

**PRESCHOOL TEACHER'S KNOWLEDGE,
SKILL AND PRACTICE OF HOTS IN TEACHING
SCIENCE SUBJECT**

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by

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LIST OF ABBREVIATIONS

HOTS	Higher Order Thinking Skills
MOE	Ministry of Education
IBSE	Inquiry-Based Science Education
KSPK	Kurikulum Standard Prasekolah Kebangsaan
DSKP	Dokumen Standard Kurikulum Dan Pentaksiran
MTS	Malaysian Teacher Standards
KEMAS	Jabatan Kemajuan Masyarakat
JPNIN	Jabatan Perpaduan Negara dan Integrasi Nasional
PD	Professional Development
PBL	Project-based learning

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**PENGETAHUAN, KEMAHIRAN DAN AMALAN KBAT GURU
PRASEKOLAH DALAM MATAPELAJARAN SAINS**

ABSTRAK

Kajian ini menyiasat pengetahuan, kemahiran dan amalan pemikiran aras tinggi guru dalam mengajar kanak-kanak prasekolah melalui pendidikan sains awal. Sebanyak 481 borang soal selidik telah dilengkapkan dan diperoleh daripada guru prasekolah di Semenanjung Malaysia. Data dianalisis menggunakan Perisian SmartPLS versi 3.0 yang digunakan untuk Analisis Faktor Penerokaan dan Analisis Faktor Pengesahan. Dapatan kajian menunjukkan bahawa Pengetahuan KBAT dalam kurikulum, Pengetahuan KBAT dalam Pedagogi, Kemahiran Pedagogi, Kemahiran Perancangan/Persediaan, Kelayakan Ikhtisas dalam PAKK/Prasekolah dan Latihan/Kursus KSPK memberi impak positif kepada amalan KBAT guru. Di samping itu, analisis mendedahkan bahawa pengetahuan KBAT dalam kurikulum dan kemahiran perancangan/persediaan mempunyai perkaitan yang positif. Pengetahuan KBAT dalam Kurikulum dan Kemahiran Pedagogi mempunyai perkaitan yang tidak signifikan. Kesan penyederhanaan mendedahkan kesan penyederhanaan positif Latihan/Kursus KSPK terhadap hubungan antara (Pengetahuan KBAT dalam Kurikulum dan Pengetahuan KBAT dalam Pedagogi) dan amalan KBAT guru. Kajian ini memberi implikasi dasar kepada Kementerian Pendidikan (KPM) dan pihak berkepentingan. KPM harus mempertimbangkan untuk memberi penekanan kepada pembaharuan pendidikan prasekolah, justeru, mengutamakan pembangunan guru dengan memaksimumkan sumber pendidikan prasekolah. Latihan guru prasekolah harus diperluaskan, disatukan dan ditugaskan di seluruh negara untuk dimulakan setiap tahun. Walau bagaimanapun, ianya harus diikuti dengan penyeliaan yang konsisten

dan berkesan terhadap pelaksanaan pengetahuan/kemahiran pedagogi yang diperolehi daripada latihan setiap suku tahun. Kajian ini mengesyorkan bahawa analisis membujur perlu dipertimbangkan pada masa hadapan dengan saiz sampel yang sama atau lebih. Ini adalah untuk melihat bagaimana set kebolehan guru (seperti kemahiran KBAT, pengetahuan KBAT, kelayakan profesional, dsb.) boleh mempengaruhi amalan KBAT mereka di dalam bilik darjah untuk membantu meningkatkan pengajaran dan prestasi akademik kanak-kanak secara konsisten dalam tempoh tertentu.

PRESCHOOL TEACHER'S KNOWLEDGE, SKILL AND PRACTICE OF HOTS IN TEACHING SCIENCE SUBJECT

ABSTRACT

This study investigates the teacher's knowledge, skill and practice of higher order thinking in teaching preschool children through early science education. A total of 481 questionnaires were completed and obtained from preschool teachers in Peninsular Malaysia. The data was analysed using the SmartPLS Software version 3.0 which used for the Exploratory Factor Analysis and Confirmatory Factor Analysis. The findings indicated that Knowledge of HOTS in the curriculum, Knowledge of HOTS in Pedagogy, Pedagogical skills, Planning/Preparation Skill, Professional Qualification in ECCE/Preschool and KSPK Training/Course have a positive impact on teacher's practice of HOTS. In addition, the analysis reveals that knowledge of HOTS in curriculum and planning/preparation skills has a positive correlation. Knowledge of HOTS in Curriculum and Pedagogy skills has an insignificant correlation. The moderating effects reveal a positive moderating impact of KSPK Training/Course on the relationship between (Knowledge of HOTS in Curriculum and Knowledge of HOTS in Pedagogy) and teacher's practice of HOTS. The study provides policy implications to the Ministry of Education (MOE) and stakeholders. MOE should consider directing their emphasis on preschool educational reforms, thus, prioritizing teachers' development through the maximization of preschool educational resources. Expanding preschool teachers' training should be consolidated and assigned nationwide to begin yearly. However, that should be followed with consistent and effective supervision on implementing the pedagogical knowledge/skills acquired from training quarterly. This study recommends that a longitudinal analysis should be

