ABSTRACT

Assessing the construct validity of a CXC Mathematics multiple choice Examination using MIRT

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In this research, the principles of Multidimensional Item Response Theory (MIRT) were used to assess the construct validity of a Mathematics multiple-choice test. The Program TESTFACT, employing the use of Full Information Item Factor Analysis, was used to determine the dimensionality of the following three item response data sets: TOTAL, which includes the entire sample of test data; FIRSTHALF, the upper half of the sample data ranked by Classical Test Theory's Total Test Sore; and, SECONDHALF, the lower half of the ranked sample data set.

To answer a question correctly in Mathematics, sometimes students need to recall some basic facts, translate English statements into mathematical symbols, use reasoning to make inferences, and apply knowledge to unfamiliar situations. Hence, many test items are multidimensional: they require the use of more than one skill to arrive at a correct answer. MIRT was developed to analyze tests whose items are thought to be multidimensional.

The analysis of FIRSTHALF, showed that the profile dimensions of the test corresponded with the statistical dimensions identified in this item response data set. This confirms the construct validity of the test for this group. In TOTAL,

two profile dimensions were identified; the lack of congruency between the statistical dimensions in this data set and the test constructs suggests, that the interaction between the examinees and the test items affected the total number of profile dimensions uncovered in TOTAL. In SECONDHALF, one profile dimension was identified and the statistical dimensions uncovered in this data set were described in terms of the test's content domain.

The behaviour of SECONDHALF clearly affected the construct validity of the entire group; and, the profile dimensions distinguished between 'Mathematic students' and 'non-Mathematics students'. Consequently, a close examination of SECONDHALF is likely to provide information about the conceptual difficulties faced by low scoring students that will be beneficial to researchers, test constructors, teachers and students generally.

Keywords: Construct, Dimensionality, Statistical Dimension, Profile Dimension, TESTFACT, Construct validity, Normality, Item Response Theory, Multidimensional Item Response Theory, Item Factor Analysis, Classical Test Theory, Total Test Score, Item response data.