ABSTRACT

'The design and validation of an instrument to measure the Topic Specific Pedagogical Content Knowledge of physical sciences teachers in electric circuits.'

Extensive research describes common misconceptions when learning to understand how electric circuits function and the concurrent difficulties of teaching this content. The primary purpose of this study was to design and validate an assessment tool that uses these misconceptions to measure teachers' Topic Specific Pedagogical Content Knowledge (TSPCK) for teaching electric circuits. In conjunction with the TSPCK assessment tool, a Content Knowledge (CK) assessment tool was adapted from existing content tests for electric circuits. The purpose of the CK assessment tool was to test the assumption that teachers' TSPCK cannot develop without them having prior CK.

The study used a Mixed-Method approach with both quantitative and qualitative analysis to determine validity and reliability. The TSPCK assessment tool items were designed using the following components: (i) Learners' Prior Knowledge; (ii) Curricular Saliency; (iii) What makes the topic difficult to understand; (iv) Representations and Analogies; (v) Conceptual Teaching Strategies (Mavhunga, 2012). The purpose of the TSPCK assessment tool was to extract teacher reasoning within these components. The responses were scored using a criteria referenced rubric. The scores were statistically analysed using Rasch analysis.

The CK and TSPCK assessment tools were found to be statistically valid. The small sample size of 16 respondents meant there were some concerns with regard to reliability. However, when the qualitative data is analysed together with quantitative data, an argument can be made that a valid and reliable assessment tool to measure TSPCK in

electric circuits has been designed. The CK and TSPCK assessment tools for electric circuits are now available for further use in pre-service and in-service teacher training.

Keywords

Topics Specific Pedagogical Content Knowledge

Electric circuits