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Factors Influencing Teaching Higher-order Thinking Skills Among Mathematics Teachers in Malaysian Primary Schools

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ABSTRACT

Integrating higher-order thinking skills (HOTS) into the mathematics curriculum has been a longstanding goal of the Malaysian education system. By recognizing its growing importance in enhancing students' thinking abilities, this study explores the factors influencing the teaching of HOTS in primary schools across Malaysia. A quantitative research approach is used to analyze 269 randomly selected mathematics teachers from primary schools in Temerloh, Malaysia, to investigate the impact of four influencing factors: teachers' knowledge of HOTS, pedagogical skills, attitude, and barriers to teaching HOTS. The findings from this study revealed that all four influencing factors significantly predict the teaching of HOTS among Malaysian mathematics teachers. These results hold significant promise in enriching teaching practices and fostering HOTS integration within the school context. By providing valuable insights into the dynamics of teaching HOTS, this study aims to equip teachers, schools, and administrators with essential resources to enhance students' academic achievements. The implications of this research are far-reaching and hold the potential to revolutionize the learning and teaching landscape in Malaysia, not only in mathematics but also in other disciplines, thereby elevating the overall learning experience.

Keywords: Attitude, higher-order thinking skills, knowledge, Mathematics teachers, primary school students, skill

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INTRODUCTION

Higher-order thinking skills (HOTS) encompass a range of cognitive abilities, such as problem-solving, reflection, value reasoning, innovation, and decision-

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making, as defined by the Ministry of Education (2013). These skills have become increasingly critical in the fast-paced information era, as they empower individuals to address global competition effectively and identify connections between various concepts, thereby enhancing problem-solving efficiency. Particularly for young learners, including students, cultivating HOTS is integral to their education, enabling them to tackle novel problems, uncertainties, questions, or dilemmas. The practice of HOTS aids in overcoming challenges associated with generating innovative ideas and can be activated when students encounter unfamiliar situations. As a result, mathematics teachers play a crucial role in fostering HOTS by exploring pedagogical skills, attitudes, knowledge, and potential obstacles to teaching HOTS.

Within mathematics education, the development of HOTS holds intrinsic importance. These skills enable students to engage in abstract language functions, such as expressing and defending ideas, speculating, and hypothesizing, which are vital components in learning and applying mathematics (Rahmawati et al., 2019). Furthermore, HOTS involves the acquisition of complex judgmental skills, including critical thinking and problem-solving, which are essential for students studying mathematics. The HOTS model, as proposed by Saragih et al. (2017), comprises three key components: meta-components, performance components, and knowledge acquisition components. By teaching HOTS to students, as emphasized by Sa'dijah et al. (2021), educators can equip them with the necessary preparation to tackle challenging academic tasks, future work roles, and responsibilities. Consequently, HOTS has the potential to serve as a predictive indicator of students' academic success.

Despite its significance, there is a paucity of literature on the teaching of HOTS and the factors influencing its implementation among mathematics teachers. Comprehensive studies in this area are limited. As primary school mathematics teachers evaluate their instructional practices, they may be prompted to shift their focus towards emphasizing HOTS goals in line with traditional teaching approaches. Contemporary methods, often teacher-centered and catering to large passive classes, have been less inclined to involve students in understanding the purpose of learning or the expected outcomes, owing to a prevalent emphasis on examination-oriented teaching (Eastman & Studd, 2020). Hence, the present study seeks to explore the factors influencing the teaching of HOTS in the mathematics classroom. This investigation encompasses an examination of mathematics teachers' knowledge of HOTS, pedagogical skills, attitudes, as well as any potential barriers to the effective teaching of HOTS.

