Developing and Validating the Instruments for Measurement of Motivation, Learning Style and Learning Discipline in Islamic Education

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Abstract. In Islamic education today, not many researchers use quantitative research methods based on Structural Equation Modeling (SEM) to analyze the various relationships between the variables in the model formed based on the theory under study. This research will establish and validate the instrument by using Exploratory Factor Analysis (EFA) to measure motivation, learning styles and learning discipline in Islamic Education subjects. This study has adapted the instruments that have been developed by some previous researchers, as well as modify some statements in accordance with current research. According to Awang (2010: 2012), if a researcher adapts the instruments previously developed by the researchers and modifies the statement to fit the current research, they need to re-run the Exploration Factor Analysis (EFA) procedure because the current field of study may different from previous studies, or the current study population is much different from previous studies in terms of socio-economic, racial and cultural status. Therefore some of the previously built items are no longer suitable for current research, or there may be different structural items in the current study compared to structures that have been found in previous studies. Therefore, researchers need to recalculate the value of Internal Reliability for the current instrument of the new Cronbach Alpha value. Taking into consideration the recommendation by Awang (2010; 2012), researchers have decided to re-run EFA on items that measure their construction. This study will explain in detail the procedures for carrying out EFA analysis for each construct in Islamic education studies.

Introduction

Education is a constantly changing field in line with the development of the environment. During the learning and facilitation process (Learning and Facilitation - PdPc) in schools, teachers are a key factor that can influence the way students learn. Although some students learn something according to their own approach or method, they do not realize that the method they use is a distinctive and different learning style with other students. According to Emeliana, Hussin, Mohd Izyan, Shamsul and Azizi (2012), teachers should make full use of every learning style to make learning more interesting. Teachers should also communicate clearly, motivate and apply flexible learning styles, especially in Islamic Education subjects that are mostly taught in regular schools and religious schools. Most parents today are eager to send their children to religious schools, in the hope that their children will be religious.

In the study of Islamic education, researchers rarely use Structural Equation Modeling (SEM) methodology to analyze the various relationships among variables in the model formed based on the theories studied. The validity and reliability of the questionnaire items may be disputed, as they are not appropriate to evaluate them. Therefore, to generate validity and reliability of the questionnaire items, investigators must use Exploratory Factor Analysis (EFA). This research will explain in detail the methods to obtain validity and reliability of item questionnaires by using EFA for measuring motivation, learning style and learning discipline for Islamic Education subjects.

Literature Review

Wanqing, Chin and Khairi (2012), found that external motivations such as fun, language learning, self-esteem and socio-cultural influences (the desire to approach people and the culture of the international community) strongly influence the mastery of student learning. Joachim (2014) found that internal motivation factors were higher than the external motivation for students in determining academic achievement in their learning. According to Azizi and Donald (2010), motivation can affect the areas of growth, development, learning and achievement. A high level of motivation will motivate students, while the emotional element affects and influences the student's learning style compared to other elements. According to Gwo, Han, Chun and Iwen (2013), learning styles are considered as one of the factors that need to be taken into account in developing the learning system. Most students learn with learning styles according to the teacher's version of instruction, resulting in better learning achievement than those who do not follow the instructions.

Furthermore, Bambang (2010) found that there are several factors that influence the achievement of learning, where the level of student learning discipline is one of the factors that affect the achievement. The higher the level of discipline of learning, the higher the learning achievement that can be achieved. Therefore, teachers always use learning models that can improve students' learning discipline, while parents need to pay attention to how their children learn, in order to form the character of learning discipline.

Exploratory Factor Analysis (EFA)

EFA is identifying the components that exist within the set of questionnaires that have been established. EFA is a statistical technique that transforms a linearly constructed data set into a small construction set that can provide a thorough overview of all the information contained in the original construction (Duntemen, 1989). The goal of EFA is to reduce the dimensions of the original data to some smaller components and can be interpreted more easily and meaningfully (Duntemen, 1989; Lewis-Beck, 1994 & Field, 2006).

According to Tabachnick and Fidell (2007), EFA must go through several levels. The first rank calculates the correlation matrix between all factors analysed by factors. The next stage eliminates several factors from the matrix correlation and determines the number of factors formed. Reversal of these factors is done to improve the interpretation so that factors are more meaningful and can be interpreted. The last and most important step in factor analysis is to interpret the results of the factors obtained and give the appropriate name for each factor.

