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The Relationship between Students' Personality and Their Achievement in Solving Mathematics Higher Order Thinking Skills Questions

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ABSTRACT

This study identifies the relationship between the personality traits and achievements in solving the mathematics HOTS questions of 254 Year Six students from three primary schools in Ulu Tiram. The findings from the personality questionnaire and the mathematics HOTS question paper were an-alysed. The findings showed that the main dominant personality traits of the students were the openness followed by extraversion, neuroticism and agreeableness. For the achievement in the HOTS paper, 61 students scored highly, 55 in the very high category, and the rest were in the very low, low and medium categories. The result of regression analysis showed that the predictor of the standardised predictive coefficient of the neurotic characteristic ($_{\beta}$ = −.132) was significant, while the correlation value of students' achievement and neurotic personality trait was 0.132. This showed that the relationship between students' neuroticism and their achievement in solving the mathe-matics HOTS question was very low. Therefore, only neuroticism out of the five types of personality traits contributed to the achievement of Year Six students in solving the mathematics HOTS ques-tion. Hence, the findings conclude that personality traits are not the main factor affecting the achievement of the Year Six students in solving mathematics HOTS questions.

Contribution/Originality: This study contributes to the literature of personality and achievement in solving mathematics higher order thinking skills question among primary school students particularly in Malaysia.

1. Introduction

Personality factor influences students' achievement and encourages learning (Wan Yusop, 2014). According to Mahyuddin (1995), attitude is an internal factor affecting student achievement and personality trait related closely to behaviour. Hence, personality is the content of internal factors that affect a person's achievement. Therefore, students need to have personality while possessing a higher level of thinking in order to progress not only in a challenging society but also globally. Studies have showed that attitude affected overall academic achievement including students' mathematics achievement (Hazrati-Viari et al., 2012). However, studies on the effect of internal factors on the personality and achievement of students in solving the mathematics HOTS questions are minimal. Therefore, the focus of this study is the effect of personality traits on the HOTS in mathematics among primary school students.

2. Literature Review

2.1. Personality Traits

People's personality traits differ and contribute to their level of mastery. According to Azizi and Shahrin (2008), that personality is a dynamic organisation associated with a person's psychophysical system for adapting to the environment. According to Abd Rahman (2010), personality refers to the characteristics based on the Five-Factor Traits Theory (Big Five Personality). This theory explains personality based on five dimensions. The Five-Factor Traits Theory is produced based on the Five-Factor Model. This model is the result of the formation of combined lexical and statistical approaches. Psychologists Allport and Odbert introduced these two approaches. They identified 17,953 trait items and classified them into four parts which are stable, temporary, social and metaphorical assessments. Then, factor analysis and cross-cultural studies identified the formation of the Five Traits Factor. Finally, the Five-Factor Personality Traits was formulated by Jeff Mc Crace and Paul Costa (Abd Rahman, 2010). The five dominant individual personalities are divided into five basic attributes based on the OCEAN concept: (O) Openness to experience: openness; (C) Conscientiousness: has awareness; (E) Extroversion: has a social nature (likes to mingle); (A) Agreeableness: have the same opinion (easy to reach agreement), and (N) Neuroticism: has a neurotic nature (encounters emotional disturbances).

2.2. Higher Order Thinking Skills (HOTS)

HOTS refers to the abstract intellectual operation process which can be classified into four types of thinking, namely inferential, critical, creative and a combination of thinking skills such as problem-solving and decision-making (Salandanan, 2009). Brookhart (2010) identified three major categories in defining HOTS which consists of transferring, critical thinking and problem-solving. The Curriculum Development Division (CDD, 2014a) states that HOTS is the ability to use knowledge or methods to solve the problem creatively and, innovatively and thus create a new dimension based on the knowledge that has been learned. HOTS involves the analysis of information to identify and evaluate problems and

later creates a new solution which is part of the teaching and learning process (Chidozie et al., 2014).

