Mastering the Basic Content Knowledge in Higher Order Thinking Skills Among Teachers in Malaysia in Teaching and Learning Process

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Abstract: Malaysia education system has undergone a major change by adopting a new policy known as the Malaysian Education Development Plan (PPPM) 2013 to 2025. In this policy, various issues have been emphasized to improve the education system in our country to compete with the more developed countries. The main thing to emphasize in this system is the high order thinking skills. In this context the teacher plays an important role in applying the element. Unfortunately, most of the teachers fail to play the role.

The purpose of this research is to find out the basic things in the implementation of HOTS, namely knowledge, application, determination among teachers and readiness of among students towards higher order thinking skills (HOTS) in Negeri Sembilan (one of state in Malaysia) in teaching and learning process. A total of 120 Mathematics and Science teachers at all levels involved. The sample of the study is selected at random.

The findings were analyzed using SPSS descriptive form, percentage, mean and frequency and intervention. The findings show that teacher knowledge on HOTS and application of HOTS in the teaching and learning process is low that is below 50%. While the application of students in HOTS and teachers' efforts to know about HOTS also show at very low percentage that is below 30%. These results indicate that many teachers are still poor in the contain knowledge of HOTS cause the student achievement is very low and difficult to achieve PPPM objectives.

Therefore, the ministries and education departments should take this into account in order to organize workshops or build a module related to KBAT as a guide to help teachers understand and apply the skills in the teaching and learning process.

Keywords: Thinking Skills, Higher order Thinking Skills (HOTS) , Knowledge, Application, Courage, Readiness of Students

1. Introduction

Education can be defined as an ongoing process of seeding knowledge in each person. Prof. Syed MohdNaquib Al-Attas (2008) quoted from the Science and Development Society's Scientifically-Graded Society article written by Lilia Halim (2013), defines education as an effort or process of dripping something into a human being. The above views emphasize the importance of education in forming quality human beings in line with the National Education Philosophy to create a balanced and harmonious human being in terms of intellectual, spiritual, emotional and physical harmony based on god's belief and obedience.

Teachers are thinkers and decision makers; reflective thinking is one of the key skills to be effective teachers. Teacher teaching is a complex cognitive activity and requires teachers to use complex knowledge and skills (Borko& Putnam 1996). This knowledge distinguishes a scientist from a science educator. A scientist has science knowledge while a science educator is a person who translates knowledge science for students' understanding (Lilia 2013). Effective science teachers can attract students to study science. Effective teachers have the skills of research, collaborative skills and take into account the variety of students' abilities (Lingard et al., 2002).

The life of the 21st century, demands a more complex life in which we need to have critical, creative and innovative thinking. This is because most of our daily needs have been automated that make us less thoughtful. Challenging life in the globalization era causes information access at the fingertips without the boundaries of time and place. High-level thinking skills are essential to survive all these challenges.

Unfortunately, in the field of science, Malaysia has not achieved any remarkable changes or achievements in the world. Malaysia sits on the bottom of several tests for Science subjects held internationally. Among them are the "International Student Assessment Program" (PISA) 2012- 53 of the 65 countries, "Trend in Mathematical and Science Studies" (TIMSS) 2011- Science 32 and the UN Education Index ranked Malaysia 98th out of 181 countries. In 2015 no one of our country's students reach level 6 in PISA exams and only 0.6% achieve at 0.6%. Lesser developed Southeast Asian countries such as Thailand, Vietnam are in our country. This is because the questions in PISA and TIMMSS involve high level skills questions and the students less expose towards the application of science concept in their lives cause the students could not answer the questions.

Additionally, the UPSR results in 2015, 2016 and 2017 pupils receive A in Negri Sembilan less than 12% compared to the previous year. Whereas in 2015 found that many students did not get A though the quantity to pass increased. This is because HOTS questions in the exam are increasing year by year. One of the factors that students cannot answer in the exam is that they do not get enough exposure from their teachers. The results of the questionnaires conducted using the MuslihaSamsah instrument, 2013 found that 87.3% of teachers did not understand what the HOTS question was about. They have no direct exposure to these HOTS.