The instrument used in this study has adapted the instruments that have been developed by some previous researchers based on Islamic education subjects, as well as modifying some statements to suit the ongoing research. According to Awang (2010: 2012), Hoque et al (2016; 2017) and Noor et al. (2015), if a researcher adjusts the instruments previously set by the researchers and modifies statements appropriate to current research, then they must re-run the EFA procedure. This is because the current field of study may be different from previous studies, or the current research population is much different from previous studies in terms of socio-economic, racial and cultural status.

Therefore, there may be some items that were previously built, no longer appropriate for current research or there may also be different item structures in the current study compared to structures in previous studies. Therefore, researchers need to recalculate the value of Internal Reliability for the current instrument, the new Cronbach Alpha value (Awang, 2010: 2012; Hoque et al., 2016; 2017). In this study, researchers conducted a pilot study on 100 Form 4 students and ran an EFA on an item that measures construction by considering recommendations by Awang (2010; 2012) and Hoque et al. (2016, 2017).

Research Findings

Exploratory Factor Analysis (EFA) for Motivation Constructs. Building Motivation is measured using 8 items labelled as MD1 to ML8. Each item statement is measured using an Interval Scale of 1 to 10. The EFA procedure using Principal Component Analysis (PCA) with Varimax Rotation has been performed on 8 items that measure the construction of Motivation. The findings from Table 1 show that the Bartlet Test score is significant (P value <0.05). Measure Sampling Adequacy by Kaiser-Meyer-Olkin (KMO) is 0.723 which is above the minimum value of 0.6 (Awang, 2010 and 2012 and Hoque et al., 2016; 2017). Both achievements (Significant Bartlet Test, and KMO value> 0.6) reflect observed data for subsequent procedures in Factor Exploration Analysis (EFA) (Awang, 2010 and 2012 and Hoque et al., 2016; 2017).

Table 1: Value of KMO and Bartlet Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.723**
Bartlett's Test of Sphericity	Approx. Chi-Square	237.236
	df	28
	Sig.	.000

The total value of the described variance (Total Variance Explained) is important for the researcher to know what percentage of items used can measure the study construction. Table 2 shows the total value of variance estimated by the items used to measure the construction of Motivation. The reading from Table 2 shows that the construction of motivation measured using 8 items in 2 components can measure the construction of the Motivation of 68.118%. This value is sufficient because it exceeds the minimum requirements of 60% (Awang, 2010; 2012 and Hoque et al., 2016; 2017).

Table 2: The Estimated Amount of Variance

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.137	39.217	39.217	3.137	39.217	39.217
2	2.512	28.901	68.118	2.512	28.901	**68.118**

Extraction Method: Principal Component Analysis.

The findings from Table 2 show the construction of Motivation measured by two components only. Thus, the researcher wants to know the item chosen to measure the component. Table 3 shows the distribution of items received to measure the constructs of Motivation. All items have a factor weighting factor (Factor Loading) exceeding the minimum limit of 0.6 as suggested by Awang (2010; 2012) and Hoque et al. (2016, 2017). Items weighing less than 0.6 should be excluded as they do not contribute to construction constructs (Awang, 2010 and 2012 and Hoque et al., 2016; 2017). MD1 and ML8 items have a weighting factor of less than 0.6 and are excluded from the questionnaire for further study.

Table 3: Items for components

Component Matrixa		
	Component	
	1	2
MD1	This item is disengaged	
MD2		.699
MD3		.778
MD4		.784
ML5	.783	
ML6	.844	
ML7	.850	
ML8	This item is disengaged	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Another information that should be reported by researchers is the reliability of items that have been built to measure the constructs. Measurement of instrument reliability is estimated through the Cronbach Alpha value. The Cronbach Alpha value of the instrument must exceed a minimum of 0.7 for adoption in this study. Table 4 shows the Cronbach Alpha value for each component of the Motivation construction. This construction has an Alpha Cronbach value exceeding the value of 0.7 and can be applied in this study (Awang, 2010; 2012 and Hoque et al., 2016; 2017).