Current Study

Malaysia has been dedicated to elevating the standards of science and mathematics education to foster global competitiveness among its students. The Malaysia Education Development Plan (PPPM) 2013–2025

emphasizes the significance of HOTS in shaping competent individuals capable of critical and creative thinking, preparing them for global competition. In pursuit of this objective, the Ministry of Education has undertaken various initiatives to cultivate students' HOTS. An example of such efforts is the collaborative effort between the Ministry of Education and Agensi Inovasi Malaysia (AIM) in developing the i-THINK program, which aims to instill HOTS in schools and foster a culture of lifelong learning among students (Hamzah & Wan Yusoff, 2021). The primary aim of this study is to nurture creative and innovative students and teachers who possess the ability to solve intricate problems. Eight thinking tools were employed by students and teachers to incorporate HOTS into the teaching and learning processes, thereby equipping them with higher-order abilities, including creative and critical thinking skills.

Despite these endeavors, Malaysia's performance in international mathematics exams has exhibited a significant decline, as noted by Mullis et al. (2012). This decline has occurred despite significant changes in the mathematics curriculum over the years, such as the implementation of the Modern Mathematics Program (MMP), the New Curriculum for Primary School (KBSR), the Integrated Curriculum for Secondary School (KBSM), and the Teaching and Learning of Mathematics in English (PPSMI). The ongoing problem of ineffectiveness in teaching HOTS in schools persists, even with the attention given to HOTS in Malaysia's curriculum.

However, it is crucial to recognize that figures alone provide a limited perspective on student performance, and the quality of education necessitates examining other critical aspects. It is evident that students who do not possess core intellectual skills, such as HOTS, will face challenges in succeeding in a rapidly evolving economy (Ibrahim & Harun, 2017). In Malaysian primary schools, traditional teacher-centered models emphasizing information sources, algorithms, and drills continue to be employed (Meldawati et al., 2020). Teachers often perceive their primary role as information providers, leading to a high inclination toward implementing teacher-centered learning in their classrooms (Muganga & Ssenkusu, 2019). Consequently, this approach may result in lower student participation, increased reliance on memorization, and a dearth of HOTS among Malaysian students. Additionally, Malaysian teachers may lag in questioning skills and techniques that promote HOTS (Yusoff & Selman, 2018).

In light of these findings, it is evident that despite efforts to emphasize HOTS in education, there remain challenges and gaps in effectively implementing and fostering these critical thinking skills among students in Malaysia. Addressing these issues is crucial for enhancing the overall quality of education and preparing students for success in a dynamic and competitive global landscape.

Literature Review

Higher-order Thinking Skills (HOTS) among Mathematics Teachers. In modern

education, developing critical thinking and problem-solving skills is crucial for students to thrive in an ever-changing world. Mathematics, as a fundamental subject, plays a vital role in nurturing HOTS among students. The concept of HOTS originates from Bloom's (1956) cognitive domain taxonomy, encompassing reasoning, logical thinking, and critical thinking abilities essential for daily life and academic success (Hadi et al., 2018). HOTS can be seen as a complex and advanced form of skill involving the interpretation and application of knowledge (Arip et al., 2018), which develops after students have acquired basic foundational knowledge, distinguishing it from lower-order learning characterized by rote memorization and lack of reasoning (Kacmaz & Dubé, 2021).

Effective mathematics educators employ various pedagogical strategies such as problem-based learning, inquiry-based approaches, collaborative activities, and open-ended tasks to stimulate critical thinking and creativity among their students (Sebatana & Dudu, 2022). However, despite the importance of promoting HOTS, teachers face challenges like large class sizes, time constraints, standardized testing pressures, and the need to cover a broad curriculum. Moreover, some teachers may lack adequate professional development opportunities to enhance their understanding and application of HOTS in mathematics education (Ghanizadeh et al., 2020).

To equip mathematics teachers with the necessary skills and knowledge to effectively promote HOTS, comprehensive training and ongoing professional development are essential. Specialized training programs can have a significant impact on teacher practices and student outcomes. Creating a supportive environment where teachers can share experiences and best practices related to HOTS is also crucial. Research suggests that students exposed to a learning environment emphasizing HOTS tend to achieve better academic outcomes (Lu et al., 2021). Continuous professional development and support from educational institutions are vital to empower teachers to elevate the quality of mathematics education and equip students with the skills needed to thrive in a dynamic and competitive world. Ultimately, this research emphasizes the imperative role teachers play in shaping the minds of young learners and fostering a society that values critical thinking and problem-solving. The present study explores the factors influencing the teaching of HOTS in the mathematics classroom.

