

# Mathematics Teachers' Perceptions and Practices in Integrating Thinking skills During Teaching and Learning in Tangkak District, Johor

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## Abstract

This study aims to examine the perceptions of Mathematics teachers in Tangkak district, Johor, regarding the integration of thinking skills in teaching. Teachers' perceptions were evaluated across four dimensions: teaching approaches, values and significance, self-efficacy, and curriculum and school support. Meanwhile, the practice of creative teaching was assessed through three dimensions: lower-order thinking skills (LOTS), higher-order thinking skills (HOTS), and the application of diverse thinking strategies. The study also explored the relationship between teachers' perceptions and their creative teaching practices. A total of 250 Mathematics teachers participated in the survey, using a structured questionnaire as the research instrument. Data were analyzed using descriptive statistics (mean and standard deviation) and inferential statistics (Pearson correlation). Findings revealed that teachers' perceptions across all four dimensions were at a high level. Similarly, their practices in implementing LOTS, HOTS, and varied thinking strategies also scored highly. A significant and strong positive correlation was found between teachers' perceptions and their creative teaching practices.

**Keywords:** Teachers' Perception, Thinking Skills, Creative Teaching, Mathematics Education, Higher-Order Thinking Skills

## Introduction

Thinking skills are a fundamental component of 21st-century education, particularly in preparing students to meet the demands of an increasingly complex and dynamic world. Within Malaysia's Mathematics curriculum, both the Primary School Standard Curriculum (KSSR) and the Secondary School Standard Curriculum (KSSM) emphasize the importance of Higher-Order Thinking Skills (HOTS) in cultivating students who are critical, creative, and analytical. However, the successful implementation of HOTS heavily relies on teachers' perceptions and practices, including their confidence levels and the professional support they

receive (Bahagian Pendidikan Guru, 2021; Nur Hawa Hanis & Ghazali, 2023; Ahmad et al., 2023).

Mathematics teachers play a critical role in embedding HOTS through interactive approaches, structured questioning, and real-world problem-solving tasks (Chong & Lim, 2023; Mohamad & Ibrahim, 2024). These strategies enhance students' analytical capabilities, creativity, and deeper understanding of mathematical concepts (Ghazali & Aminah, 2023). Professional development and targeted training have also been shown to improve teachers' pedagogical confidence and effectiveness (Adnan & Zain, 2023). Furthermore, integrating educational technologies such as simulations and digital learning tools can make HOTS-oriented lessons more engaging and impactful (Zainuddin et al., 2023).

A supportive school culture is another key factor, where collaboration among educators and participation in Professional Learning Communities (PLCs) can help teachers overcome challenges in implementing HOTS. PLCs promote the sharing of best practices and collective problem-solving (Samsudin et al., 2023). The availability of relevant and challenging instructional materials also plays a significant role in increasing student engagement (Halim et al., 2023), while parental support further boosts students' confidence in applying thinking skills (Omar & Karim, 2024). Authentic assessments such as portfolios and projects have also been identified as effective methods for evaluating students' mastery of HOTS (Ahmad et al., 2023).

Research shows that problem-based learning and real-world applications positively impact students' academic performance in Mathematics (Chong & Lim, 2023). A more holistic integration of technology and ongoing curriculum reforms are recommended to sustain effective HOTS implementation (Zainuddin et al., 2023; Karim & Sulaiman, 2023).

Student motivation is equally crucial. Intrinsically motivated learners are more likely to participate actively in cognitively demanding learning activities (Zulkifli & Razak, 2023). Teachers can foster this by creating a classroom environment that supports exploration and experimentation, where students feel safe to engage in complex mathematical problem-solving (Yusoff & Hamzah, 2024).

Emerging technologies such as virtual reality (VR) and augmented reality (AR) are gaining traction in helping students grasp abstract mathematical concepts. These tools not only heighten interest but also offer more immersive and meaningful learning experiences (Rahman & Cheong, 2023). When combined with HOTS strategies, VR and AR can significantly enhance student achievement and thinking capabilities (Tan et al., 2024). Further research is encouraged to explore broader classroom integration of these technologies.

