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A Profile Of The Engineering Students' Conceptual Understanding On Electricity

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This study aimed in revalidating a reliable diagnostic instrument on electricity which emphasized on parallel resistors. At the same time, it has also established an academic profile of the engineering students' conceptual understanding on electricity; examined the difficulty and discrimination level of the items and assessed the students' conception and misconceptions on electricity. Five intact classes chosen by cluster sampling from fifteen existing classes of PHY193 were involved in this study, namely the second semester engineering students undergoing a Diploma in Engineering program. The respondents comprised 102 engineering students with 56 from the Electrical Engineering group, 28 from the Mechanical Engineering and 18 Civil Engineering students studying in a local university. The descriptive approach was used in this study, aimed at addressing the four research questions which examined the academic profiles of the engineering students' conceptual understanding on electricity, analyzed the validity and reliability of the instrument PCCUT (*Parallel Circuit Conceptual Understanding Test, PCCUT*), assessed the items' difficulty and discriminating levels and the students' conceptions and misconceptions on electricity. The

diagnostic instrument (PCCUT) used in this study was distributed to the students and the Rasch Measurement Model was used with the WINSTEP software version 3.71.0.1 during the analysis process. The result has produced a good Cronbach Alpha reliability value of 0.82 and an excellent item reliability of 0.97. In order to clarify the responses provided by the students in terms of the difficulties that they encountered in electricity, a set of interview questions was given to the lecturers teaching the course. The lecturers confirmed that the students had difficulties in understanding the concepts of current and voltage. Written responses given by the students have acted as guidelines to the source of misconceptions. The findings of this study indicated that each of the engineering students can be categorized into one of the six academic bands which are the 'exceptional', the 'proficient', the 'have some knowledge', the 'need improvement', the 'problematic' and the 'not recommended'. These categories act as performance indicators informing the students and others of their basic level of conceptual understanding on electricity. The analysis of PCCUT has also enabled the items to be placed in hierarchical order and according to its discrimination level, with the concept of current being the most difficult and the most non-discriminating (item 13). Some conceptions and most importantly, misconceptions which occurred among the students have also been uncovered. 'Local, sequential and superposition reasonings' are the most common misconceptions. By focusing on the areas of misconceptions and allocating more time to these issues, proper instruction could be planned in improving the students' weaknesses. In addition, these findings also provide some guidance for research directions into local and international students' common areas of misconceptions.