According to the Examination Board (2013), in the 1950s, Benjamin Bloom developed a taxonomy comprising six levels of thought development from easy to advanced and challenging levels which were knowledge, understanding, application, analysis, synthesis and evaluation. Benjamin Bloom's student, Lorin Andersen improved the Bloom's Taxonomy in the 1990s by changing from the use of the noun to the verb which was remembering, understanding, applying, analysing, evaluating and creating. According to the Curriculum Development Division (2014b), HOTS includes skills such as applying, analysing, evaluating and creating according to Anderson's Bloom taxonomy. This revised edition is aimed at the development of the 21st-century learning which is emphasised in education currently (Sharuji & Mohd Nordin, 2017). Learning using the HOTS assessment can effectively improve students' critical thinking skills in mathematics as it enhances their understanding of mathematical concepts. This is because HOTS involves issues that require decision-making skills. Students have the freedom to solve problems in different ways. This situation requires students to use different thinking skills. HOTS trains students to inject new ideas into existing strategies or create a new problem-solving strategy (Widana et al., 2018). According to the Examination Board (2013), HOTS refers to cognitive skill assessment items by applying knowledge in a new situation for problem-solving, analysing by breaking the idea into components to understand the relationship between components, evaluating to make decisions and create new ideas and approaches.

Looking at mathematics achievement in Malaysia, in the Programme for International Student Assessment (PISA) 2015, mathematics Malaysia received 446 points, which is an increase of 25 points from PISA 2012 (Organisation for Economic Co-operation and Development, 2018). Malaysia was ranked 57 out of 74 countries in the PISA 2015. However, Malaysia was still below the average point of 496 for the Organisation for Economic Co-operation and Development (OECD) and the international average point of 458. Meanwhile, Malaysia ranked 22 out of 43 countries with 465 points in Trends in International Mathematics and Science Study (TIMSS) 2015 (Mullis et al., 2016). The fifth TIMSS cycle in 2015 reached its fourth highest performance since TIMSS 1999. Despite an increase in points, Malaysia's performance was still at the low-level benchmark and was below the TIMSS average score. The low achievement of mathematics subjects in international tests such as PISA and TIMSS is due to the poor application of HOTS among students although thinking skill was introduced in the Integrated Secondary School Curriculum (KBSM) and the Primary School Integrated Curriculum (KBSR) as early as 1994 (Abdul Rashid, 2016).

The most direct approach to measuring the effectiveness of HOTS implementation is through the UPSR result and performance. The Examination Board (2013) stated that the percentage of HOTS questions would be increased to 80% of the total questions in the UPSR 2016. Given this, considering the effect of the HOTS implementation on UPSR 2016, 113 schools comprising 40.07% of the schools were in good and excellent levels. One hundred sixty-nine were below the good and excellent levels of 59.93% based on the examination of the HOTS learning rating (Badd, 2017). This meant that less than half of the schools achieved a satisfactory HOTS level in the year 2016. Looking at the UPSR 2017 results, there was an increase of 1.6% for the candidates in mastering a minimum level from 66.5% to 68.1%, while for candidates who could not achieve the minimum level of mastery for at least Grade E, showed a decrease of 0.9% in the year 2017 compared with 2016. Overall, the UPSR results in 2017 were an improvement on the results in the year

2016. However, the increase was slightly less than significant. Hence, based on the improvement percentage, this change did not make a significant difference to the percentage of 40.07 schools that were good and excellent compared to 59.93% of schools under the good and excellent HOTS level in 2016. This indicates that less than half of all schools achieve satisfactory HOTS proficiency

2.3. Personality and HOTS

Personality traits are closely related to students' academic achievement (Hassan et al., 2005). This is because the personality trait represents a stable characteristic for an individual that provides guidelines for improving the effectiveness of students to regulate their learning activities (Caprara et al., 2011). Marcela (2015) and Köseoğlu (2016) found that different learning strategies and personality traits affected the students' academic achievement. Different learning strategies and personality traits affect their academic achievement (Ghani et al., 2010; Jensen, 2015). Rotter (1966) explained that success depends on one's personality. Personality is related to learning that will help, stimulate, encourage, and support students to strive for excellence and success as they are confident to be able to control events that occur in their lives. With such beliefs, these individuals have the initiative to strive and set goals for themselves.

