PEMBELAJARAN PROYEK STEM-ESD TERKAIT SDG *LIFE BELOW WATER* TERHADAP KETERAMPILAN REKAYASA DAN AKSI SISWA DALAM MENGATASI PERMASALAHAN MIKROPLASTIK

SKRIPSI

Disusun untuk memenuhi sebagian syarat untuk memperoleh gelar Sarjana Pendidikan Biologi

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UNIVERSITAS PENDIDIKAN INDONESIA

2025

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Universitas Pendidikan Indonesia
Agustus 2025

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ABSTRAK

Pembelajaran Proyek STEM – ESD Terkait SDG *Life Below Water* terhadap Keterampilan Rekayasa dan Aksi Siswa dalam Mengatasi Permasalahan Mikroplastik

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Ekosistem perairan tawar di Indonesia semakin terancam oleh polusi plastik, khususnya mikroplastik, yang menjadi tantangan dalam pencapaian SDG 14 *Life Below Water*. Dibutuhkan pembelajaran bermuatan SDGs yang melibatkan siswa SMA dalam mengatasi permasalahan mikroplastik. Penelitian ini bertujuan untuk mendapatkan informasi mengenai pembelajaran proyek STEM-ESD terkait SDG *Life below Water* terhadap keterampilan rekayasa dan peningkatan aksi siswa dalam mengatasi permasalahan mikroplastik. Metode dan desain penelitian yang digunakan dalam penelitian ini adalah *pre-experiment one group pretest posttest design*. Pengambilan data keterampilan rekayasa menggunakan LKPD, produk teknologi, dan proses siswa dalam merekayasa teknologi penyaring mikroplastik sederhana yang kemudian diolah menggunakan rubrik PBER (*Performance-Based Evaluation Rubric*) dan aksi siswa menggunakan kuesioner aksi berkelanjutan. Hasil menunjukkan bahwa pembelajaran proyek STEM-ESD berhasil memunculkan keterampilan rekayasa siswa pada kategori *novice designer* dengan nilai rata-rata keseluruhan kelompok sebesar 71 namun peningkatan aksi siswa berdasarkan skor *N-Gain* hanya sebesar 0,042 yang dinilai sangat rendah. Penerapan pembelajaran proyek STEM-ESD ini mampu memberikan dampak positif terhadap keterampilan rekayasa dan aksi siswa dalam mendukung prinsip dan nilai-nilai berkelanjutan SDGs. Rekomendasi penelitian selanjutnya adalah keterampilan rekayasa difokuskan melalui *scaffolding*, fasilitasi desain, dan manajemen proyek, sedangkan aksi siswa diperkuat melalui durasi reflektif yang lebih panjang dan menekankan pada isu lokal.

Kata kunci: Pembelajaran Proyek STEM-ESD, SDG *Life below Water*, Keterampilan Rekayasa Siswa, Aksi Berkelanjutan Siswa, Mikroplastik

ABSTRACT

STEM – ESD Project-Based Learning on SDG Life below Water to Enhance Student's Engineering Design Skill and Sustainability Action in Addressing Microplastic Issues

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Freshwater ecosystems in Indonesia are increasingly threatened by plastic pollution, particularly microplastics, which pose a challenge to achieving SDG 14 Life below Water. There is a need for SDG-oriented learning that engages high school students in addressing microplastic problems. This study aims to investigate the implementation of STEM-ESD project-based learning related to SDG Life below Water on student's engineering skills and the improvement of their sustainable actions in tackling microplastic issues. The research employed a pre-experimental one group pretest posttest design. Data on engineering skills were collected through LKPD, student's engineered products, and their processes in designing a simple microplastic filter, which were then analyzed using the Performance-Based Evaluation Rubric (PBER). Student's sustainable actions were measured using a sustainable action questionnaire. The results showed that the STEM-ESD project-based learning successfully fostered students' engineering skills at the novice designer category with an overall average score of 71. However, the increase in students' actions based on the N-Gain score was only 0.042, which is considered very low. The application of STEM-ESD project-based learning had a positive impact on student's engineering skills and sustainable actions in supporting the principles and values of the SDGs. Future research is recommended to strengthen engineering skills through scaffolding, design facilitation, and project management, while sustainable actions should be enhanced through longer reflective durations and a stronger emphasis on local issues.

Keywords: STEM-ESD Project-Based Learning, SDG Life below Water, Student's Engineering Design Skill, Student's Sustainability Action, Microplastic

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