Analysing Primary Students' Performance in Hots and Lot Mathematics Questions According to Gender

Suffiah Jamel and Subadrah Madhawa Nair*
Faculty of Education and Liberal Studies, City University Malaysia, Petaling Jaya, Selangor, Malaysia

Keywords: HOTS, LOTS, Mathematics Test, Primary School, Gender, Malaysia.

Abstract: Many studies indicate that primary school students face problems in answering Higher Order Thinking Skills (HOTS) mathematics questions compared to Lower-Order Thinking Skills (LOTS). The objective of this study is to investigate primary school students' performance in answering HOTS and LOTS mathematics questions according to gender. A descriptive research design was employed in this study to collect quantitative data. The mathematics test was administered in the study and used to measure the students' performance in HOTS and LOTS questions. The sample of the study consists of 50 primary school students in Petaling Jaya, Malaysia. The data was analyzed using SPSS Programme for Windows version 25. The findings indicate that there is no significant difference between the male and female students in their performance for both LOTS and HOTS mathematics questions. However, this research only involves participants from one primary school, further research should include a larger sample for better generalization.

1 INTRODUCTION

1.1 Background of the Study

Higher Order Thinking Skills (HOTS) skills have been hotly debated since Malaysia joined PISA in 2009. The Malaysian government has decided to join PISA to evaluate and improve the country's education system. Many changes have taken place since Malaysia joined PISA. One of them is creating a new development plan. This is to produce a generation that thinks outside the box. They want to produce students that can think higher or commonly known as HOTS. HOTS is a thought process that required students to think outside of the box by manipulating information and ideas that have been given, making it a new approach and implications (Gunawan, 2012).The implementation of HOTS is a challenge for students and teachers in today's teaching and learning. The learning of school mathematics today is still far from high-level thinking skills (Aleksius, 2017). She added that all the HOTS skills questions in mathematics can only be realized if the learners are able to design mathematics learning well and more on the interwoven way of learning mathematics and apply mathematical knowledge in existing mathematical learning. This relates to the techniques of questioning and answering the questions during the lesson.

1.2 Research Questions

1. Is there a significant difference in students' mean score for answering LOTS mathematics questions according to gender?

2. Is there a significant difference in students' mean score for answering HOTS mathematics questions according to gender?

2 REVIEW OF LITERATURE

2.1 Higher Order Thinking Skills (HOTS) in Mathematics

High Order Thinking Skills (HOTS) or known as critical thinking is a process of thinking of students in a higher cognitive level that is developed from various cognitive concepts and methods and learning taxonomies such as the method of problem solving, bloom taxonomy, and the taxonomy of learning, teaching, and assessment (Aleksius, 2017).

Jamel, S. and Nair, S.
Analysing Primary Students' Performance in Hots and Lot Mathematics Questions According to Gender.
DOI: 10.5220/0012508300003792

In *Proceedings of the 1st Pamir Transboundary Conference for Sustainable Societies (PAMIR 2023)*, pages 811-814
ISBN: 978-989-758-687-3

Mathematics is an important subject to explore students' creativity because Mathematics is closely related to creative thinking. It plays an important and unique role in the development of students' creative learning. The fostering of students' creativity through mathematical activities is fundamental in the learning process. Based on the important role of classroom learning in the development of students' thinking abilities, it is necessary to explore further how teachers can systematically cultivate students' creativity in mathematics classrooms (Zhang et al., 2020). The identification of key competency indicators in mathematics is critical, as it may provide assessment opportunities that allow for early identification of and intervention for students most likely to be at risk for lagging in mathematics achievement. Even so, only a few studies have sought to investigate the relationship between certain preschool mathematics competencies and later mathematics achievement, and whether specific competencies are predictive of later mathematics achievement (Nguyen et al., 2016).

Problem solving skills have an important role in learning mathematics as an initial ability for students in formulating concepts and capital success for students in solving mathematics problems (Aleksius, 2017). Problem solving is a part of a very important mathematics curriculum because in the learning process and completion, students may gain experience using the knowledge and skills they already have to apply to non-routine problem solving. KSSR (Primary School Standard Curriculum) is the result of improvements and revisions to The Integrated Primary School Curriculum (KBSR) that has been implemented almost three decades in Malaysia. The KSSR design contains six important components mentioned as a backbone (MOE, 2013). These pillars are introduced to complement all the important aspects that need to be developed in a student balanced and harmonious individual. These pillars are communication; spirituality, attitudes, and values; humanity; science and technology; physical development and aesthetics; and personal skills. In developing KSSR, Malaysian Ministry of education has created a formative and summative assessment system that prioritizes student progress from one level to another. Student achievement is not compared to other students. Figure 1 below shows the six pillars contained in DSKP (Primary School Standard-Based Curriculum) Mathematics Year 5.

