

ABSTRACT

The development of electrical technology requires learning media that can improve students' understanding and practical skills in basic electrical systems. However, practical learning in vocational high schools still faces limitations in the availability of teaching aids that meet learning needs. This study aims to design and produce a lighting and battery charging system teaching aid that is effective, safe, and easy to use for basic electrical learning at SMK Muhammadiyah Kawali.

The research employed an engineering design method using a Research and Development (R&D) approach. The research stages consisted of needs identification, literature study, selection of design alternatives, design modeling, technical calculations, tool fabrication, preparation of standard operating procedures, and testing. The designed system uses a 12 V DC power source with main components consisting of a battery, headlights, turn signals, brake lights, reverse lights, position lights, switches, relays, fuses, a regulator, an alternator, and an electric motor.

The resulting teaching aid has dimensions of 700 mm in length, 600 mm in width, and 800 mm in height. The charging system uses a 12 V alternator with an output of 8 A, theoretically producing a charging power of 96 Watts. The teaching aid is equipped with a fuse protection system and lighting and charging circuits that allow students to directly observe, operate, and measure electrical systems.

The test results showed that the teaching aid was successfully constructed according to the design and could be used as a practical learning medium for studying lighting and battery charging systems. The teaching aid is also equipped with a practical module as a guideline for learning activities. Therefore, the designed teaching aid can serve as a practical learning medium to help students understand the working principles of lighting systems, battery charging systems, and basic skills in inspecting vehicle electrical systems.

Keywords: *Teaching Aid, Basic Electrical System, Lighting System, Battery Charging System, SMK Muhammadiyah Kawali.*