3. Methodology

This is a quantitative study that adopts the survey research design. A total of 254 (48% male and 52% female) Year Six students from three primary schools in Ulu Tiram responded to the personality questionnaires and mathematics HOTS Questionnaire Papers. Most were Chinese (96.5%), Malays (1.6%), and Indian (2.0%) aged 12 years. Referring to Table 1, 438 students from school A, 269 from school B and 41 from school C took part in this study.

Table 1: Number of Respondents from Three Primary Schools in Ulu Tiram, Johor

No.	School	Number of Year Six Student	Total Student
1	A	438	
2	B	269	748
3	C	41	

The personality questionnaire was a five-factor personality test item (Big Five Inventory) developed by John, Donahue and Kentle in 1991 (John et al., 1991). This questionnaire contained Part A on respondents' demographics while Part B was related to personality traits. This personality test had 44 items that examine students' personality traits from five dimensions which were openness, conscientiousness, extroversion, agreeableness, and neuroticism. It then examined their relationship with achievement in solving the mathematics questions in the form of HOTS. A total of 16 items were in the negative category. The reliability of this test had been tested, and the reliability value of extroversion was 0.65, agreeableness was 0.71, conscientiousness was 0.65, neuroticism was 0.65, and openness was 0.75 (Abd Rahman, 2010). The test consisted of short questions that could be answered easily within a short time and respondents were happy to respond to the test. Questionnaires were scored based on a four-point Likert scale. The mathematics HOTS questionnaire was produced by the researcher and comprised eight questions based on the four top-level Bloom's taxonomy with two questions each for every level of mastery in HOTS, namely applying, analysing, evaluating, and creating (Curriculum Development Division, 2014b). This test included subjective questions and

required students to answer each item by writing answers in the space provided. The instrument specification table, scoring scheme and validity of an expert assessment were evaluated by three mathematics experts in education from the Head of Mathematical Committees in school to verify the mathematics HOTS questions. The test paper was checked based on the scoring rubric of the solution provided by the student to obtain their achievement data in solving the questions. Regression was used to analyse the data.

4. Findings

4.1. Descriptive Analysis Types of Students' Personality Traits

The data from the questionnaire were analysed to get the frequency, percentage, and descriptive numbers to identify personality traits. Referring to Table 2, 12 students possessed the dominant personality trait of extroversion (4.7%), only one student had the dominant personality trait of agreeableness (0.4%), no student in the personality trait of conscientiousness (0%), 10 students dominated personality trait of neuroticism (3.9%) and 231 students with 90.9% possessed openness.

Table 2: Frequency and Percentage Distribution of Dominant Personality Trait

Type of Personality Trait	Frequency	Percentage (%)
Extroversion	12	4.7
Agreeableness	1	0.4
Conscientiousness	0	0
Neuroticism	10	3.9
Openness	231	90.9
Total	254	100

4.2. Descriptive Analysis of Students' Achievement in Solving Mathematics HOTS Questions

The data obtained from the mathematics HOTS test paper were analysed using frequency and descriptive statistics and compared with score ranges to identify the students; achievement in solving the HOTS questions in Table 3. From the 254 students, 55 (21.7%) were in the very high achievement category with a score of 25 to 30. For the high category with a score of 19 to 24, there were 61 students (24.0%). Meanwhile, 47 students (18.5%) scored 13 to 18 and belonged to the medium category. In addition, 57 students (22.4%) in the low category scored 7 to 12. For the very low cate-gory, 34 students (13.4%) scored 0 to 6.

Table 3: Frequency and Percentage Distribution for Year Six Students' Achievement in Solving Mathematics HOTS Questions

Score	Category	Frequency	Percentage (%)
25 – 30	Very High	55	21.7
19 – 24	High	61	24.0
13 – 18	Moderate	47	18.5
7 – 12	Low	57	22.4
0 – 6	Very Low	34	13.4

Modified from Peng and Hamad (2018)

Based on Table 4, the mean score and the standard deviation of the HOTS Test Questions with a total of 30 marks were 16.79 and 8.178, while the median was 17. Meanwhile, the mode for the mathematics HOTS test questions with a total of 30 marks were 9 and 27. This meant that most students scored 9 and 27.

