Social Science and Human Research Bulletin

ISSN(e): 3050-5542
ISSN(p): 3050-5534

Vol. 03(02): 191-195, February 2026
Home Page: http://sshrbjournal.org/

Book Introduction: *Early Childhood Science Education--Theory and Practice*

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Article DOI: 10.55677/SSHRB/2026-3050-0206 **DOI URL: https://doi.org/10.55677/SSHRB/2026-3050-0206**

KEYWORDS: mathematics learning area, problem-solving skills, young children.

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Published: February 13, 2026

ABSTRACT: Early childhood science education is widely recognized as an essential component of early learning, and existing studies have consistently highlighted its significance. This article conducts a content analysis and critical introduction of *Early Childhood Science Education: Theory and Practice*, written by Chien Chu-ying, Chen Shu-min, and Ouyang Yuan. The purpose is to support preschool teachers in developing a comprehensive understanding of the book's key themes, theoretical foundations, and practical orientations in early childhood science education, thereby enabling them to implement higher-quality science teaching in early childhood settings.

1. INTRODUCTION

Science in preschool is a content area under construction in many countries.

science is part of many countries' preschool curricula, which does not mean that there is a fixed idea of what kind of science content should be taught. Sci ence content in preschool has been described as consisting of two domains of knowledge, "domain-specific or conceptual knowledge" and "domain-general or procedural knowl edge"(Thulin, Leden & Hansson, 2025). Young children are born with strong curiosity and an intrinsic motivation to explore, and they often understand new things and phenomena in the world around them through active exploration and hands-on experiences. Early childhood science education is widely recognized as an essential component of early learning, and existing studies (Greenfield, 2015; Juan, & Shih, 2026; Shih, 2025a, 2025b, 2025c, 2025; Tu, 2006; Ye & Shih, 2021) have consistently highlighted its significance. However, professional anxiety in teaching refers to the stress and nervousness that educators experience due to their job duties and the challenges they encounter (Simkhada, Dahal, Pant, Luitel & Manandhar, 2025), and how to effectively implement science education in early childhood settings, teachers need a clear and informed understanding of its conceptual foundations and pedagogical implications. Therefore, this article conducts a content analysis and critical introduction of *Early Childhood Science Education: Theory and Practice*, written by Chien Chu-ying, Chen Shu-min, and Ouyang Yuan. The purpose of this article is to support preschool teachers in developing a comprehensive understanding of the book's key themes, theoretical foundations, and practical orientations in early childhood science education, thereby enabling them to implement higher-quality science teaching in early childhood settings.

2. CONTENT ANALYSIS

Science education in early childhood has been found to be vital for children to build curiosity and understandings of the world around them. The incorporation of science

education as part of a whole of curriculum approach to learning have been found to provide 'an important foundation for children's knowledge and interest in science as well as reinforcing and integrating critical language, literacy, and math readiness skills. The aim of science education is to build knowledge of scientific thinking, concepts, and processes (Speldewinde, Infantino & Campbell, 2025) .

A common belief among adults is that science concept learning is something to be addressed in the later years of schooling. Thus, early childhood educators tend not to emphasise science teaching and learning. Science, however, is a discipline upon which all curriculum learning can begin as young children are innately curious about their surroundings (Blake .& Howitt, 2012). This book approaches early childhood science education through the lenses of predetermined versus emergent curricula, and structured versus unstructured learning designs, presenting the diverse ways in which theory and practice can be integrated. Such an organization responds to the current emphasis on child-centered and inquiry-based approaches in early childhood education, and highlights the crucial role of teachers as both facilitators and co-inquirers in the learning process. Through examples drawn from experimental activities, cooking projects, and life and physical science curriculum units, the book demonstrates that science learning is no longer limited to the transmission of factual knowledge, but is instead embedded in children's everyday experiences and authentic problem situations. Furthermore, the "everyday science" orientation presented in this book offers important insights into interdisciplinary learning in early childhood education. Scientific activities not only involve understanding natural phenomena, but also encompass language development, mathematical thinking, social interaction, and emotional growth. When teachers intentionally design open-ended questions and inquiry-based contexts, children are more likely to develop skills in observation, questioning, reasoning, and expression—abilities that form the foundation of both scientific literacy and civic literacy. Finally, from the perspective of curriculum generation, the book reminds us that children are not passive recipients of knowledge, but active agents in constructing understanding. While emergent and unstructured project-based curricula place higher demands on teachers' professional judgment and real-time pedagogical decision-making, they also provide children with greater space for exploration and autonomy. The future development of early childhood science education should continue to consider how to strike a balance between planned structure and spontaneous emergence, ensuring that science learning remains purposeful while also flexible and creative (Chen, Yan & Yuan, 2017; Chen & Shih,
2025; Chien, Chen & Ouyang, 2023; Lin & Shih, 2026; Thulin & Redfors, 2017).

