

# Effect of Motivation, Learning Style and Discipline Learn about Academic Achievement Additional Mathematics

Zamri Chik, Abdul Hakim Abdullah

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## **Effect of Motivation, Learning Style and Discipline Learn about Academic Achievement Additional Mathematics**

**Zamri Chik, Abdul Hakim Abdullah**

Faculty of Islamic Contemporary Studies, Universiti Sultan Zainal Abidin, Gong Badak Campus,  
21300 Kuala Terengganu, Terengganu, Malaysia

### **Abstract**

Using quantitative research methods based on Structural Equation Modeling (SEM) in educational research, to analyze the various relationships among variables in the model formed based on the theories studied, few researchers did. This study was conducted to determine the effectiveness of motivation, learning style and discipline of teach on academic achievement Form four students Additional Mathematics in Kuala Terengganu District. The instrument used in this study is based on the School Inventory Learning model developed by Selmes (1987). The item questionnaire in this instrument has been adapted to the investigation investigation. A total of 260 research samples were included in the study, consisting of four forms students in 10 schools in Kuala Terengganu District. Data were analyzed using IBM-SPSS-AMOS (SEM) program version 21.0. SEM analysis consists of two main models: the measurement model and the Structural model. Prior to the SEM test, some adjustment tests were performed to ensure that the tested indicator actually represented the measured construct. Two analyzes in this study are prerequisites that have been met before the SEM analysis is done ie Factor Exploration Analysis (EFA) and Confirmatory Factor Analysis (CFA). The findings indicate that the motivation, learning style and discipline of learning have a positive and significant effect on student achievement in academic achievement. Furthermore, motivation also has a positive and significant impact on the learning discipline, but the learning style has no positive and not significant effect on the learning discipline. Intermediate analysis findings for the learning discipline take place between motivation and academic achievement and do not occur between learning styles and academic achievement. The findings in this study indicate that educators need to instill enthusiasm for students as well as to know their students' learning styles and to ensure that students have a learning discipline, because it can affect student academic achievement.

**Keywords:** Structural Equation Modeling (SEM), Motivation, Learning Styles, Learning Discipline.

## Introduction

Education is a constantly changing field in line with the development of the environment. These changes affect education especially in the curriculum aspect. To make Malaysia a developed country by 2020, the field of education has been identified as one of the key success factors (critical success factors). The Malaysian Government through the Ministry of Education of Malaysia (MOE) has always designed, planned and improved the education system in Malaysia. Among the steps taken include the introduction of the Education Development Master Plan (PIPP, 2006-2010) and the latest Malaysian Education Development Plan (2013-2025) as wages and at the same time leading to the transformation of national education. 21st Century learning is a world education transformation based on a more dynamic and creative approach to learning and facilitation (PdPc) with relevant learning content in line with current developments. Teachers must be prepared to accept change and manage change efficiently and effectively as they are the implementing group responsible for implementing the change. Teachers act as planners, careers, counselors, drivers and assessors (Malaysian Quality Standard of Education Wave 2-SCKMg2) to develop the full potential of students to produce student academic achievement continuously at an optimal level.

Education is a constantly changing field in line with the development of the environment. During the PdPc process at school, teachers are the main factors 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 et al. (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 the Supplemental Mathematics lessons that are mostly taught in schools. Based on the theory of motivation by using goal-setting theory, the main goal of achieving a person influences achievement through variation in the quality of self-regulatory processes (Locke, 2005). This self-regulation process is closely related to a student's metacognitive abilities or skills. It shows an indirect relationship between motivation and academic achievement through metacognition. Students need the enthusiasm and motivation as well as an effective way of learning to overcome their weaknesses in Supplemental Mathematics. Therefore, this study will look at the role played by motivation (internal and external) towards students to achieve additional academic mathematics achievement.

