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Teachers' Levels of Knowledge and Interest on Higher Order Thinking Skills (HOTS) According to the Field Taught and Category of Schools

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Abstract: This paper discusses teachers knowledge and interests on HOTS according to field taught and the school category, namely primary school and secondary school. This paper focuses on the mastery of the knowledge and interests of teachers teaching HOTS in sequence and if there exist any relationships and differences according to the type of subjects taught and the category of school. This research uses a quantitative approach involving 100 teachers from five primary and secondary schools. Teachers from four different fields which are Language, Mathematics, Science and Humanities represent as respondents in this research. Findings show that teachers' knowledge related to HOTS still at medium level according to the field taught. Nearly 50% of the respondents surveyed are capable of emphasizing HOTS as key elements in their learning and teaching processes. Analyses of the data also clearly indicate that the levels of knowledge teachers have showed a very positive relationship with the levels of interest shown by teachers on HOTS. Analysis of the study found the levels of interest in primary school teachers on HOTS to be higher than secondary school teachers. The study found the lack of references to be the major problems for teachers in implementing HOTS more effectively.

Key words: HOTS, LOTS, knowledge, interest, teacher resources

1. Introduction

The education system is at the core of national development which is not only responsible for producing high quality human capital but the heart of the success of a transformation policy that wants to be implemented by our government (Education Development Plan of Malaysia, 2013–2025). Education is the backbone of the development of social capital and economic in addition to trigger creativity and the generation of innovation that completes the younger generation with the skills to compete in the job market and be a boost to economic growth (PPPM, 2013).

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The PPPM, aspiration systems and aspirations of pupils are the two main pillars to do the transformation in our education system. The aspirations of pupils, the skills of thinking made one of the key components to produce pupils who balanced in accordance with the National Education Philosophy. Every student will learn how to acquire knowledge throughout their lives to instill curiosity and practice lifelong learning to enable them to link the various disciplines of knowledge and create new knowledge (Mayer, 1977). Every student should master the various skills including cognitive reasoning and critical thinking, creative, and innovative skills. This area is less attention, resulting in less capable students to apply the knowledge and critical thoughts outside the academic context (PPPM, 2013).

Thinking skills are divided into two types, namely the low level thinking skills (LOTS) and higher level thinking skills (HOTS). LOTS is defined as the use of potential limited minds focused routine applications and mechanistic (LPM, 2013). While Onosko & Newmann (1994) defines high level thinking skills (HOTS) as the use of the potential of the mind to cope with new challenges. This requires someone to understand HOTS, translate, analyze, and manipulate information. (M.H. Yee, 2013)

The Ministry of Education defines High Level Thinking Skills (HOTS) as the ability to apply knowledge, skills, values in making of reasoning and reflection for problem solving, decision making, innovative and able to create something (LPM, 2013).

2. Statement of Problem

Although the performance of students in Malaysia increased over the last decade, but there is a risk of achievement gap with other countries that widely increasing. According to the Education Development Plan of Malaysia (2013–2025), the risk can be viewed through the latest international assessment issued by the Program for International Student Assessment (PISA) and the study of Trends in International Mathematics and Science Education (TIMSS). Based on the results of TIMSS 2011, 35% and 38% Malaysian students fail to reach the minimum levels of skill in Mathematics and Science, an increase of two to four folds as compared to seven and 13% in 1999 (LPM, 2013).

Unfavorable results also recorded by Malaysian students in the decision cycle assessment for 2009 PISA. Malaysia's first participation, which position the country is grouped in the bottom third among 74 participant countries, namely under the Organization for Economic Co-operation and Development (OECD).

Almost 60% of students aged 15 years who joined PISA 2009 fail to reach the minimum levels of skills in Mathematics, while 44% in reading and 43% in the comparative scores in Science. PISA scale shows pupils aged 15 years in Singapore, South Korea, Hong Kong and Shanghai, China has the performance of three or more years of schooling compared to Malaysian students at the same age. Over the last decade both international student assessment system, the PISA and TIMSS, has emerged as a method of direct comparison of the quality of education across a wide range of success system (TIMSS, 2011).