The scenario that happens in many schools is that teachers only conventional teaching, based on chalk and talk. It is a traditional learning method and most learners only learn one step. According to Aris et al. (2000), the interaction between students and teachers becomes less and more restrictive and in turn causes students to be passive in the classroom. They just sit over all the time and it's really boring. In addition, students' understanding of subjects is also limited as students are difficult to know the extent of their understanding and their ability to learn. Then the knowledge they are learning does not go into their brain. Exams in KSSR emphasize more on HOTS questions where pupils need to think before responding to previous in the KBSR curriculum. This sentence is supported by Dr Na'imahBintiIshak, 2013 where teachers can not apply the memorization teaching method only as they need to question the HOTS questions. The questionnaire was also used by most teachers in Negeri Sembilan to practice rote and centered examination compared to HOTS.

Teacher is a supporter of the creation of a high-minded community and requires competent teachers to use HOTS. Therefore, teachers need to equip themselves with the knowledge to teach and assess students in terms of FIGURE. The intellectual involvement in the classroom is the teacher's responsibility. When a teacher performs a lesson containing pedagogy that helps students develop HOTS, the teacher can directly improve student achievement. (Boaler&

Staples, 2008; Franco, Sztajn&Ramalho 2008). In the context of integrating HOTS in schools in Malaysia, trained teachers need to have basic things like knowledge about subjects, skills to teach such skills and appropriate attitudes. In addition, the willingness of teachers to handle the teaching and learning processes demanded by an innovation is one of the major variables that determine the success or failure of the innovation. (Rajendran 2001).

Although there are excellent teachers in the Malaysian education system, the AKEPT 2011 study found that only 50% of the teaching was delivered effectively. This means the delivery of subjects does not involve the students adequately and the teaching method is more passive and in the form of lectures. The subjects presented are more focused on understanding the inefficient content and not focusing on high-level thinking skills. This statistic also shows the big challenges that will be faced because about 60% of teachers today will continue to teach for another 20 years. This indicates that teachers are not yet fully prepared to educate students to face this growing world.

There are a number of previous studies that examine teacher readiness in the handling of teaching and learning processes that integrate HOTS. The main problem faced by teachers is the lack of teachers in implementing this agenda because of lack of knowledge and skills (Rosnani&Suhailah, 2003). Teachers are less prepared in terms of science, pedagogical skills and attitude to teach HOTS. (Rajendran, 2001). According to Ball and Garton (2005), most teachers do not know how to apply HOTS to students and some are less prepared.Different findings are seen in the study by Sukiman.et al (2012) where Mathematics teachers have sufficient skills to develop students' thinking skills, have enough understanding to teach thinking skills, able to teach students to think well and be confident that the objective thinking skills can be achieved through the subject being taught. Teachers also have a positive perception of the value and importance of thinking teaching. (Sukiman et al., 2012).Barathimalar (2014) also finds that Mathematics teachers are well-prepared and aware of the importance of HOTS in creating a society of high-mindedness.

Education in this country has undergone significant changes in the adoption of a new policy known as the Malaysian Education Development Plan (PPPM) 2013 to 2025. In this policy, various matters have been emphasized in improving the quality of the nation's education to compete with more developed countries. Malaysia's education director Datuk Dr Khair Mohammad Yusof said in the effort to create and develop a human model that will drive the nation's future, the nation needs a generation of Malaysians with first-class minded thinking, mastering the higher thinking skills (HOTS), innovative and creative and able to propel the nation into international order. So to achieve this dream, teachers play an important role in applying high level thinking skills in education. This has been supported by former examining board examiners where the success of the HOTS element appraisal in the student assessment is largely dependent on the continuing cooperation and commitment of all parties.