Various teaching methods have been used in schools aimed at improving the academic achievement of the students' Additional Mathematics subjects, to ensure decline and problems arising in additional mathematics learning can be identified. In addition to the students' own factors that lead to a decrease in performance in the Mathematics Supplementary subjects, educators also sometimes have no suggestions or motivations for their students. Some even consider that a weak student is a habit or an ordinary trait, without trying to give advice or to overcome it. Some weak and self-aware students sometimes exist, but the need for appropriate and effective motivation and encouragement and learning styles of educators is essential.

The importance of teachers to know and understand a student's learning style is because the effectiveness of a student's learning style may not be the same. Thus, teachers need to introduce different learning styles to ensure the appropriateness of all students involved.

Students also need to know which learning styles are appropriate for them, while teachers need to play an important role in helping their students understand the trends and ways they learn, to improve the effectiveness of learning so as to achieve good results. Several findings have been made in the West, finding the suitability and motivation of motivation with learning styles can produce good academic achievement. According to Nelson (2003), there is a positive impact between motivation and learning styles on student achievement. Students exposed to learning styles and motivated, achieving higher academic achievement, compared with those not exposed. During the PdPc process, teachers must diversify teaching strategies to create positive stimuli for students to learn. In this way, teachers will be able to increase students' interest and curiosity towards their teaching. Students who are motivated by teachers will usually be more interested in helping the process of achieving learning goals.

The purpose of this study was to examine the effectiveness of motivation, learning styles and discipline of learning on student academic achievement, as well as the role played by the discipline of learning as a mediator of the relationship between motivation and learning styles to the academic achievement of four students.

### **Research Methodology**

The research method used is quantitative, and using research instruments based on the Learning Inventory model in the School developed by Selmes (1987). The questionnaire items have been adjusted according to the suitability of the learning system in SMA. Data were analyzed using Structural Equation Modeling (SEM) with IBM-SPSS-AMOS program version 21.0. SEM is formed with two main models namely measurement model and Structural model. Before the SEM test is tested, prior adjustment tests should be made to ensure that the tested indicator actually represents the measured construction. There are two analyzes as prerequisites that must be met before the SEM analysis is performed: (1) Exploration Analysis Factor (EFA), and (2) Confirmation Factor Analysis (CFA). Validation factor analysis (CFA) is a test of measurement model to ensure that each construction meets procedures such as validity and reliability for each experiment being built (Kline, 2016; Awang, 2015; Chua, 2014d; Byrne; 2013; Hair et al., 2006; Schumucker & Lomax, 2004). Comparison of model measurement is essential to ensure that any latent construction in this study is compatible with the data studied before SEM can be continued (Kline, 2016; Awang, 2015; Schumucker & Lomax, 2004).

Using the CFA method can assess the extent to which factors are observed significantly to the latent construction used. This assessment is done by examining the stiffness value of the regression pathway from factor to observed variable (factor loading) rather than the relationship between factors (Byrne, 2001). Through the use of CFA, any item not conforming to the measurement model is derived from the model. This inequality is due to the low load factor value. Researchers need to apply the CFA process to all model-related constructions, either separately or collectively (combined CFA models) (Alias & Hartini, 2017).

The compatibility of the hypothetical models tested is verified using the Fitness Indexes to see the values of Root Mean Square Error of Approximation (RMSEA<0.08), Goodness of Fit Index (GFI>0.90), Comparative Fit Index (CFI>0.90) and Chi Square/Degree of Freedom (chisq/df

<5.0). According to Hair et al. (2006) if the value of  $\chi^2$  is less than 2.00 but significant, it should be noted whether the sample is large or vice versa. Sample size above 200 can cause  $\chi^2$  to be significant. Therefore, Hair and his colleagues propose two other indices namely CFI and RMSEA to ensure CFA analysis establishes a dimensionless research model. If the CFI value exceeds 0.90 and the RMSEA is less than 0.08 it is said that the existence of Unidimensionality exists for the formation of each construct.