considered in the future with the same sample size or more. This is to capture how teachers' set of abilities (such as skills of HOTS, knowledge of HOTS, professional qualification, etc.) can influence their practice of HOTS in a classroom to help improve their teaching and children's academic performance consistently over some time.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The Malaysian education system involves preschool, primary, secondary, and higher education. Preschool education is essential as it is the first formal education children receive. For that reason, the National Preschool Education Curriculum (KSPK) is no exception in transforming existing learning content by empowering HOTS elements in the teaching and learning process (DSKP, 2016). According to the Ministry of education (MOE, 2013), literacy, numeracy, and higher order thinking skills are core intellectual skills essential to children's success in today's rapidly changing economy and globalized society. The adoption of HOTS among preschoolers in Malaysia has been emphasized to ensure that the new generation of children receives a quality education to be more globally competent. With such effect, Higher Order Thinking Skills (HOTS) has been integrated into all subjects in the school, including preschool education. HOTS are applied in the education system with the intention of students not only memorising but also understanding and practicing what they learn through mastering the skills of using, analysing, evaluating and creating (MOE, 2018). According to Heri Retnawati et al. (2018), a student's abilities can be seen through Higher Order Thinking Skills (HOTS) and should be developed through teaching and learning. Besides that, HOTS can be taught to all children; these skills are not related to age. It is not merely that the higher order ones are for older children and the low-level are for young children. A decade ago, it has been proved that these skills really start to occur in the early years of schooling as children naturally are curious and eager to learn. Tay-Lim (2011) stated that young children in preschools can be competent

thinkers and teachers can encourage children's thinking through open-ended questioning and reflective discourse.

According to the Ministry of education's (MOE) ambition to produce pupils with 21st-century skills for their future careers. The integration of HOTS is clearly stated in all subjects' content knowledge and learning standards in preschool curriculum (DSKP, 2016). In science, most teachers need good skills to develop HOTS among students, particularly in planning learning activities (Tajularipin Sulaiman et al., 2017). Based on the Preschool curriculum handbook (BPK, 2017), HOTS can be integrated into the classroom through science activities in the form of reasoning, problem-solving, inquiry learning, project-based learning and so on. Nurturing and cultivating HOTS can help children perform thought operations such as making analyses and inferences, increasing understanding and improving their achievements. Through the planning of such activities, guidance from teachers can encourage children to improve the practice of thinking using thinking tools such as mind maps and high-level questioning during the classroom session.

According to the Ministry of Education (MOE), quality preschool teachers are teachers who can cover three critical aspects of the Malaysian Teacher Standards (MTS), which are the practice of professional teaching values, good knowledge and understanding, and practical teaching skills (MOE, 2009). Therefore, the teacher's knowledge, skill and practice are the standards for professional competencies. It is a requirement for effective teaching and learning, including teaching higher order thinking into the subject matter. These three elements contribute to positive children's outcomes. Without a full grasp of these three elements, the HOTS curriculum cannot be implemented as the government intended. Accordingly, professional development

will improve early education teachers' knowledge, skills and practices in educating children (Sheridan et al., 2009).

As the curriculum changes, effective professional development (PD) is needed to improve teacher's knowledge, practice and students' learning outcomes related to these 21st-century skills (Darling-Hammond et al., 2017). The Ministry of education (MOE, 2012) aims to change the qualification standard by encouraging all preschool teachers to obtain a minimum qualification in early childhood education. The teachers must attend a related course or formal training before they are eligible to teach. The Ministry further emphasized that higher qualifications in early childhood education and training are essential for preschool teachers to be more competent to apply the curriculum with an appropriate approach that focuses more on higher order thinking (MOE, 2017). PD needs to be regarded as an ongoing task for preschool teachers (Visković & Višnjić Jevtić, 2018). Since 2005, the Ministry of education has tried only to recruit qualified teachers, and their number has continued to increase (UNESCO, 2015). Studies from several countries have shown that a qualified teacher in the preschool program makes a significant difference in providing quality education, resulting in improved outcomes for young children (Foong et al., 2018). Therefore, preschool management needs to pay attention to a teacher's professional qualification for effective classroom teaching.

1.2 Background

Implementing higher order thinking skill into subject matter is necessary to improve the quality of teaching. In order to be more competent in teaching, teachers are encouraged to adopt the Malaysian Teacher Standards and align their practices to the vision of the MTS for their teaching effectiveness. Malaysian teacher standards

consult with professional competencies and are aligned with international standards. Competency refers to teacher professional skills based on the practice of professional teaching values, knowledge and understanding, and teaching skills (MTS, 2009). These standards would require teachers to reformulate new methods, investigate new ways of doing things and explore the new teaching technique. Figure 1.1 shows the Standards for achieving professional competencies in teaching. The MTS consists of three main content standards in line with this aim.

Figure 1.1

Malaysian Teacher Standards

STANDARD	S1: Practice of professional teaching values S2: Knowledge and understanding S3: Skills in teaching and learning	Teacher Competency
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Source: MTS (2009). Ministry of Education.

- Standard 1: Practice professional teaching values within the teaching profession. This standard refers to those values teachers hold in teaching. These values are essential for teachers to be more effective in their teaching profession.
- Standard 2: Knowledge and understanding of education, subject matter, National curriculum and co-curriculum. Teachers should know to improve teaching, and they should also perform their teaching efficiently and effectively. These standards encourage the teachers to be more creative and innovative in developing HOTS for the students.
- Standard 3: Teacher’s skills of teaching and learning in the classroom. Planning, implementing and evaluating are essential abilities for teachers to teach.