Table 4: Instrument Reliability Value

Component	Number of Items	Cronbach's Alpha
1	3	.808
2	3	.797
Total	**6**	

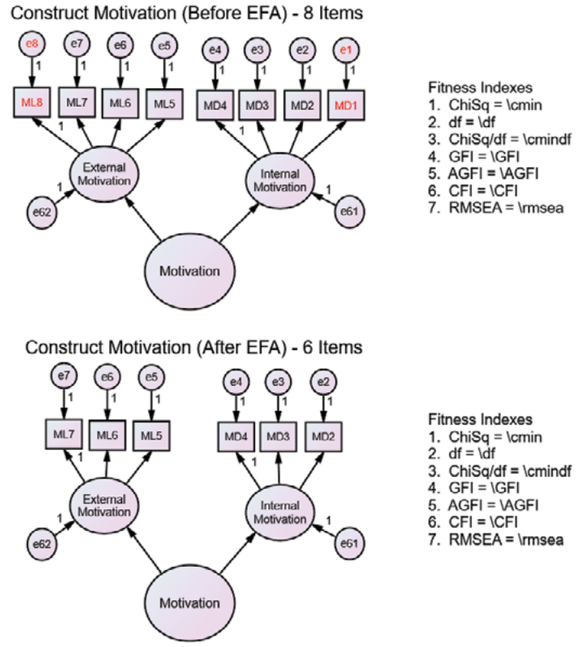

Figure 1: Component Position and Item for Motivation Construct (Before and After EFA)

Exploratory Factor Analysis (EFA) for Learning Style Constructs. Constructing Learning Style is measured using 45 items shortened GP9 to GGU53. Each item statement is measured using the Interval Scale between 1 and 10. The exploration factor analysis procedure (EAEX) using the Component Principal Analysis (PCA) method with Varimax Rotation has been done on 45 items that measure the Learning style. The findings in Table 5 indicate that the Bartlet Test score is significant (P value <0.05). At the same time, the Measure of Sampling Sufficiency measure by Kaiser-Meyer-Olkin (KMO) is 0.877 which is above the minimum value of 0.6 (Awang, 2010: 2012; Hoque et al., 2016; 2017). These two achievements (Significant Bartlet Test, and KMO value> 0.6) reflect eligible data for subsequent procedures in Factor Exploration Analysis (EFA) (Awang, 2010: 2012; Hoque et al., 2016; 2017).

Table 5: Value of KMO and Bartlett Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.877**
Bartlett's Test of Sphericity	Approx. Chi-Square	4120.009
	df	990
	Sig.	.000

The total variance value explained (Total Variance Explained) is important for the researcher to know what percentage of items used can measure the study construction. Table 6 shows the total value of variance estimated by the item used to measure the Learning Style construct. The reading from Table 6 shows that the Learning Style construct measured using 4 components can measure the learning style 60.774%. This value is sufficient because it exceeds the minimum requirements of 60% (Awang, 2010; 2012 and Hoque et al., 2016; 2017).

Table 6: The Number of Components and Value of Variance Described

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	18.911	42.024	42.024	18.911	42.024	42.024
2	4.336	9.636	51.660	4.336	9.636	51.660
3	2.301	5.114	56.774	2.301	5.114	56.774
4	1.800	3.999	60.774	1.800	3.999	**60.774**

Extraction Method: Principal Component Analysis.

The findings from Table 6 show the construction of a Learning Style measured by 4 components. Thus, the researcher wants to know the selected item to measure each component. Table 7 shows the distribution of items received to measure the Learning Style construct. All items have a factor weighting factor (Factor Loading) exceeding the minimum limit of 0.6 as suggested by Awang (2010; 2012) and Hoque et al. (2016, 2017). Items with a weighting factor of less than 0.6 should be excluded as they do not contribute to construction measurements (Awang, 2010 and 2012 and Hoque et al., 2016; 2017).

Table 7: Number of Extracted Components

Rotated Component Matrixa				
	Component			
	1	2	3	4
GP9				.843
GP10				.845
GP11	This item is disengaged			
GP12				.840
GP13				.875
GP14		.644		
GP15	This item is disengaged			
GP16		.719		
GP17		.692		
GP18		.680		
GP19	This item is disengaged			
GP20	This item is disengaged			
GM21	This item is disengaged			
GM22	This item is disengaged			
GM23	This item is disengaged			
GM24	.623			
GM25	.629			
GM26	.744			
GM27	.742			
GM28	.755			
GM29	.720			
GM30	.707			
GM31	.784			
GM32	.721			

