

## Effectiveness of Division Wheel in Basic Mathematics Operation Case Study: Primary School Perspective

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**Abstract:** Mathematics is important in everyday life. Mathematics involve with the concept of addition, subtraction, multiplication, and division. Advance topic in mathematics may cause students to experience difficulty catching up with the syllabus, especially as a majority primary students are not able to understand basic concept of division. Therefore, this research study has been conducted to determine the effectiveness of 'division wheel' in mathematics division operations. The target for sample size is 400 respondents involving only standard five in between excellent, moderate and poor classes. This research study involves a questionnaire using the Likert scale, while the analysis used is descriptive analysis. A test will be carry out before (pre-test) and after (post-test) teaching method using 'division wheel'. Pre-test analysis shows majority male respondents have poor achievement, while female respondents have moderate achievement. After applied the 'division wheel', there are increasing numbers for excellent and moderate achievement for male respondents and excellent for female respondents after taking post-test. Questionnaire results shows that the majority of students prefer to use 'division wheel' as concrete material in learning process. 'Division wheel' had helps students understand the concept of basic division operation and confident to answer question properly without teacher's help. Students start to love doing mathematics especially divide questions. In conclusion, the 'division wheel' has become a new method in mastering the concept of division.

**Keywords:** Advance, syllabus, understand, confident, mastering.

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### I. Introduction

Mathematic is a core subject in every school levels until university, because skilled workers apply basic mathematics in everyday life (Adnan and Zakaria, 2010). It has become evidence that mathematics is very important and should be studied by all students at school. However, majority of the student in the country are still unable to mastering the Mathematics very well (Ismail and Awang, 2008). Due to modernization, the curriculum of mathematics syllabus is always changing and advancing, while the government has to undergo some changes especially the teaching methods from traditional to modern where this may allow the students will understand the concepts with distinctive way (Mahamad et al., 2010). In general, traditional methods are an effective approach in strengthening the ability of the student in making an algorithm calculation. However, the traditional methods are unable to train students to think critically and conceptualize the relationship between mathematics in everyday life problems with mathematics problems in the form of words (Zanzali and Azlan, 2007). On the other hand, modern methods may provide an opportunity for students to explore and create a relationship between the actual situations with the situation given by the teacher. By doing so, the government has devised various education policies and long-term plan to improve the quality of education in Malaysia as Teaching and Learning of Science and Mathematics in English (PPSMI) (Heng and Tan, 2006), Standard Curriculum for Primary Schools (KSSR), Education Development Plan (MECC), and so on.

Through the teaching experience at some schools finding that most of the students do not master the basic operations (add, subtract, multiply and divide) very well because they are unable to understand the concept meaningful. These students will face some problems when studying for a higher level or further topics, as most of the mathematics related questions require students to mastering the basic operations. Based on a research study, most of students experience difficulties in the operating topic due to failure in memorizing the multiplication tables (Bugelski, 1956). Thompson (1999) stated that students unable to empower the topic of division operation due to problem in calculation which knows as "long division" that requires memorization of multiplication tables. This situation will cause the students to feeling bored in studying Mathematics, leading them assume that mathematics are a difficult and boring subject (Idris et al., 2007). According to the National Numeracy Strategy, teachers should encourage students to explain how they solved the mathematical questions so that teacher will know the students status on the understanding of the concepts that are being taught (Reyset et al., 2012) (Ismail, 2009). Therefore, it is important to know the students' difficulties issues in mastering the concept of division and help to improve students' proficiency in division operations.

The main focus in this case study is the problem of mastering the basic concepts of operation. Therefore, this research study has been conducted to determine the effectiveness of division wheel in helping poor students to master the concepts of division operation. This occurs because the teachers are only concerned with memorizing multiplication tables method in solving mathematical problems involving division operations. If students are unable to memorize their multiplication tables, this means that they will find difficulties in solving math questions. This problem will become worse if it is not treated immediately at early stage, because the syllabus of the Primary School Curriculum Standard (KSSR) mathematics emphasizes the skills of students in master basic operation such as addition, subtraction, multiplication and division. Owens (1993) stated that average students are only able to understand that division should repeat the subtraction process; however, since they are not exposed to the previous method by using the concrete material, this definitely will cause the students to unable to link both parts of this operation. This situation will happen to the poor students in mastering multiplication will struggle to solve math questions which are involving the division operation and assume that mathematics is a difficult and dull subject (Lim, 2009). Thus, this will affect the level of student achievement in mathematics, which is considered as an important subject in the education system worldwide. According to an experience teacher, Khatiminet al. (2013), students need a lot of drills and practice. The uses of teaching aids can be manipulated so that the students can understand well what they have learned with their own ways which will have a positive impact. Indirectly, the students became more interested in learning mathematics and increased their confidence in solving the basic mathematics operation.

