

# MATHEMATICS TEACHERS' PERCEPTION USING TEXTBOOK TO PROMOTE HOTS

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**ABSTRACT:** In Malaysia Higher Order Thinking Skills (HOTS) is an important aspect in teaching and learning especially at primary schools. It is proved in many studies that students will become more creative and innovative if they are trained with activities towards produce good thinking especially in classroom teaching and learning. Tan and Siti (2015), in their research found that the aim to develop and enhance students' HOTS has been a major educational goal. As a matter of fulfilling a national aspiration in education, the role of teachers in inculcating HOTS is another important aspect of teaching HOTS effectively. Although there is several factors influence what mathematics teachers teach children, there is much evidence that the curriculum and the textbooks are important determinants of what children are taught and what they learn. Thus, this study is to assess the perception of Primary Mathematics (PM) teachers' to use textbooks in teaching and learning to promote HOTS. Through a questionnaire survey of 30 PM teachers from 30 National Primary (NP) schools in Petaling Perdana, Shah Alam Selangor and interviews with 10 of them, the researcher compared the teaching processes and strategies for nurturing students' HOTS. The results shows that PM teachers' perception on teaching practices to promote of HOTS appear to be a significant issue, and they did not recognized the use of textbooks in their teaching and learning instruction. Their teaching practices with textbook utilization in mathematic classrooms were not thoroughly carried out in ways that would facilitate HOTS among students. This might affect the success of HOTS outcomes in PM educational settings.

**Keywords:** Higher Order Thinking Skills, Textbook, Primary Mathematics, National Primary

## 1. INTRODUCTION

The "Kurikulum Standard Sekolah Rendah" (KSSR) was introduced by Ministry of Education in 2011 to overcome certain shortcomings within the older system. This new restructured curriculum was developed for our students to have the necessary knowledge, skills and also the values to face as well as to overcome the challenges of the current times.

After many research, the education paradigm is being changed from Lower Order Thinking Skills (LOWs) towards Higher Order Thinking skills (HOTS). As many countries have implemented it in their curriculum. Malaysia has made a very positive move to implement HOTS in current Primary Mathematics (PM) curriculum. Besides that, HOTS has been highly highlighted recently as part of government's effort to meet the need of future nation. As an immediate action to develop and enhance these skills, year 2013 has become the year in conducting HOTS in the subject of mathematics and science [10]. This transformation in education especially in the subject of mathematics has generated many questions about the implementation and the success of HOTS. Furthermore, there are questions regarding how well HOTS accepted in mathematics education; as well as the readiness among teachers and students.

The implementation of HOTS in our mathematics education system means, besides scoring in routine subject examinations it is also to educate our children to become wise decision makers and efficient problem solvers. In order to achieve these goals, teachers need more training in the aspects of critical thinking in real life as well in their respective subject matters. [11] reviewed that if want to teach our students to be skillful in critical and creative thinking through instructional materials, the need of teachers who can infuse these thinking skills into are essential. In other words, teachers always must be able to relate thinking skills to correspond to the subject content that they are trying to impart. In this way, students should be trained to be skillful in doing observation, analysis and generalization.

In today's highly competitive global "knowledge economy", students need to be self - directed and possess lifelong learning skills. They are required to possess "21st-century skills", such as creativity and critical thinking, problem solving and analytical reasoning in their learning, according to [18]. In this concern, it can be argued that HOTS are necessary skills that build productive citizens as productivity is based on individuals' ability to analyze, to combine knowledge of different resources, to discuss, to judge, and to evaluate. Various definitions of the term HOTS were provided by several specialists who are interested in the field. [3] created the term HOTS and defined it in the levels of analysis, synthesis, and evaluation of knowledge. In the analysis level, learners engage in two processes: (1) identify causes for particular events, and (2) analyze information to reach a conclusion. Learners are required to think deeply and critically. In the synthesis level, learners make predictions and solve problems. Moreover, learners are encouraged to produce a variety of creative answers, instead of finding only one correct answer. In the evaluation process, learners evaluate ideas and information and offer their thoughts and opinions on the value of the issues being examined. Additionally, Bloom's view could be summarized as an individual would "use cognitive skills from previous knowledge and apply them to new problems/issues/situations" (1956, p.38). In Malaysia, most of the teachers are confused themselves, they thought that are teaching HOTS in classroom but in reality they just inducing LOTs among their students [16].