Table 4: Frequency and Percentage Distribution for Year Six Students' Achievement in Solving Mathematics HOTS Questions

Achievement of mathematics HOTS Test Questions (30 Marks)			
Mean	Standard Deviation	Median	Mode
16.79	8.178	17.00	9, 27

4.3. Regression Analysis on The Relationship Between Students' Personality Traits and Their Achievement in Solving Mathematics HOTS Questions

Regression analysis test was used to determine the significant relationship between students' personality traits and their achievement in solving mathematics HOTS questions. The predictor variable of neuroticism was included in the regression model with $p < .05$. The value of $p = 0.035$ indicated that the null hypothesis should be rejected, and the alternative hypothesis was accepted that there was a significant relationship between students' neuroticism and their achievement in solving the HOTS questions. The correlation between the criterion variable which was the students' achievement in solving HOTS questions and predictor variable of neuroticism was .132. The R2 value of .018 showed that there was a 1.8% (r =.132) change for the criterion variable which was students' achievement in solving HOTS question. This was due to the variance change in the predictor variable, neuroticism. This meant that the personality trait of neuroticism was the major factor for students' achievement.

The result of the ANOVA test in the regression model showed that multiple regression model formed by the criterion variable, the students' achievement in solving the mathematics HOTS questions and predictor variable, neuroticism was significant [$F(1,252) = 4.501$, $P < .05$] in Table 5. In other words, there was a significant correlation between neuroticism and the students' achievement in solving the questions at the significance level $p < .05$.

Table 5: Predictor Variable of Personality Trait Included in the Regression Mode

Predictor Variable		Neuroticism
R		.132
R2		.018
ANOVA		
Df	Regression	1
	Residual	252
F		4.501
Sig.		0.035

The significant result showed that the multi-regression model formed by students' achievement in solving mathematics HOTS questions and neuroticism could be generalised to the population as shown in Table 6. This model was represented by the equation below that describes the relationship between students' personality trait and their achievement in solving the questions. Students' achievement in solving mathematics HOTS questions = 18.364 -0.255 (neuroticism). The β value represents the standard

regression coefficient for the predictor variable in the form of linear combinations. The regression coefficient of predictor variable which was having significant neuroticism ($_{\beta}$ = -.132, p <.05) in p <.05 indicates that neuroticism was a factor for students' achievement in solving mathematics HOTS questions.

Table 6: Significant Result of Regression Model Formed by Predictor Variable and Criterion Variable

Coefficients		
Constant	Unstandardised Coefficients - B	18.364
	Sig.	.000
Neuroticism	Unstandardised Coefficients – B	-0.255
	Standardised Coefficients – Beta	-.132
	Sig.	0.035

Based on Table 7, the predictor variable of extraversion with a significance value of .387 indicated that there was no significance at p <.05 against the criterion variable in the linear combination. Therefore, the null hypothesis was accepted, and the alternative hypothesis was rejected where there was no correlation between extroversion and students' achievement in solving the questions. In addition, the small beta in value (estimated beta value when included in a multiple regression model) for extroversion was 0.54 leading to the use of stepwise procedures to exclude extroversion from the regression model. This meant extroversion was not included in the regression model. In addition, the partial correlation value for extraversion was 0.55 which showed that the correlation between the predictor variable and the criterion variable was not strong (<.70). However, the value of Collinearity Tolerance for extroversion was .994 which was much greater than the value of .10 (>.10). This value indicates that there was no multicollinearity problem for the study data.

The predictor variable of agreeableness which had a significant value .433 also showed no significance at p <.05 against the criterion variable in the linear combination. Therefore, the null hypothesis was accepted, and the alternative hypothesis was rejected where there was no correlation between agreeableness and students' achievement in solving mathematics HOTS questions. The small beta in the value of -.049 which was included in the multiple regression model for agreeableness caused the stepwise procedures to exclude it from the regression model. This meant that agreeableness was not included in the regression model. In addition, the partial correlation value for agreeable was -0.049 meaning that the correlation between the predictor variable and the criterion variable was not strong (<.70). However, the value of Collinearity Tolerance for agreeableness was .984 which was much greater than the value of .10 (>.10). This value indicates that there was no multicollinearity problem for the study data.

