

ABSTRAK

Anggur Aris Sihombing: Perbandingan Media Simulasi Tinkercad dan Falstad Circuit Simulator terhadap Hasil Belajar Elemen Elektronika Siswa Kelas X SMKS Sinar Husni. Skripsi. Fakultas Teknik Universitas Negeri Medan, 2025.

Penelitian ini dilatarbelakangi oleh rendahnya hasil belajar kognitif dan psikomotorik siswa pada materi elemen elektronika akibat penggunaan media pembelajaran yang kurang interaktif. Media simulasi berbasis komputer, seperti Tinkercad dan Falstad Circuit Simulator, memungkinkan visualisasi rangkaian secara dinamis dan dapat meningkatkan pemahaman konsep serta keterampilan praktik siswa. Penelitian ini bertujuan untuk membandingkan efektivitas penggunaan media simulasi Tinkercad dan Falstad Circuit Simulator terhadap hasil belajar kognitif dan psikomotorik siswa kelas X. Penelitian menggunakan pendekatan kuantitatif dengan metode *true experimental* dan desain *pretest-posttest control group design*. Sampel penelitian terdiri dari dua kelas X TITL SMKS Sinar Husni yang masing-masing berjumlah 35 siswa. Instrumen penelitian berupa tes hasil belajar kognitif dan rubrik penilaian psikomotorik. Analisis data dilakukan melalui uji normalitas, uji homogenitas, uji *independent sample t-test*, perhitungan N-Gain, serta ukuran efek (*effect size*) Cohen's d. Hasil penelitian menunjukkan adanya perbedaan yang signifikan antara kedua media pembelajaran. Nilai rata-rata hasil belajar psikomotorik siswa yang menggunakan Tinkercad sebesar 79,71, sedangkan siswa yang menggunakan Falstad Circuit Simulator sebesar 71,57, dengan nilai $t_{hitung} = 3,124$ dan $Sig. = 0,003 (< 0,05)$. Rata-rata N-Gain kognitif pada kelas Tinkercad sebesar 0,44 termasuk kategori sedang dan lebih tinggi dibandingkan kelas Falstad Circuit Simulator. Ukuran efek pada hasil belajar kognitif menunjukkan nilai Cohen's d sebesar 0,67, sedangkan pada hasil belajar psikomotorik sebesar 0,75, yang termasuk kategori efek sedang. Temuan ini membuktikan bahwa media simulasi Tinkercad lebih efektif dalam meningkatkan hasil belajar kognitif dan psikomotorik siswa dibandingkan Falstad Circuit Simulator.

Kata kunci: Tinkercad, Falstad Circuit Simulator, hasil belajar, kognitif, psikomotorik, N-Gain.

ABSTRACT

Anggur Aris Sihombing: A Comparison of Tinkercad and Falstad Circuit Simulator Simulation Media on the Learning Outcomes of Electronic Components among Grade X Students of SMKS Sinar Husni. Undergraduate Thesis. Faculty of Engineering, Universitas Negeri Medan, 2025.

This study was motivated by the low cognitive and psychomotor learning outcomes of students in electronic components materials due to the use of less interactive instructional media. Computer-based simulation media such as Tinkercad and Falstad Circuit Simulator are able to visualize electronic circuits dynamically and are expected to improve students' conceptual understanding and practical skills. This study aimed to compare the effectiveness of Tinkercad and Falstad Circuit Simulator simulation media on students' cognitive and psychomotor learning outcomes. The study employed a quantitative approach using a true experimental method with a pretest–posttest control group design. The research sample consisted of two Grade X Electrical Power Installation Engineering (TITL) classes at SMKS Sinar Husni, each comprising 35 students. Research instruments included a cognitive learning outcomes test and a psychomotor assessment rubric. Data were analyzed using normality and homogeneity tests, an independent sample t-test, N-Gain analysis, and Cohen's d effect size. The results showed a significant difference between the two simulation media. The average psychomotor learning outcome of students taught using Tinkercad was 79.71, while those taught using Falstad Circuit Simulator achieved an average score of 71.57, with a t value of 3.124 and a significance value of 0.003 (< 0.05). The average cognitive N-Gain score of the Tinkercad class was 0.44, categorized as moderate and higher than that of the Falstad Circuit Simulator class. The effect size analysis indicated a Cohen's d value of 0.67 for cognitive learning outcomes and 0.75 for psychomotor learning outcomes, both classified as moderate effects. These findings indicate that Tinkercad simulation media is more effective than Falstad Circuit Simulator in improving students' cognitive and psychomotor learning outcomes in electronic components learning.

Keywords: *Tinkercad, Falstad Circuit Simulator, learning outcomes, cognitive, psychomotor, N-Gain.*