

## ABSTRAK

**Dinda Natalisa Br Gurusinga, NIM 4211131024 (2025). Pengembangan dan Implementasi E-Modul STEM Berbasis PjBL Pada Materi Kesetimbangan Kimia Untuk Meningkatkan Hasil Belajar Siswa.**

*Sains, Technology, Engineering, and Mathematics* (STEM) adalah solusi pembelajaran untuk abad ke-21. Kemajuan teknologi membuat media Pendidikan mengalami perubahan, yaitu dengan penggunaan media *soft copy* berupa modul elektronik. Penelitian ini bertujuan untuk: (1) Bagaimana kelayakan e-modul STEM berbasis *project based learning* pada materi kesetimbangan kimia; (2) Bagaimana respon peserta didik terhadap penggunaan e-modul STEM berbasis *project based learning* (PjBL) pada materi kesetimbangan kimia; (3) Bagaimana peningkatan hasil belajar peserta didik setelah diberikan penggunaan e-modul STEM berbasis *project based learning* pada materi kesetimbangan kimia. Model pengembangan yang digunakan adalah model ADDIE. Berdasarkan hasil penelitian menunjukkan bahwa (1) Hasil kelayakan e-modul STEM berbasis *project based learning* pada materi kesetimbangan kimia termasuk kategori “sangat valid” dengan persentase rata-rata kelayakan e-modul sebesar ( $M = 87,68 \pm 8,523$ ); (2) Respon peserta didik terhadap penerapan e-modul STEM berbasis *project based learning* pada materi kesetimbangan kimia menunjukkan bahwa e-modul yang dikembangkan “sangat praktis” sehingga mudah digunakan dalam proses pembelajaran dengan hasil rata-rata persentase respon peserta didik kelas eksperimen 1 sebesar ( $M = 93,15 \pm 1,198$ ); eksperimen 2 sebesar ( $M = 91,41 \pm 1,067$ ); eksperimen 3 sebesar ( $M = 90,32 \pm 3,890$ ). (3) Peningkatan hasil belajar peserta didik yang diberi perlakuan menggunakan e-modul STEM berbasis *project based learning* pada materi kesetimbangan kimia pada kelas eksperimen 1 meningkat sebesar 71,42%; eksperimen 2 sebesar 70,69%; eksperimen 3 sebesar 68,63%. Sedangkan N-Gain kelas kontrol sebesar 38,72%.

**Kata kunci:** E-Modul, STEM, *Project*, Kesetimbangan Kimia.

## ABSTRACT

**Dinda Natalisa Br Gurusinga, NIM 4211131024 (2025). Development and Implementation of PjBL-Based STEM E-Modules on Chemical Equilibrium Material to Improve Student Learning Outcomes.**

Science, Technology, Engineering, and Mathematics (STEM) is a learning solution for the 21st century. Technological advances have made educational media change, namely through the use of soft copy media instead of electronic modules. This research aims to: (1) What is the feasibility of a STEM e-module based on Project Based Learning on chemical equilibrium material; (2) How do students respond to the use of STEM e-modules based on Project Based Learning (PjBL) on chemical equilibrium material; (3) How do students' learning outcomes improve after being given the use of STEM e-modules based on Project Based Learning on chemical equilibrium material. The development model used is the ADDIE model. Based on the research results, it shows that (1) The feasibility results of the STEM e-module based on Project Based Learning on chemical equilibrium material are in the "very valid" category with an average percentage of e-module feasibility of ( $M = 87,68 \pm 8,523$ ); (2) Students' responses to the application of Project-Based Learning-based STEM e-modules on chemical equilibrium material show that the e-modules developed are "very practical" so they are easy to use in the learning process with the average percentage of responses from experimental class 1 students being ( $M = 93,15 \pm 1,198$ ); experiment 2 was ( $M = 91,41 \pm 1,067$ ); experiment 3 was ( $M = 90,32 \pm 3,890$ ). (3) The increase in learning outcomes of students who were treated using STEM e-modules based on Project Based Learning on chemical equilibrium material in experimental class 1 increased by 71,42%; experiment 2 was 70,69%; experiment 3 was 68,63%. Meanwhile, the N-Gain for the control class was 38,72%.

**Keywords:** E-Module, STEM, Project, Chemical Equilibrium.