On the other hand, the significant value for the predictor variable of conscientiousness was .072 and showed no significance at p <.05 against the criterion variable in the linear combination. Therefore, the null hypothesis was accepted, and the alternative hypothesis was rejected where there was no relationship between conscientiousness and students' achievement in solving mathematics HOTS questions. The beta in the value of conscientiousness incorporated into the multiple regression model was -.118. Stepwise procedures rejected conscientiousness from the regression model because a beta of -.118 was too small. Therefore, conscientiousness was not included in the regression model. Furthermore, the correlation between the predictor variable and the criterion variable was not strong (<.70) due to the partial correlation value for conscientiousness was .113.

However, the value of Collinearity Tolerance for conscientiousness was .913 which was much greater than the value of .10 (>.10). This value indicated that there was no multicollinearity problem for the study data.

The predictor variable of openness also showed no significance at p <.05 against the criterion variable in linear combination with a significance value of .207. Therefore, the null hypothesis was accepted, and the alternative hypothesis was rejected where there was no relationship between openness and students' achievement in solving mathematics HOTS questions. The estimated beta value for openness .079 in the multiple regression model was too small. This caused the stepwise procedure to exclude openness from the regression model. Furthermore, the correlation between the predictor variable and the criterion variable was not strong (<.70) as the partial correlation value for openness was 0.080. However, the value of Collinearity Tolerance for openness was .990 which is much greater than the value of .10 (>.10). This value indicates that there was no multicollinearity problem for the study data.

Table 7: Predictor variable that was excluded

Model	Beta In	Sig.	Partial Correlation	Collinearity Statistics
				Tolerance
Extroversion	0.54	.387	0.55	.994
Agreeableness	-.049	.433	-.049	.984
Conscientiousness	-.118	.072	-.113	.913
Openness	.079	.207	.080	.990

Referring to Table 8, the standardized residual value showed a minimum of -2.169 and a maximum of 1.809 within ± 3.3. This meant that there was no extreme value (outlier) problem for the study data. Therefore, the extreme value conditions for conducting multiple regression tests could be fulfilled.

Table 8: Standardised Residual Value

	Standardised Residual
Minimum	-2.169
Maximum	1.809

The analysis showed that neuroticism ($_{\beta}$ = -.132, p <.05) affected student achievement in solving mathematics HOTS questions. It contributed 1.8% (r =.132, R2 =.018) variance in the students' achievement in solving questions [F (1,252) = 4.501, P <. 05]. In contrast, the other four predictor variables comprising extroversion, agreeableness, conscientiousness and openness did not affect students' achievement in solving HOTS questions. Hence, neuroticism was only variable predicting students' achievement in solving mathematics HOTS questions.

5. Discussion

Based on the descriptive analysis of the types of personality traits, students possess openness, extroversion, neuroticism and agreeableness. The most dominant personality trait was openness with 231 students (90.9%), extroversion with 12 (4.7%), followed by neuroticism with ten students (3.9%) and agreeableness with one person (0.4%). No student (0%) had the personality trait of conscientiousness. Based on the descriptive analysis of students' achievement in solving mathematics HOTS questions, the mean

score, median and standard deviation of the HOTS questions paper are 16.79, 17 and 8.178. Meanwhile, mode is 9 and 27. Sixty-one students (24.0%) are in the high category of the HOTS questions, followed by 57 (22.4%) in the low category and 55 (21.7%) in the very high category. Next, 47 students (18.5%) are in the moderate category, and 34 (13.4) are in the very low category. This shows that most of the students are in the high category in the achievement of solving mathematics HOTS questions, while the lowest number of students is in the very low category. However, by looking at the students' achievement in solving the questions, 116 students (45.7%) are in the high and very high categories. Meanwhile, 138 (54.3%) are in the very low, low and medium categories. More than half of the total number of students (54.3%) were in the low, very low, and medium categories.

