

# Level of Oral Questions Used by New and Experienced Teachers in Mathematics Teaching in Primary Schools

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***Abstract---** This study was conducted to study the level of oral questions used by new and experienced teachers in the mathematics teaching process. The use of high-level oral questions can help improve students' thinking and understanding of mathematics teaching. Data from the qualitative case study was collected through observations, semi-structured interviews, document analysis and field notes. Six mathematics teachers from six different primary schools in a district in Malaysia were selected as participants of the study using purposive sampling method. The data were then analyzed using a constant comparative method to identify the patterns and themes that emerged from the data obtained. The study found that new and experienced teachers focused more on low-level oral questioning in the mathematics teaching process. The oral questions posed emphasize the memorization aspects of mathematical procedures and formulas. This indirectly diminishes the opportunity for students to train their thinking to a higher level. The implication of this study is that teachers need to be given more in-depth training to help them improve their skills in implementing oral questioning processes to help improve students' high-level thinking skills.*

***Keywords---** Oral Questioning, Mathematics Teaching, Oral Questioning Level, Primary School.*

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## I. INTRODUCTION

The use of multiple levels of oral questions in the mathematics teaching process is very important as each step of teaching requires the application of a different level of question (Curriculum Development Division, 2014). Effective oral questioning not only focuses on high-level questions alone but also needs to be varied according to circumstances and situations (Mahmud et al., 2019). Although Guskey (2010) suggested that teachers should focus on the use of high-level questions, MdYunus (2015) emphasized that teachers need to diversify their inquiry level to produce students with a clearer sense of mathematics and thinking. Therefore, teachers should be wise to diversify the level of oral questions in the classroom in proportion to the learning objectives to make the learning process more meaningful (Musalib & Ahmad, 2012).

Bloom's taxonomy has been used as a reference in determining the cognitive level including the questioning aspect. The level of oral questioning used in schools under the Ministry of Education Malaysia applies the questioning based on the revised edition of Bloom's Taxonomy by Anderson and Krathwohl (2001) (Figure 1).

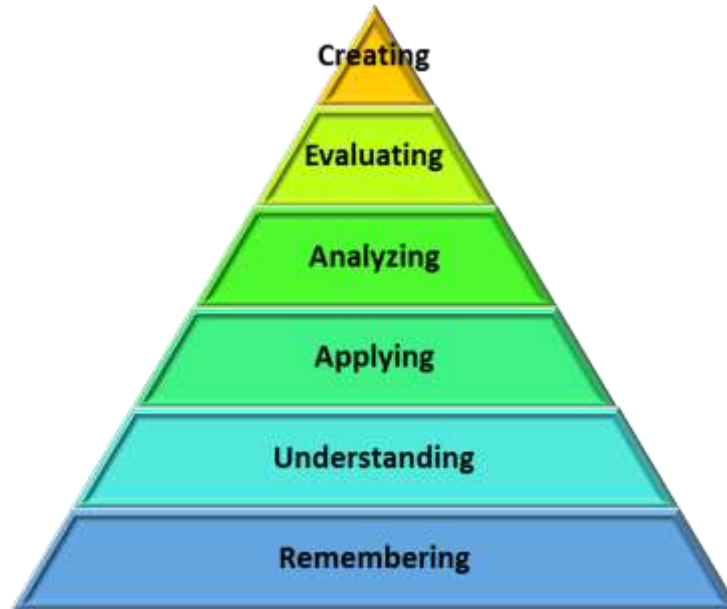


Figure 1. Bloom Taxonomy

There are basically two levels of oral questioning, namely low-level and high-level oral questioning as found in the revised edition of Bloom's Taxonomy. The lower levels of oral questioning include the level of remembering and understanding while the upper level questions include applying, analyzing, evaluating and creating. Each level of question used by a teacher has its own function and purpose and should be used according to the learning needs. The functions of each level of the question are shown in Table 1.

