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# DC CIRCUITS: CONTEXT AND SENSE-MAKING

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The present papers report on a programme that aims to probe, at a fine-grained level, how students engage with simple DC circuits, in particular with regard to context and sense-making. We discuss the results from an instrument, the Aspects of Circuits Questionnaire (ACQ), in which non-substantive variations of a simple circuit were presented to students. This talk discusses ACQ itself and then highlights the findings that pertain to context sensitivity.

An important part of the first year physics curriculum is electricity. However, it has become apparent world-wide that teaching even the very basic concepts has not been successful in helping students gain a proper understanding thereof. One criticism of the way in which circuits is often taught is that it is too theoretical and that involving students in practical work and simulations should improve the situation. Thus many innovative curricula have been developed in which students are taken through a structured sequence of laboratory exercises in order to clarify the concepts. One very popular approach for example has been to use circuits in which the brightness of a light bulb is used as a visual proxy for current. However, despite many such attempts the results have not shown dramatic improvements in student understanding.

An eight questions probe, Aspects of Circuit Questionnaire (ACQ) was developed for this broad fine-grained investigation. All circuits were open circuits, consisting of a single battery connected to a resistive element with a single wire. Each question was presented as a situation in which a posited group of students discuss a particular situation, and take a particular stand. Respondents are then presented with four choices, from which they have to choose one, Forced Choice Responses (FCR). The respondents are then requested to explain in detail their reasons for the particular choice. The FCR data were analyzed by tallying the choices and presenting them as histograms for visual comparison while the Free Written Responses (FWR) data were analyzed using a grounded approach.

The analysis of the FCRs showed that majority of student's responses were highly sensitive to context [3]. A key finding that emerged from the coding of the FWR was that only one "foothold idea" was productive across the entire spectrum of micro-contexts: "loop continuity / completeness" [4].

References

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## Apply to be<br> considered for a student <br>   award (Yes / No)?

no

## Level for award<br> (Hons, MSc, <br>   PhD, N/A)?

n/a

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