Based on the regression analysis of the relationship between students' personality trait and the achievement in solving mathematics HOTS questions, the standard regression coefficient of neuroticism ($_{\beta}$ = -.132, p <.05) is significant p = 0.035 at p <.05, and as such it is the only trait included in the regression model. The results of the ANOVA test in the regression model shows significant results [F (1,252) = 4.501, P <.05]. In other words, there is a significant relationship between neuroticism and students' achievement at the significance level p <.05. The significant result of p = 0.035 indicates that the multi-regression model formed can be generalised to the population. The correlation between students' achievement and neuroticism is .132. Referring to the Table of Correlation Strength Classification (Yusoff et al., 2018), the correlation value of 0.00-0.19 indicates the strength of the relationship is very low. Thus, the correlation value of .132 in this study implies that neuroticism and students' achievement is very low. On the other hand, the R2 value of .018 indicates that 1.8% (r =.132) changes in students' achievement are due to the variance change in neuroticism [F (1,252) = 4.501, P <.05]. This shows that neuroticism is a personality trait affecting students' achievement.

Overall, extroversion, agreeableness, conscientiousness and openness are not only insignificant at p <.05 with the values of .387, .433, .072 and .207, they also have small beta values (estimates of beta when included in multiple regression model) of 0.54, -049, -.118 and .079, thus causing stepwise procedures to eliminate them from the model. This means the predictor variables in linear combination are not significant concerning students' achievement. Furthermore, the partial correlation value for all four variables of 0.55, -0.049, -133 and 0.080 indicates the correlation between each predictor variable and the criterion variable is not strong (<.70). This means the variables cannot be included in the regression model in the situation where the data has no multicollinearity problem. This can be demonstrated through Collinearity Tolerance values for all four variables with values of .994, .984, .913 and .990 which are much greater than the value of .10 (>.10). In addition, the standard residual value shows the minimum at -2.169 and maximum at 1.809 which is located within the ± 3.3 indicating the study data has no extreme value (outlier) problem. This fulfils the extreme value requirements for multiple regression test. Hence, the equation that explains the relationship between students' personality trait and the achievement in solving mathematics HOTS questions as follows:

Students' achievement in solving mathematics HOTS questions = 18.364 -0.255 (neuroticism)

The regression analysis model shows that for each unit improvement in neuroticism, the students' achievement is expected to decrease by 0.255 units. Students with high achievement in solving HOTS questions are expected to have low neuroticism. Students with high neuroticism will perform poorly in solving the questions. The findings are

supported by Pickering et al. (2016) who reject the findings of Perkins et al. (2015) that higher levels of neuroticism are associated with higher levels of creativity, particularly intellectual creativity and creative problem-solving. According to the Curriculum Development Division (2014a), HOTS is an ability to use creative and innovative problem-solving knowledge or methods to create new dimensions based on the knowledge that has been learned. According to Chidozie et al. (2014), HOTS involves analysing information to identify and evaluate problems, thus creating new solutions which should be part of teaching and learning. Thus, the level of intellectual creativity and creative problem solving presented in Perkins et al. (2015) is part of the HOTS which is applied in the teaching and learning of students.

The rejection of the findings from Perkins et al. (2015) can be proven by Power et al. (2015) which states that there is a weak relationship between artistic and neurotic creativity which has the risk of psychotic disorders. It should be emphasised that the creativity of this finding is specific to artistic creativity rather than intellectual creativity. Furthermore, this artistic creativity is only for those who have mental disorders rather than those who possess neurotic personality traits (Pickering et al., 2016). Therefore, Pickering et al. (2016) states that the findings from Perkins et al. (2015) are wrong and summarise that neuroticism discourages creative thinking. This means that high neuroticism does not contribute to the achievement in HOTS. On the other hand, low levels of neuroticism will encourage achievement in HOTS. This is in line with the findings of this study.

