The relationship between influence factors (perception, knowledge, interest) and mathematics performance of primary students in a national school in Malaysia

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***Abstract*: The role of mathematics is vital for everybody and in many fields. However many students regard it as tough, and they hate it. Therefore this study would like to identify the performance of primary school students in mathematics. It is also to determine the relationship between influence factors (perception, interest, and knowledge) and performance. 110 students from a national school in Shah Alam, Selangor joined this study. The questionnaire used to collect data, and it contains three parts, includes 26 Likert-scale for influence factors questions and 20 multiple choice questions as well 10 essay questions for performance which adapted from the UPSR syllabus. SPSS 20.0 uses to analyze the data. Meanwhile, descriptive statistics, normality, correlation, regression, and ANOVA use to test the data. Findings showed the students had a moderate perception, interest, and knowledge however low in term of performance. The result also shows a significant correlation between influence factors and performance as well as a significant correlation between knowledge and performance. Finally, the regression model proved that the perception, interest, and knowledge could use as an indicator in learning mathematics.**

Index Terms: Key Words: Perception, knowledge, interest, mathematics, performance, primary students, Malaysia

INTRODUCTION

Mathematics is essential irrespective in any fields; science, management, business or social sciences. As we move to the Industrial Revolution (IR) 4.0, where the use of automation as central to economic development and sustainability of a country, therefore the role of Mathematics becomes more critical than before. However, in Malaysia, like most of the others developing countries, the mathematics performance of students still weak and it is far from international standards, such as Program for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TMISS). PISA graded Malaysia in the bottom third, ranking 52 out of 65 countries. Meanwhile, TMISS ranked it as low to medium achievement and placed Malaysia 18th out of 39 countries.

The core presentation principles of PISA or TMISS is the superiority of scholars, it climaxes on the use of perilous intellectual in resolving difficulties. TIMMS splits the presentation into four levels, with the uppermost is a progressive yardstick, it evaluates the capability of scholars to apply and motive in a variety of problematic conditions, solve linear reckonings, and make oversimplifications. Beside able to solve a variability of fraction, quantity, and percent difficulties and validate their assumptions. Scholars can use their information of symmetrical figures to solve a wide variety of difficulties about the area. Finally, scholars establish the considerate of the denotation of medians and can solve problems concerning probable values. Temporarily, the low yardstick means scholars have some information of whole numbers and basic graphs (TIMMS, 2017). The benchmark bases on bloom taxonomy; level 1 -3 considers Lower Order Thinking Skills LOTS) meanwhile level 4-6 Higher Order Thinking Skills (HOTS).

To overcome it, Malaysia develops with education blueprints 2015 – 2025, aims to be in the top third of countries in international assessments (TIMMS and PISA) within 15 years (MOE, 2017). Subsequently, ministry education introduced critical thinking elements in new KSSR (Primary School Standard Curriculum) which is parallel with TIMMS and PISA standards. Hence, more HOTS questions include in UPSR (year six assessment), means that more critical thinking, problem-solving questions over time, the 'how' and 'why,' and which (Rajaendram, 2018).

KSSR tested in UPSR 2016, the result, overall students' performance declined sharply. It was only 4,896 (1.1%) scored straight as, compared to 38,344 or 17.7% in 2015 (The Star Online, 2016). Teachers accused that KSSR shortchanged and the instructions were a blur and existed of grey areas as they felt that they left in the dark (G. Surach, 2017). However, the UPSR 2017 results show some improvement, the students achieving nearly doubled with 8,958. Nevertheless, the slower compare to UPSR 2015.

Mainly students face difficulty in problem-solving questions, such as difficulties in the understanding the keywords, unable to figure out what to assume and what information from the problem, tend to guess the answer, and lastly they do not like to read long problems (Phonapichat P, Wongwanich S, and Sujiva S. (2014).

There are many reasons for poor performance in mathematics, as Dapaah Addae B and Darko Agyei (2018) found that the attitude, confident, interest and perceived usefulness concerning mathematics. Finally Lei Mee Thien and Mei Yean Ong, (2012), studied of 5197 and 5546 15-year-old Malaysian and Singaporean students, indicated that the Index of economic, social, and cultural status (ESCS), mathematics self-efficacy, and mathematics anxiety have significant effects on mathematics performance in Malaysia and Singapore at the student level.