This is supported in recent Preliminary Report of the Malaysia Education Blueprint 2013-2025 that most lessons in schools did not adequately engage students in constructive thinking where many teachers still relied on 'lecturing' format and learning, therefore only involved the process of recalling facts or delivering knowledge to students rather than cultivating HOTS in teaching and learning processes. Traditional teacher - centred instruction is implemented through teachers, rigorous examinations, and student written

reports. In such environments, the teacher's role is to direct learning in each aspect (Tu & Twu, 2002). This teaching method has failed to reach students HOTS, owing primarily to the teacher's ineffectiveness in motivating students. Hence, students play a passive role and do not have a chance for reflection as a learning outcome [12].

Although several factors influence what mathematics teachers teach children, there is much evidence that the curriculum and the textbooks are important determinants of what children are taught and what they learn. Hence, it is worth noting that curriculum and educational processes are responsible for building learners' abilities and thinking habits. In Malaysia, primary schools use textbooks as the main source of references for teachers and students. This can be achieved when the textbooks are enriched with critical thinking activities to urge learners to think; otherwise, they will become low achievers who focus on LOTs.

With the importance of HOTS in conjunction with the use of PM textbooks, this research study is focused on the PM teacher's teaching practices with textbooks to promote HOTS in their classroom. The subjects of this study are PM teachers who are teaching in the district of Petaling Perdana, Shah Alam Selangor.

### 1.1 Problem Statement

It is very importance for every students to possess 21st-century skills that includes more creative as well as critical thinking, analytical reasoning, decision making skills as well as problem solving skills in their learning to survive in today's world which is highly competitive and challenging [18]. Krishnan and Yassin (2009) concluded that the ability to memorise the content whole textbooks is no longer sufficient for students to be competent in current world. Students must be able to explore as well as relate the knowledge with the real world, by utilising textbook. In almost every subject area, at nearly every grade level, students and teachers of mathematics are expected to use a textbook as a resource [1]; Kluth, 2005).

In classroom the textbooks provide an important reference and guidelines for teachers in assisting pupils to learn mathematics (Ministry of Education, 2003). It is a primary source of information for teachers. Now in Malaysia, all textbooks are given for free to all pupils in public schools. All textbooks are written by a team of experience teachers. The content of the textbooks are considered the best and it was designed according to the specifications outlined by the Ministry of Education. In 2011 the Ministry of Education published new mathematics textbooks for Primary 1 followed by the publication of the new textbooks for Primary 2, Primary 3, Primary 4, Primary 5 and Primary 6 from 2012 to 2016. The content of the textbooks focus more on real life contexts and it was designed beautifully to cater current curriculum with more HOTS and critical thinking elements. Mathematics textbooks always in a close way follow the guidelines of Curriculum Development Centre. [9] in his research on mathematics textbooks concluded that the teaching of mathematics relies on textbooks more than any other subject area and majority in mathematics lessons the textbook is often the teacher's main source of content, sequencing and instructional activities and ideas for lessons. It is accepted worldwide that mathematics textbooks have a

major influence on classroom practice [8]. Textbooks are important vehicles for the promotion of specific types of mathematics curriculum.

[17] in the research about current KSSR mathematic textbook found that textbooks are well aligned with the mathematics syllabus in terms of structure, content and expectation. Since 2011, the first year of KSSR implemented PM teachers are constantly encouraged to use textbooks and promote HOTS in their teaching. The questions of how textbook has been used in Malaysian primary classroom by PM have not been addressed. While examples are often given in other higher educational settings, they are rarely provided in the PM setting. Are PM teachers aware of the promotion of HOTS approaches during their teaching? Are PM teachers already using textbooks and meeting the Malaysia's policy in education, which includes the teaching of HOTS? This study investigated the PM teachers who are teaching in the district of Petaling Perdana, Shah Alam Selangor teaching experiences and practices with textbooks utilization to promote HOTS.

### 3. METHODOLOGY

This study aims in identifying teachers' perception of the use of textbook to promote HOTS in teaching and learning PM. The questionnaire survey and subsequent semi-structured interviews were designed with the following research questions;

1. How do PM teachers perceive their competencies in using textbooks to promote HOTS?
2. What are teachers perceptions of the role of the teachers have to play when incorporating HOTS in their lessons?

#### 3.1 Participants

This study collected data from 30 PM teachers who were teaching in the district of Petaling Perdana Shah Alam schools. The participants were between 28 to 50 years old, and 60% were females and 40% were males. The participants were selected randomly from 90 participants who attended a day course in district.

