

## Multilevel learning approach to enhance self-efficacy in teaching scientific inquiry: A critical review

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This critical review explores the potential of multilevel learning approaches to enhance science teachers' self-efficacy in teaching scientific inquiry. Classrooms today, especially those led by educators qualified through Open and Distance Learning (ODL) require instructional strategies that address diverse cognitive abilities and readiness levels among students. Multilevel teaching, involving differentiated instruction, collaborative learning structures, and technology integration, provides a framework to support inclusive and effective inquiry-based science education (IBSE). Drawing upon Bandura's theory of self-efficacy and key empirical studies, this review examines how multilevel learning structures, professional development (PD), and cognitive diagnostic assessment models contribute to teachers' confidence and instructional competence. The review synthesizes findings from seventy key sources, including works by Seneviratne et al. (2019), Hannah and Lester (2009), and Lee et al. (2023), to present a holistic understanding of how multi-tiered learning dynamics improve science inquiry instruction. The review uses a critical literature review methodology, evaluating multilevel learning strategies in terms of their influence on teacher professional growth and pedagogical outcomes. It highlights key mechanisms like mentoring, prompting strategies, digital scaffolds, and nested team learning models. Findings indicate that multi-faceted PD embedded in authentic contexts, supported by sustained mentorship and assessment feedback loops, substantially enhances self-efficacy. The paper concludes by proposing a multilevel intervention framework for science educators, particularly those in ODL environments. The study offers recommendations for future PD design, educational leadership, and policy aimed at equipping teachers with the confidence and capability to foster scientific inquiry in heterogeneous learning settings.

**Keywords:** *Multilevel learning, Teacher self-efficacy, Inquiry-based science education (IBSE), Open and distance learning (ODL), Professional development*