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Confirmatory Factor Analysis for Principal's 'Rabbani' Leadership, Present Climate Culture to Student Personality Formation in Terengganu State Secondary Schools

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Abstract

There are two ways to conduct Confirmatory Factor Analysis (CFA) using individual confirmatory factor analysis or group confirmatory factor analysis based on the measurement model. The number of items depends on the construct used in the study and the measurement model analysis is conducted separately if the number of items in the construct is more than four. Whereas, pooled CFA runs all measurement models at the same time. This Unidimensionality requirement can be met through the item deletion procedure that has a low factor loading value to reach the set level of fitness indexes. Items with a factor loading value of less than 0.6 are considered unimportant to the measurement of the construct and can be discarded (Chik & Abdullah, 2018). A total of 384 study samples were involved in this research, among PIHE (Public Institutions of Higher Education) students in three (3) states on the East Coast of Peninsular Malaysia. Data were analyzed using the IBM-SPSS-AMOS (SEM) program version 21.0. Adjustment tests were conducted to ensure that the tested indicators truly represent the construct being measured and Confirmatory Factor Analysis was conducted in this study as a prerequisite that must be met. The findings of the study show that all the correlations between the constructs Principal's 'Rabbani' Leadership (based on Practice of Building Kindness, Principal Capacity Building Practices, Group Resilience Building Practices, Practices for Building a Culture of Knowledge, Teaching Process Development Practices), Early Climate Culture and Student Personality Formation, have a value less than 0.85 (<0.85) among Terengganu state secondary school. The results of the combined

confirmatory factor analysis of all measurement models (Pooled CFA), prove that all constructs do not have a strong relationship with each other to avoid the existence of multicollinearity problems.
Keywords: Principal's 'Rabbani' Leadership, Early Climate Culture, Student Personality Formation, Confirmatory Factor Analysis (CFA), Pooled CFA

Introduction

Excellence in education is closely related to the practice of high discipline among school leaders and has a great impact on student achievement. Parents will send their children to excellent schools to ensure academic improvement and the formation of their children's personalities. Various methods have been adopted by the Ministry of Education Malaysia (MOE) to improve the quality of national education and one of them is through the Malaysian Education Development Plan 2013-2025 (Preschool to Post-Secondary Education). Through this 12-year development plan, the School Transformation Program 2025 (TS25) has been formulated to improve student achievement in schools through effective leadership of principals, competent teachers and strong commitment from the Parent-Teacher Association.

There are five important elements related to the leadership practices of principals and headmasters for schools as learning organizations. Among them are, providing learning opportunities and spaces for teachers, being a learning model, encouraging innovation, providing appreciation and recognition, and developing the potential of school staff. Therefore, the analysis in this study will collect real data to determine the influence of Principal's 'Rabbani' Leadership (based on Practice of Building Kindness, Principal Capacity Building Practices, Group Resilience Building Practices, Practices for Building a Culture of Knowledge, Teaching Process Development Practices), and Early Climate Culture on the Student Personality Formation among Terengganu state secondary schools. This article will verify the real data by using CFA analysis to determine validity and reliability.

Methodology

The research method used is quantitative and uses research instruments that have been adapted according to the suitability of factors Principal's 'Rabbani' Leadership (based on Practice of Building Kindness, Principal Capacity Building Practices, Group Resilience Building Practices, Practices for Building a Culture of Knowledge, Teaching Process Development Practices), and Early Climate Culture on the Student Personality Formation among Terengganu state secondary school. Data were analyzed using Structural Equation Modeling (SEM) with the help of the IBM-SPSS-AMOS version 21.0 program. SEM is formed with two main models namely Measurement Model and Structural Model. Before the SEM test is performed, an adaptation test should be conducted to ensure that the indicators tested truly represent the construct being measured. Confirmatory Factor Analysis (CFA) is a measurement model test to ensure that each construct meets procedures such as validity and reliability for each construct tested (Kline, 2016; Hair et al., 2006; Schumacker & Lomax, 2004). The fit of the measurement model is very important to ensure that each latent construct in this study has fit with the data studied before SEM can continue (Kline, 2016; Schumacker & Lomax, 2004).