The hypothetical model is considered to be in accordance with the research data when the  $\chi^2/df$  value is less than 3.0 (Marsh and Hocevar, 1985). The hypothetical model is also considered to correspond to a GFI value greater than 0.90 (Joreskog and Sorbom, 1993). The value of RMSEA is very good if it is smaller than 0.08 (Hair et al., 2006; Browne & Cudeck, 1993), but still less than 0.1 (Byrne, 1998, 2013). Bentler (1990) also recommends receiving CFIs over 0.90. But the CFI value between 0.80 and 0.89 is still at the margin received. To verify the model developed, the bootstrapping value is determined. According to Bollen & Stine (1992), the developed model is considered to have validity when the bootstrap value exceeds 0.05 means there is no difference between the data collected from the sample with the proposed model. Therefore, the proposed model is valid based on data collected from the research sample.

## Research Findings

### CFA Analysis for Conventional Motivation Measurement Models

The Analysis of Fitness Index in Table 1 shows the Motivation Construction Model has reached the level of Compatibility Index level. This means Building Validity for this construction has been achieved (Awang 2011; 2012; 2014; 2015; Awang et al., 2015a; Kashif et al., 2016).

Table 1: Analysis to Determine Construct Validity

| Name Category       | Name Index | Index value | Research Findings     |
|---------------------|------------|-------------|-----------------------|
| 1. Absolute fit     | RMSEA      | 0.074       | Reached the set level |
| 2. Incremental fit  | CFI        | 0.975       | Reached the set level |
| 3. Parsimonious fit | ChiSq/df   | 2.309       | Reached the set level |

The Measurement Model for the construction of Motivation has reached the level of Compatibility Index. This means Building Validity for this construction has been achieved (Awang 2011; 2012; 2014; 2015; Awang et al., 2015a; Kashif et al., 2016).

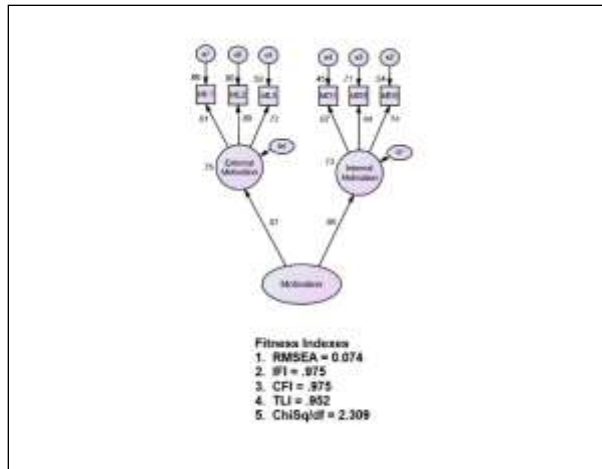


Figure 1: Measurement Model for the Second Layout of Building Motivation

### CFA Analysis for Learning Styles Conflict Measurement Models

The Analysis of the Fitness Index in Table 2 shows the Learning Style Styles Measurement Model has reached the level of Compatibility Level. This means Building Validity for this construction has been achieved (Awang 2011; 2012; 2014; 2015; Awang et al., 2015a; Kashif et al., 2016). The Measurement Model for Learning Style constructs has reached the level of Compatibility Index level. This means Building Validity for this construction has been achieved (Awang 2011; 2012; 2014; 2015; Awang et al., 2015a; Kashif et al., 2016).

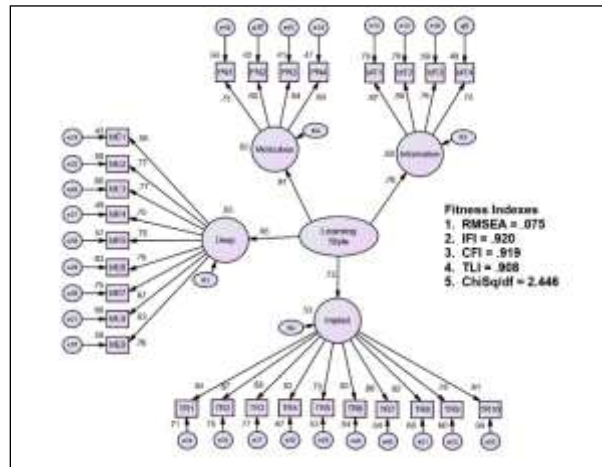


Figure 2: Second Layout Measurement Model for Learning Styles Build

Table 2: Analysis to Determine Construct Validity

| Name Category       | Name Index | Index value | Research Findings     |
|---------------------|------------|-------------|-----------------------|
| 1. Absolute fit     | RMSEA      | 0.075       | Reached the set level |
| 2. Incremental fit  | CFI        | 0.919       | Reached the set level |
| 3. Parsimonious fit | ChiSq/df   | 2.446       | Reached the set level |