#### 3.2 Data Collection

This study examined the perspective of teachers from 30 schools in the district of Petaling Perdana, Shah Alam Selangor. The teachers are from a mix of socioeconomic backgrounds and levels, including lower PM teachers (standard 1 to 3) and higher PM teachers (standard 4 to 6). Data collection took place on the day the PM teachers attended the course. During registrations the first 30 teachers who registered their attendance earlier were given the survey. The selected PM teachers received a year 4 PM mathematics textbook in order to answer the survey questions. All the completed survey forms collected within 2 hours. Therefore, convenient sampling method was used in this study.

The further study, a focus group interview approach was used to obtain the further perceptions of the teachers. This approach has the potential for participants to interact as well as give out ideas beyond what individual person can contribute [5]. There were ten teachers involved in the focus group interview, six of them female and the other our male. Most of the teachers have less than 10 years of PM teaching experiences. During the interview the researcher acted as a facilitator. The interview lasted for about 20 minutes. After

that researcher summarized the responses and sent the summary to the teachers to verify. The ten teachers held an additional group meeting for about 15 minutes with the researcher being absent. This allows them to come up with their responses.

**4. DATA ANALYSIS AND FINDINGS**

All the 30 copies of questionnaires were returned. From the questionnaires; 43% of the participants have taught PM for four years or more, 30% have taught for three years, the other 27% have just taught for one or two years. Qualitative data collection was conducted by inviting 10 randomly selected teachers to a focus group interview when they returned the completed questionnaire. The details about the survey answers and interviewees are in Tables 1 and 2.

**Table 1 Information about the respondents in the questionnaire survey**

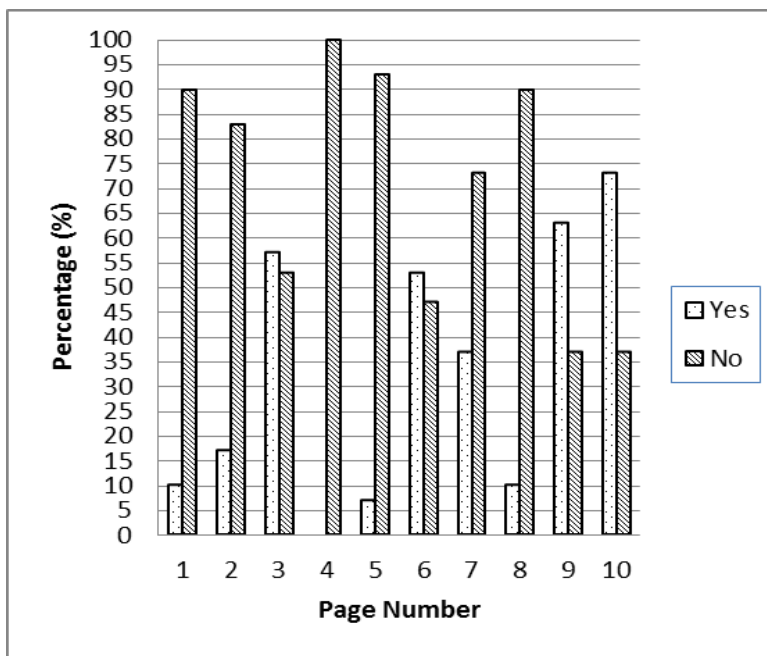
Total teachers	30
Gender	Male: 40 % Female: 60%
Teaching PM Experiences	1 year: 10% 2 years: 17% 3 years:30% 4 years and above: 43%
PM Option	Total: 73% Male:70% Female: 80%

**Table 2 Information about interviewees**

Interviewees	1	2	3	4	5	6	7	8	9	10
Gender	M	F	M	F	M	M	F	F	F	F
Teaching Experience (Years)	4	2	25	5	4	11	7	4	6	13

Based on table 2, 40% of the interviewees have teaching PM experience less than 5 years and 30% of the interviewees have experience more than 10 years. To answer the research question 1, all the selected teachers use latest KSSR Year Four PM textbook. For the research

purpose, only chapter 4 in Year Four which is under topic division was analysed. This topic consists of 10 pages. Figure 1 below shows the analysis of the survey to answer the question 1: Does the content of the textbook help teachers to develop students' HOT skills?



**Figure 1 Analysis of the survey questions**

Based on figure 1, more than 60% of the PM teachers believe the last two pages of the topic multiplication have HOTS. The last two pages of the topic consist of problem solving questions and enrichment questions. All the teachers choose none of the content in page 4 helps to develop HOTS. The page 4 of the topic consists of only two examples and solutions. For page 5, only two teachers stated yes there is

content to promote HOTS. This page also consist of solutions of examples, but three different methods were given compare to page 4 only one method for two questions. For the page 3 and 5 about 50% of the PM teachers choose yes to state there is HOTS content. As conclusion, the survey results shows that PM teachers perceive that, pages which consist of questions like to find

unknown, multiple methods and problem solving helps to promote HOTS in classroom during teaching and learning. The page with only solution to the questions does not contain any HOTS element.

and 8 non-option teachers. Most of the PM options teachers believe the pages with find unknown value, multiple methods and problem solving questions promotes HOTS in teaching and learning.

