

Preschool Teachers' Pedagogical skills and Challenges on the integration of Higher-Order Thinking Skills in Classroom Practice

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Abstract

The development and integration of Higher-Order Thinking Skills (HOTS) in early child childhood education solely do not rely on curriculum demands but also on teachers' pedagogical capability and competence. Development and integration of Higher-Order Thinking Skills (HOTS) in early child childhood education by the preschool teachers are not without any challenges as teachers must be equipped with sound knowledge. This article explores preschool teachers' pedagogical competence and challenges faced when embedding HOTS into instructional process. Pedagogical techniques include preschool teachers' ability to employ scaffolding strategies, questioning techniques, classroom interaction patterns and questioning techniques to ensure whether learning experiences encourage analysis, evaluation, and creativity. To implement effective pedagogical techniques, preschool teachers faced numerous challenges. The study employs a qualitative research approach using document analysis of academic sources such as journal articles and other related documents of early childhood education on Higher-Order Thinking Skills (HOTS), pedagogical capability, competence, and challenges faced by the preschool teachers. Findings showed that preschool teachers with sturdy pedagogical techniques incline to use more problem-based activities, open-ended questioning, and collaborative learning to motivate children's reasoning. In contrast, inadequate pedagogical capability frequently results in challenges in terms of procedural teaching, memorisation, and constraining cognitive growth. The findings implicate that consolidating pedagogical skills through professional training and reflective practice is important for cultivating Higher-Order Thinking Skills in preschool classrooms.

Keywords: Pedagogical Skills, Competence, Challenges, Preschool Teachers, Higher-Order Thinking Skills (HOTS)

Introduction

Developing higher-order thinking skills, namely problem-solving, critical and creative thinking, analytical reasoning, and decision-making, is important for children. However, preschool teachers often face substantial challenges in this attempt (Ganapathy et al., 2017). One main

challenge encountered by preschool teachers is the quest for engaging and effective strategies to invigorate children's higher-order thinking. These challenges arise from the restricted grasp of higher-order thinking skills, that hinders their capability to efficiently cultivate critical and creative thinking in preschool learners. In China, significant effort is fixated on improving the quality of early childhood (Tao Deng et al., 2022). Teachers are responsible to motivate children's interests in subjects and they should stimulate children's thinking and problem-solving as stipulated in the Chinese National Guidelines of Learning Outcomes for Children Ages 3 to 6 (Ministry of Education of the Peoples' Republication of China MOE, 2012). In spite of this, preschool Chinese teachers use a top-down deliver of subject content, with restricted effectiveness of including children in meaningful content discussion that encourage children's higher-order thinking (Li et al., 2015). In addition, the entire-class lesson continues the most predominant in Chinese preschool teaching core concepts and skills that encourage school preparedness (Li et al., 2015), restricting their effectiveness. The difficulties in enhancing preschool children's are complicated, including varied children's needs emerging from their diverse early capabilities (Smith et al., 2022), subject beliefs, and practical limitations related with applying detailed or explicit teaching methods (Yerizon et al., 2022).

The integration of higher-order thinking skills in formal learning environments has become a central priority, with specific relevance to early childhood education, in light of the growing significance of producing analytical, critical, and problem-solving capabilities from a young age (Kalin & Ozturk, 2024). Current research papers from 2023 onwards highlight the indispensable nature of incorporating these skills, transcending rote learning to equip children with the competence for multifaceted engagement of ideas and well-grounded decision-making (Cojorn & Sonsupap, 2024). This synthesis intends to methodically review present research regarding preschool teachers' pedagogical techniques in cultivating higher-order thinking skills and the challenges faced during this incorporation within classroom practices. This review produces findings from present studies, accentuating effective teaching techniques and acknowledging recurring barriers that obstruct the successful adoption of higher-order thinking skills in early childhood education. In particular, this review will probe into ten explicit past studies published from 2023 onwards to account a wide-ranging overview of the present landscape of higher-order thinking skills and challenges incorporation in preschool education. A wide-ranging systematic review from 2023 papers associated to higher-order thinking skills in learning, recognising dominant research methods, efficient learning approaches, and thematic scopes, thus providing substantial evidence and recommendations for both teachers and researchers (Yanti & Thohir, 2024). Based on this foundation, past studies have explicitly explored the utilisation of higher-order thinking skills within selected subject areas, such as Science, Mathematics, in which a cohesive instructional framework integrating collaborative practices, technology, and inquiry-based learning has been demonstrated to considerably improve higher-order thinking (Gradini et al., 2025).