Factors Influencing Teachers Teaching HOTS in Mathematics Classrooms

This study focuses on four main factors influencing teachers' approach to teaching HOTS in the mathematics classroom: Teachers' knowledge of HOTS, pedagogical skills, attitudes toward HOTS, and Barriers to HOTS teaching. Previous literature, such as the work of Aliakbari and Sadeghdaghighi (2013), has already explored key factors that impact teachers in teaching HOTS. The first two elements under study are teachers' pedagogical knowledge of HOTS and their attitude toward teaching HOTS. Utami et

al. (2019) have found that teachers with better attitudes and beliefs about HOTS experience greater success in implementing it. To effectively organize a HOTS-oriented curriculum, teachers must understand the approaches, tactics, and procedures to instruct students about HOTS (Bartell, 2013). Moreover, Retnawati et al. (2017) have reported that teachers' understanding of teaching HOTS has a beneficial influence.

Research conducted by Sevian et al. (2018) highlights that students also support teacher professional development in HOTS. The pedagogy literature by Baguma et al. (2019) contributes to developing thinking skills. Additionally, Anderson and Taner (2022) point out the importance of HOTS-related pedagogical skills for effectively engaging low-advantage learners. Similarly, Singh and Marappan (2020) emphasize the significant impact of teachers' pedagogical skills in using HOTS activities, regardless of students' learning capabilities. Another critical factor is the correlation between teachers' perceptions and knowledge about teaching HOTS and their practices (Rachmawaty & Ariani, 2019). Teachers' willingness to prioritize teaching HOTS is strongly influenced by their belief that such thinking abilities improve students' academic performance and decision-making skills and inspire them to think beyond conventional boundaries (Seif, 2017). Studies investigating teachers' attitudes toward HOTS and their perceptions of students' advantage levels have suggested that some teachers might consider HOTS activities ineffective for low-advantage learners, leading to a preference for lower-level HOT activities (Ardila, 2020; Jannah, 2018). The third factor affecting HOTS teaching is the pedagogical skills of teachers. Research by Lawson et al. (2019) reveals a severe lack of skills and preparation to teach HOTS in schools. An efficient understanding of HOTS knowledge and pedagogical abilities is crucial for organizing and enhancing HOTS, making it a requirement for 21st-century teachers (Seman et al., 2017).

The final factor explored in this study is the barriers to HOTS teaching. Teacher-related barriers encompass uncertainty about how to teach HOTS, the misconception that HOTS is only suitable for high-performing students, limited time for higher-level thinking, assessments not testing critical thinking skills, and discomfort in asking open-ended questions. Additionally, mathematics teachers face difficulties, such as developing HOTS-based problems and finding suitable learning tools, as well as evaluating students' HOTS abilities (Jailani & Retnawati, 2016; Retnawati et al., 2017). The student-related barrier arises from some students' preference for easy solutions over engaging in rigorous critical thinking (Niemi & Kousa, 2020). Lack of interest in the subject, resistance to higher-level thinking, insufficient background knowledge, limited experience in HOTS development, and impatience with higher-level thinking also contribute to student-related barriers (Wilson & Narasuman, 2020). Based on the findings, the study proposes the following hypotheses:

Hypothesis 1: Teachers' knowledge of HOTS significantly impacts the teaching of HOTS in the mathematics classroom.

Hypothesis 2: Teachers' pedagogical skills significantly impact the teaching of HOTS in the mathematics classroom.

Hypothesis 3: Teachers' attitudes toward HOTS significantly impact the teaching of HOTS in the mathematics classroom.

Hypothesis 4: Barriers have a significant negative impact on the teaching of HOTS in the mathematics classroom.

Figure 1 depicts the conceptual model illustrating the relationship between the independent variables and the teaching of HOTS.