This study focus on the variable factors (perception, interest, and knowledge) as the influence of student's performance in mathematics. Thus, some questions raised are: what are the performances of students in mathematics; is there a relationship between variable factors (perception, interest, and knowledge) and student performance in Mathematics? How strong is the relationship between variable factors and student performance? Is the relationship linear? To answer this question, it is necessary to investigate the relationship between variable factors and performance in mathematics.

11. LITERATURE REVIEW

Performance of Students in Mathematics

Malaysia, like others country, moves towards globalization and automation, hence Mathematics is crucial to sharp the students critical thinking. However, many students claimed that mathematics is the problematic subject (Sue Thomson, 2013). Furthermore, the overall performance of Malaysian students mathematics is still weak and far from satisfaction. TIMMS 2015, revealed only 1.7% the Malaysian students achieved excellent performance level, the majority is only able to answer the lower level question. Furthermore, TIMMS ranked Malaysian students 465; it was far from our neighbor country Singapore was 621 (Gurney G 2016).

In PISA 2015, Malaysian students scored 411 below of PISA performance standard (500). Again, still far behind others countries such as Singapore 656, Taiwan – 620, and Thailand -416. It confirmed by Salim F, Ahmad A, Waini and Miswan N H (2017) study on 165 first-year students in the Faculty of Engineering Technology who took the Mathematics Competency test upon entering the university at the beginning of their first semester found 84% of them failed.

To make it the matter worse, the students' have a negative attitude toward mathematics due to feeling anxiety and fear of mathematics. Sa'ad TU; Adamu A.; M. Sadiq A, (2014) alleged it was because of inadequately qualified teachers, poor teaching methods, insufficient teaching materials, as well as overcrowded classes. Isack M (2015) who studied of the 4 secondary schools, 8 mathematics teachers and 60 students, blamed poor teaching environment, not well-managed mathematics departments, inadequate self-practice and students' poor background as the factors poor mathematics performance. Bed Raj Acharya (2017), said teachers were the failure to the linkage between new mathematical concept, anxiety, negative feeling of mathematics, besides poor of school and assessment system. Finally, Safiyeh and Ali (2014) and Masitah Shahrill, (2015) suggested that math extra curriculum activity in class will improve the students' performance in mathematics.

2.1.2 Students' Interest in Mathematics

Interest plays a crucial role in the increases performance of the students, especially in mathematics. However, the literature shows that many students claimed that they lack interest in learning mathematics, added that the mathematics is difficult, boring, not very practical, and very hard to understand (A. Azmidar, D Darhim, and J A Dahlan, 2017). However, (F. Muhamad, 2018) said that interest could cultivate it through the process of teaching and learning, support of the structure of the school, as well as back from the family. Nevertheless, O. Philia, (2018) found Nigerian students' interest in mathematics was high. They believed that mathematics is a rewarding and necessary subject which can assist them in their future career development. Finally, Schiefele, U.; Schreyer, I. (2012) indicated that 30% of the performance inconsistency in Mathematics due to lack of interest and motivation.

Students' Knowledge in Mathematics

Knowledge in Mathematics is vital to stimulus students in achieving a higher performance towards Mathematics. Lack of knowledge contributed to poor performance of mathematics among the students (Zeidmane A, Paed, Rubina T. 2017). The study by Lapinid (2015) found out that students' knowledge in mathematics mainly in the foundation level only not on advanced mathematics such as applying the formulas, properties, theorems and solving the problem and it is due to teachers (Kim, 2013). Teachers confidence, competence, attitudes and beliefs as well as their expectation and experienced in Mathematics was support of student knowledge (Brian Hudson, 2015). Jürgen Baumert, (2017) point out that teacher's content knowledge, and pedagogical content knowledge correlates with student knowledge in learning Mathematics. Finally, Alreshidi, N. A. (2016) concludes that problem-based learning teaching strategy significantly improves students' knowledge application.

Students Perception in Mathematics

Perception towards mathematics is crucial in improving students performance, and positive perception is the key of score mathematics (Mariam Setapa, 2016). The factors influence students in mathematics were knowledgeable lecturer (Mariam Setapa, 2016) and learning environment (Yang, 2013). However, the perception of the students tends to change as their semesters go up (Peter R. Johnston, 2016). His indicates that the performance of mathematics can improve through enhancing positive perception towards mathematics (W. Anne, 2013).

