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Levels of Understanding and Skills of Mathematics Teachers in the Implementation of Higher Order Thinking Skills (HOTS) in Teaching Mathematics in Secondary Schools

Wong Boh King, Muhammad Sofwan Mahmud

Universiti Kebangsaan Malaysia, Bangi, Malaysia

Email: sofwanmahmud@ukm.edu.my

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Abstract

Mathematics achievement among students in Malaysia in international assessment Trends in International Mathematics and Science Study (TIMSS) and Program for International Student Assessment (PISA) is still at a low level. Therefore, teachers need to play a major role in inculcating and applying Higher Order Thinking Skills (HOTS) among students through various teaching strategies. The purpose of this study is to identify the level of understanding and skill in applying HOTS among secondary school mathematics teachers in Mukah, Sarawak. This survey study with a quantitative approach involved 28 mathematics teachers who were selected at random from three secondary schools in Mukah district, Sarawak who were selected as respondents. The questionnaire instrument will be used to obtain information related to this study and analyzed using the Statistical Package for the Social Science (SPSS) version 27.0 software. The findings of this study will be described in descriptive and inferential analysis. Descriptive analysis was used to obtain frequency, percentage and mean. The results of the study show that the level of understanding of teachers in applying HOTS in mathematics teaching is high (mean = 3.53) while the level of skill of teachers in applying HOTS in mathematics teaching is moderate (mean = 3.37). Furthermore, Spearman rho will be used as an inferential analysis to identify the relationship between aspects of teachers' understanding and skills with the application of HOTS elements in mathematics teaching. The results of the study show that there is a significant and very strong positive relationship between the aspect of understanding and skills of mathematics teachers by applying HOTS elements in teaching mathematics ($r(26) = 0.950$, $p<0.01$). Overall, this study provides benefits and guidance to improve the quality of teacher teaching in terms of understanding and skills to implement HOTS elements in the teaching process through continuous professional development (CPD) and in-service training.

Keywords: Higher Order Thinking Skills (Hots), Understanding, Skills, Teacher, Mathematics

Introduction

Education in the twenty-first century is a revolution that prepares and equips students in terms of knowledge and abilities to enable students to face a life full of obstacles in the field of education and even in the professional field. As a result, the Malaysian Education Development Plan 2013-2025 was introduced by the government to ensure that education in Malaysia is in accordance with global education standards. According to the Malaysian Education Development Plan 2013-2025, there are six main characteristics that each student must possess in order to compete at the global level: knowledge, leadership skills, thinking skills, bilingual abilities, ethics and spirituality, and national identity (Ministry of Education Malaysia, 2013).

Therefore, the noble effort of Ministry of Education Malaysia to produce human capital that is highly capable of thinking and who will be responsible for the growth of the nation is centred on thinking skills, particularly Higher Order Thinking Skills (HOTS). As a result, the application of HOTS emphasises three key elements: curriculum, pedagogy, and assessment. This is because, according to the results of the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA), students' mathematics achievement is still below average. Malaysia ranks one-third lower than the other nations evaluated internationally. Meanwhile, the TIMMS report reveals a dramatic decline in Mathematics achievement from 1999 to 2019. Therefore, the application of HOTS is prioritised to be able to develop creative and critical thinking to solve problems, make decisions, and be able to create something as well as increase achievement performance among students (Ministry of Education Malaysia, 2013). The success of students with HOTS in mathematics is influenced by teachers' abilities to develop students' HOTS capabilities through comprehension of the idea of studying mathematics, communication in mathematics, creativity, problem solving, and reasoning (Tambunan & Naibaho, 2019).

The implementers who make sure that a nation's efforts in education are successful are the teachers. The HOTS learning environment requires teachers to use a variety of student-centered teaching and learning strategies. As a result, teachers must prepare themselves to accept changes in the educational environment by exhibiting an openness and commitment to their profession; conventional teaching must transform to teaching that is centered on the demands of the twenty-first century (Nagaretnam & Mahmud, 2022). The 21st century educational system therefore employs an effective teaching and learning process by employing the practise of Higher Order Thinking Skills (HOTS) to direct pupils to think critically and creatively and to actively involve students in learning activities.