### CFA Analysis for Learning Discipline Model

The Analysis of Fitness Index in Table 3 shows Measurements of Constructive Model Learning Discipline has reached the level of Compatibility Level. This means Building Validity for this construction has been achieved (Awang 2011; 2012; 2014; 2015; Awang et al., 2015a).

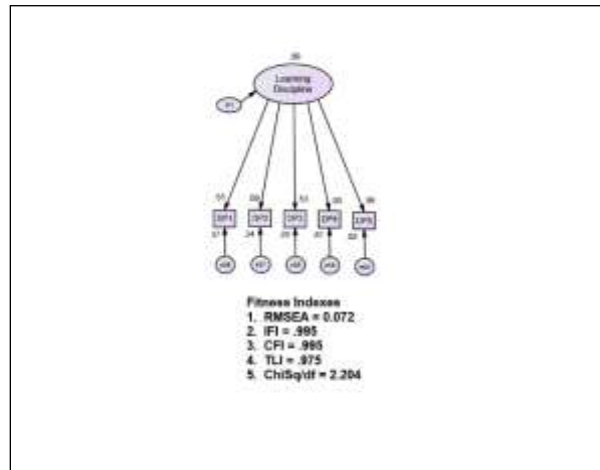


Figure 3: Second Layout Measurement Models of Learning Discipline

Table 3: Analysis to Determine Construct Validity

| Name Category       | Name Index | Index value | Research Findings     |
|---------------------|------------|-------------|-----------------------|
| 1. Absolute fit     | RMSEA      | 0.072       | Reached the set level |
| 2. Incremental fit  | CFI        | 0.995       | Reached the set level |
| 3. Parsimonious fit | ChiSq/df   | 2.204       | Reached the set level |

The Measurement Model for the construction of the Learning Discipline has reached the level of Compatibility Index. This means Building Validity for this construct has been achieved (Awang 2011; 2012; 2014; 2015; Awang et al., 2015a; Kashif et al., 2016).

### Confirmation Factor Analysis of All Measurement Models (Pooled CFAs)

The Integrated Validation Factor (CFA) analysis is required to evaluate the correlation value between construct in the Discriminant Validity procedure. If the correlation value between constructs exceeds 0.85, both constructs are said to be excessive (Awang, 2015; Hoque et al., 2017; Awang et al., 2015a; Kashif et al., 2016). For overly complex models involving second-order construction, joint validation factor analysis is difficult. Second level construction is a construct that has dimensions or substructures where each dimension or substructure has a certain number of items. The researcher will find it difficult to combine all the second level constructs in one model to conduct Pooled Confirmatory Factor Analysis.

To solve this problem, all second order constructions need to be summarized into first order construction by taking minutes from each sub-construction or dimension (Awang; 2014; 2015; Hoque et al., 2017). The procedural findings of Combined Factor Confirmation (Pooled CFA)

are shown in Figure 4. As always, the value on a single-headed arrow is the weighting factor of each item, while the value on the double-headed arrow is the correlation between the constructs. Through the Combined Validity Factor Analysis method, only one model of the compatibility index represents all the constructed constructs. The findings from Table 4 show the three categories of model compatibility indexes for all construction model constructions have been achieved.