III. RESEARCH METHODOLOGY

The respondents of this study are 110 of year six students from a national school in Shah Alam, Selangor, Malaysia. They divided into three classes; which is A (best), B (medium) and C (lower) level of class. The questionnaire used to measure the performance of the respondents and divided into three main parts; section A represents respondents' demographic information, section B, influence factors, which consist of three features that impact students' performance, they are - perception, interest, and knowledge. It measures by using a five-point Likert scale ranging from 1- strongly disagree 5- strongly agree. Meanwhile, section C measured by using 20 multiple choices and 10 subjective questions. For the knowledge and performance question items constructed a base on mathematics UPSR curriculum as advised and validated by Mathematics teacher. Finally, SPSS 16 used to analyze data, meanwhile descriptive statistics, and correlation, and regression analysis used to test the data.

IV. FINDING

Profile of Respondents

The gender composition of the respondents more less similar which is 53.64% female and 46.36% male with the majority race is Malay (97.27%), and only 2.73% was Indians and none of the Chinese students. 35.45 of respondents from A class, followed by B 32.73% and finally from C is 31.82%.

Performance of Primary students on Mathematics in a National School at Shah Alam, Selangor

The cross-tabulation result in table 1, revealed that performance mathematic as overall was low to medium. Only 22 out of 110 students categorize as high performance, and 20 of them from class A. Class B and C only managed to have one person as high performance, a majority of them falls under low performance. Finally was almost all C class or 88.6 % (31out of 35) group in low performance.

Table 1: Performance in Mathematics by Class

		Performance			
		Low Performance	Medium Performance	High Performance	Total
Kelas	A class	3	16	20	39
	B class	27	8	1	36
	C class	31	3	1	35
Total		61	27	22	110

Performance level of influence factors and overall performance

In order to identify the performance level, the performance data computes into three level; they are 1= low; 2= medium and 3 = high. Next, the following formula used to identify the mean score of each influence factors that contribute to the overall performance of students in mathematics. $\sqrt{\frac{\sum(X-\overline{X})2}{(n-1)}}$ Where X = each score, $\overline{X}$ = the mean or average, n = the number of values and $\sum$ = mean sum across the value. The result in table 2 indicated that the mean score of influence factors are moderate; perception (M = 2.2091), interest (M = 2.0182) and knowledge (M = (2.1818) were medium, however, mean score for performance was low (M = 1.6455).

Table 2: Descriptive statistics of students' variable factors level and Performance Level

	N	Minimum	Maximum	Mean	Std. Deviation
Variable factors: Level_Perception	110	1.00	3.00	2.2091	.62215
Level_Interest	110	1.00	3.00	2.0182	.59016
Level_Knowledge	110	1.00	3.00	2.1818	.65219
Level_Performance	110	1.00	3.00	1.6455	.79663
Valid N (listwise)	110				

Normality Test

The normality test was designed to test for the assumption of normality. As shown in figure 1, the plot tends to follow the straight line, therefore, the assumption of normality of the data required in the regression analysis fulfilled.

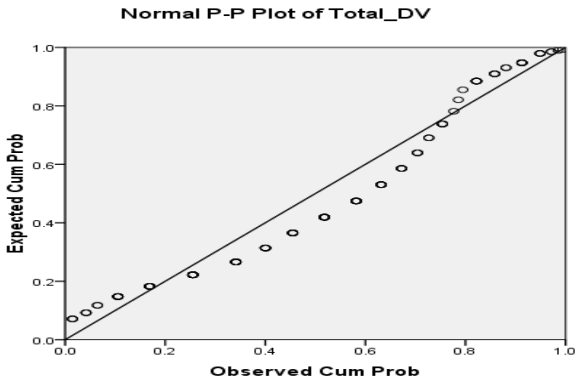

Figure 1: Normality Test

Correlation between influence factors and Performance

The correlation formula used in this study is $r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)2][N\sum y^2 - (\sum y)2]}}$ where N = number of pairs score, ∑xy = sum of the products of paired scores, ∑x = Sum of x scores, ∑y = sum of y scores, $\sum x^2$ = sum of squared $x$scores and $\sum y^2$ = sum of squared y scores. Table 3 shown that there is a significant moderate positive correlation between perception and interest (r = 0.455) as well knowledge (r = 0.438) however there is significant weak positive correlation perception and performance (r = 0.202). The significant strong correlation found between interest and knowledge (r=0.677). Based on the correlation coefficient and the p value, it can stated that the higher the variable factors, the higher the performance will be. The higher the students' perception, interest, and knowledge, the performance increases.

