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Development of Project-Based and Deep Learning-Based Student Worksheets in Basic Biology to Improve Students' Critical Thinking Skills

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Abstract. This research addresses the urgent need to enhance college stu-dents' critical thinking skills in conventional Basic Biology courses. The Pro-ject-Based Learning (PjBL) approach is proven effective in de-veloping high-er-order thinking skills. Furthermore, integrating Deep Learning into biology education can strengthen students' critical thinking by encouraging them to connect biological concepts in depth and apply them in real-world contexts. This study aims to develop a Basic Biology student worksheet that integrates a Project-Based Learning (PjBL) model with a Deep Learning approach. The goal is to make learning more applicable, meaningful, and reflective, thus equipping students with critical thinking skills. The research is a type of Re-search and Development (R&D) study, utilizing the ADDIE model (Analy-sis, Design, Develop-ment, Implementation, Evaluation), a systematic design framework. The primary data collection instruments were expert validation sheets, student response questionnaires, practicality sheets, and effectiveness tests. The research sample consisted of 40 students enrolled in a Basic Biolo-gy course. The results indicate that the Deep-PjBL student worksheet is cat-egorized as Valid, Practical, and Effective. Therefore, it can be used in biolo-gy education to enhance students' critical thinking skills.
Keywords: Student Worksheet, Basic Biology, Project Based Learning, Deep Learning; Berpikir Kritis, Critical Thinking Skills

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