Rotated Component Matrixa				
	Component			
	1	2	3	4
GT33		This item is disengaged		
GT34	.715			
GT35		This item is disengaged		
GT36	.762			
GT37	.814			
GT38	.813			
GT39	.798			
GT40	.743			
GT41		This item is disengaged		
GT42		This item is disengaged		
GT43		This item is disengaged		
GT44		This item is disengaged		
GGU45		This item is disengaged		
GGU46		This item is disengaged		
GGU47		This item is disengaged		
GGU48	.710			
GGU49		This item is disengaged		
GGU50		This item is disengaged		
GGU51	.741			
GGU52	.681			
GGU53	.630			

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

Another information that will be reported by the researcher is the internal reliability value of the item that has been selected to measure the construct. Measurement of instrument reliability is estimated through the Cronbach Alpha value. The Cronbach Alpha value of the instrument must exceed a minimum of 0.7 for adoption in this study. Table 8 shows the Alpha Cronbach value for each Learning style component. This construction has an Alpha Cronbach value exceeding the value of 0.7 and can be applied in this study (Awang, 2010; 2012 and Hoque et al., 2016; 2017). Table 8 shows all the components that measure this construction to achieve the required internal reliability.

Table 8: Internal Reliability Values

Component	**Number of Items**	**Alpha Cronbach**
1	4	0.908
2	4	0.815
3	9	0.935
4	10	0.961
Total	**27**	

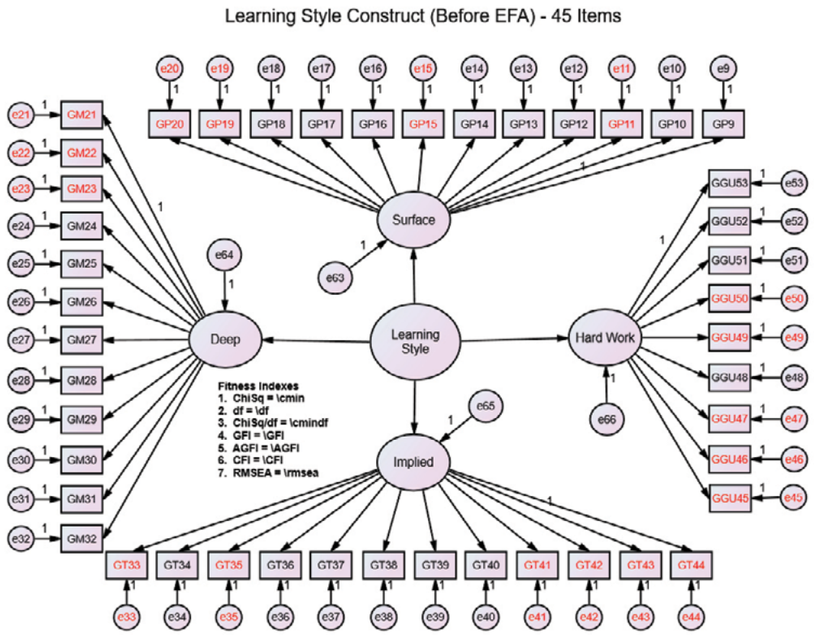

Figure 2: Component Position and Item for Learning Style Constructs (Before EFA)

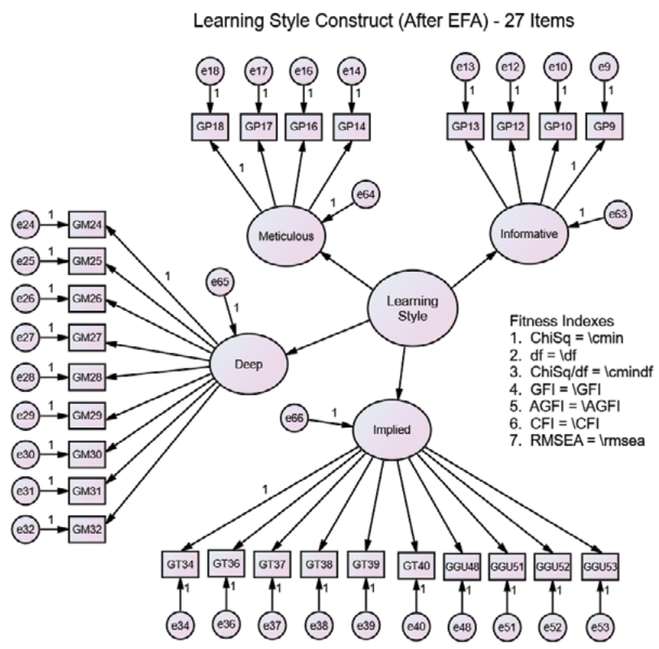

Figure 3: Component Position and Item for Learning Style Constructs (After EFA)