Figure 2 and figure 3 shows the perceptions of PM option teachers and non-options. There are 22 PM option teachers

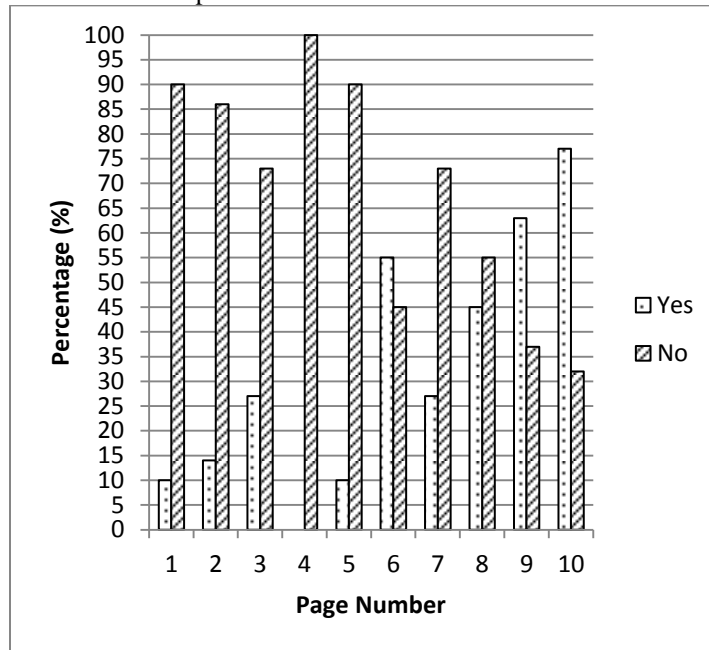


Figure 2 Analysis of the survey questions for PM option teachers

There are total 22 PM option teachers. Out of 22 teachers about 17 teachers or 77 % of the teachers choose there are HOTS items in the last page of the topic. 55% of the teachers

choose 'Yes' for the page 6 and 63% of the PM option teachers choose 'Yes' for the page 9.

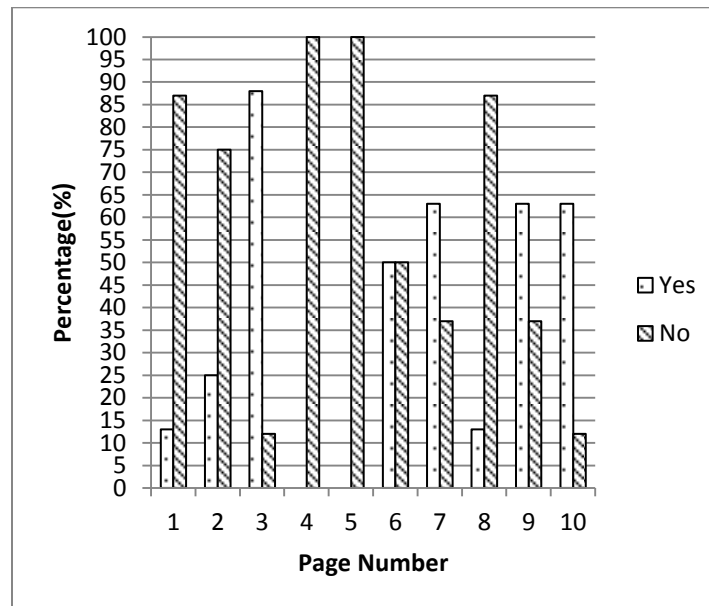


Figure 3 Analysis of the survey questions for PM non-option teachers

There 8 teachers or 27% of the teachers are non-option PM teachers. None of the teachers choose 'Yes' for page 5. The non-option teachers do not except multiple solution as promoting HOTS element. Based on Bloom's Taxonomy, the

skills involving analysis, evaluation and synthesis or creation of new knowledge are considered to be HOTS. It requires different type teaching and learning methods in order to learn facts and concepts. The multiple solutions in page 5, falls

under synthesis where by the students create new knowledge to solve the questions. This results shows that non-option teachers unable identify element of HOTs in the textbooks. About 63% of the teachers choose there are HOTs elements in page 9. The percentage of option and non-option choose page 9 as ‘Yes’ are equally same. Most of the non-option and option teachers choose page 10 has element HOTs. Page 10 consists of questions to find out unknown or to complete the number sentences as well as problem solving questions. This results shows that both option and non-option PM teachers

understand that HOTs involves the learning of complex judgmental skills and problem solving. [6] in their research stated that through practicing in learning, students will able to acquire, analyze, synthesize, and utilize the information to achieve a solution or find settlement of difficult situations in real life.