Higher-order thinking skills originated from Bloom's Taxonomy of Educational Objectives, originally published in 1956. Bloom arranged and structured learning objectives in higher-order thinking skills and lower-order thinking skills in this taxonomy, where higher-order thinking skills covered analysis, evaluation, and creation, while lower-order thinking skills encompassed remembering, understanding, and applying (Bloom, 1956). Next, higher-order thinking is defined as the development of analytical, critical, and creative approaches for

students. Factors such as teachers' pedagogical skills, children's learning motivation, and engagement influence the learning and development of higher-order thinking skills (Lu et al., 2021; Kwangmuang et al., 2021).

Although teachers decisively and constantly practising higher-order thinking skills are valuable for cultivating critical thinking skills (Deng et al., 2022), higher-order thinking skills aid in directing teaching practices, entirely or partially (Ballı & Özgenel, 2021). However, higher-order thinking skills cannot be applied or used uncritically, as the need for employing higher-order thinking also is contingent on the type of task and children's prior knowledge (Zondo et al., 2025). Some researchers have different definitions of 21st-century skills. 21st-century skills are also known as the 4C skills that encompass communication and collaboration skills, critical thinking skills, problem-solving skills, and creativity and innovation skills, on the other hand, higher-order thinking skills recapitulates and condenses these skills (Yulianto et al., 2019). Some other researchers opined that 21st-century skills include critical thinking, problem-solving capabilities, self-direction skills, and computer and technology skills (Trilling & Fadel, 2012). Moreover, several scholars recommend that the 4C skills in the 21st-century encompass collaborative skills, communication skills, critical thinking, and creativity based on problem-solving acquisition. In spite of this, the opposing definitions among scholars, they all take in problem-solving capability. The development of higher-order thinking skills has arisen as a foundation for cultivating creativity, reasoning, problem-solving, and critical thinking in the fast-changing context of 21st-century education. The higher-order thinking skills are important for thriving in the current knowledge economy. Amidst the ongoing transformation of global educational paradigms from rote learning towards problem-based learning, past studies have shown that students demonstrated low competencies in transferring learning concepts to new problems (Esti et al., 2023).

Some teachers wrongly believe that only good students can engage in higher-order thinking skills specifically, resulting in an unequal emphasis on lower-order thinking skills in-class activities for lower-ability learners (Shah & Zakaria, 2024). This misconception always results in a neglect of early childhood abilities for intricate cognitive growth, subsequently restricting prospects for all children to produce important problem-solving and analytical capabilities. The aforementioned findings demand a re-assessment of teacher training programs to tackle these deep-rooted biases and improve teaching approaches that consistently encourage higher-order thinking skills across heterogenous student cohorts. There is a critical demand for professional development that not explains young children's cognitive abilities but also prepares teachers with practical strategies for effectively employing higher-order thinking skills activities.

Research Methodology

This study employs a qualitative research design, employing thematic analysis as the primary method to obtain accurate findings. The analysis focuses on previous studies concerning teachers' knowledge in using Higher-Order Thinking Skills (HOTS) in classroom pedagogy, which constitutes the main objective of this research. Thematic analysis is a methodology employed for the examination of qualitative data, involving the systematic exploration of a given dataset in order to discern, scrutinise, and subsequently communicate recurring patterns (Braun & Clarke, 2006). The aforementioned approach serves as a means of delineating data, yet it concurrently entails the exercise of interpretation during the stages of

code selection and theme construction. One notable characteristic of thematic analysis lies in its inherent adaptability, enabling its utilisation across a diverse array of theoretical and epistemological paradigms.