Table 1. Level of Questions Based on Bloom's Taxonomy

<i>Level of Questions</i>	<i>Description</i>
Remembering	Oral questions that require students to remember the content of lessons learned such as definitions, formulas, and principles.
Understanding	Questions that encourage students to understand the meaning of what they remember are usually presented with descriptions in their own words.
Applying	Questions that require students to use information in new contexts to solve problems, answer questions, or perform other tasks. The information used is such as principles, formulas, theories, concepts, or procedures.
Analyzing	Oral questions that require students to simplify what they aware of, in order to see the differences, shapes, and so on.
Evaluating	Questions that require students to formulate and come up with new ideas, patterns, and structures.
Creating	Questions that use a set of criteria, established by the student or determined by the teacher to achieve a sound judgment.

Source: Curriculum Development Division (2014)

However, the studies of Muthy (2013) and Hassan et al. (2016) found that mathematics teachers focus more on lower-level oral questions than higher-level oral questions in the process of teaching mathematics. This is because there are teachers who think that students must first understand a concept and the facts of a subject before they are

encouraged to think (Saad et al., 2012). This indirectly causes teachers to dominate most of the interactions in the classroom, resulting in less student involvement in the teaching process (Kassim & Borhan, 2015).

In addition, Shahrill's (2013) study found that poor students' ability in mathematics subject made it difficult for teachers to practice oral inquiry using high-level oral questions. High-level questions asked by teachers are difficult to answer especially for low-achieving students because they have difficulty understanding the high-level questions posed to them. Thus, Maat (2015) stated that teachers are more likely to ask low-level oral questions to help low-achieving students to understand, remember and reinforce abstract mathematical concepts before asking high-level questions. Iksan (2011) also explains that if high-level questions are asked openly, only good students will dominate answering questions. Tambychik dan Meerah (2010) state that the understanding of mathematical questions or problems is an important first step and should be supported through a variety of stimuli, especially oral questions from teachers.

Mahmud et al. (2020) also emphasized that students' misunderstanding of mathematical questions indirectly made it difficult for students to answer mathematical questions in international assessment. Zohar and Dori (2003) found that some teachers still think that the higher order thinking skills (HOTS) question in mathematics teaching is only suitable for high-achieving students. Therefore, MdYunus (2015) emphasized that teachers should diversify the levels and strategies of oral questions so that the oral questioning process will be more active and engaging for students in the teaching of mathematics.

However, the most important aspect of performing oral questions at higher levels is the knowledge and skills of the teacher himself (Maat, 2015). The study of Mahmud et al. (2020b) states that the weakness of mathematics teachers in the knowledge and application of thinking skills contributes to the implementation of low-level oral inquiry as opposed to high-level oral inquiry.

In addition, it is found that in-service training is one of the requirements for teachers to develop knowledge and skills in planning and implementing teaching more effectively (Buhagiar, 2014). However, a study by Mutalib (2015) found that aspects of teacher training in oral questioning are still at a low level. Kira et al. (2013) stated that responsible party should play a role by constantly planning and implementing in-service training to help teachers improve their skills and ability to respond to oral inquiry.

The study of Zarina (2016) states that one of the reasons for the decline in Malaysian students' performance in the global assessment of TIMSS is due to the lack of student skills in higher order thinking skills. This is because the questions used in the TIMSS assessment focus more on exploration and inquiry questions. To this end, Shahrill and Clarke (2014) state that low levels of thinking skills among students are due to the lack of effective oral questioning activities that stimulate students' thinking in the teaching of mathematics. The study of Mahmud et al. (2020a) found that teachers' questions in mathematics teaching were more about solution procedures but less attention was given to higher level questions and divergent questions. This has led to the lack of questioning practice to stimulate students' thinking skills in the mathematics teaching process (Shahrill, 2013). This also indirectly caused teachers to dominate most of the interactions in the classroom, resulting in less questionable activity in the teaching process. The impact of *Mathematics Education, Universiti Kebangsaan Malaysia & Institute for Mathematical Research, Universiti Putra Malaysia*.  
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the lack of questioning activities carried out by teachers in teaching activities has resulted in teachers failing to stimulate and provoke students' thinking, resulting in less student involvement in the teaching process (Shahrill & Clarke, 2014)

