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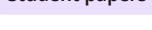
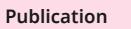
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Inquiry-Based Digital Physics Learning Integrated with Glocal Wisdom for Education for Sustainable Development

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ABSTRACT

Objective: This study aims to analyse the integration of inquiry-based learning, digital technology, Education for Sustainable Development (ESD), and glocal wisdom in physics education through a systematic literature review. The goal is to map trends, patterns, and research gaps connecting these dimensions to improve conceptual understanding, critical thinking, and sustainability-oriented learning. **Method:** A Systematic Literature Review (SLR) was conducted based on PRISMA 2020 guidelines. Data were collected from Scopus, Web of Science, SpringerLink, and ScienceDirect, covering studies published from 2015 to 2025. Of the 1,428 identified articles, 54 met the inclusion criteria. Data were analysed using thematic analysis with NVivo 14 to identify key research themes and directions. **Results:** Four major themes emerged: (1) effectiveness of inquiry-based digital learning in enhancing reasoning and conceptual mastery; (2) integration of digitalisation and ESD to foster ecological literacy; (3) application of glocal wisdom as a cultural context to enhance relevance and inclusivity; and (4) ethical and equity challenges in technology implementation. These findings indicate a paradigm shift from content-based physics learning to contextual and sustainability-driven education. **Novelty:** This study offers an integrative synthesis that combines inquiry, digitalisation, ESD, and cultural wisdom within a single framework. Its novelty lies in presenting a holistic model of physics education that promotes scientific literacy, environmental awareness, and cultural identity toward sustainable learning.

INTRODUCTION

Inquiry-based learning has become a significant focus in science education because it has been shown to improve students' critical thinking skills, conceptual understanding, and scientific skills (Kuo et al., 2023; Lising & Turpen, 2024; White et al., 2024). Within this framework, students do not simply receive knowledge; they are actively involved in the processes of observation, experimentation, and data-based inference. This approach aligns with constructivism, which emphasises the construction of meaning through direct learning experiences (Oliveira & Brown, 2022). Experimental studies show that students who learn with the inquiry model are better able to connect abstract physics concepts with real phenomena, for example, in understanding Newton's laws or the concept of energy (Henderson et al., 2021). This indicates that inquiry provides students with space for active engagement in authentic science. Furthermore, integrating inquiry into physics learning has been shown to reduce misconceptions that often arise in mechanics, electricity, and wave material (Kuo et al., 2023). Thus, inquiry-based physics learning is not merely an alternative strategy, but a fundamental foundation for strengthening science literacy in the 21st century.

Advances in digital technology have added a new dimension to inquiry-based learning practices through interactive simulations, virtual laboratories, and artificial intelligence applications (Holmes et al., 2021; Müller et al., 2021). Digital media enable