

A Case Report of Educational in 3D and 2D towards Primary Mathematics

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Abstract – Mathematics subject involve in daily life. Various materials consist of two-dimensional (2D) and three-dimensional (3D) form that exist in space and shape. However, majority of the primary students are unable to mastering the basic of geometry in Mathematics subject. Therefore, this research report was conduct to identify the effectiveness of using teaching aid to apply in classroom through ‘playing and learning’ session. As a result, ‘playing and learning’ process plus the help of using teaching aids shows more successful in mastering the geometry of 2D and 3D. Therefore, students could be able to remember more information when expose through experience of ‘playing’ in learning the Mathematics subject than having the memorization.

Keywords – 2D and 3D, playing and learning, teaching aid, experience, memorization.

INTRODUCTION

Mathematics is a subject that studies on quantity, structure, space and changes. From time to time, the mathematical experts are continuously experiment, studies, and produce varieties of formulae such as Trigo’s Law and so on. Including geometry, this topic are contained in Mathematics subject that compulsory need to learn by students especially in primary and secondary schools. It became important and evidence to human perspective due to the statistics geometry is being applied in every parts of daily life, for example architecture. The two-dimensional (2D) and three-dimensional (3D) is considering a sub-headings topic in geometry mathematics and students need to master the topic because the geometry have ability to trains the student to ‘make reasoning and thinking logically’. However, majority students in the developing countries like Malaysia are still ‘fail’ to mastering this topic. A research study conducted by Zawani[8]found that

students in standard four are still unable to identify the characteristics of 3D shapes. This situation could be occurs due to the failure of teachers to use appropriate methods and strategic in delivering teaching and learning or ‘Pengajaran Pembelajaran’ (PDP) related to this topic [4] [5]. Nevertheless, there are various methods and strategies can be applied by teachers during the process of PDP for the geometry topic in mathematics [6]. According to Gardner [3], every individual has a range of intelligence, but the used and application will be different way for everyone. Hence, teachers need to identify the intelligence possessed by students in order to plan appropriate activities of PDP by using appropriate strategies.

Based on the general literature review indicate that there are similarities and differences of strategies used in teaching on the topic of ‘space’ and ‘form’, where the article focuses on the students’ understanding on the topic by itself and not by memorizing. One of the strategies used is self-discovery, where students need to explore the content of education by themselves. For example, identify the 3D features, students should know either the features found on a 3D form or *vice versa*. It became more effective when teacher at surrounding to guide the students. At the same time, teacher will have the ability to use teaching aids to attract the students to change their mindset towards mathematics that are considered difficult and boring into more interesting and more fun. However, these method used are vary according to the level and content that will be taught to the students.

OBJECTIVES OF THE STUDY

The case study conduct to report on the access of possibility in applied 2D and 3D in educational process in Mathematics subject in primary school. Based on specific model and formula that be applied into primary students, mastering Mathematics subject will be defined

and if necessarily, an innovation towards formulae will be conducted to facilitate with the students to mastery the Mathematics.

METHODOLOGY

The research applied qualitative approach, which using observation study towards standard 1, 2 and 3 in primary school. Only five (5) students are selected from good class, moderate class, and weak class. The students will undergoes pre-post-test, where they will be tested to define the 2D shape (refer as pre-test) before the teacher guide the students to determine the correct shape. Afterwards, the students will be tested again for 3D shape (refer as post-test), where examination study are conducted to define critical thinking of the students level. Collection of the raw data will undergoes for descriptive analysis and correlated with the previous model and concept in evaluate the student's achievement.

RESULTS AND DISCUSSION

A study conducted by Zawani[8] related to the characteristics of 3D form entitled "Application of Domino game in Improving Comprehension Pupils in Year 4 of the characteristics of Form 3 Dimensions" is a method of 'playing while learning'. Domino cards become the learning aid where each card will only has one information either the shape of 3D, specific characteristics of 3D or the names of 3D shape. Student will play together with other partners, where they have to identify the characteristics of the 3D shape and place it at the cardboard that have the same characteristics. If the card that students holding does not match with the cardboard, then the student will lose the chance to put the domino cards. With this method, students can learn better because they can learn indirectly, and the experience of 'playing while learning' will leave a longer impression on the memory of the student.

The advantages of this research study is to identify the cause of student that are unable to capture the characteristics of the 3D shape leading to the majority of teachers in schools are still use the traditional strategy of memorization. This situation still exists because the traditional method used had saves a lot of time and much help to focus on more important topics. However, this method gives a negative impact where it reduces the students' interest towards mathematic and felt it was boring. Through the 'playing while learning' method can nurture students' interest in learning and students will strive to explore the content of education with the guidance of a teacher. Indirectly, it can

enhance students' understanding on the characteristics of 3D shapes and students have the ability to correct the mistakes made by the other friends. According to Brock et al [1], 'playing while learning' may provide opportunities to children through the restructuring process, new discoveries, the construction of knowledge and concepts. Lastly, students are also can re-learn the 3D-specific features through the 'playing while learning' method. However, there are little weakness where teachers are compulsory in make sure the students can identify and well knows for all the names and the main features on the 3D shapes such as surfaces, corners and edges. This is important because when playing cards domino students need to know which cards can be placed in the game so that the game runs smoothly.