Using the CFA method can assess the extent to which the observed factors are significant to the latent construct used. This evaluation is done by examining the value of the

strength of the regression structure path from the factor to the observed variable (ie Factor Loading value) instead of the relationship between the factors (Byrne, 2013). Through the use of CFA, any item that does not fit the measurement model is dropped from the model. This discrepancy is due to the low value of the load factor. Researchers need to perform the CFA process on all the constructs involved in the model, either separately or in a pooled CFA model (Alias & Hartini, 2017). The suitability of the tested hypothesis model was verified by using Fitness Indexes to see the value of Root Mean Square Error of Approximation (RMSEA<0.08), Comparative Fit Index (CFI>0.90) and Chi Square/Degrees of Freedom (chisq/df<5.0). According to Hair et al. (2006) if the χ2 value is less than 2.00 but significant, then it is necessary to state whether the sample size is large or vice versa. A sample size that exceeds 200 can cause the χ2 value to be significant. Because of that, Hair and his colleagues suggested two other indices namely CFI and RMSEA to ensure that the CFA analysis forms the unidimensionality of the study model. If the CFI value exceeds 0.90 and the RMSEA is less than 0.08, it is said that there is unidimensionality for the formation of each construct.

Findings

Confirmatory Factor Analysis (CFA)

There are two models that need to be analyzed in carrying out Structural Equation Modeling (SEM), namely the Measurement Model and the Structural Model. Chik and Abdullah (2018) suggest two steps that need to be carried out in a Structured Equation Modeling (SEM) namely: a) Confirming the Measurement Model of all the constructs involved through the Confirmatory Factor Analysis (CFA) method, and b) Modeling all the constructs into Structural Model as well as doing SEM procedures (Chik & Abdullah, 2018). The fit of the Measurement Model with the study data is important to validate a SEM. If the Measurement Model does not match the data from the field, then the constructed SEM is invalid. Therefore, the first step in SEM analysis is to determine the appropriateness of the Measurement Model to the data from the field. Analysis of the fit of the Measurement Model with field data is done by using Confirmatory Factor Analysis (CFA) to confirm the proposed Measurement Model of the construct.

Testing the Validity and Reliability of the Measurement Model: Before evaluating the appropriateness of a constructed model, the evaluation of Unidimensionality, Validity and Reliability of the Measurement Model of the construct of this study needs to be carried out first. Unidimensionality: This requirement can be met through the items deletion procedure that has a low Factor Loading value until it reaches the set Fitness Indexes level. Items with a Factor Loading value of less than 0.6 are considered unimportant to the measurement of the construct and should be discarded. Validity: The three types of validity that must be achieved by a construct measurement model are Construct Validity, Convergent Validity and Discriminant Validity. Construct Validity: Refers to the accuracy of a measurement instrument used to measure the intended construct in the study. Construct Validity describes the extent to which a statement in the item used can measure the construct that the researcher wants to measure. Construct Validity is achieved when all Fitness Indexes for the construct in question meet the specified level (Chik & Abdullah, 2018). Table 1 below shows the three categories of fit index that need to be achieved by a construct measurement model, namely Absolute Fit, Incremental Fit and Passionate Fit.

Table 1
Three 3 Categories of Matching Indexes and Recognized Index Types

Name of Category	Name of Index	Level of Acceptance
Absolute Fit Index	RMSEA	< 0.08
Incremental Fit Index	CFI	> 0.90
Parsimonious Fit Index	Chisq/df	< 3.0

Source: Chik & Abdullah (2018)

Convergent Validity: Refers to the relationship of a measurement model with other measurement models in theory. Convergent validity of a construct will be achieved if all Average Variance Extracted (AVE) values reach a minimum value of 0.50. Discriminant Validity: Explains the extent to which a construct does not have too strong a relationship with another construct in the same model so that it can be said that a construct is a shadow or repetition (redundant) of another construct. Discriminant Validity is assessed through the discriminant validity index summary. According to Chik & Abdullah (2018) and Hoque et al. (2017), discriminant validity for a construct can be achieved if all diagonal matrix values are greater than other values in row cells and also in column cells. The diagonal value of the matrix is the square root of the AVE, while the values in the matrix are the correlations between the constructs in the model. Average Variance Extracted (AVE): The AVE value is calculated from the factor loading value for each item in a certain construct and needs to reach a minimum limit of 0.50 (AVE > 0.5) to prove the reliability of the Measurement Model of a latent construct in this study, which can be achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022). Reliability: SEM uses the Composite Reliability (CR) value to verify the reliability of the Measurement Model according to the factor loading value of each item. Each construct that has a value of CR>0.6, has achieved Composite Reliability (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

CFA Analysis for the Measurement Model of Practice of Building Kindness Construct

The analysis of Fitness Indexes in Table 2 below shows that the Practice of Building Kindness construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

Table 2
Analysis To Determine Validity for Practice of Building Kindness Construct