Additionally, it is crucial for teachers to have knowledge and awareness of how to conduct HOTS activities associated with mathematics in order to contribute to the variety of teaching methods used in the classroom that integrate elements of the curriculum, pedagogy, and assessment. According to a research by Kassim et al. (2017), teachers' knowledge and grasp of KBAT strategies are, however, restricted to eight thinking maps and questioning techniques. According to Nagaretnam & Mahmud (2022), it also found that teachers had less knowledge of 21st century learning in mathematics implemented in the classroom due to the difficulty of fully implementing 21st century learning skills and student-centered activities in the field of mathematics. Teachers frequently share memory-boosting strategies with students who are about to take an exam without prompting them to reflect on the information they have learned (Mohd Syaubari et al. 2019). As a result, the evaluation or assessment carried out in the classroom should emphasise the parts of HOTS so that students

are given the opportunity to present and give opinions or responses to high-level questions to stimulate students' thinking.

Mathematics teachers' competence can be seen in the aspects of skills that play an important role in the implementation of HOTS, such as planning and management of teachers in implementing HOTS, communication skills, information and communication technology skills, and classroom management skills (Radzi & Muzammi, 2018). According to Norfadillah Zalina & Najihah (2017), mathematics teachers must emphasise not only mathematical skills such as measuring and building, translating real-world situations into mathematical models, solving problems, and making decisions, but also HOTS skills such as applying, analysing, evaluating, and creating, as well as creative, critical, and reasoning thinking skills and thinking strategies. As a result, mathematics teachers need to focus on developing well-structured and focused lessons for all groups of students.

Furthermore, due to time restrictions among teachers to complete the curriculum, the application of HOTS elements is given less emphasis in teaching and learning sessions, and the level of involvement and knowledge of students towards KBAT elements is limited (Md Hassan et al., 2021). Teachers also overemphasize factual questions in tests and exams without incorporating HOTS components into the question structure. This is due to a shortage of resources, including time and exposure, to enhance teachers' understanding and expertise of the elements of HOTS (Andin & M.Z, 2023). However, HOTS questions that are relevant to the students' skill level and employ easy-to-understand keywords are offered so that they can apply successful HOTS elements among students (Md Hassan et al., 2021).

Therefore, it is important to develop ongoing training to enhance the knowledge and abilities of mathematics teachers in the implementation of HOTS. In order to start the process of students accepting HOTS elements, teachers will play a crucial part in doing so. They must be highly committed to the process and effectively discharge their duties.

Problem Statement

Higher Order thinking skills (HOTS) have been implemented in the Primary School Standard Curriculum and the Secondary School Standard Curriculum to emphasise the skills of evaluating, analysing, exploring, and creating (Siti Sarah Muhammad Raflee & Lilia Halim, 2021). As a result, in addition to having basic pedagogical abilities, teachers also need to possess High Order Thinking Skills (HOTS), which are competences connected to thinking skills used in the teaching process (Radzi & Muzammil, 2018).

However, Malaysia's performance in the Trend in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA) reveals that Malaysian students are still struggling to solve high-level math problems, particularly those that take the form of HOTS and require application and reasoning. This statement is also supported by the study of Ngoung Baul & Mahmud (2021) stating that there are many questions in the form of reasoning and complex problem solving emphasized in the TIMSS international assessment. Additionally, according to Siti Sarah Muhammad Raflee & Lilia Halim (2021), students are not prepared for or less adept at employing thinking abilities in the process of studying mathematics. As a result of this, students' learning and day-to-day activities may be impacted by feelings of worry and nervousness when dealing with math-related tasks, such as addressing math-related problems (Ching Peng & Rosli, 2021).

Teachers must therefore equip themselves to implement HOTS aspects through broad knowledge, abilities, and values in order to meet the demands and goals of students. In addition, they face a number of difficulties in adapting to changing educational trends. This is

due to a lack of total teacher preparation and understanding to integrate HOTS in 21st century learning (Bernard Tahim Bael et al., 2021). Furthermore, according to the research of Siti Sarah Muhammad Raflee & Lilia Halim (2021), teachers are less skilled and have challenges in the production and building of HOTS items. As a result, most teachers conduct the teaching and learning process using fact or memory type questions. Besides, according to a study by Nagaretnam & Mahmud (2022) stated that mathematics teachers are more satisfied with the learning method conventional for mathematics subjects because it requires mastery of concepts and prioritizing calculation accuracy in mathematics subjects. In order to cultivate and implement HOTS in the teaching process, mathematics teachers must be aware of their obligations in terms of the preparation of their own knowledge, abilities, and attitudes.