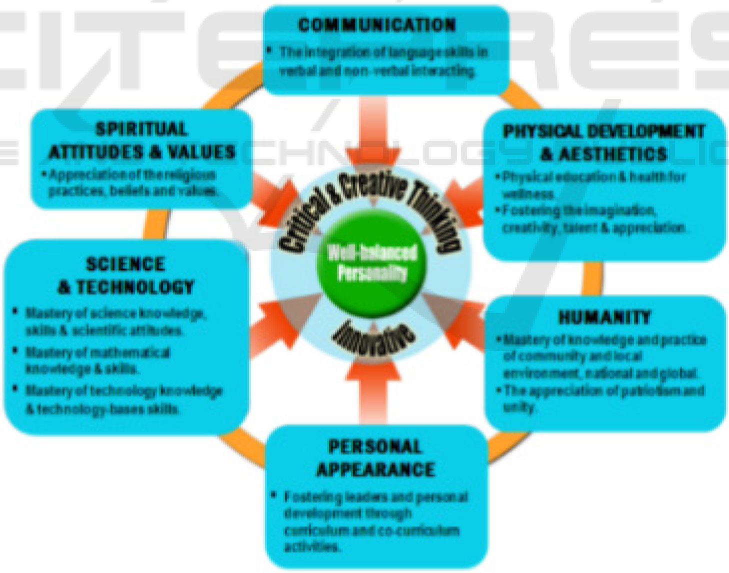

Figure 1: Six Pillars in National Curriculum Framework.

This new curriculum is based on some pre-set criteria. Among them is to make sure all students pass the set standards. Similarly, with the determination of knowledge, skills and values that need to be clearly measured through the thinking carried out continuously. Next the teacher can analyze and make follow-up actions so that students achieve the set standards (Abdullah et al., 2019).

KPM is confident of the implementation of KSSR can raise the standards of the national curriculum to be able to compete and standing with global education also ensures future generations are supplied with knowledge, skills and values relevant to needs and challenges 21st century and able to form the 1st generation of Malaysia towards achieving the country forward by 2020. (MOE, 2013).

2.2 Mathematics Achievement According to Gender

According to Jaafar et al. (2020), the level of motivation towards mathematics between the gender did not show any difference significant. The mean score of the level of motivation between male and female students did not show significant differences. Female students always show much better motivation and better achievement in mathematics especially in TIMSS and PISA. In a study conducted by Alhassora et al. (2017), gender is not a barrier factor in mathematics achievement unless the students themselves are less motivated, less interested, have negative perceptions of mathematics and fail to master the basics concepts of mathematics. In addition, the latest PISA 2018 report also reported an achievement gap between male students and female students in performance in mathematics.

3 METHODOLOGY

This study uses descriptive research design. The study was conducted at National Primary School, which is situated in the Petaling Jaya, Selangor Malaysia. The population is about 200 students aged between 10 to 11 years old, enrolled in the academic year 2020. Purposive sampling is used to select 50 samples. The sample comprised of 25 male and 25 female.

The mathematics test was used as an instrument to collect quantitative data. The mathematics test consists of 40% of LOTS questions and 60% of HOTS questions based on revised Bloom's Taxonomy (Anderson & Krathwohl, 2001). The students were given 40 mathematics multiple choice questions to be completed within 60 minutes. The students' answers were marked by a mathematics teacher based on the HOTS and LOTS questions. All the students' scores for the LOTS and HOTS questions were changed to 100% for the purpose of analysis.

4 RESULTS AND DISCUSSION

RQ1: Is there a significant difference in students' mean score for answering LOTS mathematics questions *according to gender?*

Table 1: Comparison of LOTS questions between male and female students in their mathematics test.

Group	N	Mean	Std. Deviation	Mean Difference	t-value	df	p-value
Male	25	77.53	10.98	-5.1	1.520	48	.170
Female	25	71.52	16.44				

Level of significance is at $p<0.05$

Findings in Table 1 show that the mean number of mathematics LOTS questions for the male students is higher (Mean=77.53, SD=10.98) than the female students (Mean=71.52, SD=16.44). Findings from the independent samples t-test show that there is no significant difference between the male and female students in answering their LOTS mathematics questions (Mean difference = -5.1, t= 1.520, df= 48, p=0.170). These findings are supported by a study that conducted by Ahmad et al. (2017) that revealed gender is not a factor that is a barrier to increase in the level of mathematics achievement unless the student himself is less motivated, lack of interest, a negative attitude towards mathematics and not mastering the basics of mathematics.