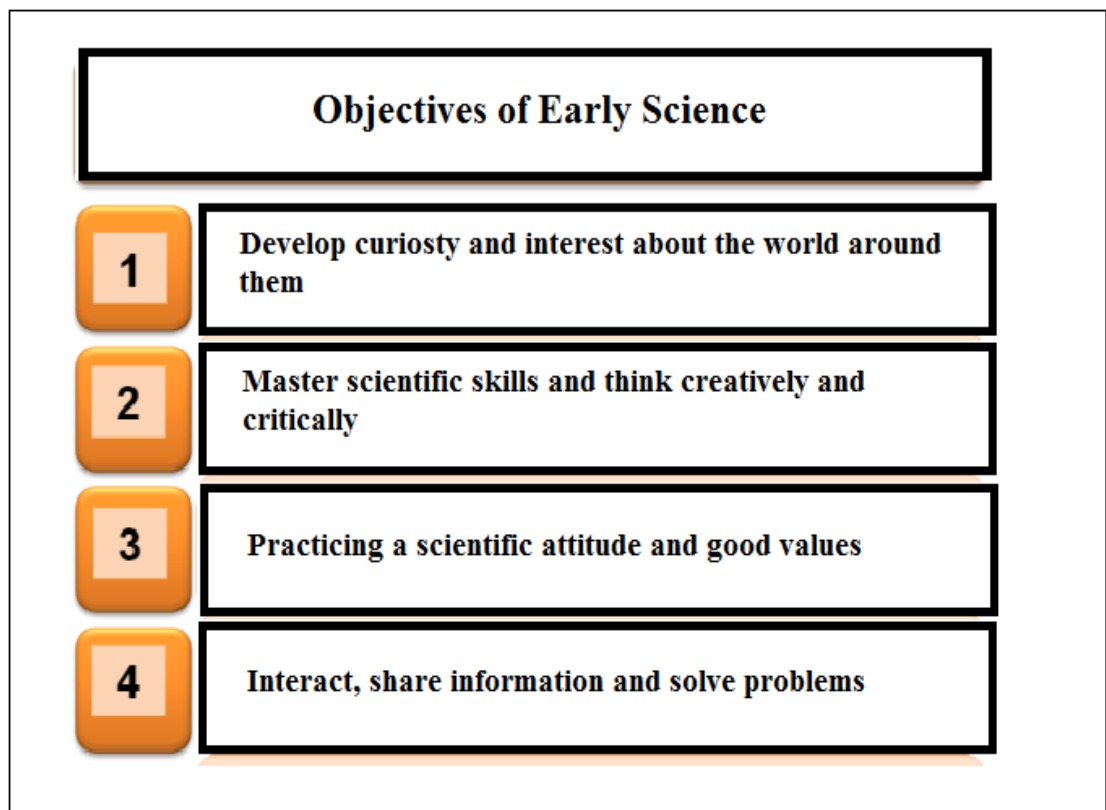
According to MTS, knowledge and understanding of education, subject matter, National curriculum and co-curriculum are important to improve teaching. Since HOTS has been included in the new curriculum, teachers need to have knowledge of HOTS and understand the concept of HOTS in curriculum. Every seven years, the preschool curriculum is reviewed to ensure teaching modules are up to date and changes are made to improve the education system. In 1993, the MOE published the 'Guidelines for Preschool Education Curriculum' (GPKPP) as a guide for preschool teachers in designing, implementing and evaluating preschool teaching activities. However, MOE redesigned the preschool curriculum, and the first National Preschool Curriculum was implemented in 2003 to sets the benchmark and the requirements for all preschool providers in the country. After five years of implementation, the 2003 National Preschool Curriculum was reviewed, and finally, the National Preschool Standard Curriculum (KSPK) was published and implemented in 2010 in all government and private preschools. Again, the KSPK was revised in 2016 and implemented in 2017. The Revised KSPK 2017 reflects the Ministry's aspirations to encourage HOTS and problem-solving skills in children (MOE, 2017).

The Preschool curriculum was drafted to encourage child's potential in a holistic and integrated manner to produce intellectually, spiritually, emotionally, and physically balanced and harmonious individuals. According to National Preschool Standard Curriculum Framework, Critical Thinking Skills, Creative and Innovative, is a component of higher-order thinking skills for preschool children. Higher order thinking skills (applying, analysing, evaluating and creating) must be used in these thinking skills. The National preschool curriculum is a guide for teaching activities in all subjects, including science. Teachers must be flexible enough to plan and prepare the lesson without limiting the teacher's creativity. Figure 1.2 show the objective of

early science in preschool curriculum. The objectives show that the elements of HOTS have been included in the teaching early science to students. Based on these objectives, teachers need to understand of the environment that can build students' thinking skills. Besides that, teachers need to teach scientific skills, creativity and critically skills. Teachers also need to teach students to solve problems. These all objectives will provide students to the higher-level skills.

Figure 1.2

Objectives of Early Science in preschool curriculum



Adapted from: KSPK (2017). Preschool Standard curriculum document

However, in order to teach subject content in the curriculum, teachers need pedagogical knowledge to transform the knowledge into teaching. Knowledge of content and pedagogical knowledge are two important aspects before a teacher can teach effectively. Shulman (1986) insists that teachers need to master two components

of knowledge, namely content knowledge and pedagogy of a subject. Content knowledge refers to knowledge about the curriculum, syllabus, lesson content and learning outcomes of a subject. Meanwhile, pedagogical knowledge is knowledge related to approaches and techniques to deliver subject content to students. Based on the preschool curriculum, HOTS can be taught to the students using various teaching approaches. In teaching higher order thinking skills Ministry of education (CDD, 2014b) has mentioned that teaching strategy, thinking tools and questioning techniques are the elements of HOTS in pedagogy. Higher order thinking skills can be identified in Content Standards (SK) and Learning Standards (SP) through the statement of the verb in the level of thinking skills based on Taxonomy Anderson's Bloom. The standard preschool curriculum has stated that the higher order thinking skills (HOTS) refer to applying, analysing, evaluating and creating skills. Table 1.1 shows pedagogical knowledge related to questioning techniques to deliver subject content to preschool children.