Table 4: Comparison of Value Index Models for Three Compatibility Categories

| Name Category       | Name Index | Index value | Research Findings     |
|---------------------|------------|-------------|-----------------------|
| 1. Absolute fit     | RMSEA      | 0.066       | Reached the set level |
| 2. Incremental fit  | CFI        | 0.904       | Reached the set level |
| 3. Parsimonious fit | ChiSq/df   | 2.128       | Reached the set level |

Another requirement of the validity that all constructs in the model need is Discrimination Validity. Discriminatory validity is necessary to prove that all constructs in the model do not have a strong relationship with each other causing multicollinearity problems (Awang, 2014; Hoque et al., 2017; Awang et al., 2015a; Kashif et al., 2016). This verification requires researchers to develop the Discrimination Index Validity Summary table. Table 6 shows the Summary of Discrimination Validity Index among all constructs in the model.

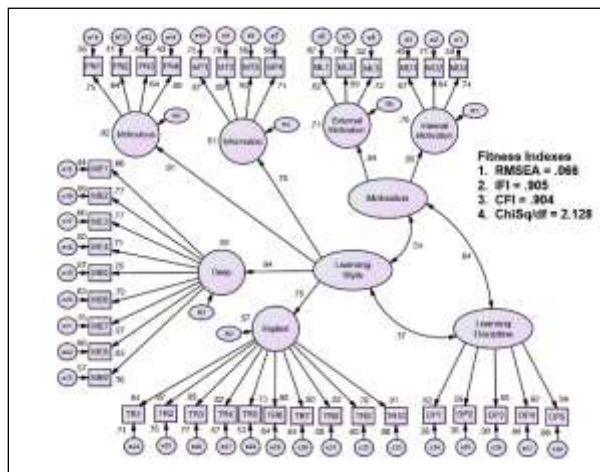


Figure 4: Findings of Results from the CFA Construct Combinations Procedure (Pooled Construct CFA)

Table 5: Summary of Discrimination Validity Index

| Construct           | Motivation   | Learning Styles | Learning Discipline |
|---------------------|--------------|-----------------|---------------------|
| Motivation          | <b>0.865</b> |                 |                     |
| Learning Styles     | 0.540        | <b>0.849</b>    |                     |
| Learning Discipline | 0.640        | 0.370           | <b>0.744</b>        |

Table 5 presents the root values of the Index of Concentration Validity (AVE) for each construct on the diagonal matrix. Another value in the table is the correlation between the two



constructs. According to Awang (2014; 2015; Hoque et al., 2017; Awang et al., 2015a; Kashif et al., 2016), Discrimination Validity will be achieved if all the root values of convergence validity (AVE) (Diagonal) are greater than other values of both rows and columns. Findings from Table 5 show Discrimination Validity for all constructions in the model achieved.

### Analysis of the Impact between Building Motivation, Learning Styles and Learning Disciplines

Analysis by using SEM yields a standard regression value between the construct and the usual regression value and both have their own utility. Figure 6 shows the standard regression weight findings, whereas Figure 7 shows a typical regression value as a result of the SEM procedure.

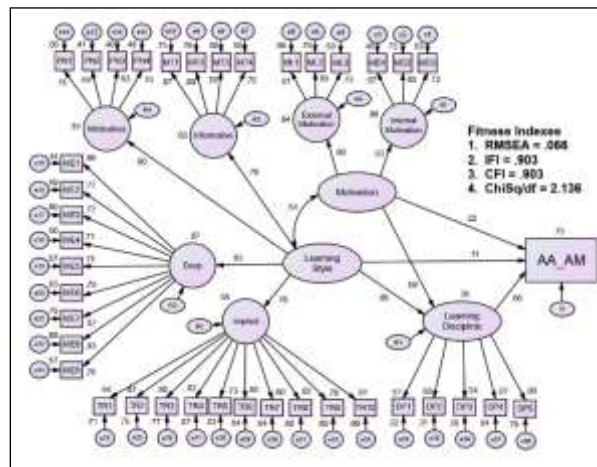


Figure 5: SEM Insights Shows the Standard Regression Value between Construction

An important summary of the SEM findings in Figure 5 (standard regression):

- 1) The  $R^2$  value for the construction of the Learning Discipline is 0.38. This shows the two constructors constructed in the model (see arrow), namely Motivation (MTV) and Learning Style (LS) which accounted for 38% of the Learning Discipline (LD) among the populations in the study.
- 2) The value of  $R^2$  to build AA\_AM (Academic Achievement Additional Mathematics) is 0.75. This shows three constructs of predictors in the model (see arrow), namely Motivation, Learning Styles and Learning Discipline contributing 75% to AA\_AM among the populations in the study.
- 3) The correlation value between two free constructs on the model shown by double-headed arrows is as follows: The correlation between Motivation and Learning Styles is 0.54. This shows that the SEM model is valid and has no multicollinearity problem.