RQ2: Is there a significant difference in students' mean score for answering HOTS mathematics questions according to gender?

Table 2: Comparison of HOTS questions between male and female students in their mathematics test.

Group	N	Mean	Std. Deviation	Mean Difference	t-value	df	p-value
Male	25	54.0	15.29	-1.17	-.242	48	.251
Female	25	55.17	18.72				

Level of significance is at $p<0.05$

Results in Table 2 show that the mean score for HOTS mathematics for female students is higher (Mean=55.17, SD=18.72) than the male students (Mean=54.0, SD=15.29). Findings from the independent samples t-test show that there is no significant difference in students' mean score for answering HOTS mathematics questions according to gender (Mean difference=-1.17, t=-.242, df=48, p=0.251). Therefore, the findings answer Research Question 3. These results do not support findings by Hidayanti et al (2020) that male students cannot find good solutions to solve HOTS questions.

5 CONCLUSION

Results of the study clearly indicate that students performed significantly better in answering LOTS questions than HOTS questions. This is because HOTS questions are more difficult than LOTS questions and require students to apply knowledge, analyse, evaluate and create. On the other hand, LOTS questions only require students to remember and understand. The findings of the current study also revealed that there is no significant difference between female students and male students in answering HOTS and LOTS mathematics questions. The result did not show much of the difference between the male and the female students in their performance on HOTS and LOTS questions.

It is also important to note that there are limitations in this study. First, the sample size of this study only consists of 50 standard 5 students in one primary school. As such, it is hoped that future studies will involve a larger sample from different primary schools in other provinces in Malaysia. In addition, this study is only based on mathematics questions.

It is suggested that future researchers may conduct similar studies on four levels of HOTS questions which are applying, analyzing, evaluating, and creating to obtain more comprehensive data on students' HOTS mathematical questions. In addition, it is suggested that future researchers can conduct quasi-experimental studies on how to improve students' HOTS mathematics questions and prepare them with the essential skills that will help them in their 21st century learning.

REFERENCES

Abdullah, N., Mohd Noh, N., Hamzah, M., Nik Yusuf, N. A., & Omar, R. (2019). Readiness Levels of Science and Mathematics Teachers in Implementing the Primary School Curriculum Standard (KSSR) (81 - 96). Jurnal Pendidikan Sains Dan Matematik Malaysia, 4(1), 81-96.

Ahmad Alhassora, N. S., Abu, M. S., & Abdullah, A. H. (2017). Hindering Factors in Mastering Higher-Order Thinking Skills: Application of Rasch Measurement Model. Man In India, 97(19), 275–280.

Aleksius Madu (2017). Higher Order Thinking Skill (HOTS) in Math Learning. Mathematics Education Study Program, Faculty of Teacher Training and Education, University of Nusa Cendana Kupang-East Nusa Tenggara-Indonesia.

Alhassora, N. S. A. and Abu, M. S. and Abdullah, A. H. (2017) *Inculcating higher-order thinking skills in mathematics: why is it so hard?* Man in India, 97 (13). pp. 51-62.

Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's Taxonomy of educational objectives: (pp. 67-68). New York: Longman.

Hidayanti, R. & Syahri, A. A. (2020). Analysis of Critical Thinking Ability in Solving Mathematical Problems in View of Gender Differences in Class VIII.I Students of SMP Negeri 2 Labakkang. SIGMA (Intellectual Voice of Mathematical Style), 12(1), 71–80.

Jaafar W., Naliza W. & Maat, Siti. (2020). The Relationship Between Self Efficacy and Motivation with Stem Education: A Systematic Literature Review. International Journal of Modern Education. 2. 19-29. 10.35631/ijmoe.24002.

Ministry of Education (2013). Malaysia Education Blueprint 2013-2025 (Preschool to PostSecondary Education). Putrajaya: Bahagian Pendidikan Guru.

Nguyen, T., Watts, T. W., Duncan, G. J., Clements, D. H., Sarama, J. S., Wolfe, C., & Spitler, M. E. (2016). Which preschool mathematics

competencies are most predictive of fifth grade achievement? Early childhood research quarterly, 36, 550-560.

Zhang, C., Chen, W., & Zhang, Z. (2020). Learning Process Analysis from Learners' Perspective. Beijing: Beijing Normal University Pres