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.038	Reach the set level
2. Incremental fit	CFI	0.999	Reach the set level
3. Parsimonious fit	ChiSq/df	1.680	Reach the set level

The Measurement Model for the Practice of Building Kindness construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

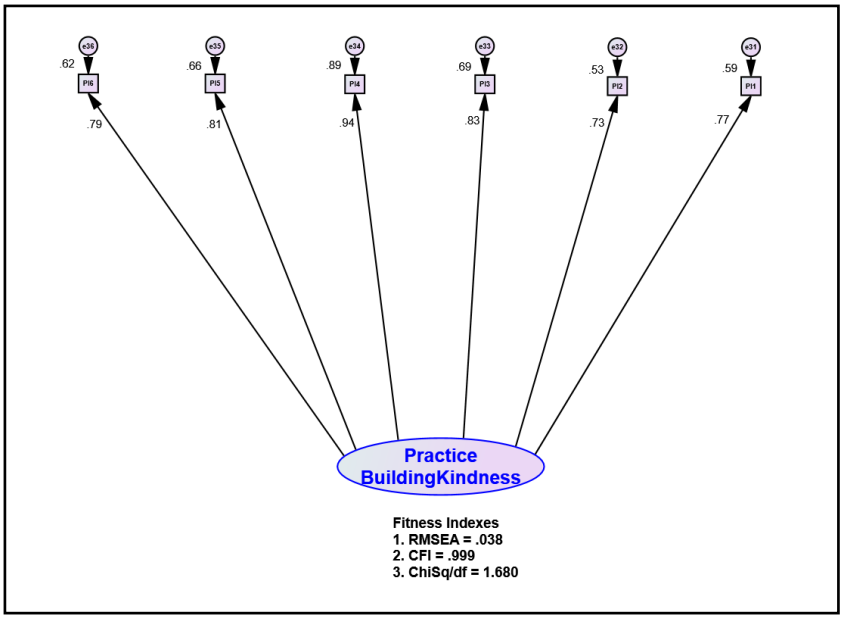

Figure 1. The Measurement Model of Practice of Building Kindness Construct

CFA Analysis for the Measurement Model of Principal Capacity Building Practices Construct

The analysis of Fitness Indexes in Table 3 below shows that the Principal Capacity Building Practices construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

Table 3
Analysis To Determine Validity for Principal Capacity Building Practices Construct

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.048	Reach the set level
2. Incremental fit	CFI	0.997	Reach the set level
3. Parsimonious fit	ChiSq/df	2.082	Reach the set level

The Measurement Model for the Principal Capacity Building Practices construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

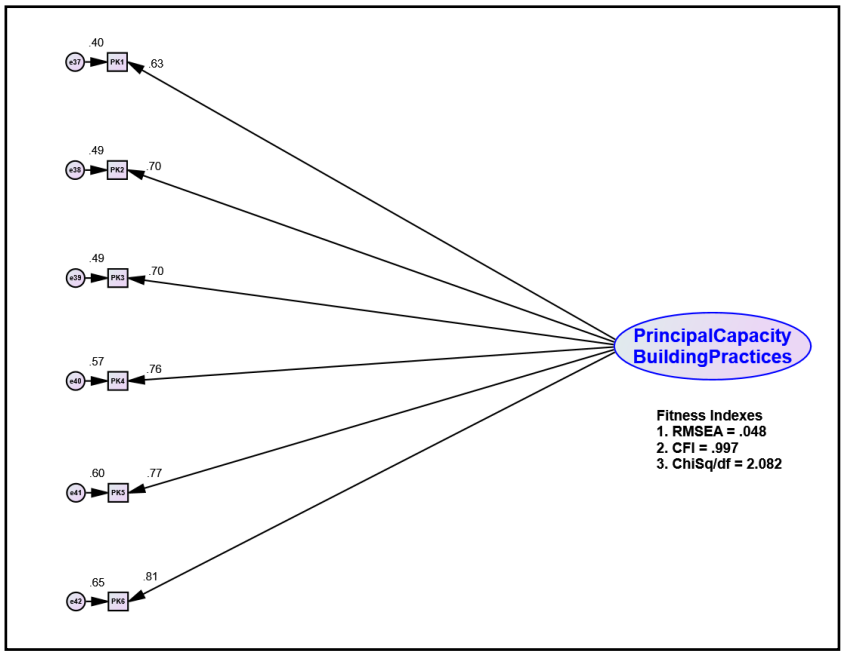

Figure 2. The Measurement Model of Principal Capacity Building Practices Construct

CFA Analysis for the Measurement Model of Group Resilience Building Practices Construct