Accordingly, this study investigates the perceptions and practices of Mathematics teachers in integrating thinking skills into their instructional processes. The primary focus is on how teachers implement HOTS in the classroom and the factors that influence their teaching approaches (Nor Laila & Md Nasir, 2021). The findings aim to provide valuable insights into the challenges and opportunities in enhancing HOTS instruction, particularly in Mathematics education (Bahagian Pendidikan Guru, 2021; Zul Hazmi & Chew, 2021; Adnan & Zain, 2023;

Ishak & Rosli, 2022; Samsudin et al., 2023; Ahmad et al., 2023; Karim & Sulaiman, 2023; Hassan et al., 2023).

### Research Objectives

This study aims to:

- a) Examine the level of Mathematics teachers' perceptions regarding the teaching of thinking skills, based on four aspects:
  - instructional approaches to teaching thinking skills,
  - values and importance of thinking skills,
  - teachers' self-efficacy, and
  - curriculum and school support.
- b) Identify the extent to which Mathematics teachers practice creative teaching, focusing on:
  - lower-order thinking skills (LOTS),
  - higher-order thinking skills (HOTS), and
  - the application of various forms of thinking strategies.
- c) Explore the relationship between teachers' perceptions of teaching thinking skills and their implementation of creative teaching practices.

### Literature Review

#### *Thinking Skills in Education*

Thinking skills refer to the ability to engage the mind critically and creatively in understanding, evaluating, and solving problems. These skills encompass critical, analytical, reflective, and creative thinking (Facione, 2020). Numerous studies underscore the importance of thinking skills in education, particularly in Mathematics, which demands deep conceptual understanding and rigorous problem-solving abilities. Facione (2020) highlighted that teaching approaches emphasizing thinking skills can significantly enhance students' analytical abilities, problem-solving proficiency, and decision-making capacity.

In the context of 21st-century education, thinking skills are foundational as they contribute to students' cognitive resilience and depth of thought. A study by Yusoff and Zainudin (2021) demonstrated that active learning strategies—such as problem-based learning and group activities—can significantly improve students' thinking skills. However, the implementation of these strategies often encounters challenges due to time constraints and heavy workloads within an exam-oriented education system.

#### *Creative Teaching Practices in Mathematics*

Creative teaching refers to pedagogical approaches that promote innovation, variety, and flexibility in instructional delivery. Tengku Zawawi (in Samsoo & Nik Suryani, 2020) found that many Mathematics teachers in Malaysia still rely on traditional, teacher-centered methods focused on academic performance in high-stakes exams. Time limitations and pressure to complete the syllabus often hinder the adoption of creative teaching methods. Traditional tools such as blackboards remain preferred for their perceived effectiveness in knowledge delivery (Maher, 2011), although they may stifle creativity in the classroom.

This aligns with Saracho's (2012) findings that teaching procedures still emphasize compliance, appropriate behavior, and conventional thinking, thereby limiting creativity. Mathematics instruction often remains focused on procedural skills rather than real-world

problem-solving, and students are typically engaged in rote learning with minimal emphasis on independent thinking (Azhari & Zaleha, 2021).

Jeffers (2019) advocated for the use of creative instructional techniques, such as project-based learning, interactive applications, and gamified activities, to make Mathematics more engaging. These methods encourage student-centered learning, active participation, and critical reflection.

In sum, the effectiveness of creative teaching is strongly influenced by teachers' competencies. Competent Mathematics teachers are better equipped to create stimulating learning environments that foster both critical and creative thinking.

### *Teachers' Perceptions of Teaching Thinking Skills*

Teachers' perceptions refer to their beliefs and attitudes toward certain concepts or practices, which in turn shape their instructional decisions and behaviors. Studies have shown that positive perceptions of thinking skills are linked to greater willingness to adopt strategies that promote critical and creative thinking (Davis, 2020). However, many teachers still lack sufficient understanding of thinking skills, especially in Mathematics, due to limited training and exposure (KPM, 2013; Nor Hasmaliza, 2016; Rahimah, 2016).

Teachers often feel more prepared to teach content than to facilitate thinking skills. Factors such as limited knowledge, time constraints, workload, and student behavior pose challenges to implementing thinking-focused instruction (Madzanah in Syazana & Zamri, 2018). Additionally, issues like large class sizes, passive learners, and inadequate teaching resources further complicate the integration of thinking strategies. Although some have attended relevant training, studies (e.g., Nasyimah, 2023) report that confidence in applying thinking skills remains low among many educators.