Additionally, there is still little research on teachers' knowledge of and abilities to utilise Higher order Thinking Skills (HOTS) in teaching mathematics in Malaysia, particularly in rural Sarawak, particularly in the Mukah district. This is due to the fact that most earlier studies, such as Radzi & Muzammil (2018) and Maxwell & Mistima (2021) were carried out in urban regions as opposed to rural areas. While the two items utilised together to apply HOTS in the teaching of mathematics acquire less attention from researchers and are less frequently used in rural areas as locations for research. This study was conducted in order to bridge that gap by figuring out how effectively teachers comprehend and implement Higher Order Thinking Skills (HOTS) when teaching mathematics. The following research questions will therefore be addressed by this study:

a) What is the level of understanding of teachers in applying Higher Order Thinking Skills (HOTS) in teaching Mathematics in rural schools, Mukah district.
b) What is the level of teachers' skills in applying Higher Order Thinking Skills (HOTS) in teaching Mathematics in rural schools, Mukah district.
c) What is the relationship between teachers' understanding and skills in applying Higher Order Thinking Skills (HOTS) in teaching mathematics in rural schools, Mukah district.

Research Objectives

The following are the aims of the research conducted in this study:

d) To identify the level of understanding of teachers in applying Higher Order Thinking Skills (HOTS) in teaching Mathematics in rural schools, Mukah district.
e) To identify the level of teachers' skills in applying Higher Order Thinking Skills (HOTS) in teaching Mathematics in rural schools, Mukah district.
f) To determine the relationship between teachers' understanding and skills in applying Higher Order Thinking Skills (HOTS) in teaching mathematics in rural schools, Mukah district.

Research Hypothesis

There is a hypothesis formed in this study as follows:

H_0 : There is no significant relationship between teachers' understanding and skills in applying Higher Order Thinking Skills (HOTS) in teaching mathematics.

Research Methodology

In the context of this study, a quantitative approach will be used through a survey design involving a questionnaire that is in line with the objectives of the study, which are to identify

the level of teachers' understanding and skills in applying Higher Order Thinking Skills (HOTS) in teaching mathematics as well as the relationship with teaching mathematics.

This study was carried out at three secondary rural schools in Mukah district, Sarawak, namely SMK Three River, SMK St. Patrick, and SMK Mukah. The researcher chose secondary rural schools in Mukah district, Sarawak, as the study's location because it allowed the researcher to perform the study with a lower cost and limited time. Meanwhile, the level of understanding and skill of teachers in applying higher order thinking skills (HOTS) in teaching mathematics in secondary rural schools must be addressed. In the context of this study, the secondary school mathematics teachers will be selected randomly as a sample for this study. According to the Determination Table of Krejcie & Morgan (1970), the sample size was determined to involve only 28 mathematics teachers with a total population of 30 people. In order to efficiently facilitate and assess the respondents' responses in the statistical software, a questionnaire will also be created in Google Forms (GF) and distributed online to the respondents through the WhatsApp application.

Instrument

A questionnaire that was conducted by the researcher himself was the tool utilised in this investigation. Parts A, B, and C of this instrument will be evaluated on a 5-point Likert scale for each of its three components. Part A contains the demographic profile of the respondents consisting of gender, race, age, years of teaching experience, level taught among students and attendance at HOTS courses. While part B contains the level of understanding of teachers implementing HOTS elements in teaching Mathematics, with a total of 10 items. The items have been adapted and verified by experts in a study conducted by Maxwell & Mistima (2021). Furthermore, part C contains items on the skill level of teachers applying HOTS elements in teaching Mathematics, with a total of 10 items and adapted and verified by experts in a study conducted by Radzi & Muzammil (2018). Meanwhile, the instrument used in this study did not alter the content of the items in the construct of the level of understanding and skills of teachers applying HOTS in the teaching of Mathematics to be measured. Therefore, the researcher did not implement the expert validation process to ensure the accuracy of the content of the instrument.

