

ABSTRAK

Fitri Hayati Kurnia : Pembelajaran Berbasis Proyek Terintegrasi E-STREAM (*Environmental, Science, Technology, Religion, Engineering, Arts, Mathematics*) dalam Pembuatan Bioplastik Untuk Meningkatkan Literasi Sains dan Kreativitas Siswa

Rendahnya literasi sains siswa menjadi tantangan dalam pembelajaran di sekolah, terutama karena pendekatan yang masih teoritis dan kurang terhubung dengan kehidupan nyata, membuat siswa kesulitan memahami konsep ilmiah dan kurang peduli terhadap masalah lingkungan. Sampah plastik menjadi masalah nyata di sekitar siswa, Kota Bandung membuat program zero waste untuk mengurangi sampah dari sumbernya. Penelitian ini bertujuan mengembangkan pembelajaran berbasis proyek terintegrasi E-STREAM melalui pembuatan bioplastik dari kulit pisang untuk meningkatkan literasi sains. Penelitian dilakukan pada satu kelas X SMA menggunakan model Pengembangan 4D (*Define, Design, Development, Disseminate*). Literasi sains diukur melalui enam kompetensi berdasarkan kerangka PISA 2025. Hasil menunjukkan peningkatan literasi sains dengan rata-rata N-Gain 0,71 (kategori tinggi). Peningkatan tertinggi pada kompetensi menjelaskan dampak interaksi manusia dengan sistem Bumi (N-Gain 0,80), mengintegrasikan unsur *Environmental* dan *Religion*, yaitu melalui pemahaman tanggung jawab manusia terhadap kelestarian alam. Kompetensi menjelaskan fenomena ilmiah (N-Gain 0,77) berkembang melalui pengamatan langsung terhadap proses biodegradasi, mengintegrasikan unsur *Science, Technology, dan Mathematics*. Kompetensi pengambilan keputusan ilmiah (N-Gain 0,71) menampilkan keterlibatan *Engineering* dan nilai moral dalam mempertimbangkan solusi lingkungan. Kompetensi menghargai perspektif dalam krisis sosio-ekologis (N-Gain 0,73) mencerminkan kolaborasi dan empati, didukung oleh unsur *Art* dan *Religion* dalam kegiatan diskusi kelompok. Kompetensi tindakan keberlanjutan (N-Gain 0,60) menunjukkan pemikiran inovatif melalui pemanfaatan limbah organik, merancang dan mengevaluasi penyelidikan ilmiah (N-Gain 0,63) menunjukkan integrasi elemen *Engineering* dan *Mathematics* dalam eksperimen. Integrasi unsur E-STREAM mampu mendorong pemahaman ilmiah yang kontekstual dan bermakna. Pendekatan ini menjadi alternatif pembelajaran abad ke-21 yang relevan, serta meningkatkan literasi sains melalui pengalaman langsung yang nyata bagi siswa.

Kata Kunci: bioplastik, E-STREAM, literasi sains, pembelajaran berbasis proyek

ABTRACT

Fitri Hayati Kurnia : *E-STREAM (Environmental, Science, Technology, Religion, Engineering, Arts, Mathematics) Integrated Project-Based Learning in Bioplastic Production to Improve Students' Science Literacy and Creativity*

Low science literacy among students poses a challenge in school learning, especially because the approach is still theoretical and disconnected from real life, making it difficult for students to understand scientific concepts and less concerned about environmental issues. Plastic waste is a real problem around students, and the city of Bandung has created a zero waste program to reduce waste at its source. This study aims to develop integrated project-based learning using the E-STREAM approach through the production of bioplastic from banana peels to enhance science literacy. The research was conducted in one 10th-grade high school class using the 4D Development Model (Define, Design, Development, Disseminate). Science literacy was measured through six competencies based on the PISA 2025 framework. The results showed an increase in science literacy with an average N-Gain of 0.71 (high category). The highest increase was in the competency of explaining the impact of human interaction with the Earth system (N-Gain 0.80), integrating Environmental and Religion elements, namely through an understanding of human responsibility for environmental sustainability. The competency of explaining scientific phenomena (N-Gain 0.77) developed through direct observation of the biodegradation process, integrating Science, Technology, and Mathematics elements. The competency of scientific decision-making (N-Gain 0.71) demonstrated the involvement of Engineering and moral values in considering environmental solutions. The competency of valuing perspectives in socio-ecological crises (N-Gain 0.73) reflects collaboration and empathy, supported by elements of Art and Religion in group discussion activities. The competency of sustainable action (N-Gain 0.60) demonstrates innovative thinking through the utilization of organic waste, while designing and evaluating scientific investigations (N-Gain 0.63) demonstrates the integration of Engineering and Mathematics elements in experiments. The integration of E-STREAM elements fosters contextual and meaningful scientific understanding. This approach serves as a relevant 21st-century learning alternative and enhances science literacy through real-world, hands-on experiences for students.

Keywords: bioplastics, E-STREAM, science literacy, project-based learning