

ABSTRAK

PENGEMBANGAN E-MODUL INTERAKTIF BERBASIS *PROBLEM BASED LEARNING* DENGAN PENDEKATAN *DEEP LEARNING* PADA MATERI IKATAN KIMIA

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Materi ikatan kimia merupakan salah satu materi kimia SMA yang dianggap sulit oleh peserta didik karena bersifat abstrak dan menuntut pemahaman konsep yang berjenjang, sehingga media pembelajaran interaktif yang mendukung pemahaman konsep diperlukan. Tujuan penelitian ini adalah (1) mengembangkan e-modul interaktif berbasis *Problem Based Learning* (PBL) dengan pendekatan *deep learning* pada materi ikatan kimia, dan (2) mengetahui kelayakan e-modul yang dikembangkan. Jenis penelitian ini adalah penelitian dan pengembangan (*Research and Development/R&D*) yang menggunakan model 4D dimodifikasi menjadi 3D, dengan tahapan pendefinisian (*define*), perancangan (*design*), dan pengembangan (*develop*). Subjek uji coba produk adalah 10 peserta didik kelas XI SMA Pangudi Luhur Sedayu yang dipilih melalui teknik *purposive sampling*. Data dikumpulkan melalui lembar validasi ahli, soal *pretest-posttest*, dan angket respons peserta didik. Hasil penelitian ini menunjukkan (1) bahwa e-modul interaktif berbasis PBL dengan pendekatan *deep learning* pada materi ikatan kimia berhasil dikembangkan melalui model 3D (*define, design, develop*), dimana setiap tahap pembelajarannya menerapkan prinsip *deep learning*, yaitu berkesadaran (*mindful*), bermakna (*meaningful*), dan menggembirakan (*joyful*). (2) E-modul yang dikembangkan berkategori layak dengan validitas aspek media sebesar 95,06% dan aspek materi sebesar 93,98%. E-modul juga terbukti efektif meningkatkan hasil belajar peserta didik dengan rata-rata N-Gain sebesar 0,76 (76,13%), serta praktis digunakan dengan rata-rata respons peserta didik sebesar 84,11%. Dengan demikian, e-modul interaktif berbasis PBL dengan pendekatan *deep learning* pada materi ikatan kimia yang dikembangkan pada penelitian ini terbukti valid, efektif, dan praktis sehingga layak dijadikan alternatif bahan ajar interaktif.

Kata kunci: *Deep learning, E-modul Interaktif, Ikatan kimia, Problem Based Learning*

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ABSTRACT**DEVELOPMENT OF AN INTERACTIVE E-MODULE BASED ON
PROBLEM-BASED LEARNING WITH A DEEP LEARNING
APPROACH FOR CHEMICAL BONDING TOPIC**

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Chemical bonding is one of the senior high school chemistry topics that students often find difficult because it is abstract and requires a hierarchical understanding of concepts; Thus, interactive learning media that support conceptual understanding of this topic are needed. This study aims to (1) develop an interactive e-module based on PBL with a deep learning approach on chemical bonding material, and (2) determine the validity, effectiveness, and practicality of the developed e-module. This research is a Research and Development (R&D) study using a 4D model modified into a 3D model, consisting of the define, design, and develop stages. The product trial subjects were 10 eleventh-grade students at SMA Pangudi Luhur Sedayu, selected by purposive sampling technique. Data were collected through expert validation sheets, pretest-posttest questions, and a student response questionnaire. The results showed that (1) the interactive PBL-based e-module with a deep learning approach on chemical bonding material was successfully developed through the modified 3D model, with each learning stage applying the deep learning principles of mindful, meaningful, and joyful learning and (2) the developed e-module was categorized as very valid, with a media aspect validity of 95.06% and a material aspect validity of 93.98%. The e-module also proved effective in improving student learning outcomes, with an average N-Gain of 0.76 (76.13%); practical to use, with an average student response of 84.11%. Thus, the PBL-based interactive e-module with a deep learning approach on chemical bonding material developed in this study is suitable as an alternative interactive teaching material.

Keywords: Deep learning, Chemical bonding Interactive e-module, Problem based learning,