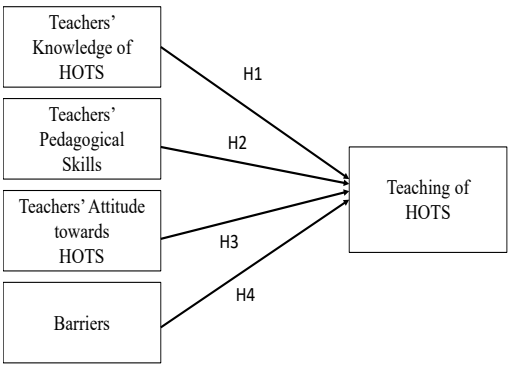

Figure 1. Conceptual framework

METHODOLOGY

Research Design

This quantitative research study has been carried out to test the proposed research framework. According to Cohen et al. (2002), the quantitative approach is a research method that is powerful and suitable for large and small-scale research such as experiments, case studies, correlational research, and action research. In this study, a correlational research design was used. A correlational research design was chosen because no manipulation of the variables was involved in this study (Bloomfield & Fisher, 2019), and it was carried out to obtain information on the present scenario of teaching HOTS in mathematics classrooms among mathematics teachers.

Participants and Procedures

This study focuses on primary school mathematics teachers, intending to encourage them to prioritize HOTS when evaluating their instructional techniques. The rationale behind this research stems from the observation that traditional teacher-centered methods, which often emphasize exam preparation, can hinder student engagement and comprehension of the reasons and outcomes of learning in contemporary mathematics education. The accessible population for this study includes all mathematics teachers in the Temerloh district, which was selected as the study region due to its predominantly remote and rural schools. Primary school students in this area have been observed to lag behind their peers in terms of HOTS attainment compared to nearby districts.

To ensure the data collected is representative and generalizable, the researchers adopted a stratified random sampling approach. They divided the Temerloh district into four zones: Kuala

Krau, Temerloh, Lanchang, and Mentakab. From each zone, two primary schools-one urban (Temerloh and Mentakab) and one rural (Kuala Krau and Lanchang) were chosen. A random sample of approximately 296 mathematics teachers was then selected from each of the eight chosen primary schools. By using stratified random sampling, the study aims to capture insights and experiences from both urban and rural contexts, providing a comprehensive understanding of the factors influencing the teaching of HOTS among current primary school mathematics teachers in the Temerloh district. The research also seeks to define the factors influencing HOTS in mathematics teaching. For measuring continuous data, the researchers primarily utilized a five-point Likert scale. To determine the appropriate sample size when using the continuous scale for data collection, they followed Cochran's formula, as recommended by Bartlett et al. (2001). Consequently, 269 math teachers were chosen for the study.

A flow of procedures leading to data collection was prepared to achieve this goal. Firstly, the researcher obtained the necessary approval from the Temerloh District Education Office (PPDT) to acquire the total number of mathematics teachers in primary schools. These mathematics teachers have been assured that their responses are kept confidential. Finally, the completed questionnaires were collected by the researcher. Of the 350 randomly distributed questionnaires, 332 mathematics teachers finished the surveys. The overall sample size, 269 (*M* Age = 25.12, *SD* = 1.73), as shown in Table 1, represents a response rate of 76.85% due to missing data. It aligns with what has been suggested in earlier work (Hair et al., 2010).

Table 1
Respondents' demographic profile (n = 269)

Demographic information	*f*	%	*M*	*SD*
Age			25.12	1.73
Below 25	5	1.86%		
25–35	109	40.52%		
36–45	89	33.09%		
46–55	61	22.67%		
Over 55	5	1.86%		
Gender				
Male	81	30.11%		
Female	188	69.89%		
Schools				
Malay medium national school	189	70.26%		

Table 1 *(continue)*

Demographic information	*f*	%	*M*	*SD*
Chinese medium national school	38	14.13%		
Tamil medium national school	42	15.61%		
Degree Level				
Diploma	87	32.34%		
Degree	156	57.99%		
Master	26	9.67%		

Measures

Teachers' Views on Knowledge of HOTS. The ten-item scale used in this study was adopted from Rajendran's (2001) instrument to measure the view toward knowledge of HOTS among mathematic teachers using a 5-point Likert scale: (1) Strongly disagree, (2) Disagree, (3) Neither agree nor disagree, (4) Agree, and (5) Strongly agree. An example of the questions in this segment is: "I know details of the curriculum for teaching HOTS". The Cronbach's α for the measurement is .98.

