

AN INQUIRY-BASED SIMULATION-SUPPORTED APPROACH TO ASSIST
STUDENTS' LEARNING OF BASIC ELECTRIC CIRCUITS

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ABSTRACT

Important aspects of teaching and learning are to understand what difficulties students have, why they face these difficulties, and how to help them overcome these difficulties. This research investigated the alternative conceptions that students hold pertaining to the concepts of open circuits and short circuits in a Basic Electric Circuits course. Data gathered from different sources including interviews, tests and documents were analyzed to characterize students' conceptual learning difficulties. The researcher adapted a diagnostic instrument that consists of 12 multiple choice items for the pretest and posttest. The participants were 80 first-year students enrolled in a Diploma in Electrical Engineering programme at one local public university; where 47 students constituted the treatment group and 33 students constituted the control group. The pretest was administered to both groups during the first week of the semester. An inquiry-based simulation-supported approach session was conducted with the treatment group after the pretest. The inquiry-based simulation-supported approach incorporated predict-observe-explain (POE) tasks. The extent to which this approach can assist students' in developing conceptual understanding was investigated. Students' verbal responses during the circuit simulation using Multisim software were recorded and analyzed. The posttest was administered during the final week of the semester to both groups. Research findings are presented in two parts. The first part is a quantitative analysis of students' performance on the pretest and posttest. The second part is a qualitative analysis of students' documents and interviews to identify their alternative conceptions. Findings reveal that the inquiry-based simulation-supported approach positively impacted students' conceptual understanding. The advantages and disadvantages of applying the inquiry-based simulation-supported approach in Basic Electric Circuits are discussed.

ABSTRAK

Aspek penting dalam pengajaran dan pembelajaran ialah memahami apa kesukaran yang dialami oleh pelajar, mengapa mereka mengalami kesukaran ini dan bagaimana membantu mereka menyelesaikan kesukaran ini. Kajian ini menyelidik konsep sampingan yang pelajar miliki berkaitan konsep litar buka dan litar pintas dalam kursus “Basic Electric Circuits”. Data yang dikumpul daripada pelbagai punca termasuk temubual, ujian dan dokumen telah di analisis untuk menyatakan kesukaran pembelajaran konsep pelajar. Penyelidik telah mengadaptasi instrumen diagnosis yang mengandungi 12 soalan pelbagai pilihan untuk kegunaan ujian awalan dan ujian akhiran. Sampel terdiri daripada 80 orang pelajar tahun satu jurusan Diploma Kejuruteraan Elektrik di sebuah universiti awam tempatan; di mana 47 pelajar membentuk kumpulan rawatan dan 33 pelajar membentuk kumpulan kawalan. Ujian awalan kepada kedua-dua kumpulan telah dikendalikan pada minggu pertama semester. Sesi pendekatan simulasi-berbantu berasaskan-inkuiri telah dijalankan dengan kumpulan rawatan selepas ujian awalan. Pendekatan simulasi-berbantu berasaskan-inkuiri ini menggabungkan tugas *predict-observe-explain* (POE). Sejauh mana pendekatan ini dapat membantu pemahaman konsep pelajar telah dikaji. Pernyataan daripada sesi perbualan pelajar semasa menggunakan perisian Multisim dirakam dan dianalisis. Ujian akhiran telah dikendalikan pada minggu terakhir semester kepada kedua-dua kumpulan. Dapatan kajian telah dipersembahkan dalam dua bahagian. Bahagian pertama mengambilkira dapatan kuantitatif mengenai prestasi pelajar dalam ujian awalan dan ujian akhiran. Bahagian kedua mengambilkira dapatan kualitatif melalui analisis dokumen dan temubual untuk mengenalpasti konsep sampingan pelajar. Dapatan kajian mendedahkan bahawa pendekatan simulasi-berbantu berasaskan-inkuiri telah memberi impak positif kepada pemahaman konsep pelajar. Kebaikan dan keburukan mengaplikasikan pendekatan simulasi-berbantu berasaskan-inkuiri dalam “Basic Electric Circuits” turut dibincangkan.