The analysis of Fitness Indexes in Table 4 below shows that the Group Resilience Building Practices construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

Table 4
Analysis To Determine Validity for Group Resilience Building Practices Construct

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.074	Reach the set level
2. Incremental fit	CFI	0.989	Reach the set level
3. Parsimonious fit	ChiSq/df	3.637	Reach the set level

The Measurement Model for the Group Resilience Building Practices construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

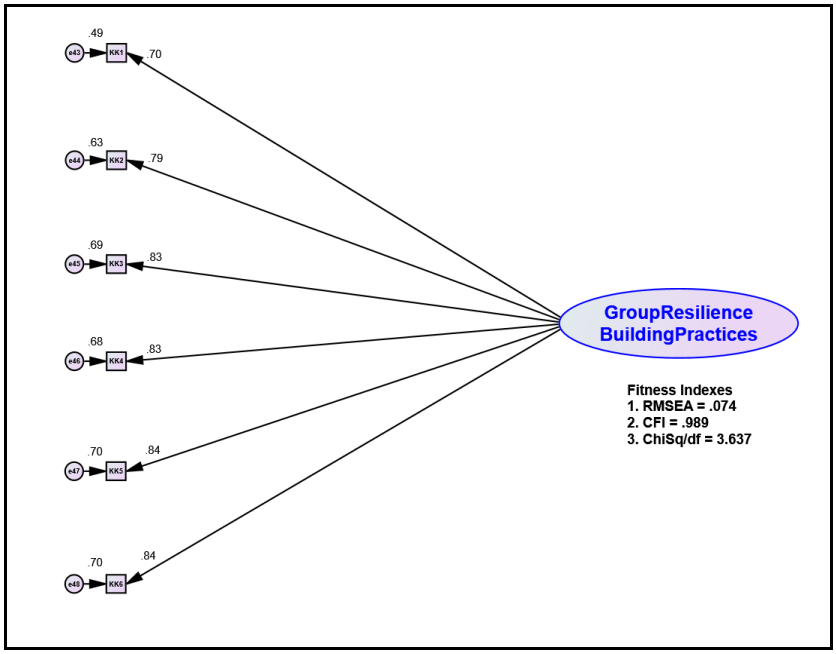

Figure 3. The Measurement Model of Group Resilience Building Practices Construct

CFA Analysis for the Measurement Model of Practices for Building a Culture of Knowledge Construct

The analysis of Fitness Indexes in Table 5 below shows that the Practices for Building a Culture of Knowledge construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

Table 5
Analysis To Determine Validity for Practices for Building a Culture of Knowledge Construct

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.058	Reach the set level
2. Incremental fit	CFI	0.996	Reach the set level
3. Parsimonious fit	ChiSq/df	2.636	Reach the set level

The Measurement Model for the Practices for Building a Culture of Knowledge construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

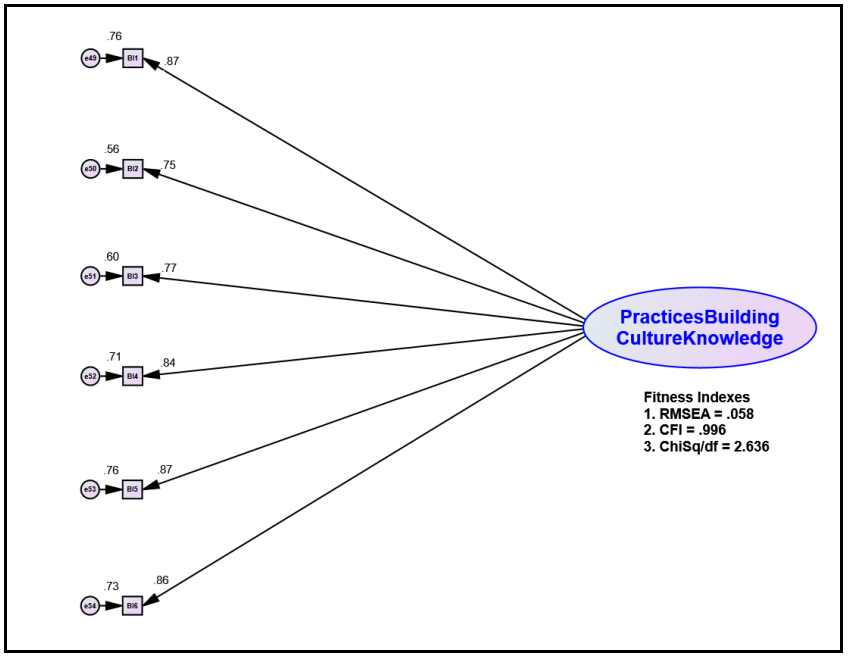

Figure 4. The Measurement Model of Practices for Building a Culture of Knowledge Construct