Teachers' Views on Pedagogical Skill. Again, Rajendran's (2001) instrument was used. All nine items were tallied according to the response format of the 5-point Likert scale, with values ranging from 1 (Completely Disagree) to 5 (Completely Agree). To obtain the responses, an example of the questions asked is: "I can plan a lesson to teach HOTS". The acquired Cronbach's alpha value for the measurement is .94, higher than the accepted Cronbach's α value of 0.7.

Teachers' Attitude Toward Teaching HOTS. Eleven items were used in this study, as they have previously been tested by many researchers (Rajendran, 2001). The 5-point Likert scale used for this segment ranges from 1 (Completely Disagree) to 5 (Completely Agree). An example of the questions asked is: "I find a great deal of satisfaction in teaching HOTS". The acquired Cronbach's α score for innovation measurement is .90.

Barriers of Hots. This discussion was adopted from Ozkan-Akan's (2003) instrument that measures the barriers to HOTS. All 45 items (with three components, which are teacher-related barriers (16 items), students-related barriers (15 items), and external-related barriers (14 items)) were measured according to the response format of the 5-point Likert scale, with values ranging from 1 (Completely Disagree) to 5 (Completely Agree). An example of the types of questions asked is: "Teachers usually use teaching strategy in mathematics class". The acquired Cronbach's α value for the measurement is .95.

A panel of three experts was selected based on their knowledge of mathematics education to guarantee the instrument's content validity for this study. They were lecturers at Universiti Pendidikan Sultan Idris (UPSI) and Universiti Sains Malaysia (USM). After completing the content validity process, the questionnaire was retained for the reliability pilot test. Before the pilot test, during the validation stage, the questionnaire was modified because of the feedback from the expert panel. A total of 20 math teachers from the Temerloh district participated in the pilot test for this study to assess their views on the instrument's clarity and reliability. The Cronbach's α coefficient for this study ranged from .86 to .92.

DATA ANALYSIS

The Social Science Statistical Package (SPSS) Version 26.0 was utilized to analyze all the data gathered for this study. Descriptive and inferential statistics were also utilized. To ensure that the assumptions of normality, linearity, and multicollinearity were not violated, preliminary data assays were carried out. The five constructs were described using means and standard deviations. The association between the independent components and the teaching of HOTS was determined using linear correlation coefficients to match the research's goals. As this study used inferential statistics, multiple linear regression analyses were performed. The link between two or more independent variables and one dependent variable is estimated using multiple linear regression (Radhy, 2019). Researchers can use multiple regression analysis to assess the strength of the relationship between an outcome (the dependent variable) and several predictor variables, as well as the importance of each predictor to the relationship, often with the effect of other predictors statistically eliminated (Black & Babin, 2019). Finally, hypothesis testing was performed to determine the validity of the proposed hypotheses.

RESULTS

Descriptive Analysis

The purpose of the study's initial hypothesis is to establish the correlation, or relationship, between the independent variables and HOTS instruction. The findings depict a significant positive association between teachers' knowledge of HOTS and the teaching of HOTS in the mathematics classroom (r (269) =.50, p < .000). This finding reveals a moderate to significant association between teachers' pedagogical skills and teaching HOTS in the mathematics classroom (r = .643, N = 269, p < 0.00). Moreover, the study findings also show a significant correlation between teachers' attitudes and teaching HOTS (r (269) = .54, p < .001). Finally, the results show a weak but significant correlation between HOTS-related barriers and teaching HOTS (r (269) = .31, p < .001), as shown in Table 2.

