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How Effective Are Online Science Labs? An Evaluation Study of Elementary School Teacher Education Students at Universitas Terbuka

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Abstract

This study evaluated the implementation of online science practicum tutorials for students in the Elementary School Teacher Education Program at Universitas Terbuka. The research examined practicum implementation, students' mastery of science concepts, science process skills, and challenges encountered during online learning. A mixed-methods approach was applied using questionnaire surveys and learning outcome data. The respondents included 1,062 students who participated in the science practicum during the 2025 odd semester. The research instrument covered seven indicators: clarity of the practicum scheme, facilities and infrastructure, LMS features, science concept mastery, science process skills, tutor guidance, and implementation challenges. The findings showed that the online science practicum was generally effective. Most students found the LMS instructions easy to understand, the learning media clear, and the discussion features helpful in overcoming the practicum's difficulties. Independent practicum activities were perceived to improve students' understanding of science concepts, science process skills, scientific communication, and digital literacy. Flexibility in time and place was identified as a major advantage of implementing an online practicum. However, several technical challenges remain, including limited tools and materials, inadequate devices, difficulty in video editing, and unstable internet access. Students also faced difficulties conducting independent practicums without direct tutor assistance. Therefore, a more adaptive online practicum model is needed through simplified video assignments, stronger tutor support, virtual learning media development, and more flexible practicum guidelines. The findings are expected to provide recommendations for improving distance education science practicum services.

Keywords: Distance Education; Elementary School Teacher Education (PGSD); Online Science Practicum; Online Tutorial; Science Process Skills