3. Objective of the Study

This study aimed to determine:

(1) levels of knowledge among teachers on HOTS;

(2) the levels of interest shown by teachers on HOTS;

(3) the relationship between the levels of knowledge and interest on HOTS among teachers;

(4) differences between the levels of knowledge among teachers on HOTS according to the field taught;
(5) differences between the levels of interest among teachers on HOTS according to the field taught;
(6) differences between the levels of knowledge of HOTS among teachers by the category of schools;
(7) differences between the levels of interest on HOTS among teachers by the category of schools.

4. The Question of the Study

This study will answer the question that follows:
What is the levels of knowledge among teachers in HOTS?
What is the levels of interest shown by teachers in HOTS?
Is there a relationship between the levels of knowledge and the levels of interest in HOTS among teachers?
Is there any difference in knowledge among teachers in HOTS according to the field taught?
Is there any difference in the levels of interest in HOTS among teachers according to their field taught?
Is there a difference between the levels of knowledge in HOTS among teachers by category of schools?
Is there a difference between the levels of interesting HOTS among teachers by category of schools?

5. Research Methodology

5.1 The Design of the Study

The study was descriptive in nature, namely quantitative method describes a phenomenon going on. In this study two independent variables (IVs) are field taught and school category and the dependent variables (DV) are the levels of knowledge and interests of teachers in HOTS.

5.2 Location of Study

The selection of the site is based on factors such as school category, namely primary and secondary as well as the types of subjects taught.

5.3 Population and Sample the Study

This study involves primary and secondary school teachers. The number of samples is about 100 teachers consisting of 50 from primary and 50 secondary school teachers. This study was conducted at five primary schools consisting of Sekolah Kebangsaan (SK), Sekolah Jenis Kebangsaan Cina (SJKC) and Sekolah Jenis Kebangsaan Tamil (SJKT). A total of 10 teachers selected from each school as sample to answer questionnaires distributed.

5.4 Analysis of the Data

The data collected were analyzed using IBM SPSS Statistics Version 22. This study involves both types of statistical analysis that is descriptive and inferential. Before the statistical analysis is performed, the data have been filled through a process of "screening" to remove the data that attempt to interfere with the process of statistical analysis.

5.5 The Level of Knowledge Relating to HOTS

Based on Table 1, the levels of knowledge among teachers related to HOTS are among a score of 3 and 4. Teachers levels of knowledge based on three levels split (cut points) found that 68% of teachers are at Level 1 and 2 between the mean scores 1.70 to 3.90. The overall mean score stood at 3.49 between levels of uncertain and

agree. The overall analyses, found a total of 90% of the teachers know what is meant by HOTS. 71% of teachers use variety of thinking maps to help them deliver their lesson effectively.

Table 1 Percentage, Mean and Standard Deviation Related Knowledge Level HOTS

Items	Mean	SD	SCORE				
			1	2	3	4	5
I know what is HOTS	4.17	0.62	0	1	9	62	28
			0%	1%	9%	62%	28%
I attended the course on HOTS related to the subjects I teach	3.04	1.39	17	26	10	30	17
			17%	26%	10%	30%	17%
I know the theories or models related to HOTS	3.33	0.94	4	17	25	50	4
			4%	17%	25%	50%	4%
I know how to prepare questions to HOTS	3.43	0.95	3	18	17	57	5
			3%	18%	17%	57%	5%
I emphasize HOTS as a key element in writing my lesson planning	3.23	0.94	3	23	25	46	3
			3%	23%	25%	46%	3%
I am able to apply appropriate level of thinking according to the topics thought	3.58	0.82	1	12	21	60	6
			1%	12%	21%	60%	6%
I use thinking maps as thinking aids in the application of HOTS I know how to evaluate	3.61	0.93	3	13	13	62	9
			3%	13%	13%	62%	9%
I know how to evaluate HOTS elements in my students answers	3.55	0.86	3	9	24	58	6
			3%	9%	24%	58%	6%
I know how to integrate HOTS with other skills in my subject	3.36	0.92	1	22	22	50	5
			1%	22%	22%	50%	5%
I love to share the relevant information about HOTS with others to enhance my knowledge	3.58	0.85	1	15	15	63	6
			1%	15%	15%	63%	6%