Table 1.1*Questioning technique based on Preschool curriculum*

No.	Preschool Subject	Content Standard	Example of Questions
1.	Bahasa Malaysia	BM 3.8 Read sentences in context BM 3.9 Understand the content of the reading	Remembering: What is the function of a punctuation mark? Applying: How do you read this sentence using the correct intonation? "I like to eat rice, fish and vegetables". Analysing: Is this way of reading according to the correct intonation? Creating: Can you re-enact based on the material read?
2.	Moral Education	ME 2.3: Helping your neighbour Value 2: Kindness	Remembering: What does it mean to be kind to your neighbour? Understanding: Why do we need to be kind to our neighbours? Applying: How do you show kindness to your neighbours? Analysing: What will happen when you get a kind neighbour and a caring neighbour? Creating: Plan an activity how you can help your neighbour if an accident occurs.
3.	Early Science	SA 3.4: Making an exploration on the plant	Remembering: What is the name of this plant? Applying: You are provided with tools for the process of photosynthesis, try to do it Analysing: What is needed for the process of photosynthesis?

Source: Adapted from Elemen KBAT dalam Pedagogi (CDD, 2014)

Knowledge and skills in pedagogy are very important. This is because the teacher's readiness to handle teaching and learning includes knowledge and skills to teach the subject content. Teaching skills are the basis important in conveying knowledge and information to students ((Nur Athirah Ariffin & Faridah Yunus, 2017). According to Augustine Ngali (2019) with the knowledge or skill in pedagogy, it will make it easier for the teacher to plan daily lessons well and easily. Teacher can choose an appropriate teaching method that suits the level of acceptance of each student. Pedagogy needs to have good planning to ensure that teaching and learning sessions run well and smoothly. Besides that, it helps make teachers more prepared in providing teaching materials that are more interesting and meaningful. In teaching HOTS, preschool teachers should have skills in planning and implementing lessons that lead students to higher level thinking. Teacher must plan questions, assignments and activities and prepare teaching tools that require students to think continuously and evaluate their thinking and the thinking of other individuals. Table 1.2 shows teacher planned the elements of HOTS in the lesson plan.

Table 1.2*Planning and Preparation of Higher Order Thinking Skill in Daily lesson plan*

Title:	Sense of Smell
Objectives:	In this topic, students will identify the parts of the body related to the sense of smell (nose), the importance of the sense of smell and be thankful for God's gift.
Standard content	ST 6.1 Apply knowledge of various smells
Learning standards	<p>Students can:</p> <p>ST 6.1.2 Classify things that smell and don't smells based on investigation.</p> <p>ST 6.1.3 Explain the importance of smell in life daily (Application Level)</p> <p>ST 6.1.3 Compare the difference between the types of fragrances and bad smells (Level of Analysis)</p> <p>ST 6.1.4 Identify problems and situations in daily life and solutions. (Application Level)</p>
Duration:	<p>Session 1: 60 minutes (learning activity),</p> <p>Session 2: 60 minutes (enrichment activities, reinforcement and group discussion)</p>
Teaching Materials:	<ul style="list-style-type: none"> • Fragrance containers containing lemon, vanilla, onion, vinegar, nescafe, soup leaves and spices. • Paper to record.
Activities:	<p>1. Prepare several closed and perforated containers that contain substances that emit odors such as lemon, vanilla, onion, vinegar, nescafe, soup leaves and spices. This smell container is prepared by the teacher and given to each group.</p> <p>2. Let the students smell each container provided and the students guess and explain the characteristics of the smell produced.</p> <p>Teacher's Question: (Understanding Level)</p> <ul style="list-style-type: none"> • How do you know the smell of an object without see it? <p>Examples: durian smell, lemon smell, soap smell</p>

Table 1.2 (Continued)


Title:	Sense of Smell
	
<p>3. Pupils match the type of smell they smell with the picture that has been prepared. This activity is carried out in groups.</p>	
<p>4. Teacher Questions: (Application Level)</p> <ul style="list-style-type: none">• Tell us what the nose is used for in everyday life besides smelling?• Predict what will happen if someone with a cold is asked to smell perfume? Explain why	
<p>5. Teacher Questions:</p> <ul style="list-style-type: none">• Give the name of another body part that has the same number as the nose? (Remembering Level)• How do you distinguish objects that smell good from objects that smell bad? (Level of Analysis)	
<p>6. The teacher prepares the following materials:</p>	
<p>Material A: A stale milk drink box Material B: A new milk drink box Material C: Water Ingredient D: Vinegar</p>	
<p>The teacher asks the students to identify the smell of the following materials and find out the importance of the smell in everyday life situations.</p>	
<p>7. Teacher Questions: (Analysis Level)</p> <p>1. You are asked to buy a drink at a grocery store. There are materials A, B, C and D in the shop.</p> <p>Among the 4 substances shown in the diagram above, which one can be drunk? Based on the diagram above, explain as follows:</p>	

Table 1.2 (Continued)

Title:	Sense of Smell
	i) What is the similarity between substance A and substance B? _____
	ii) What is the difference between substances A and B? _____
	iii) What is the similarity between substances C and D? _____
	iv) What is the difference between material C and D? _____
Source:	1. Bloom's Taxonomy HOTS Questions 2. Evaluation 3. Enrichment

Source: Adapted from: Liza Salleh (2021). Modul Kemahiran Berfikir Aras Tinggi Prasekolah