There are 3 main elements in the implementation of HOTS namely curriculum, pedagogy and assessment and 4 supporting elements ie co-curriculum, community and private support, effort building and resources. (Azraei, 2016) In the curriculum element, the will is to provide the HOTS standard from preschool to Form 5, in terms of effective teaching pedagogy in the classroom should be implemented based on the use of thinking tools such as the i-Think program while the percentage and quality of HOTS's questions need upgraded as well as manual builders of HOTS items should be provided in terms of assessment.

The Education Ministry has reviewed the Malaysian education system in October 2011. Under the first shift in the Malaysia Education Blueprint 2013-2025 which provides equality of access to quality education, international standards have been made in the education system. Today pupils are said to have mastered knowledge when they are able to analyze information, think critically, apply knowledge creatively and communicate effectively. These are the characteristics of high-level thinking skills held by pupils in developed countries. According to Robinson (2000), besides basic skills, the more important skills to acquire a job are to have higher-order thinking skills.In this regard, the Ministry launched the revised Secondary Standard School Curriculum (KSSM) and the Primary School Standard Curriculum (KSSR) in 2017. Furthermore, the national examination and assessments have also been revamped to enhance focus on high-level thinking skills in line with the implementation of the new curriculum. For example by 2016, the UPSR exam will contain 80 percent high-level thinking questions.

All these steps will not work without the support and encouragement by qualified teachers. Teacher quality is the most significant factor in determining student's success. System quality cannot go beyond teacher quality.

2. Result and Discussion

This study was conducted on 160 teachers who attend at the Negeri Sembilan level action research seminar. 160 teachers are from various districts and they are teachers who teach in different types of schools. The results can represent all the teachers in Negeri Sembilan. Of the 160 teachers, only 120 teachers had submitted a complete questionnaire. The questionnaire was a method used to test the level of thinking skills among teachers. The questionnaire that the researcher provided was using Linkert format. The researcher has detailed the following aspects when preparing items for questionnaires. The following are items that are divided according to the objectives of the study such as teacher knowledge on higher order thinking skills (HOTS), HOTS element applying in teaching and learning process, teacher confidence in handling class involving HOTS, Teacher's work to acquire knowledge related to HOTS and HOTS Facts. All these aspects have answered the question of this study.

3. Analysis of Data

3.1See whether school teachers have knowledge about the elements of the Higher Order Thinking Skills (HOTS)

Table 1: teacher knowledge by gender

Scale	Gender	N	Min	Standard division	t-value	Sig
Teacher's knowledge about HOTS	Male	34	12.18	1.82	-2.47	0.015
	Female	86	13.26	2.28		

Based on data, significant value for Levene test is less than p = 0.05 which is 0.001 data, so variance for both groups is not the same. So we need to use the information for the second line

in T-test which is "equal variances not assumed".The independent T-test is conducted to determine the level of knowledge of HOTS among teachers based on gender between male and female. There was a significant difference between the male sex (min = 12.18, s.d = 1.82) and female sex (min = 13.26, s.d = 2.28); (t = -2.47, p = 0.015). This has proven that the null hypothesis is rejected where there is a significant difference in teacher knowledge among teachers based on gender where female have higher knowledge levels of HOTS compared to male based on mean score.

3.2 See whether teachers are applying the High Level Thinking Skills element during the teaching and learning process (T&L)

Table 2: Application of HOTS elements in T&L process according to gender

Scale	Gender	N	Min	Standard division	T-Value	Sig
Application of HOTS in T&L process	Male	34	12.68	1.98	-2.04	0.044
	Female	86	13.57	2.23		

T-test independent is conducted to knowing the HOTS application in T&L process among the teachers based on gender. There was a significant difference between male (min = 12.68, s.d = 1.98) and female (min = 13.57, s.d = 2.23); (t = -2.04, p = 0.044). This has proven that the null hypothesis was rejected where there was a significant difference in teacher's knowledge based on gender where female had higher in application of HOTS in T & L process than male based on mean score.