Analysis of the next item found that 66% teachers know and able to apply the appropriate levels of skills to think according to the topics taught. In addition, the teachers surveyed prefer to share relevant information about HOTS with other colleagues to further enhance their knowledge, although 53% of the teachers have not attended any courses to increase their HOTS knowledge of their subjects. In addition, almost 49% of teachers are practicing HOTS elements in writing their daily lesson plan.

5.6 The Levels of Interest in HOTS

Analysis of the total items in Table 2 clearly shows that the interest of teachers just stood at a moderate level. This is proved with a mean total just value of 3.15. From the mean level of analysis based on three levels (cut points) found 67% of teachers are at Level 1 and 2 between min 1.63 to 3.50. The overall mean analysis from Table 2 found the highest mean was 3.72 which indicate 69% of teachers interested in participating in workshops or related courses to enhance their knowledge of HOTS. This is supported also by the next item that is a total of 89% of teachers interested in implementing learning and teaching related to HOTS.

The interest of teachers based on related items and materials resources HOTS shows the lowest score. Only 31% of teachers have various related materials on implementing HOTS based on subjects to carry learning and teaching effectively. Lack of resources for teacher shows the link to the related item of interest for teachers to

build their own blog to upload relevant HOTS materials. Study found only 20% of teachers who wish to build their own blog related to HOTS. The levels of interest shown by teachers in HOTS also found weak because only 32% of teachers are regularly using their time to explore the various reference materials to help them implement their teaching effectively.

Table 2 Percentage, Mean and Standard Deviation of the Levels of Interest in HOTS

Items	Mean	SD	SCORE				
			1	2	3	4	5
I'm interested in implementing HOTS through my lesson	3.51	0.88	56	27	57	5	
			56%	27%	57%	5%	
I love to explore diversity methods on implementing HOTS	3.43	0.77	1	12	32	53	2
			1%	12%	32%	53%	2%
I have various collection of reference materials related to HOTS	2.96	0.94	7	23	39	29	2
			7%	23%	39%	29%	2%
I use my free time to explore various resources on HOTS	3.09	0.88	3	21	44	28	4
			3%	21%	44%	28%	4%
My aim is to produce HOTS modules related to my subject	3.2	0.95	4	21	30	41	4
			4%	21%	30%	41%	4%
I'm interested to attend courses and workshops related to HOTS	3.72	0.88	2	8	21	54	15
			2%	8%	21%	54%	15%

5.7 The Relationship between the Levels of Knowledge and Interest in HOTS among Teachers

To answer the third question of the study that is identifying the relationship between knowledge and interests of teachers in HOTS, Pearson Correlation statistics was carried out.

Table 3 Pearson Correlation Test for Mean Knowledge and Interests among Teachers in HOTS

The mean levels of knowledge related to HOTS (Coefficient of Correlation, r)	Relationship Interpretation	
The mean level of interest related to HOTS	0.476**	Strong Positive Relationship

** Significant at the 0.01 level (2-way)

Refer to Table 3, there is a positive relationship that achieves significant between the mean level of knowledge with a mean levels of interest in HOTS among teachers ($r = 0.476^{**}$, $p = 0.00$). Based on interpretation by Rowtree (1981), the relationship is positively very strong.

