher with the help of two mathematics teachers during the workshop. The observation focuses on how pupils perform using this Bar Model Kit Innovation method to solve direct questions, problems solving questions and HOTS questions. Furthermore, the observation recorded in a video camera.

To complete the posttest, at the end of the workshop, an interview was conducted by the researcher with pupils. The purpose of this interview is to obtain the views of pupils on this method. The findings from these interviews were recorded and processed using Microsoft Excel software.

V. FINDING & DISCUSSION

Table 1 shows the findings been analyzed by using SPSS version 22 for pre and posttest results. The results of the pre and post show differences in average mean scores 32.84 to 63.03. Indicates the number of pupils involved in this study, which were 31 pupils from year 6 DLP class. This finding shows that this Bar Model Kit Innovation method was effective for the pupils.

TABLE 1. ONE SAMPLE T-TEST

Type Of Test	N	Mean	Standard deviation	T-value
Pre Test	31	32.84	8.198	22.303
Post Test	31	63.03	7.648	45.885
P=0				

From the observation, the researcher and teachers found that by using this Bar Model Kit Innovation, the pupils pay more attention in the topic discussed. The pupils enjoyed the lesson using the Bar Model Kits to solve mathematic questions. At the beginning, pupils had some problem to estimate the size of bar according to its values. Later, with more practices on direct questions, they were able to estimate values correctly.

From the interviews between the researcher and the pupils, the researcher noticed that majority pupils agreed that they enjoyed solving questions using this Bar Model Kit Innovation especially using bar model kits. Pupils prefer more time doing the questions with the kits given.

VI. CONCLUSION

As a conclusion, using this Bar Model Kit Innovation representative for HOTS questions affect pupils achievements. Pupils can convert problem questions to bar representatives and this gives a clear picture to the pupil to find the best solution for the questions. This innovation can attract pupil's attention and interest in learning mathematic and also to solve solving problem solving questions.

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