3.3 Ho3: There is no significant difference between the type of school in the application of HOTS elements in the teaching and learning process

Table 3: Application of HOTS elements in T & L process according to the type of school

Type of schools	**N**	**MEAN**	**Standard division**
SMK	28	12.68	2.09
SK	46	13.15	2.36
SJK(C)	18	14.06	1.86
SJK(T)	21	14.05	2.06
Others	7	12.86	2.04

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	35.171	4	8.793	1.884	.118
Within Groups	536.796	115	4.668		
Total	571.967	119			

One-way Anova is conducted to find out the level of HOTS application in T & L process by teachers in different types of school. The findings show that National primary types of schools apply HOTS elements in schools higher than Secondary Schools and National primary schools. The result of this square also shows that there is a modest difference between the five types of schools with a value of 0.06. there was a significant difference between the kind of school flow [F (4,115) = 1.884, p = 0.118]. This has proven that the null hypothesis was rejected where there was a significant difference in the application of HOTS in T & L process among teachers based

on the kind of school where National Type Schools had higher HOTS application in T & L compared to secondary and national schools based on mean score.

3.4 Identify whether there is a difference between primary and secondary school teachers in the aspect of confidence and the spirit of applying the High Level Thinking Skills element in the teaching and learning process

Table 4: Teachers' confidence and efforts in HOTS based on type of schools

Descriptives

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Teachers confident level	SMK	28	9.8571	1.53271	.28966	9.2628	10.4515	7.00	13.00
	SK	46	10.3696	1.65138	.24348	9.8792	10.8600	7.00	13.00
	SJKC	18	10.8333	1.29479	.30518	10.1895	11.4772	8.00	13.00
	SJKT	21	10.7619	2.14254	.46754	9.7866	11.7372	6.00	15.00
	Others	7	9.5714	2.07020	.78246	7.6568	11.4860	7.00	12.00
	Total	120	10.3417	1.71741	.15678	10.0312	10.6521	6.00	15.00
Teacher' s afford	SMK	28	14.4286	2.15043	.40639	13.5947	15.2624	10.00	19.00
	SK	46	14.5000	1.67000	.24623	14.0041	14.9959	10.00	18.00
	SJKC	18	15.1667	1.54349	.36380	14.3991	15.9342	12.00	18.00
	SJKT	21	15.5238	1.74983	.38184	14.7273	16.3203	14.00	20.00
	Others	7	14.1429	2.54484	.96186	11.7893	16.4964	11.00	17.00
	Total	120	14.7417	1.86744	.17047	14.4041	15.0792	10.00	20.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Confident level of teacher	Between Groups	18.822	4	4.705	1.629	.172
	Within Groups	332.170	115	2.888		
	Total	350.992	119			
Teachers afford	Between Groups	24.039	4	6.010	1.768	.140
	Within Groups	390.952	115	3.400		
	Total	414.992	119			

The table shows teachers' confidence level and teacher effort among secondary and primary school teachers are different. Teachers in high school have low self-esteem compare to primary schools. For teachers' self-confidence aspect in secondary school is low = 9.86, s.d = 1.53 compare to primary school with the higher mean = 10.4.Teacher'safford in education is still low achievement for secondary school with the mean = 14.42, s.d = 2.15. At the same time, teachers were still unsure about their presentation, answering questions, HOTS application in the classroom where teacher confidence reached mean = 10.34 only. This has proven that the null hypothesis was rejected where there was a significant difference in teacher confidence and effort among high school and junior high school teachers where primary school teachers had high levels of confidence and effort as compared to secondary school teachers based on mean score.