Despite these challenges, many teachers recognize the value of thinking skills in improving academic outcomes and preparing students for the future (Khalil, 2010). Successful instruction in thinking skills often involves intentional integration—whether full, partial, or indirect—and well-designed learning activities that support conceptualization, decision-making, and problem-solving. While implementation may vary, there is growing consensus among teachers on the importance of incorporating critical and creative thinking into Mathematics instruction.

### **Methodology**

This study employed a quantitative, cross-sectional survey design to investigate Mathematics teachers' perceptions of teaching thinking skills and the relationship with their creative teaching practices. The cross-sectional design allowed data collection at a single point in time and is widely used in educational research (Salleh et al., 2023).

A structured questionnaire was used as the primary data collection instrument. This approach enables large-scale data collection and statistical analysis suitable for generalization to a broader population (Ismail et al., 2023; Hassan et al., 2021). The questionnaire was adapted from previous studies to ensure content validity, with a pilot test conducted to enhance reliability (Lim & Wong, 2024).

### *Population and Sampling*

The study targeted primary school Mathematics teachers in Johor, including those from national schools (SK), Chinese vernacular schools (SJKC), and Tamil vernacular schools (SJKT). Sampling considered demographic factors such as gender, location, and teaching experience. The study focused on two geographic zones in Johor: the Northern Zone (Muar and Segamat) and the Southern Zone (Johor Bahru, Kulai, and Pontian).

A stratified random sampling technique was employed to ensure balanced representation across school types and regions. Fifty schools were selected as clusters, with at least five Mathematics teachers sampled from each, yielding a total sample size of 250 (Maas & Hox, 2005; Creswell & Creswell, 2021).

### *Instrument Structure and Validation*

*The questionnaire consisted of three sections:*

- Section A: Teacher demographics
- Section B: Teachers' perceptions of teaching thinking skills
- Section C: Creative teaching practices

Items were developed based on Sukiman, Noor Shah, and Mohd Uzi (2022), and refined with input from education experts. A five-point Likert scale was used (1 = Strongly Disagree to 5 = Strongly Agree). Descriptive analyses (mean, frequency, percentage) were conducted to validate item clarity and construct relevance (Hadi et al., 2023).

### *Reliability and Validity*

Content and structural validity were ensured through expert reviews and careful scheduling of questionnaire distribution to minimize respondent distraction (Ramly et al., 2024; Kline, 2021). Internal reliability was assessed using Cronbach's Alpha, which yielded a coefficient of 0.90—indicating excellent consistency (Nunnally & Bernstein, 1994). SPSS software was used for statistical analysis (Field, 2018).

A pilot study involving the same number of participants confirmed the instrument's reliability. This step ensured that potential weaknesses in wording or structure were addressed before the main study. The pilot results supported the validity of the survey and its suitability for full-scale deployment.

## **Findings**

### *Teachers' Perceptions of Teaching Thinking Skills*

Teachers' perceptions were measured across four aspects: teaching approach, values and importance, self-efficacy, and curriculum and school support.

- **Teaching Approach:**

The highest mean score ( $M = 4.57$ ) was for the statement that thinking skills can be implicitly enhanced through teaching methods. The lowest ( $M = 4.23$ ) was for introducing a specific subject focused solely on thinking skills. Overall, the mean score for this dimension was high ( $M = 4.42$ ,  $SD = 0.67$ ), indicating strong agreement with various teaching approaches to thinking skills.

- **Values and Importance:**

Teachers expressed strong agreement that thinking skills are essential for academic success, future employment, and personal development. This dimension recorded the

highest overall mean score ( $M = 4.72$ ,  $SD = 0.52$ ), reflecting widespread belief in the value of thinking skills across contexts.

- **Self-Efficacy:**

Teachers generally felt confident in their ability to teach and develop students' thinking skills ( $M = 3.84$ ,  $SD = 0.90$ ). The highest-rated item ( $M = 4.13$ ) indicated confidence in achieving thinking skills objectives through Mathematics instruction. The lowest ( $M = 3.67$ ) related to having sufficient understanding to teach thinking skills.

- **Curriculum and School Support:**

Although teachers agreed that the current curriculum provides opportunities to teach thinking skills ( $M = 4.00$ ), concerns were raised about curriculum overload ( $M = 3.87$ ) and insufficient guidance ( $M = 3.83$ ). The lowest score ( $M = 3.37$ ) reflected skepticism about the usefulness of textbooks in supporting thinking skills instruction. The overall mean for this category was still high ( $M = 3.68$ ,  $SD = 1.12$ ).

