

ABSTRAK

Tasya Putri Haren Simanullang, NIM 4213131041 (2025) Pengembangan E-Modul Berbasis PBL Terintegrasi STEM (*Science, Technology, Engineering, And Mathematics*) Pada Materi Laju Reaksi.

Penelitian ini bertujuan untuk mengembangkan e-modul berbasis *Problem Based Learning* (PBL) terintegrasi *Science, Technology, Engineering, and Mathematics* (STEM) pada materi Laju Reaksi untuk peserta didik kelas XI di SMA Swasta Kartika I-2 Medan. Model pengembangan yang digunakan dalam penelitian ini adalah model 4D, yang terdiri atas empat tahapan, yaitu *Define, Design, Develop*, dan *Disseminate*, namun penelitian ini dibatasi sampai pada tahap *Develop*. Hasil penelitian menunjukkan bahwa e-modul berbasis PBL terintegrasi STEM memiliki tingkat validitas yang sangat baik berdasarkan hasil penilaian tujuh validator, terdiri dari tiga dosen ahli dan empat guru kimia. Aspek materi memperoleh persentase kelayakan sebesar 89,0% dan aspek media sebesar 87,4%, keduanya termasuk dalam kategori sangat valid. Hal ini menunjukkan bahwa e-modul yang dikembangkan telah memenuhi kriteria kelayakan isi, penyajian, kebahasaan, dan kegrafikan sesuai dengan standar pengembangan bahan ajar. Maka e-modul laju reaksi berbasis *Problem Based Learning* (PBL) terintegrasi *Science, Technology, Engineering, and Mathematics* (STEM) dapat dilanjutkan pada tahap uji coba dalam pembelajaran kimia.

Kata Kunci: Pengembangan Modul, PBL (*Problem Based Learning*), STEM (*Science, Technology, Engineering, and Mathematics*), Laju Reaksi, Model 4D

ABSTRACT

Tasya Putri Haren Simanullang, NIM 4213131041 (2025). Development of a PBL-Based E-Module Integrated with STEM (Science, Technology, Engineering, and Mathematics) on the Reaction Rate Topic.

This study aims to develop a Problem Based Learning (PBL) e-module integrated with Science, Technology, Engineering, and Mathematics (STEM) on the topic of Reaction Rate for Grade XI students at SMA Swasta Kartika I-2 Medan. The development model used in this research is the 4D model, which consists of four stages: Define, Design, Develop, and Disseminate; however, this research was limited to the Develop stage. The results showed that the PBL-based STEM-integrated e-module has a very high level of validity based on assessments from seven validators, consisting of three expert lecturers and four chemistry teachers. The material aspect obtained a feasibility percentage of 89.0%, and the media aspect obtained 87.4%, both categorized as *very valid*. These findings indicate that the developed e-module meets the criteria for content, presentation, language, and graphical feasibility according to the standards for learning material development. Therefore, the reaction rate e-module based on the Problem-Based Learning (PBL) approach integrated with Science, Technology, Engineering, and Mathematics (STEM) can be further implemented in the trial phase of chemistry learning.

Keywords: Module Development, PBL (Problem Based Learning), STEM (Science, Technology, Engineering, and Mathematics), Reaction Rate, 4D Model