Figure 6 shows the findings of regression values between the constructs in the model, to build the required regression equation and to test the next hypothesis.

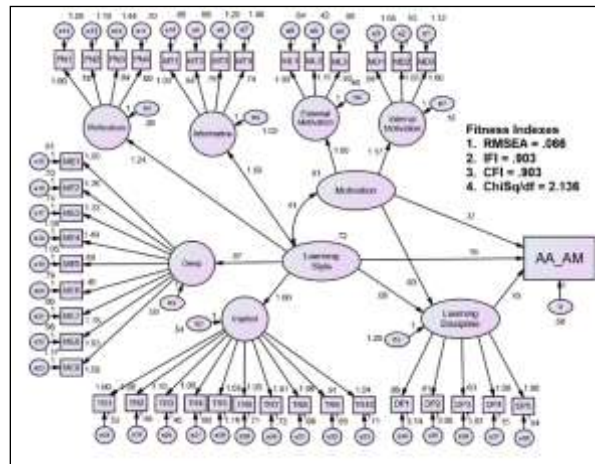


Figure 6: SEM Findings Indicate the Regression Value between Constructs

An important summary of the SEM findings in Figure 6 (regression value):  
 Regression equations for Learning Discipline (LD) and AA\_AM are as follows

$$LD = 0.93MTV + 0.08LS \quad (R^2 = 0.38)$$

$$AA\_AM = 0.37MTV + 0.19LS + 0.70LD \quad (R^2 = 0.75)$$

Furthermore, the researcher will test every hypothesis proposed in this research. Table 6 shows the approximation of the direct effects of the effects of each independent construct on the dependent construct in the model as shown in Figure 6 above.

Table 6: Regression Coefficients between Construct Value and Probability (p)

| Construct           |      | Construct           | Estimate | S.E.  | C.R.   | P     | Label           |
|---------------------|------|---------------------|----------|-------|--------|-------|-----------------|
| AA_AM               | <--- | Motivation          | 0.368    | 0.105 | 3.498  | ***   | Significant     |
| Learning Discipline | <--- | Motivation          | 0.933    | 0.145 | 6.426  | ***   | Significant     |
| AA_AM               | <--- | Learning Discipline | 0.703    | 0.055 | 12.731 | ***   | Significant     |
| AA_AM               | <--- | Learning Styles     | 0.188    | 0.081 | 2.323  | 0.020 | Significant     |
| Learning Discipline | <--- | Learning Styles     | 0.083    | 0.125 | 0.664  | 0.507 | Not Significant |

\*\*\* Significant value at the level of significance,  $p < 0.001$

Table 7 shows the results of hypothesis testing of the direct effect of independent construct on dependent construct. Hypothesis testing in Table 7 is based on the SEM findings from Figure 6 above.

Table 7: Hypothesis Test of Direct Impact between Constructs

| Direct Effect Hypothesis   | P     | Decision      |
|--|-------|---------------|
| H <sub>1</sub> : Motivation has a significant direct impact on academic achievement          | ***   | Supported     |
| H <sub>2</sub> : Motivation gives a significant direct impression on learning discipline     | ***   | Supported     |
| H <sub>3</sub> : Learning discipline has a significant direct impact on academic achievement | ***   | Supported     |
| H <sub>4</sub> : Learning styles have a significant direct impact on academic achievement    | 0.020 | Supported     |
| H <sub>5</sub> : Learning styles have a significant direct impact on learning discipline     | 0.507 | Not supported |

### Impact of Motivation on Academic Achievement

Table 6 shows that motivation has a significant direct impact on academic achievement with estimated regression value ( $\beta$ ) is 0.368 at significant level 0.001 (Estimate=0.368, CR=3.498,  $p < 0.001$ ). This means that the construction of Motivation has a positive and significant influence on the construction of Academic Achievement. This means that if the Motivation increased by 1 unit, Academic Achievement will increase by 0.368 units. The findings of this study indicate that the construct of Motivation has a positive and significant influence on the development of Academic Achievement.

