

ABSTRAK

PENGEMBANGAN E-MODUL INTERAKTIF DENGAN PENDEKATAN *DEEP LEARNING* MELALUI MODEL *DISCOVERY LEARNING* PADA MATERI HIDROKARBON

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Kurikulum Merdeka mengarahkan pembelajaran pada pendekatan *deep learning* yang menekankan pemahaman bermakna, berpikir kritis, dan kolaborasi. Namun, pada materi hidrokarbon, peserta didik masih mengalami kesulitan belajar, khususnya tata nama dan isomer senyawa. Hasil wawancara dengan guru kimia SMA Santa Maria Yogyakarta menunjukkan 52,6% peserta didik memperoleh nilai di bawah KKM pada materi hidrokarbon, sementara media pembelajaran yang tersedia masih terbatas pada buku, *slide* Canva, dan alat peraga molimod, serta belum menerapkan pendekatan *deep learning*. Penelitian ini bertujuan untuk (1) mengembangkan e-modul interaktif dengan pendekatan *deep learning* melalui model *discovery learning* pada materi hidrokarbon, dan (2) mengetahui validitas, kepraktisan, dan keefektifannya sebagai bahan ajar kimia. Penelitian ini menggunakan desain *Research and Development* (R&D) model 4D Thiagarajan yang dimodifikasi menjadi model 3D (*define, design, develop*), dengan subjek uji coba terbatas 10 peserta didik kelas XII-P1 Fase F SMA Santa Maria Yogyakarta. Produk berupa e-modul berbasis digital *flipbook* (Heyzine Flipbook) yang mengintegrasikan berbagai platform digital, memadukan tiga siklus belajar (memahami, mengaplikasi, merefleksi) dengan tiga pilar *deep learning* (*mindful, meaningful, joyful*) ke dalam enam sintaks *discovery learning*. Hasil penelitian menunjukkan rata-rata validitas ahli 93,21% (sangat valid), kepraktisan 87,88% (sangat praktis), nilai tes formatif 90,00% (sangat efektif), dan tes sumatif 70,42% (efektif). Disimpulkan bahwa e-modul yang dikembangkan valid, praktis, dan efektif sehingga layak digunakan sebagai bahan ajar kimia pada materi hidrokarbon.

Kata Kunci: *deep learning, discovery learning*, e-modul interaktif, hidrokarbon

ABSTRACT

**DEVELOPMENT OF INTERACTIVE E-MODULES USING A DEEP
LEARNING APPROACH THROUGH THE DISCOVERY LEARNING MODEL
FOR HYDROCARBON MATERIAL**

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The Merdeka Curriculum directs learning toward a deep learning approach that emphasizes meaningful understanding, critical thinking, and collaboration. However, in hydrocarbon topics, students still experience learning difficulties, particularly in nomenclature and isomers. Interviews with a chemistry teacher at SMA Santa Maria Yogyakarta revealed that 52.6% of students scored below the minimum mastery criterion on hydrocarbon material, while available learning media were limited to textbooks, Canva slide, and molecular model kits, without prior application of the deep learning approach. This study aims to (1) develop an interactive e-module based on the deep learning approach through the discovery learning model on hydrocarbon material, and (2) determine its validity, practicality, and effectiveness as chemistry teaching material. This research used a Research and Development (R&D) design based on Thiagarajan's 4D model modified into a 3D model (define, design, develop), with a limited trial subject of 10 students of class XII-P1 Phase F at SMA Santa Maria Yogyakarta. The product was a digital flipbook-based e-module (Heyzine Flipbook) integrating various digital platforms, combining three learning cycles (understanding, applying, reflecting) with the three pillars of deep learning (mindful, meaningful, joyful) within six syntaxes of discovery learning. The results showed an average expert validity of 93.21% (highly valid), practicality of 87.88% (highly practical), a formative test score of 90.00% (highly effective), and a summative test score of 70.42% (effective). It is concluded that the developed e-module is valid, practical, and effective, making it suitable for use as chemistry teaching material on hydrocarbon topics.

Keywords: deep learning, discovery learning, hydrocarbon, interactive e-module