Data and information collected from respondents through surveys are subjected to a quantitative analysis. This instrument uses a five-point likert scale, which is a scale of 1 to 5 (5 = Strongly Agree to 1 = Strongly Disagree). According to McMillan & Schumacher (2006), the use of a scale with a five-point score can increase the probability of a more accurate selection to reflect the level of understanding and skill of teachers applying KBAT in teaching mathematics. Furthermore, this research instrument will be conducted to test and determine reliability through a pilot study. Based on the results of the data analysis of the pilot study, the items related to teachers' understanding of applying HOTS in mathematics teaching found a satisfactory reliability of 0.966 while the reliability of the items measuring teachers' skills in applying HOTS in mathematics teaching was satisfactory with 0.981. According to Bond & Fox (2007), the minimum value of the Cronbach alpha coefficient set in this study is above 0.61, which is an item that is good and acceptable. This statement is supported by the study of Norulbiah & Effandi (2016), Cronbach's alpha value that exceeds 0.60 can be accepted for reliability.

In the context of this study, descriptive and inferential statistical analysis will be used through the Statistical Package for the Social Science (SPSS) software version 27 to analyze the data. To analyze the study variables, the researcher analyzed the data descriptively,

including frequency, percentage and mean. The variable for this study is the level of understanding and skill of teachers in applying Higher Order Thinking Skills (HOTS) in teaching mathematics. Therefore, the average mean score has been interpreted into 5 levels in line with the interpretation of the mean score issued by the Education Policy Planning and Research Division (BPPDP) in 2006. This is so that the level of the mean average value for each variable studied can be known. Table 1 shows the interpretation of the mean score. Furthermore, the Spearman rho Correlation test will be used to analyze and examine the relationship between the understanding and skills of teachers applying Higher Order Thinking Skills (HOTS) in teaching mathematics.

Table 1
Interpretation of Mean Score

Average Score	Interpretation
1.00 – 1.89	Very low
1.90 – 2.69	Low
2.70 – 3.49	Medium
3.50 – 4.29	High
4.30 – 5.00	Very high

Source: Education Policy Planning and Research Division (BPPDP, 2006) Education Research Master Plan (PIPP).

Data Analysis

Demographics of Respondents

This section of the study starts with part A, which deals with the respondents' demographics, followed by parts B and C, which are instruments for related research questions. The six components of the demographic profile of respondents used in this study's descriptive analysis to explain part A are gender, race, age, years of teaching experience, level taught among students, and attendance at HOTS courses. This is stated as follows in accordance with table 2.

Table 2
Demographic Information of Respondents

Demographic Background	Frequency	Percentage(%)
Gender		
Male	7	25.0
Female	21	75.0
Race		
Malay	7	25.0
Chinese	12	42.9
Melanau	5	17.9
Iban	4	14.2
Age		
Below 30 years	1	3.6
30 – 39 years	11	39.3
40 – 49 years	11	39.3
50 years or more	5	17.9
Years of teaching experience		
Less than 3 years	0	0.0
4 – 10 years	8	28.6
11 – 15 years	10	35.7
16 – 20 years	4	14.3
21 years or more	6	21.4
Level taught among students		
Form 1	10	35.7
Form 2	10	35.7
Form 3	13	46.4
Form 4	12	42.9
Form 5	12	42.9
Attendance at HOTS courses		
Yes	11	39.3
No	17	60.7

Based on table 2, the majority of respondents are female teachers that are 21 people (75.0%) while male respondents comprise 7 people (25.0%). While the majority of respondents in terms of race are Chinese, that is 12 people (42.9 %). Next, this study was followed by Malay respondents, namely 7 people (25.0 %) and the Melanau race as many as 5 people (17.9%) and the Iban race as many as 4 people (14.2%). In terms of age, there are 39.3% of respondents between the ages of 30 and 39, that is as many as 11 people and then 40 to 49 years old, that is 11 people (39.3%), then followed by respondents made up of 50 years and above, that is 5 people (17.9%). However, there are 3.6% of respondents under the age of 30, which is 1 person. In addition, most of the respondents have teaching experience between 11 and 15 years, that is 10 people (35.7%), followed by teachers with experience of 4 to 10 years, that is 8 people (28.6%) and years of experience between 21 years and above as many as 6 people (21.4%). However, there are less respondents consisting of teachers with teaching experience between 16 and 20 years, which is 4 people (14.3%). Meanwhile, there is a

majority of respondents in the aspect of analysis level taught among students, a total of 13 teachers with a percentage of 46.4% who teach Form 3. While there are 12 teachers with a total of 42.9% who teach Form 4 and Form 5 respectively. The minority of respondents is made up of teachers who teach Form 1 and Form 2 respectively with a percentage of 35.7%, which is 10 teachers. The analysis shows that there is a difference of 21.4% between teachers who have attended a course related to HOTS and teachers who have never attended the course. A total of 11 teachers who have followed the course with a percentage of 39.3% while 17 teachers who have never followed the HOTS course which is 60.7%. The profile of the study respondents in terms of frequency and percentage as shown in Table 2.