As such, little is known about how primary school mathematics teachers conduct oral questioning in the mathematics teaching process, especially in relation to the level of oral questions used because most previous studies on oral questioning are conducted in secondary schools. In addition, no studies have been conducted specifically describing aspects of oral questioning in mathematics teaching among new and experienced teachers in primary schools. Besides, most of the previous studies about questioning focused more on other subjects such as science subjects (Iksan, 2011), Geography (Mutalib & Ahmad, 2012) and English (Mahamod & Lim, 2011). Although there are studies that study the oral inquiry in mathematical subjects such as McAninch's (2015) study, they are not conducted in Malaysia and focus only on secondary school teachers.

Studies on the level of oral questioning have long been done, but study in the field of mathematics education is still relatively new especially in primary school. Therefore, this study is expected to provide a realistic scenario of the level of oral questioning implemented by primary school mathematics teachers so that problems can be identified and resolved through a number of suggested solutions.

## II. METHODOLOGY

This qualitative study had adopted the case study method. Six primary school mathematics teachers from six different schools in a district in Malaysia were selected as participants of the study using a purposive sampling method. In the context of this study, the researcher adopted the definition by Kim and Roth (2011) in which new teachers were defined as teachers with less than five years of teaching experience. The definition of experienced teachers in this study adopts the Goodwyn (2017) definition, which states that experienced teachers refer to teachers who have at least fifteen years of teaching experience.

Data was collected using observation, semi-structured interviews, and field notes. The use of various data collection techniques helps the researcher to triangulate the data at the data analysis level while also reinforcing the results obtained (Merriam & Tisdell, 2016).

In this study, data were analyzed using the constant comparative analysis, which involved combining data collection with analysis to identify patterns and themes that emerged from the primary data collected (Merriam & Tisdell, 2016). The initial analysis of the data began as soon as the fieldwork begins. Thus, the processes of data analysis and data collection were done simultaneously and was an ongoing process. The data collected in this study were analyzed using Atlas.ti 8 software to determine themes and sub-themes.

Merriam and Tisdell (2016) stated that the validity and reliability of a study refer to the extent to which the study's findings can accurately and consistently represent the phenomenon under study. Therefore, in this study, the researcher used several methods to enhance the validity and reliability of the study using the triangulation method, member checking, and peer review.

### III. RESULTS AND ANALYSIS

The ages of the research participants ranged from 27 to 50 years old (Table 2). Teacher Ana, Teacher Nadia, and Teacher Ada were in their twenties, whereas the remaining of them have less than four years of teaching experience. On the other hand, Teacher Raha, Teacher Azah, and Teacher Roza were more than 40 years of age and had more than 20 years of teaching experience. All the participants obtained undergraduate degrees in Mathematics Education. Hence, the participants were considered to have the credibility, knowledge, and skills to teach mathematics.

Table 2. Educational Background and Teaching Experience of the Research Participants

	Ana	Nadia	Ada	Raha	Azah	Roza
Age	28	27	28	46	50	44
Mathematics Teaching Experience	4	3	4	20	23	23
Academic Qualification	Bachelor Degree in Mathematics with Education					

Each of the explanations discussed in the findings is supported by excerpts from the teacher's observations as well as excerpts from the interviews conducted. Examples of labels for observations are [Azah, P3/12452-12723], where 'Azah' (participant's name), 'P3' (third observation for Teacher Azah), and '12452-12723' (sentence numbering in the observation document analyzed). For interview transcripts, the researcher used the label 'SRI' or 'II' where 'SRI' refers to the stimulated-recall interview while 'II' refers to the initial interview. For example, the label [Roza, SRI3/4751-5047] refers to 'Roza' (participant's name), 'SRI3' (third stimulated-recall interview), and '4751-5047' refers to the sentence numbering in the interview transcript document. Besides, for the data involving field notes, the researcher labelled it as 'NL' such as [Ada, NL/17082018] where 'Ada' refers to the participant, NL (field note) and '17082018' refer to the date that the field note was taken, which was August 17, 2018.