Based on the multi-regression analysis results, in conclusion, the researcher reports that only predictor variable of having neuroticism from the five types of personality trait is the factor in student's achievement in solving the mathematics HOTS questions with significant $p = 0.035$. On the other hand, four other predictor variables, namely extroversion, agreeableness, conscientiousness and openness are not a factor in the students' achievement in solving the mathematics HOTS questions. However, the personality traits of having neuroticism in students' achievement in solving the questions are very low ($r = .132$). Hence, it can be concluded that there is a very low inverse negative relationship between students' personality trait and the achievement in solving mathematics HOTS questions. Although extrovert students have different approaches to analysis, overall, they provide similar solutions regardless of the dominant personality traits possessed by the students in the mathematics HOTS questions. This shows that personality trait does not have major influence on students' ability to find solutions to answer the HOTS questions. Therefore, based on the findings of this study, researchers can conclude that personality traits are not the main factor contributing to students' achievement in solving the questions.

The findings of this study are supported by the findings of Razali (2011) which show that there is no significant correlation between the achievement of Form Four mathematics students and extroversion and neuroticism. The researcher concludes that students' personality traits are not a determining factor of achievement in Form Four mathematics students. The findings are also supported by the study conducted by Yahaya et al. (2005) showing that there is no correlation between personality characteristics of the Form Four students and the academic achievement of subjects in the PMR examination. The results of this study are similar to the study conducted by Abd Rahman (2007) which found that statistically, there is no significant correlation between personality traits and PMR achievement. According to Bujang and Yusof (2015), there is no strong or weak significant relationship between personality traits and academic achievement. Hence, the level of

academic achievement of future teachers will not be influenced by their personality traits. This is also supported by the study conducted by Mohd. Yunus and Mohd. Derus (2007) that there is no difference between personality traits for students regardless of high or low academic achievement. In other words, students' academic achievement is not an indication of their personality. Based on the findings of this study, the researchers conclude that the students' personality traits have a significant relationship with academic achievement. Therefore, it is recommended that teachers need not focus on the improvement of students' personality traits but pay attention to other aspects which affect their achievement in solving the mathematics HOTS questions such as efforts, encouragement from parents and getting help from lecturers.

According to Budsankom et al. (2015), the classroom environment, psychological state and intellectual characteristics of students have a direct impact on HOTS. According to Abu and Eu (2017), factors affecting the achievement of additional mathematics are the teaching style of teachers, and the interests and attitudes of students. From those factors, teaching style is the key factor for achieving good results. According to Surif et al. (2014), factors that influence whether students are interested in mathematics can be classified into external and internal factors. External factors refer to teachers and schoolmates, while internal factors refer to individual psychology. Goodykoontz (2008) examined external and internal factors which influence students' attitude towards mathematics. The external factors include teaching characteristics, teacher's characteristics, classroom characteristics, assessments, and achievements. The study of internal factors emphasized individual perception and learning attitude towards mathematics. Therefore, it is recommended that teachers must always take follow-up action by taking into account external and internal factors simultaneously to assist students in improving their achievement in solving the mathematics HOTS questions. In a nutshell, teachers must improve teaching and learning methods for a conducive classroom environment to attract and improve students' attitude to achieve in HOTS.

6. Conclusion

As a summary, the findings of this study are expected to give a clear picture of the relationship between personality traits and achievement in solving the mathematics HOTS questions. Based on the findings, personality traits are not a major factor contributing to students' achievement. Therefore, it is hoped that the results of the study can be used as a reference and guide to the MOE, schools and teachers to make appropriate follow-up action by taking into account the external and internal factors which affect the students' achievement. They can think of approaches, programmes or strategies that focus on other factors such as improving the teaching skills of teachers, making the classroom environment more conducive, arousing interest, attitude, psychological states and intellectual characteristics of students that affect their achievement. Such actions could improve students' achievements. It can also further improve the UPSR achievement in mathematics so that the present aspiration in Malaysia education to produce individuals with the HOTS skills to meet this challenging and competitive world can be achieved.

Ethics Approval and Consent to Participate

The application to conduct this study has been approved by the Education Planning and Research Division (EPRD), Malaysian Ministry of Education.

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Conflict of Interest

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