

ABSTRAK

ROMA ITO : Pengaruh Model *Problem Based Learning* Berbantuan PhET Dengan Pendekatan STEM Terhadap Kemampuan Berpikir Kritis Siswa. **Program Studi Pendidikan Fisika FKIP Universitas Malikussaleh, 2026**

Penelitian ini bertujuan untuk menganalisis pengaruh model *Problem Based Learning* (PBL) berbantuan PhET dengan pendekatan STEM terhadap kemampuan berpikir kritis siswa pada materi gelombang bunyi di SMA Negeri 1 Nisam. Penelitian ini merupakan penelitian kuantitatif dengan metode kuasi eksperimen menggunakan desain Nonequivalent Control Group Design. Sampel penelitian terdiri atas dua kelas XI SMA Negeri 1 Nisam, yaitu kelas XI F1 sebagai kelas eksperimen dan kelas XI F2 sebagai kelas kontrol yang masing-masing berjumlah 27 siswa. Instrumen penelitian berupa tes kemampuan berpikir kritis berbentuk soal esai yang telah diuji validitas, reliabilitas, tingkat kesukaran, dan daya pembeda. Teknik analisis data meliputi uji normalitas, uji hipotesis menggunakan Mann-Whitney Test, dan uji N-Gain.

Hasil penelitian menunjukkan bahwa terdapat pengaruh model *Problem Based Learning* berbantuan PhET dengan pendekatan STEM terhadap kemampuan berpikir kritis siswa. Hasil uji Mann-Whitney pada data *posttest* memperoleh nilai Asymp. Sig. (2-tailed) sebesar $0,010 < 0,05$, sehingga H_0 ditolak dan H_a diterima. Selain itu, hasil uji N-Gain menunjukkan bahwa rata-rata N-Gain kelas eksperimen sebesar 0,56 dengan kategori sedang, sedangkan kelas kontrol sebesar 0,37 dengan kategori sedang. Meskipun kedua kelas berada pada kategori yang sama, nilai N-Gain kelas eksperimen lebih tinggi daripada kelas kontrol, sehingga dapat disimpulkan bahwa penerapan model *Problem Based Learning* berbantuan PhET dengan pendekatan STEM lebih efektif dalam meningkatkan kemampuan berpikir kritis siswa dibandingkan pembelajaran konvensional.

Kata Kunci: Kemampuan Berpikir Kritis, Model, PhET, PBL, Pendekatan, STEM

ABSTRACT

ROMA ITO: The Effect of the Problem-Based Learning Model Assisted by PhET with the STEM Approach on Students' Critical Thinking Skills. **Physics Education Study Program, FKIP, Malikussaleh University, 2026.**

This study aims to analyze the effect of the Problem-Based Learning (PBL) model assisted by PhET with the STEM approach on students' critical thinking skills in the sound wave material at SMA Negeri 1 Nisam. This study is quantitative research using a quasi-experimental method with a Nonequivalent Control Group Design. The research sample consisted of two eleventh-grade classes of SMA Negeri 1 Nisam, namely class XI F1 as the experimental class and class XI F2 as the control class, each consisting of 27 students. The research instrument was a critical thinking skills test in the form of essay questions that had been tested for validity, reliability, difficulty level, and discrimination index. The data analysis techniques included the normality test, hypothesis testing using the Mann–Whitney Test, and the N-Gain test.

The results showed that there was an effect of the Problem-Based Learning model assisted by PhET with the STEM approach on students' critical thinking skills. The results of the Mann–Whitney test on the posttest data obtained an Asymp. Sig. (2-tailed) value of $0.010 < 0.05$, so H_0 was rejected and H_a was accepted. In addition, the results of the N-Gain test showed that the average N-Gain score of the experimental class was 0.56 in the moderate category, while the control class was 0.37 in the moderate category. Although both classes were in the same category, the N-Gain score of the experimental class was higher than that of the control class. Therefore, it can be concluded that the implementation of the Problem-Based Learning model assisted by PhET with the STEM approach is more effective in improving students' critical thinking skills than conventional learning.

Keywords: Critical Thinking Skills, Model, PhET, PBL, Approach, STEM.