Multiple Linear Regression

Multiple linear regression (MLR) analysis was conducted to investigate the impact of independent factors on teaching HOTS

Table 2
Means and standard deviations, correlations among study variables

No.	Variables	M	SD	1	2	3	4	5
1	KN	3.91	0.57	1				
2	PS	4.13	0.62	0.62**	1			
3	AT	4.09	0.64	0.37**	0.538**	1		
4	BA	2.07	0.50	0.70**	0.819**	0.49**	1	
5	TH	3.07	0.68	0.50**	0.643**	0.54**	0.31**	1

Note. Teachers' knowledge of HOTS = KN, Teachers' pedagogical skills, Teachers' attitude toward HOTS = AT, Barriers = BA, Teaching of HOTS = TH. $^{**}p < 0.01$, two-tailed.

in the Malaysian setting. The findings show that supervisory styles significantly contribute to the supervisory satisfaction of the respondents F (4,264) = 21.816, $p <$ 0.0001, as shown in Table 3. The equation based on the prediction model is as follows:

$$Y_1 = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + \varepsilon$$
$$Y(TH) = -1.067 + 0.394\ (KN) + 0.344\ (PS) + (0.196)\ (AT) + 0.375\ (BA) + \varepsilon$$

MLR analysis was used to evaluate the predictability of teaching HOTS among mathematics teachers using the study's independent variables. These factors strongly predict instruction among Malaysian math teachers. The most positive and statistically significant predictor is barriers, with $\beta = .323$, $p < .001$. To sum up, these findings offer statistical evidence for approving H_1 to H_3. The results also show that the predictor variables explain up to 24.8% of the variance in the predictability of independent variables, while the remaining 75.2% may be attributed to other factors that are not within the scope of this study.

Table 3
Multiple regression analysis results

Paths	β	t	P	Decision
KN→ TH	0.370	4.896	0.000	H_1: Accepted
PS→ TH	0.371	3.817	0.000	H_2: Accepted
AT→ TH	0.130	2.043	0.042	H_3: Accepted
BA→ TH	0.323	3.131	0.002	H_4: Accepted

Note. Teachers' knowledge of HOTS = KN, Teachers' pedagogical skills, Teachers' attitude toward HOTS = AT, Barriers = BA, Teaching of HOTS =TH.

DISCUSSION

The present study makes a substantial contribution to the existing knowledge about the factors influencing the teaching of HOTS among mathematics teachers in the Temerloh district of Malaysia. Through a comprehensive investigation that encompasses teachers' attitudes,

knowledge, pedagogical skills, and barriers to HOTS instruction, this research provides critical insights into the dynamics of HOTS implementation within this specific context. The proposed conceptual framework (Figure 1) effectively elucidates the factors under examination, highlighting their significance in shaping the integration of HOTS.

The findings demonstrate that mathematics teachers in the Temerloh district possess a positive attitude toward teaching HOTS, which aligns with a prior study by Johnson et al. (2020) conducted in the United States. The research by Johnson et al. (2020) revealed that teachers with positive attitudes toward HOTS integration were more inclined to incorporate engaging and challenging activities that fostered higher-level thinking in their mathematics classrooms. Additionally, Khonamri et al. (2021) emphasized the widespread presence of positive attitudes among teachers, underscoring the crucial role of educators in creating a supportive learning environment that fosters the growth of HOTS.

Furthermore, the study identifies teachers' perceptions of their pedagogical skills and knowledge as the most significant predictors of HOTS implementation in the mathematics classroom. This finding is consistent with the emphasis placed by Wilson and Narasuman (2020) on the importance of pedagogical skills in effectively integrating HOTS. These results highlight the global significance of providing teachers with effective pedagogical training to enhance HOTS among students. The research by Chong et al. (2022) in Hong Kong also aligns with the present study, showing that teachers' knowledge of HOTS and their pedagogical skills significantly influenced students' critical thinking abilities. Similarly, educators who possessed a deeper understanding of HOTS concepts and utilized student-centered teaching approaches were more successful in fostering HOTS development among their students.