Level of Teacher's Understanding of HOTS in Teaching Mathematics

Descriptive statistics are used to determine the level of understanding and skills of teachers regarding HOTS in teaching mathematics. Frequency, percentage and mean values will be used to analyze the level of both variables in the study. Table 3 shows the findings of the study on the level of understanding of teachers among 28 secondary school teachers towards HOTS in teaching mathematics. Through the results of the study, respondents are more supportive of agree with the statement regarding the items of teachers' understanding. The percentage of agreement is 97.30% for the agreement level of moderately agree, agree and strongly agree, which is 94.08 percent above the agreement level of strongly disagree and disagree. Overall, the level of teachers' understanding of the implementation of Higher Order Thinking Skills (HOTS) in teaching mathematics is at a high level, that is 3.53 based on the mean score interpretation table.

Table 3
Descriptive analysis of the level of teachers' understanding of HOTS in teaching mathematics

No.	Item	Strongly Disagree (N) %	Disagree (N)%	Neutral (N)%	Agree (N)%	Strongly Agree (N) %	Mean
1	Teachers understand the concept of implementing HOTS in teaching and learning mathematics.	0 (0)	1 (3.6)	11 (39.3)	12 (42.9)	4 (14.2)	3.68
2	Teachers understand how to apply HOTS in each Mathematics topic	0 (0)	1 (3.6)	12 (42.9)	13 (46.4)	2 (7.1)	3.57
3	Teachers understand each of the thinking tools that can be used in HOTS	0 (0)	1 (3.6)	12 (42.9)	15 (53.6)	0 (0)	3.50
4	Teachers understand aspects of using the i-Think concept in teaching Mathematics.	0 (0)	1 (3.6)	12 (42.9)	12 (42.9)	3 (10.6)	3.61
5	Teachers understand the cognitive level in HOTS.	0 (0)	0 (0)	12 (42.9)	16 (57.1)	0 (5)	3.57
6	Teachers understand the features of routine items in HOTS.	0 (0)	0 (0)	15 (53.6)	11 (39.3)	2 (7.1)	3.54
7	Teachers understand the features of non - routine items in HOTS.	0 (0)	0 (0)	16 (57.1)	11 (39.3)	1 (3.6)	3.46
8	Teachers can construct HOTS mathematical questions.	0 (0)	1 (3.6)	14 (50.0)	11 (39.3)	2 (7.1)	3.50
9	Teachers are able to identify the features of HOTS questions.	0 (0)	2 (7.1)	14 (50.0)	9 (32.3)	3 (10.6)	3.46
10	Teachers are capable of doing HOTS questioning.	0 (0)	2 (7.1)	15 (53.6)	9 (32.3)	2 (7.1)	3.39
Overall Mean							**3.53**

Level of Teacher's Skills Against HOTS in Teaching Mathematics

As shown in Table 4, the findings of the study state that the level of teacher's skills among 28 secondary school teachers towards HOTS in teaching Mathematics. The study found that respondents are more supportive of agree with the statement about items of teacher's skills. The percentage of agreement is 93.58% for the agreement level of moderately agree, agree, and strongly agree, that is 87.18 percent above the level of agreement strongly disagree and disagree. Overall, the teacher's skills level regarding the implementation of Higher Order Thinking Skills (HOTS) in teaching mathematics is at a moderate level, which is 3.37 based on the mean score interpretation table.

