Construct validity of attitudes towards mathematics questionnaire

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Abstract. One goal of basic education in mathematics is to help students develop an attitudes towards mathematics. The purpose of this research was to validate the attitudes towards mathematics questionnaire. Sample are 204 students for validating an attitudes towards mathematics questionnaire. The attitudes towards mathematics consists of the 14 items for self-assessment. Confirmatory factor analysis was used to confirm the construct validity. The results confirmed that the construct validity of these test an excellent fit. The results show that the fitness index of validating attitudes towards mathematics questionnaire were as follow: statistic of 68.77 (degrees of freedom = 53, p= 0.071), and the $\chi^2$/df ratio having a value of 1.30 indicates a good fit. The comparative fit index (CFI) is 0.979, and Tucker-Lewis coefficient (TLI) is 0.964, Root mean square error approximation (RMSEA) is 0.028, Standardized Root Mean Residual (SRMR) is 0.030. All the indicators indicated that were a goodness of fit between the empirical data and the hypothetical measurement model.

1. Introduction
A growing body of literature suggests attitudes towards mathematics (AtM) are related to student’s reflective thinking skills, problem solving skills, learning style, and achievement [8][10]. Consequently AtM are recognized as importance variation to student learning outcome and has become the focus of learning process [9].

2. Significant of the Study
Despite its wide-spread mention, little research has investigated the AtM, and only a few studies have defined the factor structure of AtM. For Example D S Memnun and R Akkaya refer AtM as teachers’ assessment for enhancing students’ learning outcomes but were undefined their construct [9]. Although J M arti-Parreno, A Galbis-Cordova, M J Miquel-Romero reported AtM in their research but were not clearly defined it, too [1]. To date, only a few studies have referred the factor structure of AtM [6].

3. Conceptual Framework
Attitude towards mathematics questionnaire (AtMQ) is the self-assessment inventory for diagnosing face validity. It consists of 14 items of three factor. These three are awareness (AW), perception (PE),
and readiness (RE). AW is to know about the importance, the value, the useful of mathematics in daily life, studying in higher education, and developing in any case. PE is the feeling after studying mathematics. RE is the readiness for studying mathematics [5]. Figure 1 show the conclusion of the three AtM. Each statement of AtM items is using a 5-point Likert scale namely 1 represents ‘Does not agree’, 2 represents ‘Does not really agree’, 3 represents ‘Neutral, not sure’, 4 represents ‘Agree somewhat’, and 5 represents ‘Absolutely agree’

Figure 1: Conceptual framework

4. Aim of the Study
AtMQ should be precisely measured to examine the nature of construct and to make valid explanations for each individual’s social activity. This study aimed to validate the AtMQ. The specific purposes or this study are to test the construct validity of the AtMQ with the Institute for the Promotion of Teaching Science and Technology [5].

5. Research Methodology

5.1. Sample of this Study
A total of 2,673 (N) samples of this survey research were draw from Grade 9 (n=472). Owing to incomplete response, a total of 204 cases.

5.2. Data Analysis
The rapid growing of advanced methodology would be provided the ability of researchers to analyze the construct validity. CFA was used to test the hypothesized of three-factor model consisted of 14 items in all samples. Covariance structures were fitted with the maximum likelihood method. The model fitted indicator was evaluated by means of several fit indices. Universally, the model is considered acceptable when probability value (p-value) >0.05, value of ratio between chi-square statistic and degree of freedom (χ 2/df) in 2:1 [3], the Comparative Fit Index (CFI) ≥ 0.90 and good when ≥0.95 [2][4] and Tucker-Lewis coefficient (TLI) ≥ 0.95 is good fit [11]. Moreover, Standardized Root Means Square Residual (SRMR) should not exceed 0.08 for a good fit [4]. Furthermore, Root Means Square Error of Approximation (RMSEA) value ≤ 0.06 are considered indicative of a good fit, ≤ 0.08 of fair fit, between 0.08 and 0.01 of mediocre fit and >0.01 of poor fit [4][7].

6. Research Finding
CFA was used to evaluate the goodness of fit. CFA were conducted using MPlus program. Model fit was assessed using χ2, χ2/df , CFI, TLI, SRMR and RMSEA. Results showed that all indicators indicated that there was a goodness of fit between the empirical data and the hypothetical measurement model for model. In other word, statistic of 68.77 (degrees of freedom = 53), the p-value in CFA models are not significant (.0.71), χ2/df values are fall in 2:1 (1.30), all CFI ≥ 0.95 indicate the good fit (0.979). Similarity all the TLIs ≥ 0.95 are good fit (0.964). Moreover all the RMSEAs are ≤
0.06 are considered indicative of a good fit (0.028). Finally all the SRMRs ≤ 0.08 are accepted for a good fit (0.030) too. Detailed in Figure 2.

**Figure 2.** Confirmatory factor analysis of AtMQ

7. Discussion
On this line of reasoning, AtM is considered as the most important factor because students who possessed high AtM are more likely to engage in mathematics learning outcome and achievement at high level [3]. In addition, investigating the construct validity provide the further understanding of how AtM can be measured and evaluated. This study was conducted purposively to examine the validity of the AtMQ with sample grade 9. The validity of the AtMQ are the well fit for all indicators. Results from this study provide evidence about the validity of the confirming AtMQ. It shows that AtMQ can measure the AtM and can give the valid information for classroom management. The validating information can be used for learning management in classroom ([12]). The AtMQ was measured the AtM in the learning classroom, was used the pre-post AtM measurement. These is one type of emotion which must occurred in classroom [13].
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