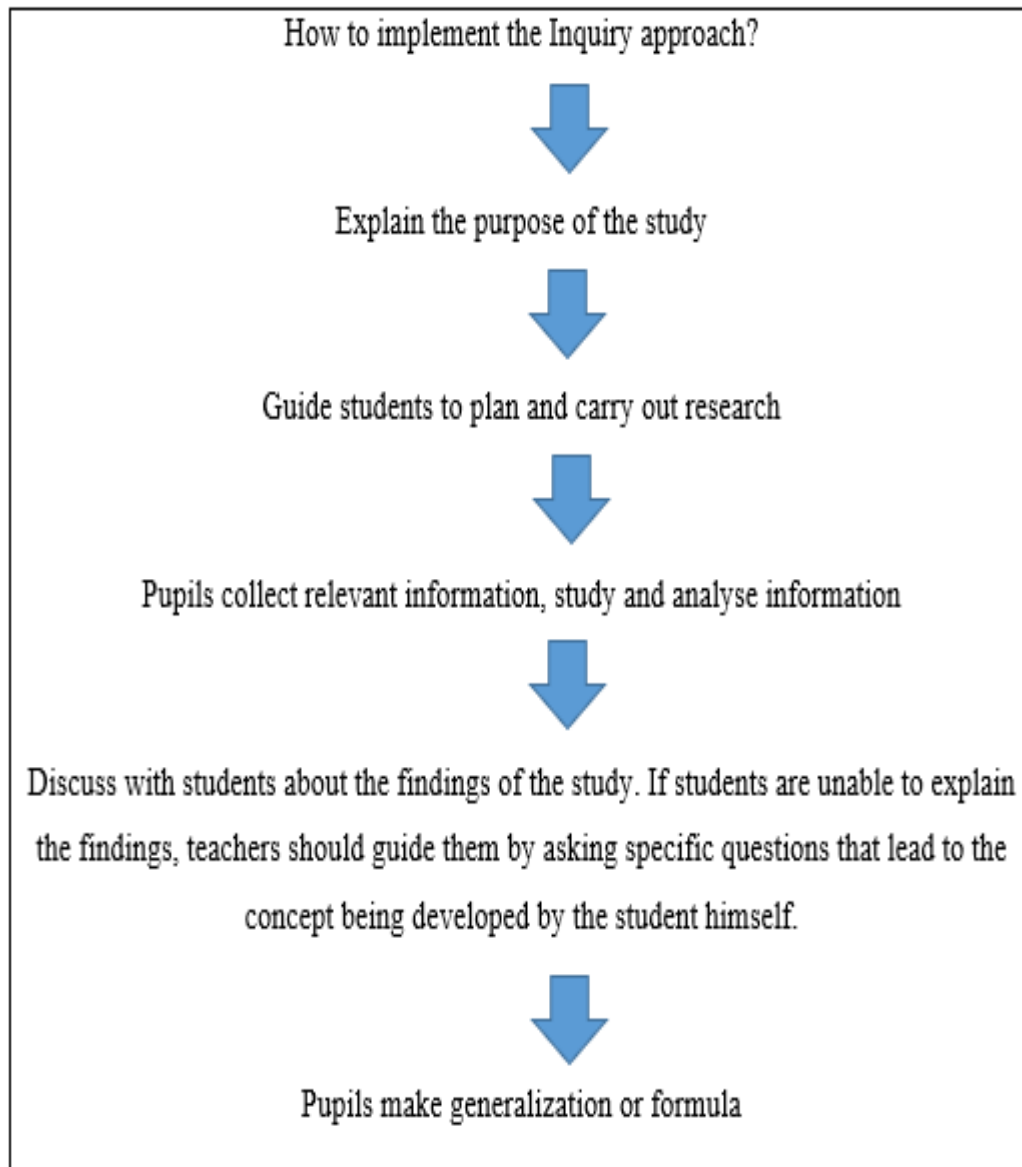
Higher order thinking skills are essential elements that should be taught to all students, including pre-schoolers, as preparation for primary school. The Ministry of Education (MOE, 2012) said the critical component of the success of Malaysia's education development plan (PPPM) was the mastery of higher order thinking skills by preschool teachers and children. Teachers need to plan and implement HOTS through various teaching and learning strategies that are effective and in line with the objectives of the daily lesson plan. Effective teaching and learning are influenced by the teacher's teaching techniques or approaches and the appropriateness of the teaching level. Teacher's readiness to handle teaching and learning includes knowledge and skills to teach the subject content. Teaching skills are the basis important in conveying knowledge and information to students. Beside planning, teacher's skills are seen through the pedagogical aspect and one of the effective pedagogical approaches is inquiry-based.

In the preschool curriculum description book, it is stated the skills to implement the inquiry approach. Refer to figure 1.3. There are a few skills to implement an inquiry approach in preschool. Firstly, teachers must explain the purpose of the activity. Once the children know the meaning of the study, teachers can guide children to plan and carry out the investigation. The study's purpose should be based on the National curriculum for all children. After that, teachers guide the children collect relevant information, study and analyse information After analysing the information, teachers should encourage children to discuss with their friends the study findings. If children cannot explain the results, teachers should guide them by asking specific questions that lead to the concept being developed by the children. Lastly, teachers guide the children to make generalizations or formulas.

By following these steps, the objective of inquiry learning can be achieved. Therefore, teachers need this scientific inquiry skill to apply in their teaching practice to infuse higher order thinking skills into children. In practicing HOTS, teachers need to implement questioning technique that encourage HOTS. A qualitative study by Nachiappan et al. (2019) explored the implementation of HOTS by teachers in teaching and learning in preschool through the Hermeneutic method. Among the elements of HOTS implemented by teachers in their teaching and learning are the skills of applying, analysing and evaluating through the practice of HOTS by using an inquiry based on the teaching and learning process as stated in table 1.3.