### Impact of Motivation on Learning Discipline

Table 6 shows that motivation has a significant direct impact on the learning discipline with an estimate of regression value ( $\beta$ ) is 0.933 at a significant level of 0.001, (Estimate=0.933, CR=6.426,  $p < 0.001$ ). This means that the construction of Motivation has a positive and significant influence on the construction of the Learning Discipline. This means that when Motivation increases by 1 unit, the Learning Discipline will increase by 0.933 units. The findings of this study indicate that the construct of Motivation has a positive and significant influence on the constructs of the Learning Discipline.

### Impact of Learning Discipline on Academic Achievement

Table 6 shows that the discipline of learning has a significant direct impact on academic achievement with an estimate of regression value ( $\beta$ ) is 0.703 at a significant level of 0.001 (Estimation=0.703, CR=12.731,  $p < 0.001$ ). This means that the construction of Discipline Learning has a positive and significant influence on the construction of Academic Achievement. This means that if the Learning Discipline increased by 1 unit, Academic Achievement will increase by 0.703 units. The findings of this study indicate that the construction of Discipline Learning has a positive and significant influence on the construction of Academic Achievement.

### Impact of Learning Style Effects on Academic Achievement

Table 6 shows that learning styles have a significant direct effect on academic achievement with regression value estimation ( $\beta$ ) is 0.188 at a significant level of 0.020 (Estimate=0.188, CR=2.323,  $p < 0.001$ ). This means that the Learning Style construction has a positive and significant influence on the construction of Academic Achievement. This means that if the Learning Styles increase 1 unit, Academic Achievement will increase by 0.188 units. The findings of this study indicate that the construction of Learning Style has a positive and significant influence on the construction of Academic Achievement.

### Impact of Learning Styles on Learning Discipline

Table 6 shows that learning style has no significant effect on learning discipline with regression value estimation ( $\beta$ ) is 0.083 at significant level of 0.507 (Estimation=0.083, CR=0.664,  $p < 0.001$ ). This means that the Learning Style constructs have no positive and not insignificant influence on the construction of the Learning Discipline. The findings of this study indicate that the construction of Learning Style has no positive and not insignificant effect on the construction of Learning Discipline.

### Intermediate Analysis (Mediator) for Development of Learning Discourse

Table 8 shows hypotheses testing the influence of mediators of the Learning Discipline construct in the relationship between two free construction (Motivation and Learning Style) and dependent construct Academic Achievement (AA\_AM).

Table 8: Hypothesis Test of Mediator Effect Learning Discourse Structure

| Testing Hypothesis for Mediator  | Decision                                  |
|--|---|
| H <sub>6</sub> : The discipline of learning is the mediator of the relationship between motivation and academic achievement      | Supported<br>See the test in Figure 7     |
| H <sub>7</sub> : The discipline of learning is the mediator of the relationship between learning styles and academic achievement | Not supported<br>See the test in Figure 8 |

### Discipline Learning Is a Mediator Relationship between Motivation and Academic Achievement

Figures 7 and Table 8 illustrate the mediator's testing procedure in the model by Awang (2012; 2014; 2015). In this model, Learning Discipline (LD) is an intermediate variable, Motivation (MTV) is an independent variable and Academic Achievement (AA\_AM) is a dependent variable. Findings indicate that intermediate contact tests are supported and the type of intermediate contact is Partial Mediation as a direct effect of Motivation (MTV) on the Learning Discipline (LD) and Learning Discipline (LD) to significant Academic Achievement (AA\_AM), and the direct effect of Motivation (MTV) on Academic Achievement (AA\_AM) is also significant. The bootstrapping findings also show full mediation because of a non-significant direct effect and are consistent with the findings of interstitial exams in the testing procedure.