Regarding barriers to HOTS instruction, the results indicate that these obstacles have a significant negative impact on teaching HOTS in the mathematics classroom. This finding resonates with a previous study by Livy et al. (2023) in Australia, which examined barriers to implementing HOTS in primary school education. The review identified factors such as limited resources, time constraints, and lack of professional development opportunities as common obstacles. While these findings may seem initially contradictory to previous studies by Torff and Sessions (2006), which suggest that barriers hinder HOTS instruction, Makki et al. (2018) argue that these challenges can be overcome through positive influences, such as capability development opportunities, administrative support, freedom to experiment with new ideas, and mentorship. This perspective underscores the importance of proactively addressing barriers and highlights the significance of supportive measures in fostering effective HOTS implementation.

The current study's findings are critically compared to previous research conducted both domestically and internationally,

making a significant contribution to the literature on HOTS implementation. Teachers' positive attitudes, effective pedagogical skills, and sound knowledge of HOTS emerge as key determinants influencing the successful integration of HOTS in the mathematics classroom. Additionally, the research emphasizes the potential for addressing barriers through proactive measures and support. These insights have broader implications for promoting HOTS not only in Malaysia but also in educational contexts worldwide. By incorporating diverse perspectives and situating the findings within a broader framework of effective HOTS instruction, this study enhances the understanding of HOTS implementation in various educational settings globally.

CONCLUSION

In conclusion, the primary objective of this study was to investigate the influence of teachers' knowledge, pedagogical skills, and attitudes towards HOTS. The findings robustly demonstrated the substantial impact of these factors on the effective teaching of HOTS within the cohort of Malaysian mathematics educators. These findings carry significant potential to enhance teaching methodologies and facilitate the seamless integration of HOTS principles across educational institutions. Furthermore, the implications of this study transcend its immediate scope and resonate deeply within the broader educational landscape of Malaysia. This resonance is particularly pronounced in subjects such as mathematics, where the deliberate promotion of HOTS is intrinsically linked to the cultivation of superior learning outcomes. Notably, the insight gained into the challenges students face when introduced to HOTS-enriched teaching methodologies holds the promise of fostering a mutually beneficial learning environment.

Implications

By building upon these outcomes, future research endeavors should be channeled toward understanding how prospective educators assimilate HOTS into their pedagogical strategies. The study's underpinning theoretical framework, bolstered by the three discerned factors—namely teachers' self-perception of HOTS knowledge, teaching skills, and attitude—serves as a compass for illuminating the dynamics of HOTS instruction, particularly within the context of mathematics education in the Temerloh district. Lastly, a critical pathway for future exploration lies in an in-depth investigation of the diverse impediments to effective HOTS instruction across varying educational contexts, as well as their consequential impacts on instructional practices. Such an undertaking is pivotal to garnering a holistic comprehension of these challenges and their ripple effects. In a succinct synthesis, this study not only bridges existing knowledge gaps but also lays the groundwork for refining pedagogy and elevating the quality of education. It is an inspiring call to collective action, propelling HOTS integration to unprecedented heights and

nurturing a generation of analytical thinkers equipped to navigate the complexities of an ever-evolving world.

Limitations and Direction for Future Studies

The study has several limitations that need to be acknowledged. Firstly, the data for this research were obtained solely from 71 schools in the Temerloh area, with the participants being limited to mathematics teachers. As a result, the generalizability of the study's findings to all mathematics teachers across different regions may be questionable, especially considering the scarcity of studies focused on primary schools. Additionally, selecting respondents from the Temerloh district introduces potential bias, as the district is known for having a higher proportion of rural schools. It could impact the applicability of the findings to more urban or diverse settings.

Another limitation is the research design employed, which is a correlational research design. Since this design does not involve the manipulation of variables, it restricts the scope of understanding causal relationships between the factors studied. The focus was gathering information about the current state of barriers to teaching HOTS, teachers' attitudes toward teaching HOTS, their knowledge, and confidence levels in HOTS instruction. For future studies, it would be beneficial to adopt more comprehensive and in-depth research methods when investigating HOTS instruction in primary schools. Qualitative methods like interviews, classroom observations, and recordings could provide richer insights into teachers' experiences and challenges in implementing HOTS. Longitudinal studies tracking the variables over an extended period could also offer a more nuanced understanding of the dynamics of teaching HOTS effectively.

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