Figure 1.3

The teaching skill of the Inquiry approach in preschool



*Source: BPK (2017). *Bahagian Pembangunan Kurikulum. Buku Penerangan Kurikulum Standard Prasekolah Kebangsaan.**

Table 1.3

Analysis of HOTS Implementation in teaching and learning Process through inquiry inquiry base

Inquiry base Implementation	Children's Response	Interpretation of HOTS in teaching and learning at Preschool level
Teacher asks question to children: Question: Can you please tell to teacher the fruit that you know?	Answer: Apple, strawberry, durian, banana, papaya, etc.	In the induction set, the level of thinking applied is to apply the information that children describe the type of fruit they knew before.
Teacher explains to children that are so many types of fruit. Teacher going to categorised all fruit in two types that is local fruit and import fruits that we need to buy from other country.	Question: Teacher what is the import fruit? Why we need buy fruit from other country?	Through the teacher's description of the type of fruit, the level of thinking of children in analysing by comparing the fruits and evaluating an information can be applied that is, children can predict the type of local and imported fruits. Children's curiosity about imported fruits can also be seen through the questions asked by children to teachers.
Local fruit is a fruit that is produced from the country itself. Local fruit is suited to the climate (tropical rainforest climate-being hot and humid in our country).		
Import fruit is a fruit that our country buys from other country. Import fruit actually cannot live in our country because of the different climate. Like in an Australia have four seasons-summer, autumn, spring, winter).		

Source: (Nachiappan et al., 2019).

Besides inquiry base, the findings of project-based strategy to implement HOTS in science, teachers found that 100 percent of children were able to re-explain the process of growing green bean seeds based on video (Nachiappan et al., 2019). In the implementation aspect of HOTS, children can analyse information (matching flash card green bean life cycle process) with a partner without teacher guidance. In addition, children can investigate each function of tree parts for good growth with

guidance. The following table 1.4 shows the analysis of the implementation of HOTS in the teaching and learning process (Green Bean Seeds).

Table 1.4

Analysis of the Implementation of HOTS in the teaching and learning Science Process (Green Bean Seeds) through the Hermeneutic Method.

Daily lesson plan Theme: Green Bean Seeds	Student response/ Student's outcome	Interpretation of HOTS in science teaching and learning in preschool
<p>Step 1:</p> <ul style="list-style-type: none"> -Teacher take out all the green bean plant - Teacher ask children watering their own green bean plant 	<ul style="list-style-type: none"> -Children watering their own green bean plant. -Children put water inside small bowl 	<p>As an induction, the teacher asked the children to water their green bean plants in their respective containers with guidance. The level of thinking applied is evaluating, that is, children make the right decision to ensure the quantity of water used to water the green bean tree accordingly.</p>
<p>Step 2:</p> <ul style="list-style-type: none"> -Teacher called up one by one children to measure the bean and record the height in the Science book. - Teacher guide one by one children measure the green bean plant using string and ruler. - Teacher let children to write the height of green bean plants follow the day in cm inside the Science book. 	<ul style="list-style-type: none"> -Children wait for their name called up by teacher to measure bean and record the height in the Science book. -Children measure the green bean using string and ruler with teacher guidance. -Children write the height of their green bean plants follow the day in cm in science book. 	<ul style="list-style-type: none"> -In Step 1, the teacher makes a reinforcement activity by instructing each child to measure the height of green beans using thread and ruler with the guidance of the teacher. - Pupils use the level of thinking analysing through the activity of investigating the nature of plants that is pupils measuring the height of the green bean tree from the first day of the experiment until the seventh day. - Pupils will record the height of the green bean tree in the Science book.

Table 1.4 (Continued)

Daily lesson plan Theme: Green Bean Seeds	Student response/ Student's outcome	Interpretation of HOTS in science teaching and learning in preschool
<p>Step 3:</p> <p>-Teacher give all children their own green bean plant.</p> <p>-Teacher let children see their plant have root come out or still not yet, on the day 4.</p> <p>- Teacher ask one by one children:</p> <p>Question: Did your green bean plant root come out or not? Why plant need root to live?</p>	<p>-All children wait their turn and listen to the teacher.</p> <p>-Children observe their own green bean plant, see whether the root already came out or not.</p> <p>Children response:</p> <p>1. "My one got root came out already, teacher".</p> <p>2. "Plant need root to live because root absorb water to continue lives".</p>	<p>In step 3, the teacher asks the children to observe the results of their experiment by looking at the changes in their respective green bean trees. The level of thinking applied in step 2 is analysing that the children check the changes in their green bean tree whether the root of the green bean tree has come out or their green bean tree died during the experiment.</p>
<p>Closing:</p> <p>Teacher asks children come in front and tell the name of the body part of plant on their green bean plant and spell it with right.</p>	<p>Children name all body part of the green bean plant. Children spelled the body part of green bean correctly.</p> <p>Leaves</p> <p>Stem</p> <p>Root</p>	<p>-At the end of the lesson, the teacher recalls what was presented by asking the children to tell each part of the green bean tree and telling the children to spell it correctly.</p> <p>-In terms of level of thinking, children can apply information by applying the knowledge they have learned to previous teaching and learning.</p>

Source: (Nachiappan et al., 2019).

Implementing HOTS need to be practiced in the classroom to encourage students' thinking skill. According to Rajendran (1999) teachers with good pedagogical skills and knowledge of HOTS will ensure students able to practice HOTS in their daily life. They are able to transform this knowledge in everyday lessons to make it easier to see the changes in the thinking skills of the students (Rajendran, 1999). According to the Ministry of education (BPK, 2017), HOTS can be implemented in the preschool classroom through reasoning, problem-solving, inquiry

learning, project-based learning and so on. Through the planning of such activities, guidance from teachers can encourage children to improve the practice of thinking using such as mind maps and high-level questioning inside and outside the classroom. Nevertheless, teachers need to understand the HOTS concept base on the revised preschool curriculum.

