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Integrating the STEMQ approach and digital flipbooks to enhance students' science and digital literacy in basic physics courses

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Abstract

The integration of digital technology into physics education has created new opportunities to improve teaching effectiveness and student engagement, particularly in complex subjects such as basic physics. This study examined instructional needs for developing flipbook-based digital teaching materials using the STEMQ approach, which integrates science, technology, engineering, mathematics, and Qur'anic values. A descriptive survey method was employed, with data collected from 20 lecturers and 95 pre-service physics teachers through questionnaires, interviews, and concept mastery tests. The results showed that lecturers had strong digital readiness, while students expressed a high demand for interactive, accessible, and spiritually relevant learning materials. Electricity and magnetism were identified as the most difficult topics in basic physics, which was confirmed by diagnostic test results revealing substantial conceptual gaps across different academic levels. The institutional infrastructure was found to be adequate, with sufficient digital facilities and internet access to support digital learning. The study concludes that developing flipbook-based digital teaching materials using the STEMQ approach is both pedagogically appropriate and contextually relevant. This needs analysis indicates that the proposed model has the potential to enhance digital and scientific literacy while integrating moral and spiritual values, in line with the objectives of Islamic higher education.