CFA Analysis for the Measurement Model of Teaching Process Development Practices Construct

The analysis of Fitness Indexes in Table 6 below shows that the Teaching Process Development Practices construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

Table 6
Analysis To Determine Validity for Teaching Process Development Practices Construct

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.047	Reach the set level
2. Incremental fit	CFI	0.996	Reach the set level
3. Parsimonious fit	ChiSq/df	2.053	Reach the set level

The Measurement Model for the Teaching Process Development Practices construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

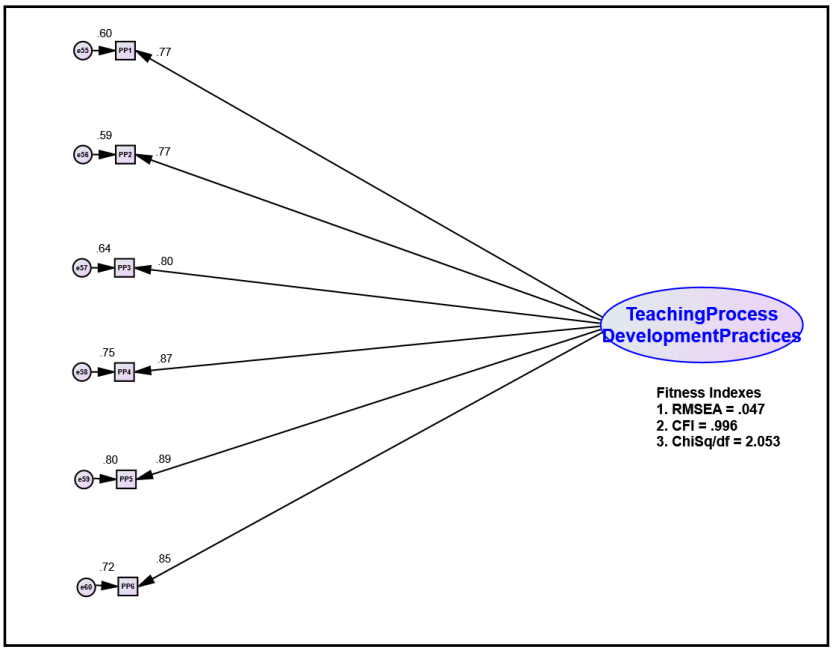

Figure 5. The Measurement Model of Teaching Process Development Practices Construct

CFA Analysis for the Measurement Model of Early Climate Culture Construct

The analysis of Fitness Indexes in Table 7 below shows that the Early Climate Culture construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

Table 7
Analysis To Determine Validity for Early Climate Culture Construct

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.048	Reach the set level
2. Incremental fit	CFI	0.932	Reach the set level
3. Parsimonious fit	ChiSq/df	2.102	Reach the set level

The Measurement Model for the Early Climate Culture construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

