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The Impact of SOLO Taxonomy-Based Physics Instruction on Gifted Students in Lyceums

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ABSTRACT

This study investigates the effectiveness of physics instruction based on the Structure of Observed Learning Outcomes (SOLO) taxonomy in enhancing the academic performance of gifted eighth-grade students in lyceums. A quasi-experimental design with pre-test and post-test measures was employed, involving two groups: an experimental group (n = 19) taught using SOLO taxonomy-based lessons, and a control group (n = 19) taught via traditional methods. The instructional unit focused on the topic "Electric Current Work and Power." Pre- and post-test assessments were conducted using a researcher-designed instrument aligned with SOLO cognitive levels. Data analysis revealed a statistically significant improvement in both groups; however, the experimental group demonstrated substantially higher gains (M = 90.37, SD = 4.34) compared to the control group (M = 79.59, SD = 4,58). Normality was verified using the Shapiro–Wilk test, and group differences were analyzed via independent t-test and Mann–Whitney U test where applicable. The effect size in the experimental group (r = 0.85) indicated a strong impact of the SOLO-based instruction. The findings provide empirical support for the SOLO taxonomy as a powerful framework to promote deep learning and critical thinking in physics education, especially for advanced learners.

Keywords: cognitive learning models; gifted education; physics instruction; SOLO taxonomy; student achievement