

ABSTRAK

Rizky Wildan Nur Cahyono. 2026. *Efektivitas Pendekatan STEM-PjBL Berbantuan Aplikasi Simulasi Virtual Terintegrasi Artificial Intelligence “EduPhy-AI” Untuk Meningkatkan Kemampuan Berpikir Kreatif Siswa*. Skripsi. Program Studi Pendidikan Fisika, FKIP, Universitas PGRI Madiun. Pembimbing (I) Dr. Tantri Mayasari, M.Pd., (II) Farida Huriawati, M.Si.

Rendahnya kemampuan berpikir kreatif siswa pada materi Perubahan Iklim dan Pemanasan Global, ditunjukkan dari hasil observasi awal yang menunjukkan 55% siswa kelas X-1 SMA Negeri 4 Madiun berada pada kategori Menengah dengan rata-rata 66,8, serta minimnya integrasi simulasi numerik tervalidasi dan kecerdasan buatan dalam pembelajaran fisika, melatarbelakangi penelitian ini. Penelitian bertujuan menganalisis efektivitas pendekatan *STEM-Project Based Learning* (STEM-PjBL) berbantuan aplikasi simulasi virtual terintegrasi *Artificial Intelligence* EduPhy-AI dalam meningkatkan kemampuan berpikir kreatif siswa. Penelitian menggunakan pendekatan *mixed method* jenis *Sequential Explanatory*, meliputi tahap kuantitatif berupa *one-group pretest-posttest design* dan tahap kualitatif berupa observasi serta dokumentasi. Sumber data adalah 34 siswa kelas X-1 SMA Negeri 4 Madiun. Data dikumpulkan melalui tes *essay* empat indikator berpikir kreatif (*fluency, flexibility, originality, elaboration*), lembar observasi, dan dokumentasi Lembar Kerja Peserta Didik. Teknik analisis data meliputi statistik deskriptif, uji normalitas *Shapiro-Wilk*, uji hipotesis *Wilcoxon Signed-Rank Test*, perhitungan *N-Gain*, dan *effect size*, yang selanjutnya ditriangulasikan dengan data kualitatif. Hasil penelitian menunjukkan nilai rata-rata meningkat dari 66,84 menjadi 83,90 dengan *N-Gain* sebesar 0,51 (kategori Sedang), dengan peningkatan tertinggi pada indikator *fluency* (*N-Gain* 0,81) dan terendah pada *originality* (*N-Gain* 0,17). Uji *Wilcoxon* menunjukkan peningkatan signifikan ($Z = -4,262$; *Asymp. Sig.* <0,001) dengan *effect size* $r=0,52$ (kategori Besar). Data kualitatif memperkuat temuan tersebut, menunjukkan keterkaitan fase *Design* dan *Prototype* dengan penguatan *fluency* dan *elaboration*. Dengan demikian, pendekatan STEM-PjBL berbantuan EduPhy-AI efektif meningkatkan kemampuan berpikir kreatif siswa pada materi Perubahan Iklim dan Pemanasan Global.

Kata Kunci: berpikir kreatif, EduPhy-AI, kecerdasan buatan, perubahan iklim, STEM-PjBL

ABSTRACT

Rizky Wildan Nur Cahyono. 2026. The Effectiveness of the STEM-PjBL Approach Assisted by the Artificial Intelligence-Integrated Virtual Simulation Application "EduPhy-AI" to Improve Students' Creative Thinking Ability. Undergraduate Thesis. Physics Education Study Program, Faculty of Teacher Training and Education (FKIP), Universitas PGRI Madiun. Advisors: (I) Dr. Tantri Mayasari, M.Pd., (II) Farida Huriawati, M.Si.

The low creative thinking ability of students on the topic of Climate Change and Global Warming, as indicated by initial observation results showing that 55% of students in class X-1 of SMA Negeri 4 Madiun fell into the Medium category with an average score of 66.8, along with the minimal integration of validated numerical simulation and artificial intelligence in physics learning, formed the background for this research. This study aims to analyze the effectiveness of the STEM-Project Based Learning (STEM-PjBL) approach assisted by the Artificial Intelligence-integrated virtual simulation application EduPhy-AI in improving students' creative thinking ability. The research employed a mixed-method approach of the Sequential Explanatory type, consisting of a quantitative stage using a one-group pretest-posttest design and a qualitative stage involving observation and documentation. The data source consisted of 34 students from class X-1 of SMA Negeri 4 Madiun. Data were collected through essay tests covering four indicators of creative thinking (fluency, flexibility, originality, elaboration), observation sheets, and documentation of Student Worksheets. Data analysis techniques included descriptive statistics, the Shapiro-Wilk normality test, the Wilcoxon Signed-Rank hypothesis test, N-Gain calculation, and effect size, which were subsequently triangulated with qualitative data. The results showed that the average score increased from 66.84 to 83.90, with an N-Gain of 0.51 (Medium category), with the highest increase found in the fluency indicator (N-Gain 0.81) and the lowest in originality (N-Gain 0.17). The Wilcoxon test indicated a significant improvement ($Z = -4.262$; Asymp. Sig. < 0.001) with an effect size of $r = 0.52$ (Large category). Qualitative data reinforced these findings, revealing a relationship between the Design and Prototype phases and the strengthening of fluency and elaboration. Thus, the STEM-PjBL approach assisted by EduPhy-AI is effective in improving students' creative thinking ability on the topic of Climate Change and Global Warming.

Keywords: Creative Thinking, EduPhy-AI, Artificial Intelligence, Climate Change, STEM-PjBL