To answer the question number 1 “How do PM teachers perceive their competencies in using textbooks to promote HOTs?” the mean scores of the survey gathered (see Table 3).

**Table 3 Mean scores of the survey**

Answers	Overall	Option Teachers	Non-Option Teachers
Yes	32.7	32.8	37.8
No	70.3	68.1	59.7

The mean scores of the survey shows most PM teachers do not perceive to use textbooks to promote HOTs. This result was supported by PM option teachers and non-option teachers. However non-option teachers had higher perceptions of using textbooks to promote HOTs than option teachers.

The following represents a summary of the responses that the teachers provided to three interview questions that were posed during that focus group interview, and additional responses that the teachers provided 15 minutes later.

**4.1 What is HOTS?**

The researcher first asked the group of teachers what the word HOTS conjured up in their mind. They were told not to use any textbook definition. Most of them describe HOTS as higher order thinking questions which need the students to think beyond the lesson of the day. During this discussion, the most senior teacher who has experience about 25 years viewed HOTS is the type of tough assessments or questions that need students to answer in given time. Only smart students or high achievers can solve the HOTS questions correctly and on time. During the discussions, the teachers add up the word HOTS as the current trend of education which teachers have to train the students to always think and come up with logic answers or solutions. Slow learner students are struggling with HOTS questions and it is not fair for them to be evaluated the same as the high performing students. This supports the previous research findings that teachers are still believes on to the thought that HOT is only for high-performing students [7].To them, low performance students have very little thinking capacity, and moreover if they have low language proficiency their thinking ability is mostly hindered [13].

**4.2 The content of current KSSR textbooks**

The second interview was whether the teachers felt that the current content of KSSR textbook better than previous one in KBSR or not. Immediately several teachers responded quickly by saying that the current one is better with new method of solutions. Two of the teachers supported that current textbooks content is more colourful and not direct writing or examples. Each topic was explained beautifully with more pictures and dialogs. The most senior teacher in the group claimed that teachers were unable to use textbooks successfully in the classroom due to limited teaching period for KSSR compare to KBSR. Majority of the teachers

supported that statement. One of them claimed, they wish to use or make sure every single page of the textbook used during teaching and learning but due to too many topics and limited time they can use textbooks only at certain time in a week or month. After the interview, the focus group added the teaching period for PM should increase at least 4 hours in a week instead of just 3 hours per week. Teachers need special training or guidance to use the current KSSR textbook because most of the solutions given in the textbooks need the teachers to understand fully before the lesson.

**4.3 Relationship between HOTS and Textbook**

The last interview question was whether the teachers felt that textbooks help them to promote HOTS in the classroom. Most of the teachers, not very sure why we (the researcher) integrating between HOTS and textbook. These responses, clearly shows that teachers lack of knowledge of HOTS and this may eventually lead teachers’ inability to assess students’ HOTS. Tan and Siti (2015) found the fact in their research too. They strongly agree that current textbook does not apply more critical thinking elements or HOTS elements but there is difference between old textbooks and KSSR textbooks. KSSR textbook give students wide range of problem solving methods but the cultivation of HOTS is a time-consuming effort where students need to reflect, justify as well as interact with discussions in limited time frame.

**5. CONCLUSIONS**

PM teachers have to be given constant exposure to HOTS courses organised by the ministry, besides using more sources of reference teacher’s need to be trained or exposed with the content of current curriculum specially from textbooks. The results shows that PM teachers’ perception on teaching practices to promote of HOTS appear to be a significant issue, and they did not recognized the use of textbooks in their teaching and learning instruction especially PM option teachers. They perceive HOTS as difficult questions that students have to solve. Their teaching practices with textbook utilization in mathematic classrooms were not thoroughly carried out in ways that would facilitate HOTS among students. This might affect the success of HOTS outcomes in PM educational settings. Not only how much textbooks are used in relation to other activities should be analysed but also how and why they are used. Finally, the main elements in the classroom, the teachers and the students,

must have the opportunity to reflect upon the characteristics of textbooks and how they use them.

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