Literature Review Analysis

This article provides a review of past studies that discuss previous studies on preschool teachers' knowledge in using Higher-Order Thinking Skills (HOTS) in classroom pedagogy. This review examines preschool teachers' knowledge and practices, and challenges in applying higher-order thinking skills effectively in the classrooms. The purpose is to determine whether preschool teachers have effectively used higher-order thinking skills, particularly in the teaching of early childhood education subjects.

Preschool Teachers' Knowledge and Practices in Using Higher-Order Thinking Skills (HOTS)

Gradini et al. (2025) investigated higher-order thinking skills in Mathematics Education specifically in terms of strategies, challenges and classroom practices. Although there is a greater emphasis on higher-order thinking skills in mathematics' syllabi, classroom application is characterised by limited scope and inconsistency. The researchers used a qualitative research approach to explore higher-order thinking skills implementation in mathematics education. There were 3 main aims of the study namely classify efficient teaching strategies for cultivating higher-order thinking skills, explore challenges faced by teachers, and examine classroom practices. Main data collection methods were classroom observations, semi-structured interviews, and document analysis. Data were collected from 25 stratified junior high school mathematics teachers. The researchers used thematic analysis to analyse the data. Finding showed that a cohesive teaching framework with a combination of collaborative practices, inquiry-based learning, and advanced learning support designed to student needs, and technology substantially improves higher-order thinking in mathematics. Findings also reveal that aligning teachers' professional growth, universal curricular support, and teacher beliefs not solely authenticates but also supports efficient pedagogy for fulfilling the present demands of problem-solving and critical thinking. Fostering of higher-order thinking is delayed by mismatch between intended curriculum and actual classroom practices, assessment process, and academic professional growth. It was also reported that mathematics classroom is gradually changing toward critical problem-solving methods, with teachers incorporating analysis, evaluation, and creative activities and tasks. Students exhibit deeper engagement with real-life activities that relate to authentic settings. The findings encourage the reform of professional growth curriculum and programs implementation to improve higher-order thinking skills application in mathematics education.

Recent literature emphasizes that higher-order thinking skills cultivates a thorough understanding of mathematical concepts fostering understanding over memorisation, empowering children to apply their understanding to authentic contexts. A study conducted by Kania and Kusumah (2025) put emphasis that evaluating higher-order thinking skills is important in confirming children's capability to think critically and creatively. The study reported that conventional assessments frequently fail to capture these higher-order thinking skills, demanding more progressive assessment tools. In a similar vein, a study conducted Ansely et al. (2025) revealed that the Bridging Analogy Learning Model improves students' problem-solving skills, stressing the importance of participatory teaching methods in cultivating analytical thinking. Past studies have illustrated that incorporating higher-order

thinking skills and STEM via project-based learning improved vocational students' readiness at the workplace (Furqon et al., 2025), while a study by Triyono et al. (2025) reported that open-ended higher-order thinking skills questions enhanced mathematical reasoning and creativity in preschool children. Khasanah et al. (2025) gender-based studies show that different student groups technique of higher-order thinking skills-based problems, required the need for personalised teaching methods. Additionally, there is also a need to incorporate ICT tools into higher-order thinking skills evaluations to encourage deeper engagement and independence in learning mathematics (Ndiung & Menggo). All these studies, although meaningful, chiefly put emphasis on inaccessible interferences instead of exploring the institutional factors that permit or compel higher-order thinking skills application across various learning settings. Gradini et al (2025) examined the views of mathematics teachers on higher-order thinking skills incorporation, accentuating gaps in teacher skills, curricular restrictions or boundaries, and old-fashioned assessment techniques as major obstacles to successful implementation.

Additional research has revealed that although inquiry-based learning frameworks are efficient in fostering critical thinking in early childhood, their prevalent implementation is hindered by dearth of training for non-qualified teachers, stressing the requirement for vigorous professional growth programs (Rosidah et al., 2024). One more study by Rathore (2025) emphasizing on the pedagogical skills employed by the preschool teachers, showed that their application and understanding of teaching techniques for cultivating higher-order thinking were always unreliable, with many teachers depending on conventional methods that do not sufficiently encourage critical or creative thinking abilities.

