ABSTRAK

Aditya Salim Nuryandi. 2026. **PENGARUH MODUL AJAR *HYPOTHETICAL LEARNING TRAJECTORY* (HLT) BERBANTUAN *PhET SIMULATIONS* TERHADAP HASIL BELAJAR KOGNITIF PESERTA DIDIK PADA MATERI ENERGI ALTERNATIF**

Penelitian ini dilatarbelakangi oleh rendahnya hasil belajar kognitif peserta didik. Permasalahan tersebut terjadi juga di SMAN 1 Tasikmalaya tahun ajaran 2024/2025 yang telah mempelajari materi energi alternatif, dikarenakan kurang bervariatifnya model pembelajaran yang digunakan serta kurangnya praktikum yang dilakukan. Penggunaan modul ajar *Hypothetical Learning Trajectory* (HLT) mampu meningkatkan hasil belajar kognitif yang didukung dengan simulasi menggunakan *PhET Simulations.* Penelitian ini bertujuan untuk mengetahui pengaruh modul ajar HLT berbantuan *PhET Simulations* terhadap hasil belajar kognitif peserta didik pada materi energi alternatif di kelas X SMA Negeri 1 Tasikmalaya tahun ajaran 2025/2026. Metode penelitian ini yaitu kuasi eksperimen dengan desain *pretest-posttest nonequivalent control group design.* Populasi meliputi seluruh kelas X SMAN 1 Tasikmalaya total 359 peserta didik. Sampel menggunakan teknik *purposive sampling* dengan kelas X-5 sebagai kelas eksperimen (41 peserta didik) dan kelas X-4 sebagai kelas kontrol (40 peserta didik). Teknik pengumpulan data meliputi tes hasil belajar kognitif berupa uraian serta lembar observasi keterlaksanaan. Uji hipotesis menggunakan uji t pada taraf siginfikansi $\alpha = 0{,}05$ menunjukkan hasil 4,49>1,67, sehingga H_o ditolak H_a diterima. Artinya, terdapat pengaruh modul ajar HLT berbantuan *PhET Simulations* terhadap hasil belajar kognitif peserta didik pada materi energi alternatif. Modul ajar HLT memberikan tahapan pembelajaran untuk mengatasi hambatan belajar peserta didik dalam proses pembelajaran berdasarkan alur belajarnya.

Kata kunci: Energi alternatif, hasil belajar kognitif, *Hypothetical Learning Trajectory, PhET Simulations.*

ABSTRACT

Aditya Salim Nuryandi. 2026. ***THE EFFECT OF THE TEACHING MODULE HYPOTHETICAL LEARNING TRAJECTORY (HLT) ASSISTED BY PhET SIMULATIONS ON STUDENTS' COGNITIVE LEARNING OUTCOMES ON ALTERNATIVE ENERGY MATERIALS***

This research is motivated by the low cognitive learning outcomes of students. This problem also occurs in SMAN 1 Tasikmalaya in the 2024/2025 academic year which has studied alternative energy material, due to the lack of variety of learning models used and the completion of the practicum carried out. The use of the Hypothetical Learning Trajectory (HLT) teaching module is able to improve cognitive learning outcomes supported by simulations using PhET Simulation. This study aims to determine the effect of the HLT teaching module assisted by PhET Simulation on students' cognitive learning outcomes on alternative energy material in class X of SMA Negeri 1 Tasikmalaya in the 2025/2026 academic year. This research method is a quasi-experimental design with pretest-posttest nonequivalent control group design. The population includes all class X of SMAN 1 Tasikmalaya totaling 359 students. The sample used a purposive sampling technique with class X-5 as the experimental class (41 students) and class X-4 as the control class (40 students). Data collection techniques include cognitive learning outcome tests in the form of descriptive and implementation observation sheets. Hypothesis testing using the t-test at significance level of $\alpha = 0.05$ showed results of $4.49 > 1.67$, so that H_o is rejected and H_a is accepted. This means that there is an influence of the HLT teaching module assisted by PhET Simulation on students' cognitive learning outcomes on alternative energy material. The HLT module provides learning stages to overcome students' learning obstacle in the learning process based on their learning flow.

Keywords: Alternative energy, cognitive learning outcomes, Hypothetical Learning Trajectory, PhET Simulations.