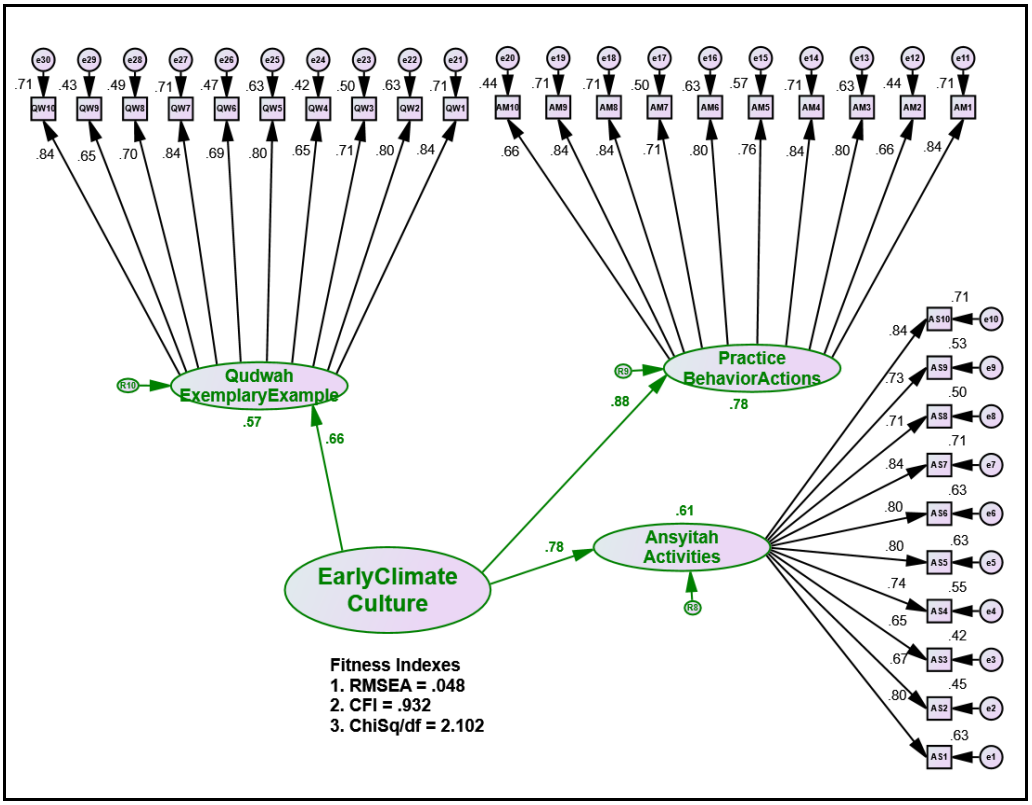

Figure 6. The Measurement Model of Early Climate Culture Construct

CFA Analysis for the Measurement Model of Student Personality Formation Construct

The analysis of Fitness Indexes in Table 8 below shows that the Student Personality Formation construct Measurement Model has reached the level of the Fitness Index level as stated in Table 1 above. This means that Construct Validity has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

Table 8
Analysis To Determine Validity for Student Personality Formation Construct

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.040	Reach the set level
2. Incremental fit	CFI	0.937	Reach the set level
3. Parsimonious fit	ChiSq/df	1.774	Reach the set level

The Measurement Model for the Student Personality Formation construct has reached the value of the Conformity Index level. This means that Construct Validity for this construct, has been achieved (Chik & Abdullah, 2018; Yusof et al, 2020; Jamin et al., 2022).

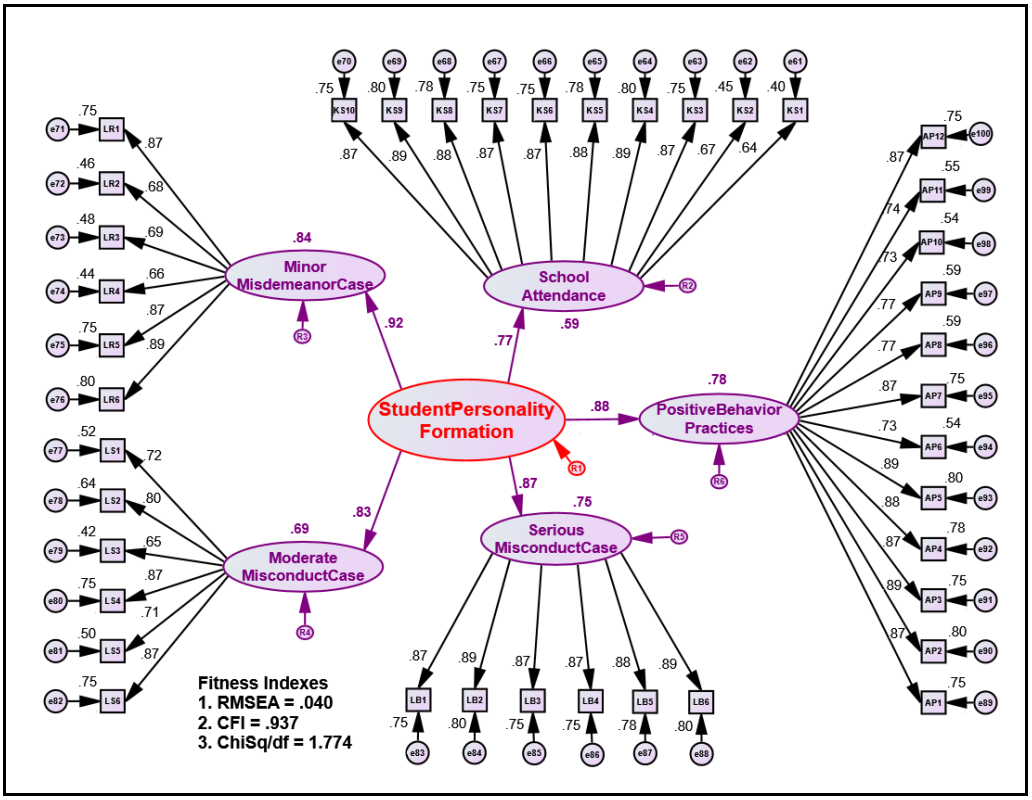

Figure 7. The Measurement Model of Student Personality Formation Construct

Combined Confirmatory Factor Analysis of All Measurement Models (Pooled CFA)