5.8 The Difference between the Levels of Knowledge in HOTS according to the Field Taught

To identify the differences in the levels of knowledge based on the field are taught, statistical analysis one-way Anova was carried out. Results of the analysis are shown in Table 4.

Table 4 Differences between the Levels of Knowledge in HOTS according to the Field Taught

Field	n	Mean	Deviation	F value	df	p value
Language	25	3.35	0.73	0.943	3	0.423
Mathematics	23	3.54	0.64			
Science	25	3.42	0.79			
Humanities	27	3.64	0.46			

Based on analysis of Anova Tests carried out, the findings shows that there is no significant difference between the mean field are taught which are Language (mean = 3.35, SD = 0.73), Mathematics (mean = 3.54, SD = 0.64.), Science (mean = 3.42, SD = 0.79) and Humanities (mean = 3.64, SD = 0.46) with the levels of knowledge among teacher related to HOTS (F =. 943, > p 0.05).

5.9 The Differences between the Levels of Interest in HOTS in accordance with the Field Taught

To identify the differences in the levels of knowledge based on the field are taught, statistical analysis One-way Anova was conducted. Results of the analysis are shown in Table 5.

Table 5 Differences between Interest Levels in HOTS according to the Fields Taught

Field	n	Mean	Deviation	F value	df	p value
Language	25	3.02	0.68	0.645	3	0.588
Mathematics	23	3.26	0.76			
Science	25	3.22	0.59			
Humanities	27	3.10	0.67			

Based on analysis of Anova Tests, the findings shows that there is no significant difference between the mean field taught which are Language(mean = 3.02, SD = 0.68), Mathematics (mean = 3.26, SD = 0.76), Science (mean = 3.22, SD = 0.59) and Humanities (mean = 3.10, SD = 0.67) with the levels of interest shown by teachers in HOTS (F =. 645, > p 0.05).

5.10 The Difference between the Levels of HOTS Knowledge among Teachers by Category of School

Statistical analysis of the t-test conducted to identify differences between the levels of HOTS knowledge among teachers by category of school. Table 6 shows the results of the differences identified.

Table 6 Differences of the Levels of HOTS Knowledge among Teachers by Category of School

Category of School	n	Mean	SD	t value	df	p value
Primary	50	3.44	.73	-.781	98	437
Secondary	50	3.54	.59			

Based on the analysis of the t-test in Table 6, findings indicate that there is no significant difference between the mean school category, namely primary school (mean = 3.44, SD = .73) and secondary school (mean = 3.54, SD = .59) with the levels of knowledge in HOTS among teachers (t =-. 781, > p 0.05).

5.11 The Differences between the Levels of Interest in HOTS by Category of School

For studying the differences in the levels of interest in HOTS among teachers by the school category, statistical analysis of the t-test was run. Table 7 shows the result of the differences identified.

Table 7 Differences of the Levels of Interest in HOTS by Category of School

Category of School	n	Mean	SD	t value	df	p value
Primary	50	3.30	.65	2.23	98	0.028
Secondary	50	3.00	.66			

Based on the analysis of the t-test in Table 7, the results of the findings showed that there is a significant difference between mean school category, namely primary school (mean = 3.30, SP =. 65) and secondary school

(mean = 3.00, SP = .66) with the levels of interest in HOTS among teachers ($t = 2.23$, $p < 0.05$). Based on the value (0.028) shows that the effect of size between the variables tested were small (Cohen, 1988).

6. Discussion

6.1 The Levels of Knowledge the Teacher Related HOTS

The main finding of this study is the levels of knowledge and interests among teachers in HOTS. Data analyses provide input that only 47% of teachers of total respondents surveyed attended workshops/courses related to HOTS for their subjects. This show the teachers still lack the opportunity to attend a workshop/course related to HOTS according to their respective subjects. Its implications, teachers are less knowledgeable about how to use the application of elements of HOTS in their daily lessons. This situation affects the teacher in terms of Daily Lesson Plan (DLP) preparation. The study also demonstrated this phenomenon in which almost 51% has not yet been able to emphasize HOTS as key elements in writing DLP. This phenomenon also supports previous studies by Nagappan R. (2001).

