Jurnal Nusantara Mengabdi
ISSN: 2808-6163, Vol 5, No 2, 2026, 95-108 https://doi.org/10.35912/jnm.v5i2.6622

Battery Demonstration for Household Electrical Energy Education among Indonesian Elementary Pupils

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Article History
Received on 10 December 2025
1st Revision on 27 December 2026
2nd Revision on 7 January 2026
3rd Revision on 24 January 2026
Accepted on 4 February 2026

Abstract

Purpose: This community service study examined whether a simple battery demonstration could support Indonesian elementary pupils' understanding of household electrical energy sources and energy transformation.

Research Methodology: The activity was conducted in August in Kuala Lumpur, Malaysia, with Indonesian elementary-age children. Fourteen pupils joined the learning session, while quantitative analysis used 14 complete pre-test and post-test score pairs available in the score sheet. The demonstration kit consisted of a battery, connecting wires, a light-emitting diode, a small propeller, and reused plastic bottles as the tool frame. Learning was implemented through a brief explanation, guided demonstration, hands-on practice, discussion, and a five-item test.

Results: The mean score increased from 3.286 (SD = 0.825) before the activity to 4.357 (SD = 0.929) after the activity. A paired-sample t-test showed a significant improvement, $t(13) = 4.020$, $p = 0.001$, with a large within-participant effect size (Cohen's $dz = 1.074$).

Conclusions: The demonstration helped pupils observe that a battery can function as an electrical energy source and that electrical energy may be transformed into light and motion.

Limitations: The study was limited by the small sample, short intervention, five-item instrument, and absence of a control group.

Contributions: The article offers a low-cost, replicable model for elementary science outreach in Indonesian overseas learning communities.

Keywords: *Battery Demonstration, Electrical Energy, Elementary Pupils, Energy Literacy, Science Outreach*

How to Cite: Pratama, M. F. W., Yuliana, D. E., & Lisnanti, E. F. (2026). Battery Demonstration for Household Electrical Energy Education among Indonesian Elementary Pupils. *Jurnal Nusantara Mengabdi*, 5(2), 95-108.

1. Introduction

Electricity is familiar to children long before it becomes a school science topic. Lamps, fans, mobile-phone chargers, toys, televisions, and other household appliances are part of daily life, but the process that allows these objects to work is not directly visible. For elementary pupils, this invisibility creates a learning challenge. Children may know that a lamp turns on when connected to electricity, yet they may still find it difficult to explain what functions as the energy source, how a complete circuit is formed, and how electrical energy changes into light or motion. Energy literacy therefore cannot be reduced to memorising terms. It needs to begin from observable experiences that help children connect household routines with scientific explanations (Merritt, Bowers, & Rimm-Kaufman, 2019; Santillán, & Cedano, 2023; Stylos, Gavrilakis, Goulgouti, & Kotsis, 2023). Because household appliances are used every day, pupils often develop a practical familiarity with electricity long before