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Confirmatory Factor Analysis: Teacher Leadership, Organizational Support and Teacher Efficacy Measurement Model

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Abstract

This study aims to build Teacher's Leadership, Teacher Efficacy and Organizational Support Model among secondary school teachers in Malaysia. This study used a confirmatory factor analysis method (CFA) to analyze the measurement model of this study. The implication of this study is expected to provide additional information in the teacher leadership, teachers efficacy and organizational support theory and provide a clear line of training and professionalism enhancement programs for teachers, schools and the Ministry of Education Malaysia.

Keywords: Confirmatory Factor Analysis (CFA), Teacher Leadership, Teacher Efficacy, Organizational Support

Introduction

Generally, the Ministry of Education Malaysia under the Education Development Plan 2013-2025 has taken drastic steps with various changes to make the transformation in the nation's education taking into account the changes in the current globalization environment. The fourth industrial revolution that has hit this time has been taken into account by the Ministry of Education in the effort to produce a young generation with the skills and ability to compete in the economic world (Ministry of Education, 2012).

Therefore, teacher leadership is an important aspect in improving the quality of teaching and learning which in turn can improve the performance of students and schools. The teacher leadership model is the cornerstone of producing high quality teachers in line with the international standards of quality education. In addition, teacher leadership is more effective when teachers as leaders are directly involved in school administration especially in decision making by school leaders. Teachers' leadership becomes stronger in the context of school culture that supports of techer leadership (Azhar, Ramli, Akmaliah, & Soaib, 2015). Teachers leadership is also found to create teachers' efficacy in carrying out their duties in the education system in schools especially when teachers carry out teaching and learning

activities. Therefore, the model of teacher leadership measurement model that affects teachers' efficacy and the influence of organizational support towards teacher leadership and teacher efficacy should be done to provide a more comprehensive understanding of teacher leadership studies. The teacher leadership measurement, organizational support and teacher efficacy model were analyzed using the confirmatory factor analysis (CFA).

Validating of Measurement Model

Confirmatory factor analysis (CFA) analysis was performed to analyze the compatibility of this research model. CFA analysis is aimed at validating the items used to measure the constructs of this study (Hair, Black, Babin, & Anderson, 2010).

The data in the study also need to be normalized to meet the requirements of CFA analysis with skewness and kurtosis values between +1 and -1 (Hair et al., 2010). CFA analysis requires at least 200 respondents {Formatting Citation}. Confirmatory factor analysis (CFA) is aimed to determine the unidimensionality, validity and reliability of this research model. Among the aspects that must be fulfilled are as follows:

(i) **Uni dimensionality**

Uni dimensionality is shown when each indicator is contained on one factor only. Uni dimensionality also shows no correlation of measurement errors in each indicator. The minimum number of indicators or items for each factor is at least three indicators (Kline, 2011). Uni dimensionality is achieved when each item has a loading factor of more than 0.5 for newly constructed items and exceeds 0.6 for items that have been constructed. Items with factor load of less than 0.5 should be dropped (Hair et al., 2010).

(ii) **Validity**

Validity in research is the ability of an instrument to measure what to measure (Kerlinger, 1986). The three types of validity required for this measurement model are as follows:

(a) **Convergent Validity**

The validity of convergence is also the correlation value of a size with the predicted size correlated theoretically. Concentration validity is obtained when all item of measurement model indicates significant condition. Validity can be verified when all constructs have AVE values greater than 0.5 (Hair et al., 2010).

(b) Construct Validity

The construct validity also refers to the item representing the constructs to be measured. The construct validity is achieved when the Fitness Indexes for the construct is fulfilled (Kline, 2011). The model's equivalency index in the model equation structure (SEM-Structural Equation model) is to show the extent to which the model corresponds to the data analyzed in the study. Hair et al. (2010) has suggested that the Fitness Indexes be fulfilled at least from one of the match model categories. The three categories of model correspondence in the measurement model are absolute fit, incremental fit and parsimonious fit as shown in Table 1.1.

