ONLINE COGNITIVE DIAGNOSTIC ASSESSMENT WITH ORDERED MULTIPLE-CHOICE ITEMS FOR YEAR FOUR TOPIC OF TIME

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The purpose of this study was to develop and validate an online Cognitive Diagnostic Assessment (CDA) with Ordered Multiple-Choice (OMC) items for Year Four Topic of Time in three types of primary schools. However, this paper only focuses on the results of six cognitive models for the subtopic of "Relationship in Time" with each cognitive model measured by an assessment comprising seven OMC items in three languages, namely Malay, Mandarin and Tamil. The sample of the study consisted of 90 Year Four pupils from National School [NS] (30), National-Type Chinese School [NTCS] (48) and National-Type Tamil School [NTTS] (12) in Penang, Malaysia. The six expert-based cognitive models were judged to be valid by mathematics education experts in terms of: (a) relevance of the attributes to Year Four Mathematics content and learning standards; and (b) hierarchical arrangement of attributes based on the Attribute Hierarchy Method. The contents of the online CDA with OMC items in Malay, Mandarin and Tamil respectively were also judged to be valid by the experts in terms of: (a) relevance of the items to the attributes intended to be measured with a S-CVI of 1.00; and (b) coverage of the items based on the Year Four Mathematics content and learning standards with a S-CVI of more than 0.80. Further, the assignment of level to each option of the OMC items in Malay, Mandarin and Tamil respectively were judged to be appropriate by the experts. The results indicated that the three versions of the online CDA consisted of the OMC items with high discriminating power, but some of them were too easy for the pupils from NS, NTCS and NTTS. At the attribute level, most of the attributes of the online CDA with OMC items were found to be reliable. At the assessment level, the three versions of the online CDA with OMC items were reliable with the values of KR-20 ranging from 0.54 to 0.86 whereby 0.50 is the minimum threshold for an assessment with less than 15 items. Analysis of the pupils' item responses indicated that the attributes in the six pupil-based cognitive models were arranged in an increasing order of complexity as shown by the decreasing pattern of the mean percentages of attribute mastery. In addition, the hierarchical arrangements of attributes of the six pupil-based cognitive models were supported by the correlation among the attributes as shown by the decreasing pattern of Spearman's Rank Order Coefficients. The six expert-based cognitive models were also excellently consistent with the corresponding six pupil-based cognitive models with the values of the overall Hierarchical Consistency Index (HCI) ranging from 0.81 to 0.83.