The Revised KSPK 2017 recommends various teaching and learning strategies to enable teachers to deliver their knowledge, improve skills and practice the professional teaching values in the curriculum. The goal is to produce balanced, critical, creative and innovative children. All preschool teachers, including public and private, must implement the same Standard in National Preschool Curriculum in their teaching. This standard will guide teachers to plan and prepare their teaching to reach the objective as the government intended. The aim of the new curriculum can only be achieved by a competent teacher with a professional qualification in early childhood education. The teachers should achieve the Malaysian Teacher Standards (MTS, 2009) to establish professional competencies. Through MTS, training institutes can provide the need to set competency levels. However, these Malaysian Teacher standards must be provided by training institutes to assist teachers in attaining competency levels. Therefore, professional development is a requirement that teachers should obtain to support and help teachers to achieve the standards.







In 2016, the Ministry of education for preschool teachers in Malaysia set the minimum qualification to increase the quality of early childhood education. Setting a minimum qualification aims to increase the number of qualified teachers. Qualified teachers are more caring and efficient in practising the proper methodologies and approaches to create positive attitudes and readiness among preschool children. The

target should be achieved by 2020 when all preschool teachers in public and private are required to obtain at least a diploma in ECCE.

All public and private preschool teachers are encouraged to improve their qualifications, pursuing their Diploma in ECCE at accredited institutions of higher learning in Malaysia. In 2017, 23 327 private preschool teachers had yet to meet the minimum requirements. While in public preschool agencies, KPM, KEMAS and JPN, a total of 193, 4382 and 952 did not have minimum requirements, respectively (MOE, 2018). This situation can affect education quality, especially involving new curriculum teaching focusing on higher-order thinking skills. Setting a minimum standard qualification is to provide qualified, caring, and efficient teachers in applying appropriate methods and approaches to stimulate children's thinking (MOE, 2017). The number of preschool teachers by eligibility and agency is shown in figure 1.4.

Figure 1.4

*Percentage of Teacher with Minimum Diploma Qualification by Agencies,
Percentage of Teacher with Minimum Diploma Qualification by Agencies, 2017*

 DOCTORATE (PHD)	 MASTER	 FIRST DEGREE	 DIPLOMA	 CERTIFICATE	 STPM/STAM/SPM PMR & OTHERS
KPM -	KPM 310	KPM 6,970	KPM 1,803	KPM 190	KPM 3
KEMAS -	KEMAS 3	KEMAS 694	KEMAS 880	KEMAS 63	KEMAS 4319
JPNIN -	JPNIN -	JPNIN 66	JPNIN 832	JPNIN 13	JPNIN 939
PRIVATE 25	PRIVATE 355	PRIVATE 4,173	PRIVATE 6,860	PRIVATE 928	PRIVATE 22,399

Source: Ministry of education (2018). Annual Report Malaysia Education Blueprint 2013-2025

In 2017, 44.4% (22,971) of the 51,825 preschool teachers had a diploma or higher in Early childhood education (ECCE). While 55.6% (28,854) of teachers had not reached the minimum requirement, the most significant number was from private preschool that faces challenges in upgrading their qualification. Besides professional qualifications, teachers must attend formal training or a related course before teaching. After the Revised KSPK 2017 was introduced, wide awareness campaigns including training were held throughout the country in 2016 to prepare for the implementation of HOTS in 2017. Ministry of education pursued to ensure all preschools, agencies, and providers received and understood the revised curriculum 2017. This was to increase the quality of in-service preschool teachers by upgrading their knowledge and skill of higher-order thinking skills. More than 268,589 preschool teachers were trained for the 21st-century learning pedagogy (MOE, 2017).

Besides professional development, some aspects must be considered in implementing HOTS in teaching. Teacher-child ratio, curriculum, and operation schedule will significantly affect the implementation of HOTS in teaching (Lily Muliana Mustafa et al., 2013). As stated before, there are two types of preschools in Malaysia that is public and private preschools. Each preschool has its strategy to provide the best services in early childhood education. According to Lily Muliana Mustafa et al. (2013), the aims and the program are significantly different between public and private preschools. Table 1.5 illustrates the different aspects of these two types of preschools.

In terms of implementing HOTS in teaching, private preschool teachers seem more competent in implementing HOTS. Their teaching approach focuses on being Child-centered with appropriate learning materials and facilities. Besides that, the teacher-child ratio of only 1:15 facilitates teachers' control of their children's activities.

The curriculum adopted emphasizes cognitive development and is adjustable objective by the potential of children. The longer operation schedules could offer extra classes for children with lower abilities. Though children are absent for some time, the teacher will try their best to help them to finish the syllabus.