Shah and Zakaria (2024) explored the incorporation of higher-order thinking skills in science classrooms from Malaysian teachers' views and practice. The researchers used a qualitative research design. Only one research method was used namely semi structured interviews. Four science teachers from two different schools took part in this study. The main aims of the study were to gather teachers' notion of Bloom's Taxonomy and their strategies used to implement higher-order thinking skills into their teaching and evaluation practices. The findings showed the teachers' positive views on Bloom's Taxonomy. Teachers agreed that higher-order thinking skills brought positive effect on student's learning attainment. However, their incorporation of higher-order thinking skills into teaching process was restricted, with the presence of lower-order thinking skills and higher-order thinking skills activities and tasks were dependent on the academic capabilities of the students taught. Significantly, some teachers believe, incorrectly, that higher-order thinking skills is appropriate only for high-ability learner, contributing to a focus on lower-order thinking activities in classroom with students who are of lower-ability. Moreover, teachers were reported to use varied sets of pedagogical techniques and approaches when teaching with high ability and low-ability groups of learners. The study implicates that there is a dire need for planned professional growth to correct misconstructions and improve teacher competences in efficiently incorporating higher-order thinking skills. The researchers propose that future study should explore the effect of teacher beliefs on teaching practices to be more wide-ranging, integrating document analysis and classroom observations to deliver a comprehensive understanding of how cognitive related theories are incorporated into real-world teaching strategies.

Not only that, studies have started to examine the role of technology in cultivating critical thinking, observing that game-based learning and interactive tools can improve learner's higher-order thinking skills, problem-solving capabilities, specifically in subjects for instance mathematics (Anggoro et al., 2024; Jamil et al., 2024). However, the effective incorporation of technology is always reliant upon teachers' digital knowledge, their willingness, and their capability to plan technologically-driven learning experiences that unaffectedly encourage in-depth cognitive engagement instead of solely low-level interaction (Gradini et al., 2025). On the contrary, extreme dependence on technology, particularly in preschool settings, have been acknowledged as a possible hindrance to developing creative thinking skills and abilities (Nurjanah et al., 2024). This frequently transpires when digital tools are employed as inactive entertainment instead of meaningful and interactive learning platforms that need dynamic mental handling and critical decision-making from young children. Moreover, a study by Cabahug et al. (2024) in the Philippines showed that although teachers commonly integrate a range of teaching techniques effectually, there exist a prominent absence in incorporating higher-order thinking, critical thinking, and creative thinking skills during instructional process, revealing a need for attentive improvement in these aforementioned areas. This proposes for a professional development inventiveness to move beyond basic pedagogical training to particularly tackle the refined integration of higher-order thinking skills with everyday classroom activities, specifically for early childhood teachers (Cojorn & Sonsupap, 2024). In addition, another current study highlighted the significance of developing teacher education programs with focused training programs that comprise structured training techniques for 'novel technologies and environments, for instance as integrating targeted scenario-based assessments and critical reflection activities, to nurture robust critical thinking behaviours among teachers (Zhang et al., 2025). The association between problem-solving capability and thinking development of teachers employing artificial intelligence was examined, ensuring that training teachers with artificial intelligence to cultivate creative thinking can increase teachers' critical thinking, thus affecting their problem-solving capabilities (Zhang et al., 2025). It was also reported in another study on delivering a wide-range analysis of present research on critical thinking skills and critical thinking disposition among nursing students, acknowledging gaps in present pedagogical techniques and recommending evidence-led techniques for improving these important skills in nursing education. This accentuates a larger need across numerous fields, encompassing early childhood education, to execute innovative pedagogical techniques and technology to nurture higher-order thinking skills among prospect experts (Zhang et al., 2025). More research has probed into the pedagogical teaching of preschool teachers regarding higher-order thinking skills, showing a significant difference between teachers' foundational understanding and their practical implementation in classroom environments.

