



Contribution ID: 125

Type: Oral Presentation

An investigation of the effectiveness of using analogies to develop a robust understanding of direct current (DC) electric circuits in first-year university students

Thursday, 4 October 2018 09:30 (20 minutes)

The effectiveness of using a teaching strategy, based on analogies for direct current electric circuits, to attempt to address first-year underprepared university students was investigated. The study consisted of 53 participants drawn from the faculty of health sciences at Nelson Mandela University. A quantitative research design was adopted using the “Determining and Interpreting Resistive Electric Circuits Concepts Test” (DIRECT) version 1.2 as a research instrument. The DIRECT is a 29-item multiple-choice test with only one correct answer in each question. The DIRECT was modified to further probe students’ confidence levels in their answers. The instrument served as a pre-test prior to the start of the formal lessons on direct current electric circuits. At the end of a five-week treatment period, the same instrument was administered to all participants as a post-test. The statistical analysis and interpretation of the pre-and posttest data were conducted using Software Package for Social Sciences (SPSS) version 23 and STATISTICA version 12. In answering the main research question (Can a misconception-based module, using analogies, positively influence academically underprepared first-year physics students’ conceptual understanding of direct current (DC) electrical circuits?) and sub-questions thereof, the students’ mean scores between the pre-and posttest were calculate and compared using t-test at a significant level of 0.05. The results revealed a statistically significant difference between the pre-and posttest mean scores. The pre-test mean score was 22.24 with a standard deviation of 8.07. The posttest mean score was 38.68 with a standard deviation of 13.93. The mean score difference between the posttest and pretest was 16.44 with a standard deviation of 13.82 at p-value less than 0.05. The results from the pre-test suggest that students held very strong alternative conceptions on direct current electric circuits. The post-test results also revealed that some alternative conceptions were still held onto after the intervention. There were no statistical significant difference found between the students’ correct answers and their confidence levels. The quantitative analysis of the results suggested that there is a positive change between the post-test mean score and pre-test mean score and this change is statistically significant ($p < 0.05$). The results showed efficient evidence to conclude that analogies-based teaching strategy was an effective means of reducing the number of alternative conceptions the students held about direct current electric circuits. The study recommended the need to ascertain out what the students felt about the improvement of their understanding of direct current electric circuits concepts. The study suggested qualitative research methodology as an area for future research.

Keywords: Analogies, Alternative conceptions, Direct Current Electric Circuits.

Apply to be considered for a student award (Yes / No)?

Yes

Level for award (Hons, MSc, PhD, N/A)?

MSc

Primary author: Mr BACELA, Collin (Nelson Mandela Univeristy)

Co-author: Dr MEIRING, Leslie (Nelson Mandela University)

Presenter: Mr BACELA, Collin (Nelson Mandela University)

Session Classification: Parallel Session 2

Track Classification: Track D - Teaching and Learning of Physics Concepts