

ABSTRAK

EFEKTIVITAS MODEL *FLIPPED CLASSROOM* BERBANTUAN VISUALISASI MOLEKUL 3D PADA MATERI HIDROKARBON UNTUK MENINGKATKAN KOMPETENSI REPRESENTASI KIMIA

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Penelitian ini bertujuan untuk mendeskripsikan efektivitas model *flipped classroom* berbantuan visualisasi molekul 3D pada materi hidrokarbon dalam meningkatkan kompetensi representasi kimia siswa. Metode penelitian yang digunakan adalah *quasi-experimental* dengan *non equivalent control group design*. Populasi dalam penelitian ini yaitu seluruh siswa kelas XII IPA SMAN 12 Bandar Lampung Tahun Ajaran 2024/2025. Pengambilan sampel pada penelitian ini menggunakan teknik *purposive sampling*, sehingga terpilih kelas XII K.P 2.2 sebagai kelas kontrol, dan kelas XII K.P 2.3 sebagai kelas eksperimen. Pada kelas kontrol diterapkan pembelajaran konvensional, dan pada kelas eksperimen diterapkan model *flipped classroom* berbantuan visualisasi molekul 3D dengan *Software Avogadro*. Teknik analisis data yang digunakan adalah uji perbedaan dua rata-rata dengan uji *independent sample t-test*. Hasil penelitian menunjukkan bahwa rata-rata *n-gain* kompetensi representasi kimia bernilai 0,62 berkategori sedang di kelas eksperimen, dan terdapat perbedaan *n-gain* rata-rata lebih tinggi secara signifikan pada kelas eksperimen dibandingkan rata-rata *n-gain* kelas kontrol. Berdasarkan hasil penelitian maka dapat disimpulkan bahwa model *flipped classroom* berbantuan visualisasi molekul 3D pada materi hidrokarbon efektif dalam meningkatkan kompetensi representasi kimia siswa.

Kata kunci: *flipped classroom*, visualisasi molekul 3D, *software Avogadro*, kompetensi representasi, hidrokarbon

ABSTRACT

THE EFFECTIVENESS OF THE FLIPPED CLASSROOM MODEL ASSISTED BY 3D MOLECULAR VISUALIZATION ON HYDROCARBON MATERIAL TO IMPROVE REPRESENTATION COMPETENCE

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This study aims to describe the effectiveness of a flipped-classroom model, supported by 3D molecular visualization, on the topic of hydrocarbons in improving students' chemical representation competence. The research employed a quasi-experimental design with a non-equivalent control group. The population consisted of all 12th-grade science students at SMAN 12 Bandar Lampung during the 2024/2025 academic year. Using purposive sampling, class XII K.P 2.2 was selected as the control group, while class XII K.P 2.3 served as the experimental group. The control group received conventional instruction, whereas the experimental group experienced flipped-classroom instruction enhanced with 3D molecular visualization using the Avogadro software. Data were analyzed using an independent-samples t-test to compare mean scores. The results showed that the average normalized gain (n-gain) for chemical representation competence in the experimental group was 0.62, categorized as moderate. Additionally, the experimental group exhibited a significantly higher average n-gain compared to the control group. Based on these findings, it can be concluded that the flipped-classroom model, supported by 3D molecular visualization on hydrocarbon material, is effective in improving students' chemical representation competence.

Keywords: flipped classroom, 3D molecular visualization, Avogadro software, representation competence, hydrocarbons.