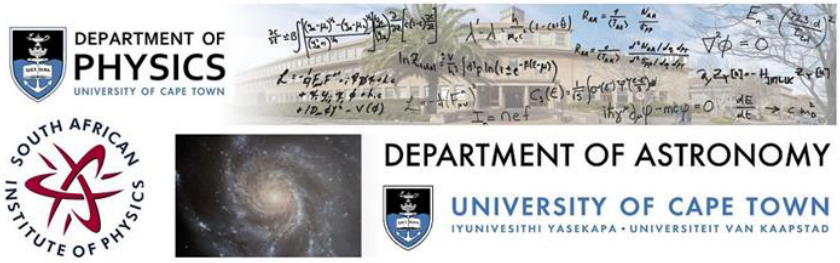

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Student difficulties with DC circuits: misconceptions or sense-making?

Thursday, 7 July 2016 11:50 (20 minutes)

Abstract content
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As part of a long-term study into student difficulties with regard to DC circuits we probed the effect on student responses when fine-grained contextual changes were made to questions related to an open DC circuit. An eight item instrument was used, each question consisting of a choice (from 4 options) followed by a written explanation. Previously we presented (a) details of the instrument (SAIP 2010), (b) selected findings from the analysis of the free writing responses (SAIP 2011), and (c) the main ideas underlying the answer choices (SAIP 2014). In the first part of the present talk we summarize the essence of the overall findings by presenting a portion of the detailed analysis from the choice responses, in particular to the questions related to (1) swapping the resistive elements (heater, light bulb and resistor) and changing the words (charge flow to current, heat up for heater to light up for light bulb) in the question. The results emphasize that the students do not respond to the different elements in a manner that is consistent with the physics perspective that all three elements are equivalent from an electrical resistance perspective. In the second part of the talk we note that the findings are better described by a "knowledge in pieces" model rather than by a unitary (mis)conceptions account. We propose a simple explanatory model of an individual student response as follows: (1) a correct but limiting interpretation of an everyday experience is triggered by the question context, and, (2) together with attempts at sense-making on the part of the student, leads to a response that is interpreted as a misconception by an instructor. The claims that students are engaged in sense-making are based on (limited) interviews.

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