## II. Methodology

In this research study, the method used to collect data involves quantitative methods, namely using a questionnaire to receive the information. This questionnaire is divided into two parts, which is part A and part B. Part A involves with the respondents gender and achievements in mathematics, while part B will be involve in determine of the effectiveness of students in mastering the concept of division through using concrete material. In this case, questionnaire that set for part B will be in Likert scale form, which can be divided into Strongly Disagree (SD), Disagree (D), Less Agree (LA), Agree (A), and Strongly Agree (SA). The Likert scale questionnaire will be distributed after having the post-test examination. The aims of pre-test and post-test are to evaluate the skills and knowledge of respondents in mathematics subject held before and after conduct the interventions which involving the use of concrete material (in this case, referred to as the division wheel) in solving a given mathematics problem. The purpose for both tests was to evaluate the effectiveness of the division wheel in helping the respondents to solve the division operation problem. Each test is only contains 10 questions for pre-post test which involving mathematics divides operation without remainder and with remainder. However, the questionnaire that set for Likert scale is only having 8 questions, which only involve with close-ended questions. The sample size for this research study is 400 respondents (Krejcie and Morgan, 1970), and only involves standard five students. Meanwhile, the selection students for this research has been randomly chosen for three different classes, which is the excellent class, the middle class, and the poor class. The analysis that involve in this research study is descriptive analysis.

**Table 1: The standardized grade of achievement using in the country**

Mark	Grade	Achievement
80-100	A	Excellent
60-79	B	Modest
40-59	C	Pass
20-39	D	Failed
0-19	E	Failed

Source: Ministry of Education Malaysia

## III. Result and Discussion

### Analysis of respondents' gender and achievement

**Table 2: Respondent's gender and achievements in mathematics subject.**

Gender	Level of Achievement			Frequency
	Excellent	Moderate	Poor	
Male	18 4.5%	66 16.5%	166 41.5%	250 62.5%
Female	24 6%	73 18.25%	53 13.25%	150 37.5%
Total	42 10.5%	139 34.75%	219 54.57%	400 100%

According to the analysis in table 2 showed the respondent's gender for standard five students in a primary school. A majority of students involves in this research study were male at 62.5%, followed by female with 37.5%. Among the students, there are only 42 respondents or 10.5% that have an excellent result with grade A or B (table 1); while moderate achievement possess 139 respondents or 34.75% referred to as grade B or C (table 1); and the last showed poor results with 219 respondents or 54.57% with a grade of C, D, or E (table 1). Although the numbers of respondents for gender are not the same, when compared between male and female, this situation shows that the percentage of females reaching excellent and moderate achievement is greater than that of males, while a majority of students suffering from poor achievement is male. The probability factors contributing to inequality excellence achievement is due to the role of family (in terms of financial problem, divorce, etc.), the role of school (in term of learning environment, facilities, etc.), and the role of students (in term of behavior, interest, and so on). However, these results shows that randomly selection of students is appropriate because the main purposes in conducting this research isto determine the effectiveness of division wheel in helping poor students to master the concepts of division operation. At the same time, this method also helps to reduce the percentage of poor grade students and increase the percentage of excellent grade students the in mathematic subject.

**Analysis comparison of pre-test and post-test**

**Table 3: Comparison of pre-test and post-test result based on percentage**

Gender	Pre Test			Post Test			Different between Pre and Post Test		
	Level of Achievement			Level of Achievement			E	M	P
	E	M	P	E	M	P			
Male	23 5.75%	78 19.5%	149 37.25%	38 9.5%	84 21%	128 32%	15 3.75	6 1.5%	-21 -5.25%
Female	39 9.75%	85 21.25%	26 6.5%	51 12.75%	79 19.75%	20 5%	12 3%	-6 -1.5%	-6 -1.5%

\*Remarks – E means Excellent, M means Moderate, P means Poor.

Table 3shows the analysis of comparison between pre-test and post-test, and the different between pre-post test.From the result of pre-test indicate that majority male respondents are located at the level of poor achievement with the total of 149 students, and most of the female respondents are located at moderate achievement with 85 students. The main reason for these results is because most of the students are not able to mastering the basic divide and 'fail' to memorize the method in solving using the "long division". After the exposure of learning process by using the 'division wheel' methods, a test will be conducted (referred to as post-test) to assess the level of understanding in basic mathematical concepts by using the same question that used during the pre-test. The result provided in post-test is very impressive. The number for poor achievement in male respondents is reducing from 149 students to 128 students, where there are improvements in the level of moderate (from 78 students to 84 students) and excellent (from 23 students to 38 students) achievement. On the other hand, the resultsfrom female respondents show that there are some reducing students in poor achievement (from 26 respondents to 20 respondents) and moderate achievement (from 85 respondents to 79 respondents), but the number for excellent achievement is increase from 39 students to 51 students. According to the different between pre-post tests, the male respondents increased by 15 students in excellence achievement and 6 students in moderate achievement; meanwhile,the female respondents are increased by 12 students in excellence achievement. This result shows an improvement for students in standard five, which proved that the 'division wheel' is able to improve the students achievement from weak to moderate and from moderate to excellent, and allows them successfully to understand and master the basic concept of mathematics, rather than memorizing the methods in solving "long division".