This problem will result in failure of teachers to plan appropriate activities to stimulate thinking skills in their daily teaching activities. If there are no clear plans so the teachers will not take the initiative to explore the diversity of sequence delivery method or material stimulation of HOTS from various sources (Anderson, 2001). Thus, the only routine methods practiced in their subjects. If the condition is prolonged, then the desire of the Ministry of Education for the realization of the aspirations of students in terms of producing skilled students is going to be just a dream only. Before students can master and expert in HOTS teachers must first well trained so that the aspirations and educational transformation can be achieved (Brookhart, 2013).

6.2 The Relationship between the Levels of Knowledge and Interests among Teachers in HOTS

Analysis of the data also clearly indicate the levels of knowledge among teachers have a very positive relationship with the levels of interest shown by teachers in HOTS. There is no denying that teachers who have a good knowledge in these skills will clearly more interested in exploring this skill in terms of use of resources, methods of presentation and sharing of information with colleagues. This is proved also by the research of (Tobias, 2013) which shows individual impacting interest to explore a particular knowledge. Johnson (2000) support the statement indicating an interest in a subject or excursions would lead a person to explore further. These features will help teachers deliver a sequence of learning and teaching HOTS effectively again. Thus, involvement and learning outcomes of students will be better than the usual or routine lesson (Harrison, 2013).

The findings also supported by review ago. Interest is an important matter as the impetus to active duty in an activity. Then, if a teacher would be interested in HOTS, then they will find resources through various media to intersperse their delivery. If teachers ' understanding of the real object-related teaching HOTS, there is no denying that the teacher will only act as relay without any creativity and innovation mastery HOTS from time to time (Sawyer, 2004).

6.3 The Differences in the Levels of Interest in HOTS by Category of School

The results show significant differences between the levels of interest in primary school teachers and secondary school teachers. Analysis the study found levels of interest among primary school teacher is higher than secondary school teachers. Although the effects of size differences are small, but basically doesn't have to exist a difference in terms of school category because all teachers should dominate and admitting HOTS in their daily

lesson. This is because by the year 2016, 40% of the question in Pentaksiran Tingkatan Tiga (PT3) and 50% of Sijil Pelajaran Malaysia (SPM) are shaped HOTS. Therefore, teachers should be prepared to transforming teaching previously more shaped of memorizing and understanding towards solving and discovery. Therefore, all teachers need to show interest in the implementation of HOTS.

From the analysis shows that almost 69% percent (a large number) of teachers interested in joining the course or workshop related to HOTS. So far, the application of HOTS more promoted to Mathematics, Science and History. Teachers of other subjects are mostly less opportunity to participate in a workshop or course related to HOTS. Through participation in workshops and courses, they will be able to exposure and enlightened about the implementation HOTS by the intended subjects respectively (KPM, 2001).

6.4 The Lack of Educational Resources for the Implementation of HOTS

The study also indicates that only 31% of teachers have various sources of reference teaching related subjects respectively. Lack of resources impact the interest of teachers to promote the lesson towards HOTS. The study also shows that most of the teachers understand the use of thinking maps such as i-Think in their lesson. I-Think only is one of the tools of thought to the teaching of HOTS. The teacher found a lack of clarity with the difference between HOTS and i-Think.

Element provides HOTS resource is one of the most important elements of the seven elements identified for the implementation of HOTS (Curriculum Development Division, 2013). These findings prove that lack of resources impact the implementation of HOTS among teachers. Teachers have not been able to use and produce various sources of HOTS that fits their field.

