

Nurturing Scientific Minds: Enhancing Scientific Thinking in Children (Ages 5-9) through Experiential Learning in Kids Science Labs (STEM)

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Abstract : Scientific thinking, characterized by purposeful knowledge-seeking and the harmonization of theory and facts, holds a crucial role in preparing young minds for an increasingly complex and technologically advanced world. This abstract presents a research study aimed at fostering scientific thinking in early childhood, focusing on children aged 5 to 9 years, through experiential learning in Kids Science Labs (STEM). The study utilized a longitudinal exploration design, spanning 240 weeks from September 2018 to April 2023, to evaluate the effectiveness of the Kids Science Labs program in developing scientific thinking skills. Participants in the research comprised 72 children drawn from local schools and community organizations. Through a formative psychology-pedagogical experiment, the experimental group engaged in weekly STEM activities carefully designed to stimulate scientific thinking, while the control group participated in daily art classes for comparison. To assess the scientific thinking abilities of the participants, a registration table with evaluation criteria was developed. This table included indicators such as depth of questioning, resource utilization in research, logical reasoning in hypotheses, procedural accuracy in experiments, and reflection on research processes. The data analysis revealed dynamic fluctuations in the number of children at different levels of scientific thinking proficiency. While the development was not uniform across all participants, a main leading factor emerged, indicating that the Kids Science Labs program and formative experiment exerted a positive impact on enhancing scientific thinking skills in children within this age range. The study's findings support the hypothesis that systematic implementation of STEM activities effectively promotes and nurtures scientific thinking in children aged 5-9 years. Enriching education with a specially planned STEM program, tailoring scientific activities to children's psychological development, and implementing well-planned diagnostic and corrective measures emerged as essential pedagogical conditions for enhancing scientific thinking abilities in this age group. The results highlight the significant and positive impact of the systematic-activity approach in developing scientific thinking, leading to notable progress and growth in children's scientific thinking abilities over time. These findings have promising implications for educators and researchers, emphasizing the importance of incorporating STEM activities into educational curricula to foster scientific thinking from an early age. This study contributes valuable insights to the field of science education and underscores the potential of STEM-based interventions in shaping the future scientific minds of young children.

Keywords : Scientific thinking, education, STEM, intervention, Psychology, Pedagogy, collaborative learning, longitudinal study

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