**Analysis of the effectiveness of students in mastering the concept of division through using concrete material**

**Table 4: Questionnaire survey evaluation after post-test**

Category	Frequency				
	Strongly Disagree	Disagree	Less Agree	Agree	Strongly Agree
I like to use memorization method to apply when solving long division.	153 38.25%	147 36.75%	77 19.25%	23 5.75%	-
I can understand with teacher's teaching in solving the divide operation.	-	-	24 6%	276 69%	100 25%
I can understand the concept of basic divide operation by only listening to teacher's explanation.	-	-	13 3.265%	198 49.5%	189 47.25%

I can solve all questions involving basic division operation.	-	-	-	258 64.5%	142 35.5%
I confident that can answer all question properly.	-	-	28 7%	105 26.25%	267 66.75%
I confident that I can solve all questions without teacher's help.	-	36 9%	22 5.5%	107 26.75%	235 59.75%
I like to do Mathematics exercise which involve divide operation.	-	-	57 14.25%	234 58.5%	109 27.25%
I like Mathematics subject.	-	-	-	132 33%	268 67%

The results from table 4 shows the questionnaire survey evaluation after the post-test is carried out in determine the effectiveness of students in mastering the concept of division through using concrete material. Majority students are very dislike to memorize the methods to apply when solving the divide operation (38.25%). Due to this reason, it is possible to state the student's achievement is very weak and poor in the mathematics subject (table 2). However, after undergoes with the 'division wheel', most of the students started to love mathematics subject (67%). This can be proven when the teacher is guiding the students to work together when solving the question involve with divide operation (69%). Therefore, at this point, it is important for a student to understand the concept of basic divide operation (even the students are only listen to the teacher explanation) (49.5%) rather than having memorizing the method of solving. Once the students are understand the basic concept of division operation, they will try to solve all the basic question (64.5%) and this will instill the confidence attitude (66.75%) when answering the question properly especially in the mathematical examination. Moreover, such a confident attitude will help the students to answering the question without any help and attention from teacher (59.75%) and the students will enjoy carrying out mathematics exercises which involve division operations (27.25%).

Based on the questionnaire survey analysis, it may be concluded that the use of "division wheel" can help respondents to complete the questions underlying operations divided by the method of "long division" and allow respondents to remember instead of memorizing multiplication tables which were no meaning for them. At this point, teachers will play an important role to teach the students by using accurate and appropriate methods such as the use of the 'division wheel', by adopting friendly methods (examples like mother and children), creating an interesting learning environment (such as rewards when answering the quiz correctly and quickly), and encouraging the students to communicate more (such as encouraging students to ask questions when they do not understand). At the same time, the learning environment is also important to contribute as one of the factors to affect the students. For examples, a shortage of chairs, tables, and books (including text books and exercise books) will prevent the students from studying well. In addition, a lack of facilities like blackboard or computers and fans will restriction and disruption the learning process between teacher and students. The situation worsen when the learning space (refer to the capability to move in class room) is narrow due to many students remaining within a class. Therefore, both of these factors have to change in order for students to have interest and excited to learn mathematic and other subjects in the school.

Apart from the factors in the school (referred to as internal school factors), other factors that outside from the school (referred to as external school factors) also play an important role in determining the student's achievement in the mathematics subject. Among the external factors are the role of parents and the role of students. According to the standard hour of schooling in this country is between 6 to 7 hours per day. So, if parents suffer from financial problems, this will put a lot of pressure to the students. For example, a lack of money to buy food during the break or recess time will disrupt the student in the learning process. Therefore, parents should solve this problem wisely so that their children can study in peace. Besides financial problems, parents' divorce problem is the bigger issue in the role of family. This is because the collapse of the family will cause a deep negative impact on students, especially during growth. For example, if one of the parents issolely taking care for their children, this will cause the children to feel a lack of love in the family. This condition definitely will affect the children. Hence, both parents should find the way to solve this problem rather than putting this burden to children to become victim of divorce case.

#### **IV. Conclusion**

This research study has achieved its objective in determining the effectiveness of division wheel in helping the students to master the concepts of division operation. The analysis has shown that the result can become an evidenced to the improvement of student's achievement in mathematic course. The result indicates the positive impact on the respondents after the intervention implemented. However, student achievement cannot be improved with application of 'division wheel' method when the students is having problem with the factors that mentioned above. Therefore, reduction in the factors and strengthening the method used of 'division wheel' will surely help the students and increase the grade of mathematics subject in the schools. Last but not

least, the 'division wheel' is a new method to reduce the difficulties issues of students' in mastering the concept of division and help to improve the students' proficiency in division operations.

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