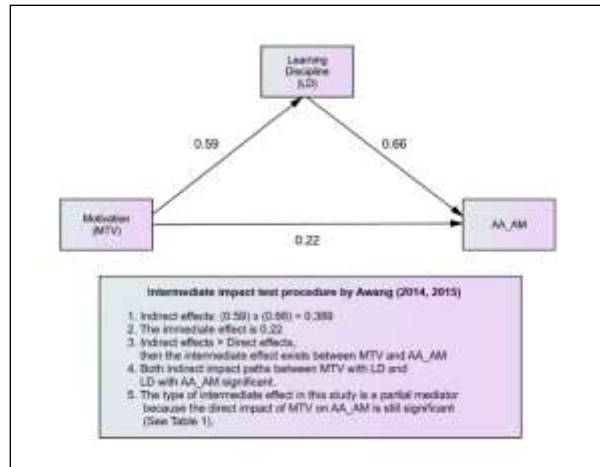


Figure 7: Hypothesis Testimonial Test of MTV-LD-AA\_AM Mediator Procedure

### Learning Discipline Is a Mediator Relationship between Learning Styles and Academic Achievement

Figures 8 and Table 8 illustrate the procedure of mediator test in the model according to Awang (2012; 2014; 2015). In this model, Learning Discipline (LD) is an intermediate variable, Learning Style (LS) is an independent variable and Academic Achievement (AA\_AM) is a dependent variable. Findings indicate that intermediary linking tests are not supported and the type of intermediate relationship cannot be applied, because the direct effect of Learning Styles (LS) on the Learning Discipline (LD) is not significant. The bootstrapping findings also do not show any mediation due to indirect messages indicating no significant inconsistencies with the results of mediation in the test procedure.

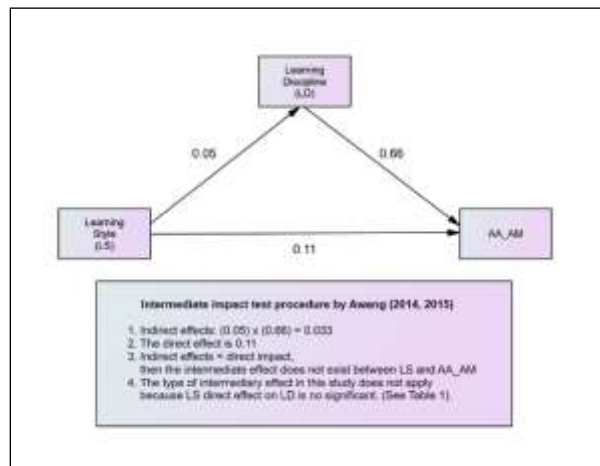


Figure 8: Hypothesis Testimonial Test of LS-LD-AA\_AM Mediator Procedure

### Conclusion

Overall, the CFA analysis carried out on the measurement model for the construction of motivation, learning styles and learning discipline, has been shown to have reached the fitness index. While the combined factorization analysis of all measurement models (Pooled CFA) shows that the three categories of model compatibility indexes for all models of construction constructs

have been achieved and discriminant validity for all constructions in the model has also been achieved. Inference analysis findings also show motivation, learning styles and learning discipline, have a positive and significant influence on academic achievement. Furthermore, motivation also has a positive and significant impact on the learning discipline, but the learning style has no positive and not significant effect on the learning discipline. Intermediate analysis findings for the learning discipline take place between motivation and academic achievement and do not occur between learning styles and academic achievement.

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### Corresponding Author

Abdul Hakim Abdullah

Faculty of Islamic Contemporary Studies, Universiti Sultan Zainal Abidin, Gong Badak Campus, 21300 Kuala Terengganu, Terengganu, Malaysia. Email: hakimabd@unisza.edu.my

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