3.5 Identify whether there is a difference between national school pupils and national-type schools on the element of High-Level Thinking Skills

Table5: student preparation according to type of school

Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
SMK	28	4.8214	1.21879	.23033	4.3488	5.2940	3.00	7.00
SK	46	5.0435	1.53415	.22620	4.5879	5.4991	3.00	8.00
SJKC	18	6.5000	1.61791	.38135	5.6954	7.3046	3.00	9.00
SJKT	21	6.2381	1.57812	.34437	5.5197	6.9564	3.00	9.00
Others	7	5.0000	1.41421	.53452	3.6921	6.3079	3.00	7.00
Total	120	5.4167	1.60138	.14619	5.1272	5.7061	3.00	9.00

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	52.837	4	13.209	6.020	.000
Within Groups	252.330	115	2.194		
Total	305.167	119			

Table 5 also shows that pupils at National Type Schools are better prepared to compete with Secondary Schools and National Schools. The Chinese National School achieved a very high significance of mean = 6.50, s.d = 1.62. secondary schools achieved very low mean = 4.82, s.d 1.22 because the HOTS level for high school was very high in comparison with primary schools. At the same time, teachers 'confidence in teaching also affects students' readiness. The table above shows the confident level of teacher's is very low in secondary schools cause the students did not know about HOTS question and could not answer during the exam time. This has proven that the null hypothesis is rejected where there is a significant difference in the readiness of pupils according to the type of school in which the Chinese National School has a high degree of readiness compared to other schools.

3.6 Ho4: There is no significant difference between teacher gender and ethnicity with their knowledge in the KBAT element

Table 6: Knowledge of HOTS by gender and race

Descriptive Statistics

Race	gender	Mean	Std. Deviation	N
Malay	Male	11.5000	1.46059	16
	Female	13.4655	1.93051	58
	Total	13.0405	2.00301	74
Chinese	Male	12.2857	.95119	7
	Female	12.8571	2.82454	14
	Total	12.6667	2.35230	21
Indian	male	13.0909	2.34327	11
	Female	12.7857	3.01735	14

	Total		12.9200	2.69134		25	
Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[b]
Race	3.485	2	1.743	.377	.687	.007	.109
Gender	10.914	1	10.914	2.362	.127	.020	.332
Race * Gander	22.858	2	11.429	2.473	.089	.042	.488
Error	526.840	114	4.621				
Total	20704.000	120					
Corrected Total	579.700	119					
Total	Male		12.1765	1.81693		34	
	Female		13.2558	2.28131		86	
	Total		12.9500	2.20713		120	

The results show that the Malays have higher knowledge in HOTS. This is because most teachers in primary schools are teachers who teach based on experience only. Additionally they are not specialize teachers in Mathematics or Science. The influence of the variable is small because it is square below 0.02. The Malay race has a significant significance compared to other nations (mean = 13.04, s.d = 2.00). The Chinese and Indians have significant values similar to the Chinese (mean = 12.67, s.d = 2.35) while Indian (mean = 12.92, s.d = 2.69). If compared to gender with race, the Malay male gender has a very big difference where Malay male have lack of knowledge in HOTS skill with mean = 11.50, s.d = 1.46.). This has proven that the null hypothesis was rejected where there was a significant difference in knowledge of teachers according to race and gender in which the Malays had a high level of knowledge of HOTS compared to the other races based on mean score.

4. Conclusion

This has shown that overall HOTS level is still low among teachers at all levels of teachers. This is because they do not know the elements contained in HOTS. At the same time, at national schools, most teachers are not based on their respective specializations. They teach based on experience. This causes them not to know the element contained in HOTS. At the same time, female teachers are more knowledgeable about HOT than male. Maybe male teachers do not have their own efforts to find information related to HOTS especially Malay male. Because they do not have enough knowledge about HOTS they are not sure to deliver inputs related to HOTS in the classroom. At the same time, the application of HOTS elements in schools also shows female teachers more active than male teachers. They need to act quickly to enable achievement to increase. Male teachers are more concerned with the traditional teaching process and do not have sufficient knowledge with the HOTS title.

As a result of this data, researchers will make the HOTS module to help teachers in primary schools to build HOTSquestions and how to answer HOTS questions easily. It greatly helps to improve the achievement and will produce high-minded students to compete with other developed countries.

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