Table 1.5

Public vs Private preschool in Malaysia

Item Discuss	Public Preschool	Private Preschool
Teaching and Learning	<ul style="list-style-type: none"> • Teacher-centered • Drill technique • Limited learning materials and facilities 	<ul style="list-style-type: none"> • Child-centered • Classroom conducive to learning • Appropriate learning materials and facilities
Teacher Qualification	<ul style="list-style-type: none"> • Locally trained • Lack of professional development • The majority of public preschool teachers have a minimum requirement Diploma in Early Childhood Education 	<ul style="list-style-type: none"> • Locally and abroad trained • Professional in dealing with parents and children • The most significant number of private preschool teachers have not reached minimum qualification in Early Childhood Education but graduated with a different professional qualification.
Teacher-Child Ratio	1:25	1:15
Curriculum	<ul style="list-style-type: none"> • Emphasize social and emotional development • Follow the government goals and objective • Intermediate Language Malay 	<ul style="list-style-type: none"> • Emphasize cognitive development • Adjustable goals are an objective by the potential of children • Intermediate language Malay, English, Chinese, Tamil or mixed languages.
Operation schedules	Only one option, 8 a.m – 12 p.m	Many options are provided: <ul style="list-style-type: none"> • 7 a.m – 12 p.m • 7 a.m – 3 p.m • 7 a.m – 6 p.m

Source adapted by Lily Muliana Mustafa and Mohamed Nor Azhari Azman (2013); MOE (20117).

1.3 Problem statement

The Ministry of Education (MOE) (2013) has mentioned the key component of the Malaysia Education Blueprint's success was the mastery of higher order thinking skills by preschool teachers and pre-schoolers to reach their optimum level by 2025. However, the practice of HOTS in teaching and learning is subject to teachers' knowledge and skills related to HOTS. Norazlin Mohd Rusdin and Siti Rahaimah Ali (2019) stated that preschool teachers' practice of higher order thinking skills (HOTS) has not yet happened at the optimum level. The implementation of higher order thinking skills needs specialised teaching strategies to be practised in the classroom to nurture the growth of thinking skills among their students. As part of the teaching aids, teachers use teaching aids, but they did not see any use of I-Think maps which is one of the elements of HOTS throughout the teaching and learning process. To reach the full potential of preschool children, teachers need to practice all the strategies and use the thinking tools (I-think) to fully implement HOTS in their teaching. If children experience the maximum implementation of HOTS since preschool, they will continue to achieve positive primary school achievement (Nachiappan et al., 2018a; Marzano, 1993).

School Inspectorate and Quality Assurance (SIQA) Observations showed that the most dominant cognitive level observed during children's activity is application. Other levels of thinking skills are less practice in the children's actions (MOE, 2015). In preschool, a study conducted using the qualitative method by Nachiappan et al. (2018a) to observe the implementation of Higher Order Thinking Skills (HOTS) in teaching and learning found that teachers always use just three levels of Higher Order Thinking Skills, that is, applying, analysing and evaluating. Without proper implementation of 'creating' as part of the four-level of HOTS. Another study found

preschool teachers always use thinking, remembering and understanding levels, representing lower order thinking skills. For instance, qualitative research (Zaharah et al., 2019) using instrument observation, interviews, and documents shows that most preschool teachers in Malaysia use only lower-order thinking skills. They suggested that preschool teachers need to find ways to master the skills of higher order thinking skills and to develop children's thinking skills better. These factors create a gap in preschool teachers teaching higher-order thinking skills. The void created due to the lack of inadequate practices of HOTS among preschool teachers explicitly highlights the need to address the lack of knowledge and understanding, leading to an ineffective knowledge transfer. Unfortunately, many preschool teachers still do not understand the concept of HOTS, and they assume it is similar to critical and creative thinking skills (Abdul Halim Masnan et al., 2019).

According to Jain (2017), besides the lack of knowledge and understanding, there is a lack of proper implementation of the KSPK curriculum by preschool teachers in Malaysia. This is because the optimum implementation and understanding of the preschool curriculum are still unclear to teachers. Therefore, there is a significant failure to master the content of the curriculum itself. Although the preschool teachers' lack of understanding and knowledge has been reported by the School Inspectorate and Quality Assurance (SIQA) since 2012 (MOE, 2012), a more comprehensive approach is yet to be conceptualised to address the current issue in the implementation of HOTS. For instance, in teaching science, Project-based learning (PBL) and inquiry-based science education (IBSE) are the strategies to implement HOTS in science. In Malaysia's science education context, IBSE is among the most suitable approaches in this 21st century (Normee Abdul Rahman & Ahmad Nadri Mat Daud, 2017). This approach involves a lot of "hands-on" activities and higher-level questioning that

require children to learn actively by conducting investigations under the teacher's guidance. However, Nurshamshida Md Shamsudina et al. (2013) pointed out that teachers usually emphasise mastery of content with less focus on developing scientific skills such as inquiry approach. This traditional direct instruction is contrary to the revised curriculum that focuses more on the children-centred approach. A conventional curriculum generally involves a teacher conveying facts to students and relies on memorization. Besides the inquiry approach, Project-based learning (PBL) is one of the effective strategies for implementing HOTS. In PBL, teachers face limited knowledge and skills in implementing project-based learning (PBL) in preschool (Romarzila, 2016). They are not given standard guidance in carrying out the PBL activities in preschool. It depends on teachers' creativity to plan and implement PBL activities in integrated learning slots in preschool.

Besides knowledge, the pedagogical skills of HOTS in preschool are still in the early stages and have not been well-structured yet. Ng and Yeo (2014) pointed out that most preschool teachers in Malaysia lack pedagogical knowledge and skill to teach children. They concluded that preschool teachers should have extensive disciplinary knowledge, effective teaching strategies, decision-making, and problem-solving skills to fulfil the children's needs. This is similar to a study by Nachiappan et al. (2018b), where only a handful of teachers in preschool have skills in HOTS. They found that some teachers still lack exposure to HOTS skills. For instance, in inquiry-based teaching skills, if children cannot explain the findings, teachers should guide them by asking specific questions that lead to the concept being developed by the children (BPK, 2017). However, teachers think that before infusing thinking skills, students should first master the facts and concepts of a subject. (Sharifah Nor Puteh et al., 2016).