This Pooled CFA analysis is necessary to evaluate the correlation value between the constructs in the Discriminant Validity procedure. If the correlation value between two constructs exceeds 0.85, then there is redundancy between the two constructs (Chik & Abdullah, 2018). A model involving a second order construct is a construct that has dimensions or sub-constructs where each dimension or sub-construct has a certain number of items. Researchers will have difficulty combining all the second-level constructs in one model to conduct Pooled Confirmatory Factor Analysis (Pooled CFA). The solution, all second order constructs need to be summarized into a first order construct model by taking the mean item of each sub-construct or dimension (Chik & Abdullah, 2018). The results of the Pooled CFA procedure are shown in Figure 8 below. The single headed arrow value is the factor loading values of each item and the double headed arrow value is the correlation between constructs. Through the Pooled CFA method, only one model fit index that represents all the constructs is released. Table 9 below shows that all three categories of model fit index for the construct measurement model have been achieved.

Table 9
Analysis To Determine Validity for All Constructs and Sub-Constructs

Category Name	Index Name	Index Value	Findings
1. Absolute fit	RMSEA	0.051	Reach the set level
2. Incremental fit	CFI	0.975	Reach the set level
3. Parsimonious fit	ChiSq/df	2.223	Reach the set level

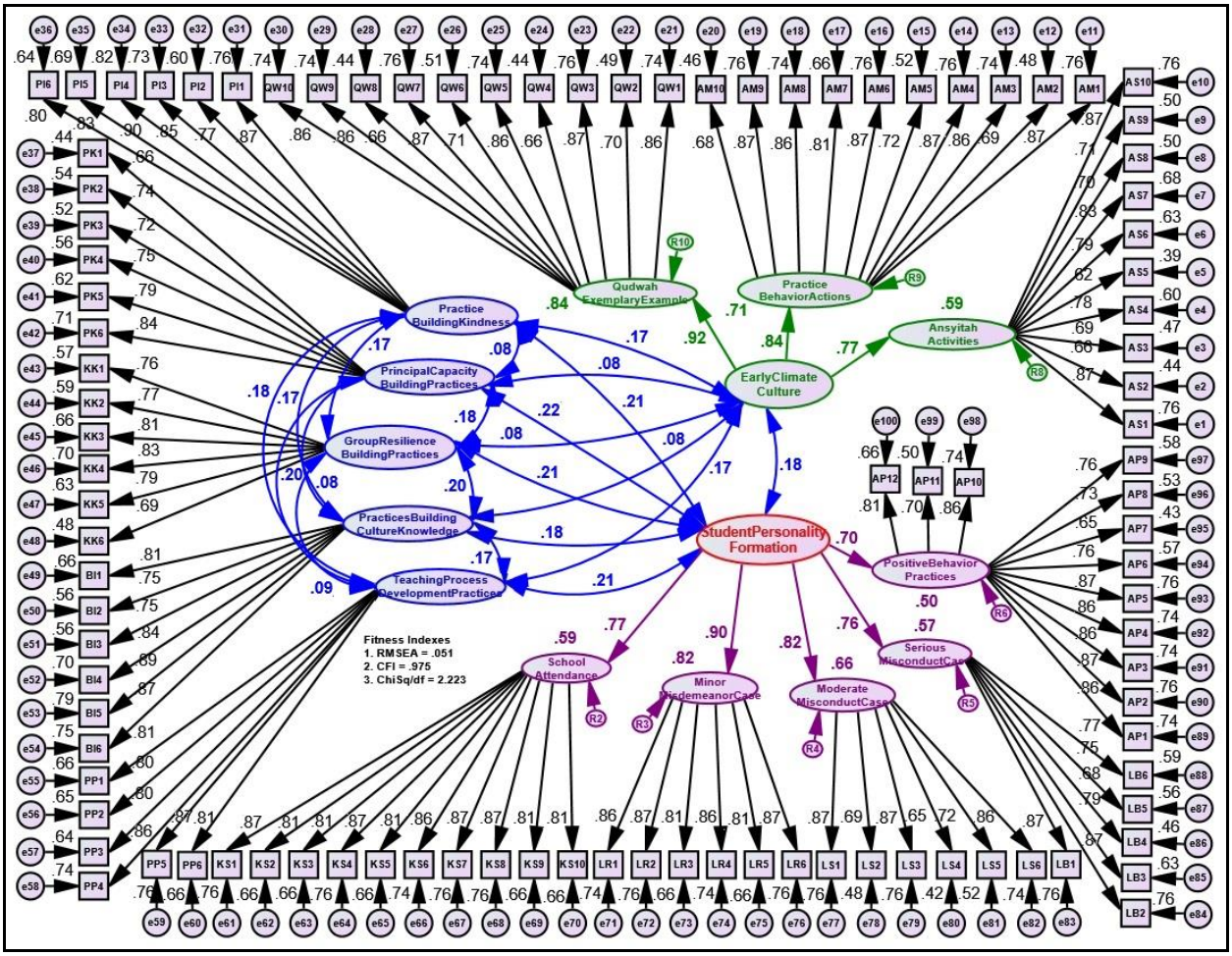

Figure 8. Pooled CFA Analysis Findings

Discriminant Validity is necessary to prove that all the constructs in the model do not have a strong relationship with each other leading to the problem of multicollinearity (Chik & Abdullah, 2018). Table 10 below shows the Discriminant Validity Index Summary between all the constructs in the model.

Table 10
Discriminant Validity Index Summary

Construct	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Practice of Building Kindness (a)	**0.84**						
Principal Capacity Building Practices (b)	0.08	**0.75**					
Group Resilience Building Practices (c)	0.17	0.18	**0.78**				
Practices for Building a Culture of Knowledge (d)	0.17	0.08	0.20	**0.82**			
Teaching Process Development Practices (e)	0.18	0.20	0.09	0.17	**0.83**		
Early Climate Culture (f)	0.17	0.08	0.08	0.08	0.17	**0.85**	
Student Personality Formation (g)	0.21	0.22	0.21	0.18	0.21	0.18	**0.80**

Table 10 above presents the square root value of AVE for each construct on the diagonal matrix. The other values in the table are correlations between the two constructs. According to Chik and Abdullah (2018), Discriminant Validity will be achieved if all the values