Studies have found that all new and experienced teachers are more focused on using lower-level oral questions than high-level oral questions. In this context, teachers are found to focus only on remembering and understanding questions. The researcher also failed to find any form of high-level oral questions posed by the teacher during the observation.

For remembering the level of questions, teachers ask oral questions that require students to remember the content of lessons learned such as definitions, formulas, and principles. This is illustrated by the memorizing questions posed by teachers during the mathematics teaching process. For example, Teacher Ada asked the student: "What are the properties of a triangle?" [Ada, P1 / 4253-4326], and then she goes on to ask students, "What about a rectangle?" [Ada, P1 / 5021-5062]. Based on the example of the oral question, it was found that Teacher Ada asked the students to recall the characteristics of the triangle and rectangle they had learned during the fourth year. Teacher Ada explained that remembering-level questions play an important role in helping students recall their previous lessons to support students' understanding of newly learned topics [Ada, II / 16552-16617].

Teacher Ana added that the remembering-level questions were often asked towards students. She said that when students succeed in remembering what the teacher emphasizes in mathematics teaching such as math formulas, it can help students in the examination or practice drills. This is shown in the excerpts below:

“Indirectly, I train students to memorize formulas because later, it can help them in examination and practice in class. Meaning that student knowledge already exists about this formula. Indirectly he will make things easier to solve. ”

[Ana, SRI1/6707-7016]

Remembering questions can also be seen through procedural questions that teachers often ask during mathematics teaching processes such as the questions posed by Teacher Roza, “Where do I go first?” [Roza, P1 / 8776-8796] and Teacher Azah, “What was the first operation?” [Azah, P2 / 16137-16161]. In this context, students are trained to memorize steps and calculation procedures to solve math problems.

For understanding questions, teachers ask oral questions that encourage students to understand the meaning of what they remembered, usually illustrated by using their own words as examples of teachers asking students to explain the response the student has given. This is shown in the following lesson excerpt:

Teacher	Okay class, what is the length of this side?
Student	4 centimeter..
Teacher	4 centimeter, okay 4 centimeters. What is the length of the width?
Student	4 centimeter also..
Teacher	4 centimeter. Why is the length also 4 centimeters?
Student	Because the length of each side is the same..
Teacher	Because this is square, so the sides are the same. So the width is 4 centimeters.

[Ada, P2/4988-5309]

Teacher Ada found that students were asked to state the length of a square. The student then recounts how he got the 4 centimeters. In this context, students can recall information that is the concept of a square, and the student can then explain the idea and concept of the square.

This study concludes that the process of teaching mathematics by new and experienced teachers is more focused on using lower-level oral questions than high-level oral questions. The findings of the study are further reinforced by the statements given by each teacher that mathematics teaching is indeed focused on lower-level oral questions like the following:

Researcher	Oh, so in your opinion, in this lesson, you were not using high-level questions?
Teacher	Not at all.
Researcher	so which one would you prefer to use at which level of oral questions?
Teacher	Low-level oral questions

[Ada, SRI 1/24050-24184]

"In my opinion, I think I'm more focused on low-level oral questions."

[Ana, SRI 1/24071-24339]

Researcher	If you are in the process of teaching mathematics in your classroom, you usually use which level of oral questions?
Teacher	Usually, I prefer to use lower-level questions because my students have difficulty understanding higher-level questions. Their level is a bit weak, too

[Azah, II/17404-17553]

Researcher	What level of questions do you use in your math teaching?
Teacher	I'm focusing more on lower-level questions.

Researcher Is there really no higher-level question at all?  
Teacher High-level questions .... I don't think so.

[Roza, SRI 1/8012-8093]

Thus, the above discussion clearly demonstrates that each participant was more focused on the use of low-level oral questions than high-level oral questions in their mathematics teaching process.