3. DISCUSSION

In the context of rapid globalization and the development of the knowledge-based economy, education is not only a fundamental force driving national and social progress but also a crucial means of shaping citizens' literacy and competitiveness. Within this framework, science education, by fostering critical thinking, inquiry-based dispositions, and interdisciplinary competencies, has become an indispensable core domain of contemporary education. Science teaching in early years contexts has been identified as deficient due to poor educator confidence, lack of content knowledge, or minimal opportunities being made available for science experiences. Current science curriculum emphasizes the knowledge, skills, and epistemic practices of science. Scientific practices usually involve asking questions, developing models, investigating, constructing explanations, and negotiating meanings. Students are not only expected to acquire more relevant science knowledge, but also to develop the ability to think and reason about phenomena and, furthermore, to take actions and solve problems. However, science teachers utilizing published textbooks and focusing on coverage and neglecting the epistemic practices aspect of science curriculum would restrain the enactment of reformed curriculum (Roberts & Collins, 2026; Su, Tsai, Chang, Chang & Lin, 2016; Wang & Shih, 2022, 2023). The primary aim of early childhood science education is to support children in "learning how to learn" by guiding them to investigate questions of "how" and "why," while also nurturing and satisfying their curiosity, spirit of inquiry, and capacity to seek

answers. Rather than hastily purchasing large numbers of encyclopedias or abstract materials, preschool teachers should prioritize creating a rich and safe environment for exploration and providing abundant opportunities for hands-on engagement. Through such everyday experiences, children are able to "play with science" in meaningful and developmentally appropriate ways. When working with young children, it is especially important to adopt a child-centered approach and to understand their individual characteristics and developmental needs in order to broaden their learning interests. When children's learning experiences are joyful, they are more likely to reproduce such experiences and become active, self-motivated learners. In general, children aged 0–3 learn primarily through rich sensory and motor experiences, whereas those aged 3–6 move into a more advanced phase that involves thinking, questioning, and problem solving (Harlan & Rivkin, 2000; Huang, 2025; Lin & Shih, 2025; Shih & Juan, 2026a, 2026b; Shih, Aslam, Pang & Manditereza, 2025).

Finally, how do children respond to setbacks and failure during science activities? How might their beliefs about failure and success in science influence their motivation to pursue or sustain interest in scientific inquiry? Consider a child attempting to balance a scale while exploring scientific concepts such as weight, cause and effect, balance, and simple machines. The child may need several attempts to place objects of different weights correctly before the scale becomes level. However, if the child feels frustrated when the scale does not balance on the first try, they may decide to withdraw from the activity altogether. This example illustrates the importance of children's achievement motivation, which is conceptualized here as a "constellation of beliefs and behaviors" that shapes multiple dimensions of early learning. These include children's performance, their willingness to engage in challenging tasks, and their interpretations of success and failure. When children view failure as a natural part of learning, they are more likely to persist; in contrast, when failure is seen as a sign of inability, motivation and interest in science activities may quickly decline (Haber & Kumar, 2025)

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