According to Ozerem [4], where he indicates about misconceptions that often occur in geometry and suggested how to resolve the issues and problems in "Misconceptions in Geometry and Suggested Solutions for Seventh Grade Students". The method apply by using 'scarfolding' or known as guidance, where the students were able to master the skills at a certain level, the teacher will assign a higher level to be achieved by students. Firstly, the students will try to reach that level by itself. If students are unable to reach that level, then the teacher should give guidance to students by providing more or less the same questions but quite easier to let students to understand the concept in its own way. Thus, it will be easier for students to master these skills. In addition, the use of teaching aids is also important because it can help students to understand something more abstract and will leave a longer impression. According to Gal and Linchevski [2] states that children prefer to visual material compared with writing materials in classifying and identifying shapes studied. Therefore, the use of teaching aids is very important in the study of space and shape. This method will allow teachers to plan activities that are more concentrate in student-centered and materials and creating opportunities for students to explore about space and form.

The advantages of this article stated by researchers that every mistake made by the students during the exams are need to be carefully identify and determine on how to resolve these errors. The method applied is to give guidance to students. Various learning aids that used as 'mauwujud' (model 2-dimensional and 3-dimensional), training, information technology and so on. After researchers identify the errors and factors, the researchers carefully analyze every mistake made by the

students and suggest appropriate teaching methods to overcome the problems encountered. Each problem using different methods and strategies to overcome such as lack of understanding for the concept of geometry, the study recommended the use of 'mauwujud' in learning sessions and training. The method used is student-centered and materials which teachers should help students to understand the concepts of geometry such as edges, corners, angles and so on. With increasing exercise can help students to get used to answering questions and find out the types of questions that are commonly asked. In a way, the students can understand more through exercise made and such methods can help teachers to overcome misconceptions in resolving questions related to the geometry and can also avoid the negligence occurred. To overcome the problem of using wrong formula, the researchers propose to use materials that can manipulate 'mauwujud' by students. For example, searching for cuboid area, teachers can provide a large cuboid and lots of small cuboid. Teachers can plan activities with manipulated by finding the area through having students to fill in the small cuboid into large cuboid, then counting the number of small cuboid that placed in big cuboid. Next, the teacher can make a comparison between the use of formula with findings of the inquiry. In this way students will understand how are the wide (broad) formula define and it allows students to understand on their own way. The weakness in this study was researchers did not elaborate on the example of the error in more detail and how to develop teaching strategies for more advanced stage.

According to the article written by Vincent Snipes and Pamela Moses [7] said that local cultural can be influences on teaching about the concept of how to find the area where the geometry of the cube is different from place to place. The author gives examples of how carpenter calculating in forming a rectangular area in the production of furniture in different countries despite the carpenter does not know the reasons and did not learn it directly. The method applied in the teaching of geometry for the title to facilitate students' understanding of geometry is primarily attributable to the rectangle with square sides. Teaching strategies in delivering the content and the form of the space is to use the findings of the inquiry strategy where students are not told how to make a rectangle using only a piece of paper and identify the characteristics of a rectangle on its own.

The advantages of this article are students need to conduct research on the formula that will be studied. In

this article explains how teachers plan activities across a broad form of 2D and having a question-and-answer session with the students. Through a question and answer session, the students are able to know and understand on its own way on how formula of an area could be found. Then, the teachers will be introduced to more about how to find the area for other forms (or shape). This method helps students take responsibility for their own learning and trying to understand the meaning of a concept rather than having memorization. The author also said modifications can be made in teaching according to the objectives to be achieved, particularly in terms of the properties of the rectangle itself. In addition, the authors also describe the teaching methods for finding an angle of 90 degrees. The method used is also the same as the invention of the inquiry where students have to carry out a study in order to understand about a 90 degree angle. This is particularly important as the introduction of something abstract angle is compared with the area and perimeter of 2D shapes. However, there are many students that still do not understand what is meaning of the angle. Teaching strategies of 2D and 3D shapes for each country is different, and this can be connected by the local culture. So, it is important to make the link between the real situations with mathematical formulae because students will find it easier to understand compared to just memorize the formulas that did not mean for them. With this invention inquiry strategy will enable students to better understand and effectively. By the way, the researchers are still opinion that the 'local culture' plays an important role and will affect teaching methods in mathematics of space and form. The weaknesses of this article are the author not specifically elaborates on how the teacher introduces students to a wide angle and student learning outcomes or results. This article is focused on the influence of local culture on learning geometry.

Classroom Teaching Activities About 'Space and Form' For Lower Primary Students (Standard 1, 2 and 3).

Time: Required 60 minutes (Approximately 1 hours)

Field: Space and Geometry

Title: Space Standard Content: Identify the form of three-dimensional (3D)

Standard Learning: Students able to name the shape of cuboid, cube, cone, pyramid square, cylindrical and spherical.

