ABSTRACT

KUSAERI: *The Development of a Diagnostic Test Using the DINA Model to Obtain the information on Misconceptions in Algebra.* **Dissertation. Yogyakarta: Graduate School, Yogyakarta State University, 2012.**

This research aims to: (1) find out a way to develop a good diagnostic test by using the DINA model, so that it can give information about misconceptions in algebra; (2) implement the diagnostic test developed using the DINA model; (3) determine the measurement of Q-matrix and the ideal number of test participants so that it can used in developing the diagnostic test using the DINA model. These three objectives are specified into: (a) finding out a way to develop the diagnostic test using the DINA model, so that it can give information about misconceptions in algebra; (b) identifying the characteristics of the good diagnostic test developed using the DINA model; (c) exploring types of utilization of the results of the diagnostic test developed using the DINA model; (d) exploring information that can be obtained from the diagnostic test developed using the DINA model; (e) determining the lengths of the ideal test of the Q-matrix needed to develop the diagnostic test using the DINA model; and (f) determining the ideal numbers of the test participants needed to develop the diagnostic test using the DINA model.

This research and development consisted of empirical research and simulation study. The empirical research was the descriptive explanatory research. The descriptive research was used to describe the development stages of the test. The explorative research was used to look for more information about latent class structure, by simulating various conditions of Q-matrix measurement and the number of test participants. The simulation used in this study was the Monte Carlo simulation. The subjects of this research were year VIII students of SMPN 1 Yogyakarta, SMPN 1 Sanden Bantul, and SMPN 1 Panjatan, Kulon Progo. The data were analyzed by using the CDM, Mplus, and R software.

The results of the study are as follows. (a) The stages of the test development in this research were: identifying basic competence and formulating indicators, constructing the learning continuum, constructing the material hierarchy, formulating the attributes, constructing the problems, conducting validation by expert judgment, and administering an empirical test. Through those seven stages, 37 items of the diagnostic test were developed. (b) Of the 37 items, 15 items must be eliminated/discarded from the test. The items were eliminated because their quality was low and they did not meet the requirements of the model fit test because their discrimination indexes were less than 0.2. (c) The utilization of the information from the results of the diagnostic test developed were done through the feedback resulting from the CBT software. The feedback is in the form of a score report per item and a diagnostic report of each student/test participant. (d) The result of the transaction of each student individually in the form of response patterns is recorded on the CBT

software. The accumulation of the students' response patterns in one class can be utilized for the analysis of misconceptions classically by using Mplus, BIGSTEP, ITEMAN or other analysis software. (e) The result of the simulation study shows that: (i) Q-matrix with the size of 4 x 3 ($Q_{4 \times 3}$) is more ideal than Q-matrix with the size of 6 x 3 ($Q_{6 \times 3}$) and 8 x 3 ($Q_{8 \times 3}$); (ii) Q-matrix with the size of 6 x 4 ($Q_{6 \times 4}$) is more ideal than Q-matrix with the size of 4 x4 ($Q_{4 \times 4}$) and 8 x 4 ($Q_{8 \times 4}$); and (iii) Q-matrix with the size of 6 x 5 ($Q_{6 \times 5}$) is more ideal than Q-matrix with the size of 4 x 5 ($Q_{4 \times 5}$) and 8 x 5 ($Q_{8 \times 5}$). A matrix is considered ideal if the matrix can provide the maximum latent class structure. (f) The result of the simulation also shows that the minimum size of the sample (N =250) can estimate the existing parameters in the DINA model better than a sample with a bigger size (N = 500 and N = 1000).

Keywords: *DINA model, latent class, misconceptions, algebra*