7. Implications of the Study

Some implications that can be highlighted which cover the implications for students, teachers and policy makers (KPM) in relation to this study. This study provides a clear indication that the levels of knowledge and interests among teachers in HOTS still moderate. Therefore, the main implications of the study the main achievement of the lesser deities MOE to produce individuals HOTS. Based on Wave 1 in PPPM, emphasis is given to improving the system with speed change method implementation (2013–2015) while in Wave 2 (2016–2020) emphasis is to accelerate the improvement of the system. If teachers have yet to understand the objective and have knowledge HOTS then of course the real objective of attaining can't be reached.

The next Implications is the related interests of the teacher of HOTS implementation. If many teachers who are not interested in the presentation of lesson towards HOTS, problems will arise with an ineffective presentation. The confidence of teachers to embed HOTS will be low. Teachers are just simply using HOTS questions existing without trying or creating a sequence of HOTS learning situations. These problems are indirectly causing students to feel bored with learning patterns because there was no innovation and creativity in teaching among teachers (Tishman, 1993).

In addition, teachers, pupils and all parties involved including parents and the surrounding community has yet to appreciate the difference from low level thinking styles and thoughts at high level. Real life related situation should be practice in HOTS among all schools and not just as far as hanging banners i-Think map in the school. Students and teachers need to be practiced with a sequence of thinking styles to find a solution for problems creatively and critically. The proposed social media should promote HOTS from some of the Malaysian society in general aware of the importance of changes in the style of thinking time.

In addition, the results showed the rate of use of thinking map like i-Think/mind map is high among teachers.

The problem identified is the notion of related teacher is to teach the application of HOTS based thinking map to students. Teachers have not been able to distinguish between CCTS and HOTS and as well as i-Think and HOTS. Its implications, when monitoring the responsible implemented, teachers are more likely to use thinking maps in their lesson without understanding the thinking map is used as a tool to stimulate thoughts only.

8. Recommendations

The KPM in stages should make sure all teachers attend related courses/workshops to exposed clear information about implementation of HOTS for all key subjects in the national curriculum. Teachers who attended training must ensure that information is shared with the members of the panel committee and the subject so as not to case dropout information among members of the committee. School administrators also should ensure the diversity of the ways teachers reinforce HOTS in lessons through staff development sessions. Teachers can also create consistency writing lesson plan daily activities require HOTS planned and integrated in the daily leaning and teaching process.

So far, the implementation of HOTS has not involving all subjects in the National Curriculum (MOE, 2001). Therefore it is suggested that the MOE and the school took the initiative to promote HOTS through social media. Teaching and learning related to HOTS must be mastered by every Malaysian society not only in curriculum on the other hand in the implementation of co-curriculum and other spiritual activities. Thus change in mind set in all parties involved will happen and transformation occurred within individual thinking styles.

The curriculum is the most important element in the implementation of the new education system. KSSR and KSSM must ensure implementation of HOTS being one of the key elements that should have started from the syllabus, lesson plans and contents in text books. Responsible parties should make sure the improvements in content of curriculum for all subjects. It is suggested of diversifying activities/questions-related curriculum content in accordance with HOTS.

5P concept, namely, planning, implementation, monitoring, evaluation and Improvement need to be practiced in the implementation of HOTS issues in schools nor KPM. Implementation of HOTS must be monitored from time to time to find out the problem and the effectiveness of the strategy practiced in an educational institution. Related findings should guide improvements and to strengthen the implementation of HOTS.

9. Conclusion

Education Ministry's desire to produce "Thinking Society" are only achieved if all parties involved including pupils, parents and the community of Malaysia join together to support the objectives of real implementation of HOTS. It is undeniable that large investment on HOTS is part of education to guarantee economic development and well-being of the country. Thus, the input obtained from this study will help citizens of teachers in particular and all parties involved generally in planning and implementing continual improvement of HOTS. The findings of this study are expected to help solve the problem of teachers in terms of mastery of knowledge and understanding, consequently improving the quality of the teaching to meet MOE's desire to produce "Thinking Society".

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