of the square root of AVE (Diagonal) are greater than other values whether the values are in rows or columns. Findings from Table 10 show that Discriminant Validity for all constructs in the model has been achieved.

Conclusion

Overall, the CFA analysis conducted on the measurement model for Principal's 'Rabbani' Leadership (based on Practice of Building Kindness, Principal Capacity Building Practices, Group Resilience Building Practices, Practices for Building a Culture of Knowledge, Teaching Process Development Practices), Early Climate Culture and Student Personality Formation construct, has reached the level of fitness indexes. The results of the combined confirmatory factor analysis of all measurement models (Pooled CFA), prove that all constructs do not have a strong relationship with each other to avoid the existence of multicollinearity problems.

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References

Byrne, B. M. (2013). *Structural equation modeling with AMOS: Basic concepts, applications, and programming (2nd ed.).* New York: Routledge.

Chik, Z., & Abdullah, A. H. (2018). Developing and validating instruments for measurement of motivation, learning styles and learning disciplines for academic achievement. *International Journal of Academic Research in Business and Social Sciences, 8* (4), 594 - 605.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivatiate data analysis (6th ed.).* New Jersey: Pearson Education International.

Hoque, A. S. M. M., Awang, Z., Jusoff, K., Salleh, F., and Muda, H (2017). Social Business Efficiency: Instrument Development and Validation Procedure using Structural Equation Modelling. International Business Management, 11(1), 222-231.

Jamin, N. H., Surat, S., & Wan Mohammad, W. M. R. (2022). Model pengukuran konstruk pengetahuan guru dalam kemahiran berfikir aras tinggi (KBAT): Analisis faktor pengesahan. Malaysian Journal of Social Sciences and Humanities (MJSSH), 7(2), 1-18. https://doi.org/10.47405/mjssh.v7i2.1299.

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th edition). New York: The Guilford Press.

Lewis-Beck M. S. (1994). *Factor analysis and related techniques*. London: Sage Publication, Ltd.

Schumacker, R. E. & Lomax, R. (2004). *A beginner's guide to structural equation modeling (2nd edition)*. Mahwah, New Jersey: Lawrence Erlbaun Associates Publishers.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics (6th ed.).* Boston, MA: Pearson.

Yusof, H., Ramelan, N. H., Mohd Noor, M. A., & Mansor, M. (2020). Exploratory and confirmatory factor analysis on the values aspects of teacher leadership model. *Universal Journal of Educational Research, 8* (12), 7085-7100. DOI: 10.13189/ujer.2020.081276.