Table 4

Descriptive Analysis Of The Teacher's Skill Level Towards Hots In Teaching Mathematics

No.	Item	Strongly Disagree (N) %	Disagree (N)%	Neutral (N)%	Agree (N)%	Strongly Agree (N) %	Mean
1	Using the verb HOTS (apply) in the curriculum.	0 (0)	1 (3.6)	16 (57.1)	8 (28.7)	3 (10.6)	3.46
2	Using the verb HOTS (analyse) in the curriculum.	0 (0)	2 (7.1)	15 (53.6)	9 (32.2)	2 (7.1)	3.39
3	Using the verb HOTS (evaluate) in the curriculum.	0 (0)	1 (3.6)	16 (57.1)	9 (32.2)	2 (7.1)	3.43
4	Using the verb HOTS (create) in the curriculum.	0 (0)	2 (7.1)	16 (57.1)	9 (32.2)	1 (3.6)	3.32
5	Effectively integrate HOTS elements in teaching and learning, you must be skilled at lesson planning for mathematics.	0 (0)	2 (7.1)	13 (46.4)	12 (42.9)	1 (3.6)	3.43
6	Teachers have skills for each features of thinking tools that can be used in HOTS.	0 (0)	2 (7.1)	15 (53.6)	11 (39.3)	0 (0)	3.32
7	Possess the ability to create educational materials based on HOTS.	0 (0)	2 (7.1)	16 (57.1)	10 (35.8)	0 (0)	3.29

8	Using a variety of strategies and techniques such as strategies based on constructivism, contextual, future studies, projects and inquiry to apply elements of HOTS.	0 (0)	2 (7.1)	15 (53.6)	11 (39.3)	0 (0)	3.32
9	Using i-THINK maps, mind maps and graphic forms in in teaching and learning.	0 (0)	2 (7.1)	13 (46.4)	13 (46.4)	0 (0)	3.39
10	Build HOTS items within the assessment.	0 (0)	2 (7.1)	13 (46.4)	13 (46.4	0 (0)	3.39
Overall Mean							3.37

The Relationship Between The Teacher's Understanding And Skills Towards Hots In Teaching Mathematics

The data for the items of teachers' understanding and skills toward HOTS in teaching mathematics are measured in ordinal form. The two variables in this study conducted a normality test and found that the data was not normally distributed. Whereas, according to Suardi's study (2019), the Shapiro Wilk test is used for data samples of less than 50 samples ($N < 50$). In the test, the data show normal distribution if the significant value exceeds 0.05 ($p > 0.05$). However, the significant value is less than 0.05 ($p < 0.05$) in this study based on Shapiro Wilk analysis. Therefore, Spearman rho which is a non-parametric inference test used to evaluate and determine the research question. Furthermore, Levene's test shows that the variance of the two variables is the same which meets the assumption of Spearman rho correlation if the significant value exceeds 0.05 ($p > 0.05$). Based on table 5, Spearman's rho Correlation test was used to determine the relationship between teachers' understanding and skills toward HOTS in teaching mathematics. According to Bond & Fox (2007), the minimum value of the Cronbach alpha coefficient set in this study is above 0.61, which is an item that is good and acceptable. There is a very strong and significant positive linear relationship between teacher's understanding and skills towards HOTS in teaching mathematics is shown by the Spearman rho correlation coefficient [$r(26) = 0.950$, $p<0.01$]. Based on the results of the analysis of this study, there is a correlation between the understanding and skills of the teachers towards HOTS in teaching mathematics.

Table 5

The relationship between teachers' understanding and skills of HOTS in teaching mathematics

Teachers' skills		
Teachers' understanding towards HOTS in teaching Mathematics	Correlation Coefficient	0.950
	Sig. (2 tailed)	< .001
	N	28

Discussion

This study determines the relationship between teachers' understanding and skills towards Higher Order Thinking Skills (HOTS) in teaching mathematics among secondary students. However, the studies on the level of understanding and skills of teachers towards HOTS in teaching mathematics are seldom carried out in rural schools. In the context of this study,

teachers as respondents from rural high schools, especially in the Mukah district of Sarawak, will be selected. This is because of the limited research on the level of teachers' understanding and skills towards HOTS in secondary schools that is conducted in the state of Sarawak, especially in the Mukah district.