Table 3: Correlation between Variable factors and Performance

		Total_Perception	Total_Interest	Total_Knowledge	Total_DV
Total_Perception	Pearson Correlation	1	.455**	.438**	.202*
	Sig. (2-tailed)		.000	.000	.034
	N	110	110	110	110
Total_Interest	Pearson Correlation	.455**	1	.677**	.334**
	Sig. (2-tailed)	.000		.000	.000
	N	110	110	110	110
Total_Knowledge	Pearson Correlation	.438**	.677**	1	.504**
	Sig. (2-tailed)	.000	.000		.000
	N	110	110	110	110
Total_DV	Pearson Correlation	.202*	.334**	.504**	1
	Sig. (2-tailed)	.034	.000	.000	
	N	110	110	110	110

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

A relationship between Influence Factors and Performance

The regression analysis is used to model the relationship between a response variable and one or more explanatory variables. In order to develop a regression equation, SPSS produces two types of coefficients, i.e., standardized coefficients and unstandardized coefficients as presented in table 4.

Meanwhile, in order to identify the strength of the relationship between two variables using coefficient correlation the following criteria used:

Table 4: Criteria for the relationship between two variables using coefficient correlation

No.	Coefficient (r)	Relationship
1.	0.00 – 0.20	Negligible
2.	0.20 – 0.40	Low
3.	0.40 – 0.60	Moderate
4.	0.60 – 0.80	Moderate
5.	0.80 – 1.00	High to very high

Table 4 shows that the intercept is -4.965 and the slope is equal to 0.585. Thus, the regression equation that stated the relationship between knowledge and performance as follows: Performance = -4.965 + 0.585 knowledge. Increase 1 unit in knowledge; the performance will increase o.585 marks on average.

Table 4: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.965	5.342		-.929	.355
	Total_Perception	-.046	.197	-.022	-.232	.817
	Total_Interest	-.010	.172	-.007	-.056	.955
	Total_Knowledge	.585	.131	.518	4.453	.000

a. Dependent Variable: Total_DV

4.7 Regression Model

The model guided by the following hypotheses:

H0: two coefficients (slope and intercept) equal to zero

H1: two coefficients (slope and intercept) not equal to zero

Table 5 shows model regression with a value of F is equal 12.050, and p-value <0.001. The value of less than 0.05 shows that there is sufficient evidence to reject the hypothesis (H0). The null hypothesis tested in this study is two coefficients (slope and intercept) equal to zero. In other words, the coefficients do not equal to zero and can be used in the regression model.

Table: 5. Analysis variance of Regression between influence factors and Performance

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1408.187	3	469.396	12.050	.000[a]
	Residual	4129.086	106	38.954		
	Total	5537.273	109			

a. Predictors: (Constant), Total_Knowledge, Total_Perception, Total_Interest

b. Dependent Variable: Total_DV

V. Conclusion

Based on the results we can conclude that as overall the performance of students in Mathematics in this study is low to medium. In term of students interest, perception and knowledge of mathematics is medium, however poor for performance. The result indicates that there is a linear, positive and medium relationship between variable factors and the performance of students. Students with a high level of perception, knowledge, and interest are expected to succeed in their performance in mathematics. Also, there is a significant moderate positive correlation between perception with interest and knowledge. However there is significant weak positive correlation perception and performance, the significant strong correlation found between interest and knowledge. Therefore, the perception, interest, and knowledge can use as an indicator in learning mathematics.

In order to succeed in learning mathematics, the teaching and learning need to diversify. Teachers should change students perception on mathematics as the complicated and boring subject by increasing their interest through new teaching and learning styles by using four learning styles; mastery activity, understanding activity, self-expressive, and interpersonal activity as suggested by Harvey F. Silver, Ed Thomas, and Matthew Perini. Besides, The Contextual Teaching and Learning (CTL) approach to learn or to discover the concepts learned through the knowledge and experience of the students. Other suggestion is to strengthen their basic knowledge

mathematics (Sufyani Prabawanto, 2016). Another crucial area is the teacher, therefore higher level training is mandatory for mathematics teacher, they also should get pre and post-service training both in pedagogy and content mathematics. Hence, the requirement of passing the teachers training should be even rigorous than now.

Though, there are several limitations of this study such as it is only one school, it may not represent the performance of overall performance of primary students in Malaysia as overall. The second limitation is influencing factors only three factors, they are perception, interest, and knowledge, even though in reality there are many others factors contribute to students achievement in mathematics such as facilities, teacher or parents. Therefore it is recommended that future study may include many factors and schools, such as Chinese Schools, Tamil Schools or may include private schools.

However, this study gives significant to education stakeholders, mainly government, school, and teacher in planning and designing of improvement of teaching and learning in mathematics to primary students in Malaysia.

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