Exploratory Factor Analysis (EFA) for Learning Discipline Constructs. Build Discipline Learning is measured using 7 items shortened DP54 to DP60. Each item statement is measured using an Interval Scale of 1 to 10. The Factor Exploration Factor (EFA) procedure using the Component Component Analysis (PCA) method with Varimax Rotation has been performed on 7 items that measure the constructs of Learning Discourse. The findings in Table 9 indicate that

the Bartlet Test score is significant (P value <0.05). At the same time, the Measure of Sampling Sufficiency measure by Kaiser-Meyer-Olkin (KMO) is 0.891 which is above the minimum value of 0.6 (Awang, 2010: 2012; Hoque et al., 2016; 2017). These two achievements (Significant Bartlet Test, and KMO value> 0.6) reflect eligible data for subsequent procedures in Factor Exploration Analysis (EFA) (Awang, 2010: 2012; Hoque et al., 2016; 2017).

Table 9: Value of KMO and Bartlett Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.891**
Bartlett's Test of Sphericity	Approx. Chi-Square	436.473
	df	21
	Sig.	.000

The total variance value explained (Total Variance Explained) is important for the researcher to know what percentage of items used can measure the study construction. Table 10 shows the total variance values estimated by the items used to measure the construction of the Learning Discipline. The reading from Table 10 found that the Learning Discourse construction measured using one component can measure the Learning Discipline concept of 64.307%. This value is sufficient because it exceeds the minimum requirements of 60% (Awang, 2010; 2012 and Hoque et al., 2016; 2017).

Table 10: Number of Components and Value of Variance Described

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.501	64.307	64.307	4.501	64.307	**64.307**

Extraction Method: Principal Component Analysis.

The findings from Table 10 show the construction of the Learning Discipline as measured by one component. Thus, the researcher wants to know the selected item to measure each component. Table 11 shows the distribution of goods received to measure the construction of the Learning Discipline. All items have a factor weighting factor (Factor Loading) exceeding the minimum limit of 0.6 as suggested by Awang (2010; 2012) and Hoque et al. (2016, 2017). Items with a weighting factor of less than 0.6 should be excluded as they do not contribute to construction measurements (Awang, 2010 and 2012 and Hoque et al., 2016; 2017).

Table 11: Number of Extracted Components

Component Matrixa	
	Component
	1
DP54	This item is disengaged
DP55	.763
DP56	.886
DP57	.857
DP58	.871
DP59	.808
DP60	.810

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

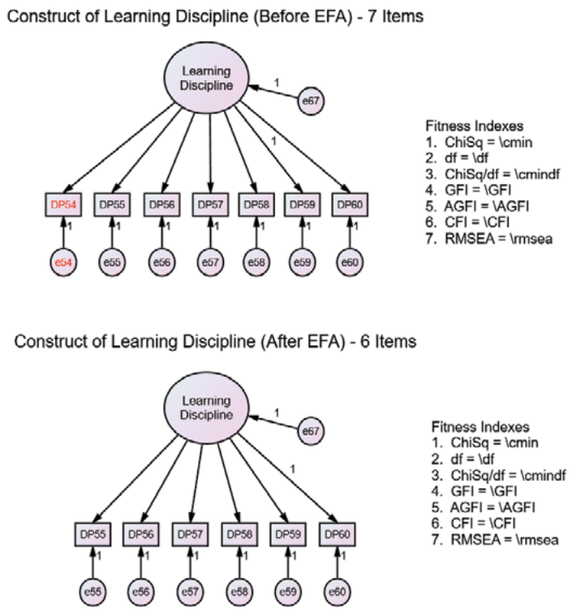

Figure 4: Component Position and Item for Learning Discipline Constructs (Before & After EFA)

Another information that will be reported by the researcher is the internal reliability value of the item that has been selected to measure the construct. Measurement of instrument reliability is estimated through the Cronbach Alpha value. The Cronbach Alpha value of the instrument must exceed a minimum of 0.7 for adoption in this study. Table 12 shows the Alpha Cronbach values for each Learning Learning Discipline component. This construction has an Alpha Cronbach value exceeding the value of 0.7 and can be applied in this study (Awang, 2010; 2012 and Hoque et al., 2016; 2017). Table 12 shows all the components that measure this construction to achieve the required internal reliability.