Based on the first findings in this study obtained, this study shows that the level of teachers' understanding towards HOTS in teaching mathematics in Mukah district is at a high level. The findings of this study are in line with the findings of a study conducted by Maxwell & Mistima (2021) which states that the level of understanding towards HOTS among mathematics teachers is at a high level. This gives the impression that Mathematics teachers have a high understanding of implementating HOTS in the teaching process in aspects of curriculum, pedagogy and assessment. Therefore, according to Maxwell & Mistima (2021), mathematics teachers' understanding towards HOTS will affect the effectiveness of teaching in the classroom. However, some teachers are prepared to use HOTS components to carry out mathematics instruction based on the study of Kassim et al. (2017). Furthermore, according to Norfaizah Binti Md Kamary & Mahizer Bin Hamzah (2020), the level of readiness among teachers are moderate because the learning content is more focused on the teaching and learning process without emphasizing other elements such as collaborative, Low Order Thinking Skills
(LOTS), Higher Order Thinking Skills (HOTS) and others related should be given attention. Therefore, teachers need to deepen the concept of KBAT so that they can implement the teaching and learning process effectively and with quality. Teachers must therefore further their understanding of HOTS in order to implement the teaching and learning process in an efficient and high-quality manner.

Beside that, the teacher's level of skills with regard to HOTS in teaching mathematics is at a moderate level based on the second finding in the study obtained. This study is in line with the study of Radzi & Muzammi (2018) shows that the level of teachers' skills to implement HOTS in the teaching process is at a moderate level. In addition to mathematical skills such as measuring, interpreting and reasoning applied in the process of teaching mathematics, teachers need to focus and emphasize elements of HOTS in the teaching process so that able to stimulate creative and critical thinking to solve problems and make decisions among students (Norfadillah Zalina & Najihah, 2017). Mathematics teachers need to be confident and equip themselves with a variety of skills in implementing teaching and learning strategies to meet the needs of students' learning styles, improve thinking skills among students as well as the teaching and learning process can be implemented in a creative and interesting way (Florengel Anak & Khairul Azhar, 2021).

According to the findings of the last study in this study, there is a significant positive relationship between the level of understanding and skills of teachers towards HOTS in teaching mathematics. This is in line with the study of Radzi & Muzammi (2018) that teachers' needs in terms of knowledge, skills and attitudes must be emphasized to implement elements of HOTS in the teaching process. Furthermore, according to the study of Bernard Tahim Bael et al. (2021), the understanding of teachers about HOTS and 21st Century learning in the Malaysian education curriculum has a great influence in improving skills and producing effective and quality teaching techniques.

Conclusion

In conclusion, teachers should play an important role to cultivate and implement HOTS among students. When the level of understanding and skills in applying the elements of HOTS in the

mathematics teaching process is high, it is possible to generate the high order thinking talent that the nation desires. Mathematics teachers need to plan wisely, attract students' interest and increase student motivation in solving mathematical problems that have a HOTS element. Additionally, teachers must be open-minded and committed to embracing the various changes that the profession of education is undergoing. Therefore, the Ministry of Education proposes that in order to raise the level of awareness and proficiency in applying HOTS among teachers, frequent training sessions and courses must be developed. The findings of this study are used as a guide for developing strategies to address the challenges faced by mathematics teachers while implementing HOTS in the classroom. Furthermore, teachers need to be creative and innovative in providing a 21st century learning environment for students by applying various teaching and learning approaches that are based on technology in order to produce a meaningful learning process among students and increase students' motivation in learning. The cognitive growth of students can benefit from creative teaching, particularly for those with learning impairments. In addition, student-centered learning will replace teacher-centered learning in 21st century education. This is due to the fact that student-centered learning can encourage students to think critically and creatively through activities like inquiry, research, and project-based learning. As a result, it is possible to improve student performance on international tests like the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA).

Therefore, the results of the study and discussion that have been discussed previously also give specific implications to management and practical aspects. Based on the findings in this study obtained, this study shows that the level of teachers' understanding towards HOTS in teaching mathematics in Mukah district is at a high level while the teacher's level of skills with regard to HOTS in teaching mathematics is at a moderate level. This study has significance for teachers in that it highlights the need for improving their competence whether in terms of knowledge, skills and attitude. These findings can also be used by administrators and educators to identify, plan, implement, monitor and evaluate continuously appropriate programs, courses or workshops to improve the competence of teachers in applying the elements of HOTS in the mathematics teaching process. In addition, appropriate facilities and equipment for the learning process must be provided to teachers. This probably has something to do with the fact that teachers' proficiency with the HOTS is still at a moderate level. The administration have to make an effort to establish an environment that is conducive and supportive of teachers implementing HOTS. Teachers must work together to incorporate HOTS into the teaching and learning process in a variety of more inventive and innovative methods. Therefore, we will be able to generate a generation that is competitive, inventive, creative, and thinking about HOTS if the relevant actions are performed by all parties involved.

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