Teaching Aids: Mauwujud (can, boxes, balls,

dictionary), model of 3D form (cuboid, cube, cone, pyramid square, cylindrical and spherical), powerpoint slide

Elements across the curriculum: Thinking skills, Entrepreneurship

Phase	Measures	Note
Introduction Set (5min)	1. Several type of 'mauwujud' (cans, boxes, balls and dictionary) put on the table and the students make observations 2. Students are guided to other examples that have the same design with 3D objects are shown.	BBB: -Cans -Boxes -Balls -Dictionary Question: -Where can you see this form? EMK: Thinking skills
1 st Step: Introduction (15 min)	1. Model and name of the 3D display on the table. 2. Students are selected at random to categorize mauwujud material with a 3D model together. 3. Students are guided to recognize the names of shapes and 3D features.	BBB: -Cuboid -Cube -Cone -Pyramid Square -Cylinders -Sphere
2 nd Step: Group Activities (20 min)	1. Students were divided into groups. 2. Each group is given a 6-piece drawing 3D shapes and a manila card which has recorded the name of these forms (Appendix 1). 3. In groups, students must affix the 3D image with the correct name. 4. Each group presented the results of their work.	BBB: -Image of 3D form -Manila cards listed the name in the form -Gam EMK: Entrepreneurship
3 rd Step (13 min)	1. A picture is display on the white screen. 2. Students have to seek other forms of 3D hidden in the image and name of the form. 3. Students will be randomly selected to answer. 4. Worksheet distributed to students.	BBB: -Power point slides -Work sheet
4 th Step: Valuation (5 min)	1. Students will be randomly selected to match the 3D shape of the form. 2. If there are errors corrected promptly.	BBB: -Power point slides
Conclusion (3 min)	1. Students are guided to express the content of the lessons learned today with a question and answer.	-

*EMK means Elements Across the Curriculum, BBB means Teaching Aid.

The strategy used in this daily program is student-centered and the materials allow students to explore on their own about the content of lessons to be learned by them on the day. With the use of 'mauwujud' in real life, this allows students to correlate between the actual situations with the situation in the classroom. The inductive approach creates opportunities for students to

observe and interpret and generalize by what they saw. Through a set of activities designed, the induction allows students to express other objects they know. Indirectly, the students must make observations on the characteristics of the object which can help to makes interpretation available to address other objects that have the same characteristics. Finally, students should make generalizations by declaring the object. Indirectly, students can explore science by itself as intended by the National Education Philosophy (FPK).

The use of 3D model allows students to touch and feel and knowing the model of itself features on the 3D model such as the vertices, edges, surfaces and others. 3D models can help students to understand the meaning of vertices, edges and surfaces with a twist. For example, vertex is referring to angle while the side is referring to a straight line on the 3D model. By applying this methods, it will help students to understand more accurately and widely because when explain by using 3D drawing, students will have difficulty in understanding all the features of 3D due to its abstract. Activities Step 1 enable students identify their own characteristics that are 3D models and facilitate students to understand the contents to be conveyed by teachers through exploration strategy.

Activities in step 2 are test students' understanding after the session PDP delivered. This activity requires students to understand the characteristics of the given and then match the corresponding 3D image. Group activities allow students to wisely guide the weak students in mastering the topic through the learning skills. Next, step 3 requires students to explore the 3D then stated the characteristics. In this way, students will have opportunities to learn while playing where they firstly have to find (referring as playing session) then tell the characteristics of the (referring as learning session). This method of learning while playing can help students to remember longer on the features in 3D and imagine the shape. This activity can attract students to scramble to respond.

Furthermore, the assessment was carried out indirectly, where teachers will select students randomly to express the features on the 3D model that being shown. Such assessments can provide feedback on the session of PDP conducted to assess the efficacy of whether students have mastered the skills taught or otherwise. The strategy applied in step 4 is more concentrate on teacher-centered event especially when students are giving the wrong answer, the teacher must correct immediately. For final session, the teacher asked the students to express what they have learned during

the class conducting and students will be able to draw conclusions and provide appropriate examples.

CONCLUSION AND RECOMMENDATION

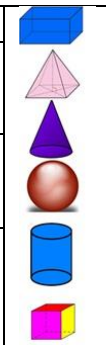
As conclusion, teaching strategies are very important especially in delivering the PDP for the topic of space and form because it is something more abstract compare to the other subject. This topic involves in many elements including 2D, 3D, perimeter, area, angle and so on. If the students could be able to understand the topic by its own and this will have given an opportunities to the students to solve the questions related to geometry when they face the questions.

LIMITATION

Since the research report is conducting in a small quantity of respondents, the results are reliable for this observation study based qualitative approach. However, this research report will be more supportive in the accuracy and precisely when conducting the quantitative approach through questionnaire.

APPENDIX 1: Example of Exercises in Identity 3D

Attach Pictures Correctly	
Cone	Cuboid
Cube	Pyramid Square
Cylinders	Sphere



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