Table 12: Internal Reliability Values

Component	Number of Items	Alpha Cronbach
1	6	0.912
Total	**6**	

Conclusion

Overall, the goods requirement in each construction as a whole meets Bartlet Test achievements (significant), KMO (> 0.6), factor weighting (Loading Factors) exceeds the minimum threshold of 0.6 and Alpha Cronbach exceeds the minimum limit of 0.7 for adoption in this study. This reflects that the items not set aside are applicable in this study (Awang, 2010; 2012; Hoque et al., 2016; 2017). After applying EFA, items to build Motivation have decreased from 8 to 6, Learning Style items decreased from 45 to 27 and the Learning Discipline item decreased from 7 to 6. The total item of the instrument in this study decreased from 60 to 39.

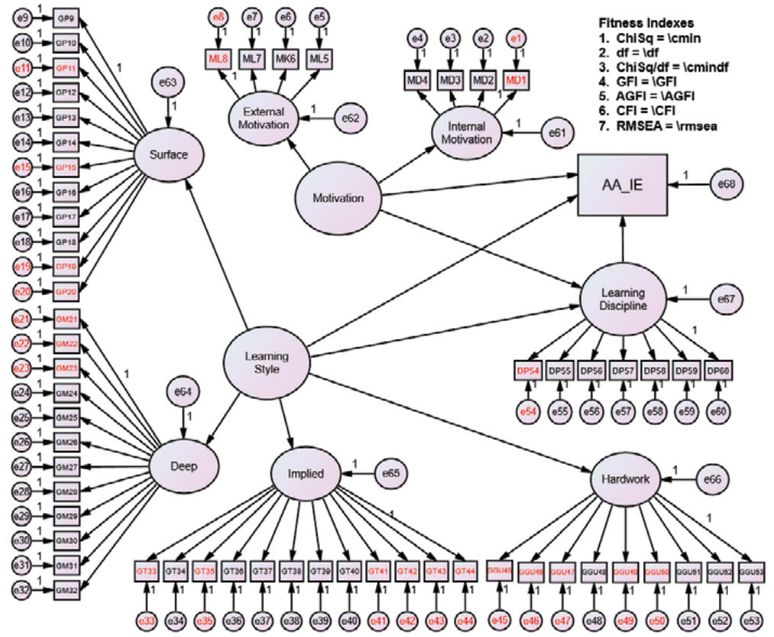

Figure 5: Overall Motivation of Building, Learning Styles and Learning Disciplines Before EFA (60 items)

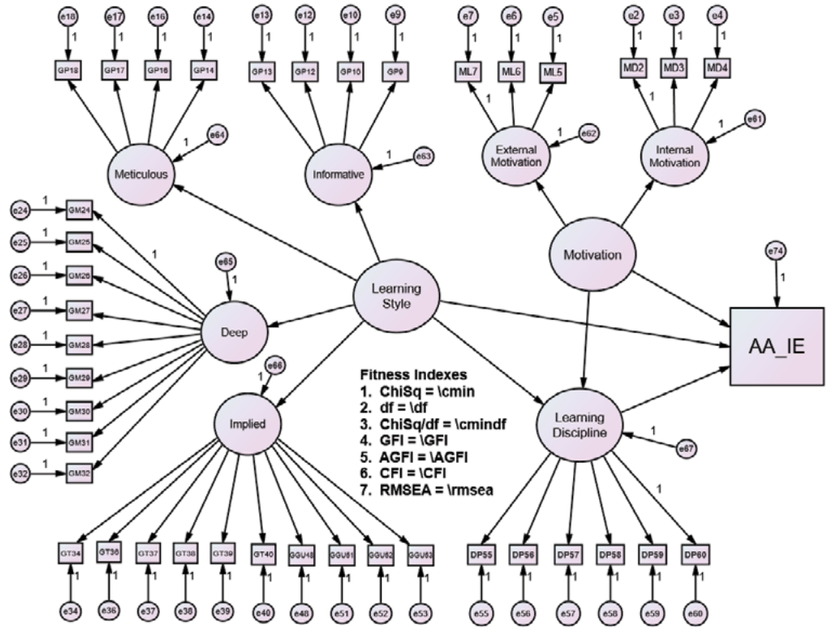

Figure 6: Overall Construct Model for Motivation, Learning Style & Learning Discipline After EFA (39 items)

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