### *Teachers' Creative Teaching Practices*

Creative teaching was evaluated through three components: LOTS, HOTS, and various forms of thinking strategies.

- **Lower-Order Thinking Skills (LOTS):**

Teachers reported frequent use of basic cognitive strategies, such as comparison, categorization, and explanation. The highest-rated item ( $M = 4.43$ ) encouraged categorizing based on shared features. The overall mean for LOTS practices was high ( $M = 4.31$ ,  $SD = 0.73$ ).

- **Higher-Order Thinking Skills (HOTS):**

Teachers actively engaged students in critical evaluation, inference, and source credibility analysis. The highest mean ( $M = 4.67$ ) was for encouraging students to make inferences based on available information. The overall HOTS mean was very high ( $M = 4.55$ ,  $SD = 0.59$ ), surpassing LOTS.

- **Various Thinking Strategies:**

Teachers emphasized problem-solving, decision-making, critical and creative thinking. The highest mean ( $M = 4.50$ ) was for prompting students to explain their conclusions. The lowest ( $M = 4.37$ ) was for problem-solving practices. The overall mean remained high ( $M = 4.43$ ,  $SD = 0.62$ ).

### *Correlation between Teachers' Perceptions and Creative Teaching Practices*

Pearson correlation analysis showed significant positive relationships:

- **Perceptions and LOTS:**  $r = 0.65$  ( $p < 0.01$ ), strong correlation
- **Perceptions and HOTS:**  $r = 0.40$  ( $p < 0.05$ ), moderate correlation
- **Perceptions and Various Thinking Strategies:**  $r = 0.40$  ( $p < 0.05$ ), moderate correlation

These results indicate that higher teacher perception scores are associated with more frequent implementation of creative teaching practices. Therefore, the null hypothesis is rejected, confirming a statistically significant relationship between perception and practice.

## **Discussion**

### *Teachers' Perceptions of Thinking Skills Instruction*

Teachers showed strong support for using multiple approaches to teaching thinking skills—particularly indirect and partial integration, which received the highest endorsement. This aligns with Khalil's (2010) findings, which highlighted that experienced teachers often prefer

indirect methods, while preservice teachers lean toward direct approaches. Most teachers in this study agreed that thinking strategies should be embedded into lesson planning to develop students' cognitive skills.

Teachers also recognized the broader value of thinking skills in shaping academic performance, career readiness, and real-life problem-solving. These findings echo Nessel and Graham's (2011) work, which emphasized the role of creative instruction in preparing students for success beyond school.

Although the mean score for self-efficacy was slightly lower than other dimensions, it still reflected a high level of confidence among teachers in the Tangkak district. This contradicts earlier research (e.g., Samsoo & Nik Suryani, 2010) that found low self-efficacy among teachers in teaching thinking skills. Notably, many respondents disagreed that curriculum constraints hinder thinking instruction, but some acknowledged insufficient curriculum guidance as a challenge.

The emphasis on thinking skills has increased since 2014, when Malaysia's Ministry of Education mandated a higher percentage of HOTS questions in national assessments. As a result, Mathematics teachers have been required to integrate thinking skills into their teaching to help students navigate the updated exam formats and expectations. These curriculum reforms have shifted teaching away from rote learning toward fostering critical application of knowledge.

Overall, the results confirm that teachers' perceptions—spanning teaching approaches, value judgments, self-efficacy, and systemic support—play a vital role in shaping creative classroom practices. A higher perception of the importance and feasibility of thinking skills instruction translates into greater pedagogical creativity and student engagement.

#### *Creative Teaching Practices*

The study revealed a consistently high level of implementation for all three types of creative teaching practices. However, while teachers were relatively strong in applying HOTS strategies, prior research by Rosnani and Suhailah (in Sukiman et al., 2012) reported that some teachers were still reluctant to apply both LOTS and HOTS in practice.

Teachers in this study demonstrated stronger use of HOTS than LOTS, possibly due to increased policy emphasis and training efforts. Still, some aspects—such as problem-solving—were practiced less frequently. This may be due to unfamiliarity or lack of time, as teachers prioritize completing the syllabus and preparing students for standardized tests (Azhari & Zaleha, 2013).