Table 1.1
The three categories of model fit and their level of acceptance

Name of category	Name of index	Level of acceptance
1. Absolute Fit	*Chisq(Discrepancy Chi Square*	*P* > 0.05
	RMSEA(Root Mean Square of Error Approximation)	RMSEA < 0.08
	GFI(Goodness of Fit)	GFI > 0.90
2. Incremental fit	*AGFI(Adjust Goodness of Fit Index)*	AGFI > 0.90
	CFI(Comparative Fit Index)	CFI > 0.90
	TLI(Tucker-Lewis Index)	TLI > 0.90
	NFI(Normed Fit Index)	NFI > 0.90
3. ***Parsimonious fit***	***Chisq/df(Chi Square/Degrees of Freedom)***	Chi/df < 5.0

RMSEA, GFI, CFI and Chisq/df are recommended scince they are frequently reported in literatures. Researchers differ on their reporting on the acceptable cut-off values, which are derived from their justifications resulting from their reviewed literatures. The widely literature supported on the widely employed fitness indexes are presented in Table 1.2.

Table 1.2
The literature support for the respective fitness index

Name of category	Name of index	Index full name	Literature
1. Absolute fit	Chi-Square	Discrepancy Chi Square	Wheaton et al. (19 77)
	RMSEA	Root Mean Square of Error Approximation	Browe and Cudeck (1993)
	GFI	Goodness of Fit Index	Joreskog and Sorbom (1984)
2. Incremental fit	AGFI	Adjust Goodness of Fit Index	Tanaka and Huba (1985)
	CFI	Comparative Fit Index	Bentler (1990)
	TLI	Tucker-Lewis Index	Bentler and Bonett (1980)
	NFI	Normed Fit Index	Bollen (1989b)
3. Parsimonious fit	Chisq/df	Chi Square/Degrees of Freedom	Marsh and Hocevar (1985)

(c) **Discriminant Validity**

Discriminant validity indicates that constructs are not correlated between the other constructs theoretically. Discriminant validity which indicates a high value indicates that the construct is unique. If the correlation value between the two latent variables exceeds 0.9 then it indicates there is an overlap between the constructs (Hair et al., 2010).

(iii) **Reliability**

Coefficient of reliability of construction refers to the measure of internal consistency of the constructs indicator which refers to the uniformity of the latent variables and calculated constructs of reliability (Hair et al., 2010).

Once the model has reached a good fit and acceptable, the next step is to determine the reliability and validity of the construct. The reliability rating of a measurement model is obtained based on the following characteristics:

(a) **Internal Reliability**

Internal Reliability (Cronbach's Alpha) is 0.70 or more (Hair et al., 2010).

(i) **Composite Reliability**

Composite Reliability is achieved when the Composite Reliability (CR) value is equal to or greater than 0.6. Composite Reliability (CR) values are calculated using the following formula (Hair et al., 2010).

(ii) **Average Variance Extracted (AVE)**

Average Variance Extracted (AVE) is obtained when the AVE value is equal to 0.5 or more to prove that sufficient convergent validity (Hair et al., 2010).

Steps to Verification of Skill Measurement Model for Teacher Leadership, Teacher Efficacy and Organizational Support

The Teacher's Leadership and Teacher's Efficacy measurement model is followed by following the following steps (Kline, 2011; Zainuddin, 2012)

(i) Run the CFA for the measurement model
(ii) Examine the Fitness Indexes obtained for measurement model. If the indexes do not meet the required level, then the researcher will examine the factor loading of each item
(iii) Delete an item with a load factor of less than 0.5
(iv) Delete one item at a time (select the lowest factor loading)
(vi) CFA analysis is implemented again after the item is removed
(vii) Examine the Fitness Indexes and repeat step (iii) to (vi) until the Fitness Indexes achieved
(viii) If the Fitness Indexes is not achieved, then look at the Modification Indices (MI). Remove one of the items that shows a high MI i.e. high MI values (over 15)
(ix) If there is a high correlation value of more than 0.9 between two sub constructs then researchers can combine the sub constructs
(iix) Get the Cronbach's Alpha, CR and AVE values to complement the measurement model

Conclusions and Future Agenda

Industrial revolution 4.0 has transformed the world landscape with the use of new technologies and innovations. This change has led to a transformation in the education system especially in Malaysia. This educational transformation needs to be implemented in line with the needs of the education ministry to produce a young generation with skills in line with current technological developments. Therefore, teacher leadership needs to be nurtured

and applied as a measure to ensure that teachers have a high efficacy in carrying out their duties and responsibilities as educators. Organizational support aspect should also be practiced by school administrators in order to ensure teacher leadership and teacher efficacy can be enhanced in school. This study is expected to provide additional information in teacher leadership, teacher efficacy and organizational support theory and as a guidance to provide teacher-training and professionalism improvement programs, to the school and the Malaysian Ministry of Education.

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