## VI. DISCUSSION

### *1) Level of Oral Questions Used by New and Experienced Teachers in the Mathematics Teaching Process*

Based on the findings of the study, new and experienced teachers in this study focused only on lower-level oral questions. The results of this study are consistent with the findings of Mahmud et al. (2019a), Hassan et. al (2016) and Maat (2015) that found math teachers focus more on low-level oral questions. Teachers also tend to ask closed-ended questions, rather than asking more challenging questions that provoke student thinking. In this context, the questions posed by teachers are more about memorizing procedures and remembering facts such as mathematical principles and formulas. This is also supported by Way (2008) who states that 93 percent of teachers' questions in mathematics teaching is low-level questions that focus only on knowledge questions and fact-checking. Obviously, there is no difference between new and experienced teachers in the aspect of oral questions used in mathematics teaching where both categories of teachers use low-level oral questions in their teaching.

The study also found that teachers' mathematics teaching focused on procedural questions and only focused on students to memorize the solution. Thus, these questions certainly do not help students to develop concepts and it is difficult to help students relate to the mathematical ideas they are learning because the teachers' questions are just around the lower level. Although issues related to the level of oral questions used by teachers in mathematics teaching have been studied for a long time, teacher still emphasizes procedural issues and teachers do not perform oral questions at higher levels. This problem may be due to the low level of proficiency that teachers have in implementing thinking skills strategies in mathematics teaching. This is in line with Zakaria and Addenan (2015) research that many teachers do not have the skills to implement thinking skills in mathematics teaching even though they are aware of their importance. This is an unexpected result because research by Maat (2015) found that the implementation of low-level oral questioning only occurred among new teachers but the findings of this study show that it occurs in both categories of teachers. Therefore, teachers need to take the initiative to improve their teaching style into teaching in the form of exploration, inquiry and problem solving so that teachers can better diversify the use of spoken questions rather than using low-level oral questions that emphasize memorization.

The Ministry of Education's intention to place Malaysia in the top three lists in the global assessment of TIMSS and PISA may not be possible if continuous mathematics teaching focuses only on low-level oral questions. This is because the low-level questions are obviously not the right questions to stimulate students' mathematical thinking especially in solving open-ended and investigative questions. The framework used by PISA (2016) shows that various components of mathematical thinking need to be applied in mathematics teaching including reasoning, modeling and building relationships between ideas. It is therefore difficult to apply this element to students if teachers practice low-

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level oral questioning in mathematics teaching. This is because the practice of low-level oral questioning implemented in the mathematics teaching process only trains students to think linearly but does not emphasize the logical reasoning involved in inductive and deductive thinking. Mahmud (2019) explains that it is important to produce students with clearer senses and mathematical thinking.

However, in order to ensure that the learning needs of the students are met, teachers should vary the use of oral questions in the teaching of mathematics. Mathematics teaching using a variety of oral questions can help students build a better understanding of concepts and nurture students' curiosity through inquiry and exploration questions. This is because mathematical knowledge and skills can be gradually developed to the best of their ability. It is in line with Gagne's Theory of Instruction (1970) that the teaching process moves from the simplest to the most complex. In addition, multi-level oral questions were also able to reinforce math concepts at all levels of students and reduce student dominance in answering the questions posed to them.

## VII. CONCLUSION

In general, the study has shown how the actual phenomenon of the level of oral questions used by primary school math teachers in teaching is implemented. All teachers, whether new or experienced teachers are more focused on lower-level oral inquiry. This indirectly causes students to be less exposed to exploratory questions that enhance their thinking. Besides, the findings of this study can also assist teachers in assessing their practice of oral questioning in the teaching and learning process of mathematics. Thus, enabling them to plan better in their practice of questioning in order to enhance students' higher-level thinking skills.

Therefore, researcher suggested that more training and exposure on the implementation of effective oral questioning in mathematics teaching should be given to teachers. In addition, there is a need for the revitalization of the professional learning community among teachers so that more sharing and improvement can be implemented in improving teachers' inquiry skills especially amongst elementary school mathematics teachers. Researcher also suggested that more in-depth research on the topic of oral questioning to be conducted, especially in finding solutions on how teachers can teach different levels of oral questioning in formative assessment.

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