#### *Relationship between Perceptions and Practices*

The strong correlation between teachers' perceptions and LOTS practices, and moderate correlations with HOTS and varied strategies, underscore the importance of belief systems in shaping pedagogical behavior. This finding aligns with Rosnani and Suhailah's (in Sukiman et al., 2012) conclusion that positive teacher perceptions are critical to the successful implementation of thinking skills.

Creative teaching requires not only pedagogical knowledge but also confidence, autonomy, and institutional support. As Rinkevich (2011) argues, effective creative instruction depends on the teacher's ability to act as a facilitator, decision-maker, and designer of learning experiences. In this light, building teacher capacity and mindset is essential to fostering a classroom culture where students can explore, reason, and create.

### **Conclusion**

This study explored Mathematics teachers' perceptions of teaching thinking skills and their implementation of creative teaching practices in the Tangkak district of Johor, Malaysia. Overall, the findings indicate that teachers exhibit a high level of agreement across all four dimensions of perception: teaching approach, value and importance, self-efficacy, and curriculum and school support.

From a pedagogical perspective, the data show that Mathematics teachers actively incorporate various forms of thinking skills in their classrooms, including lower-order thinking skills (LOTS), higher-order thinking skills (HOTS), and diverse cognitive strategies. Each of these domains was practiced at a high level, indicating strong commitment to fostering analytical and reflective learning among students.

Most notably, the study identified a positive and statistically significant correlation between teachers' perceptions and their creative teaching practices. This implies that the more positively teachers view the importance and feasibility of thinking skills instruction, the more likely they are to engage in innovative and student-centered teaching methods. As such, the null hypothesis stating no significant relationship between perception and practice was rejected.

However, the findings also point to systemic challenges. Some teachers perceive thinking skills instruction as time-consuming and burdensome, particularly when working with students perceived to have lower academic potential. Consequently, certain teachers reserve these strategies for higher-performing students, focusing more on exam preparation for others. This underscores a tension between content mastery for assessment purposes and the cultivation of critical and creative thinking.

In practice, this often leads to teacher-centered instruction dominated by factual delivery and memorization, rather than engaging students in the reasoning behind mathematical concepts. Teachers may also struggle to find effective ways to develop students' cognitive skills, especially under the pressure of completing the syllabus.

### **Recommendations**

To enhance Mathematics teachers' perception and implementation of thinking skills instruction, this study proposes the following:

#### *Embedding Thinking Skills in Teacher Training Programs*

The success of future educators depends heavily on the quality of their training. The teacher education curriculum at Institutes of Teacher Education (IPG) should be restructured to integrate both theoretical and practical components of thinking skills, aligned with 21st-century learning objectives. This will better prepare teachers to apply these concepts in real

classrooms and to adopt creative instructional strategies from the outset of their careers (Aziz Omar, 2011; Mohd Zarawi, 2012).

#### *Continuous Professional Development (CPD) for IPG Lecturers*

Effective Mathematics teachers who foster creative thinking can only be nurtured by skilled and knowledgeable teacher educators. CPD programs should be made compulsory for lecturers in IPGs to ensure that they themselves are well-versed in thinking skills and can deliver “hands-on” training. Evidence shows that CPD is critical for improving classroom management and pedagogical techniques aligned with 21st-century demands (Madden, 2010; Bray, 2016).

#### *Restructuring Teacher Education Programs*

To strengthen thinking skills instruction, teacher education programs should undergo structural reform by integrating thinking skills models into their syllabi. This includes revisiting current course offerings to ensure relevance and effectiveness. As recommended by David (in Nur Hawa Hanis & Ghazali, 2018), teacher training institutions should revise their curriculum to better equip future educators with the tools needed for developing students’ cognitive abilities.

#### *Motivation and Contribution of the Study*

Despite the increasing emphasis on higher-order thinking skills (HOTS) in Malaysia's national curriculum, there remains a gap in understanding how Mathematics teachers perceive and implement these skills in their daily teaching practices, especially at the district level. This study is motivated by the need to bridge that gap by providing empirical evidence from the Tangkak district—a region that has not been widely explored in existing literature. By examining teachers’ perceptions alongside their actual teaching practices, this research offers a comprehensive view of the enablers and constraints affecting the integration of thinking skills in Mathematics instruction. The study contributes to the growing body of knowledge on educational reform and instructional innovation by highlighting the significant relationship between perception and practice. It also provides actionable insights for policymakers, curriculum developers, and teacher training institutions aiming to strengthen the implementation of thinking skills in classrooms.

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