Preschool Teachers' Challenges in Using Higher-Order Thinking Skills (HOTS)

Liu and Yoon (2025) investigated preschool teachers' views on the use of questioning strategies during storytelling to develop children's critical thinking in Central China. Preschool teachers employ questioning strategies as one of the common pedagogical tasks in preschool because storytelling has the capacity to globalise the classroom experience utilising real or imagined stories. The researchers used a case study design comprising 13 preschool teachers in China. Data collection methods included semi-structured interviews, classroom observations, and document analysis. The findings indicate that preschool teachers need more support in generating questions, which could be addressed by improving preschool

teachers' practices in developing different types of questions. It has also been reported that preschool teachers' questioning is a typical instructional practice in China. However, at present, preschool teachers in China seldom pay adequate attention to questioning strategy as a common pedagogical task in the classroom. Du (2017) explained that many preschool teachers frequently fail to ask effective questions in the classroom. Other studies have also reported problematic patterns of questions posed by preschool teachers. For example, preschool teachers often ask closed questions and seldom give children the opportunities to think. Lu (2020) noted that closed questions restrict the development of children's thinking and imagination.

Moreover, Setyarini et al. (2018) proposed that when teaching children at the preschool level, teachers should provide more open-ended questions to foster the development of children's higher-order thinking skills. Such open-ended questions allow children to express their views and provide reasons and comments. Padmanabha (2018) noted that nurturing children's higher-order thinking skills requires multiple educational processes. In instructional process, preschool teachers are not merely providers of information; rather, children actively engage by agreeing with and building upon the ideas and views expressed by their peers. Asking open-ended questions is a common instructional practice in preschool classroom, but the quality of questioning and related skills remain important long-term goals of preschool teachers' professional growth.

Conclusion

In China, early childhood education has undergone significant transformation and now emphasizes creativity, communication, teamwork, higher order thinking skills (HOTS), and the use of technology in the teaching and learning process. In the context of early childhood education, preschool instructors' use of higher-order thinking is essential to guaranteeing that the teaching process is successful in forming preschoolers' minds. The most important skill to have in order to succeed in the twenty-first century is thought to be the ability to think at a higher level. In the information and technology age, new problems appear every day, so more creative teaching and learning methods are required.

Past studies reveal that preschool teachers' knowledge and practices are important for the effective implementation of higher-order thinking skills. At the same time, preschool teachers experienced challenges in applying higher-order thinking skills effectively in the classrooms. They should therefore integrate higher-order thinking skills in their teaching activities so that children's thinking abilities can be enhanced. Preschool teachers can employ various pedagogical techniques to support this integration, for instance, through questioning and scaffolding strategies. They should utilise both lower- and higher-level questions in the classroom to provide children with opportunity to activate their thinking at multiple levels. Preschool teachers must also equip themselves with adequate knowledge of critical thinking processes. Only then can children benefit from such teaching and respond creatively.

Implications of integrating higher-order thinking skills include the need for preschool teachers to employ appropriate pedagogical strategies to incorporate higher-order thinking skills into their teaching. They should also be able to formulate different types of questions ranging from the lower- to the higher-level questions, when teaching children in the classroom. Similarly, teachers should be able to identify children's conceptual development as influenced

by the variety of questions posed using different instructional techniques. Children's thinking abilities and imagination can be restricted by closed questions, which represent low-level questioning that does not enhance their language development. Teachers should therefore create opportunities for children to share their prior knowledge so that they can generate new ideas through analysis and reflection.

The findings empower preschool teachers to reflect on their own pedagogical strategies and classroom practices. By highlighting challenges and enablers to HOTS integration, teachers can develop strategies to overcome structural and contextual constraints, such as large class sizes, limited instructional resources, or competing parental expectations. This not only improves the quality of teaching but also enhances children's learning experiences, equipping them with essential cognitive skills that are foundational for later academic achievement and lifelong learning. Research consistently shows that teachers with stronger pedagogical content knowledge and positive beliefs about their ability to influence student learning are more likely to embrace student-centred, higher-order instructional practices (Shulman, 1987; Tschannen-Moran & Hoy, 2001).

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