

## STRUCTURAL EQUATION MODEL METHOD IN ANALYZING FACTORS AFFECTING STUDENT ACHIEVEMENT FROM CAMPUS ENVIRONMENT CHARACTERISTICS

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**Abstract.** *The quality of a student's academic performance is affected by many factors, both the student's internal factors (internal factors) and the students' own external factors (external factors). One of the external factors that influence student performance is the campus environment. This study aims to obtain the best structural equation model that can describe the relationship between latent variables and the relationship between latent variables and indicator variables, to find out which structural equation has the greatest impact, and which structure has the greatest impact on achievement. The goal has three indicators, namely motivation, attitude towards the alma mater, and attitude towards the lecturer. In this work, SEM was used to determine a student achievement model for Math Undergraduate Students FMIPA USU. Structural equation modeling (SEM) is a multivariate analysis designed to transform complex independent variables into simpler, more understandable forms. Research materials are the results of the FMIPA USU stambuk 2013, 2014, 2015 Mathematics Student Survey, a questionnaire measured using the Likert scale and a simple random sampling technique. The results of the data analysis yielded the following parameters: Almamater Recruitment Performance 0.084, Teacher Recruitment Performance 0.267, Incentive Performance 0.01.*

**Keywords:** *Campus Environment, Achievement, Latent Modif, Indicators, Structural Equation Modeling*

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### INTRODUCTION

Higher Education is a center and means of formal education whose role is to carry out educational/teaching activities, research and community service. Activities in educational activities include preparing students to think scientifically, so that they can produce qualified experts according to their respective fields, with the development of science and technology. In universities to see a student's achievement can be seen from the achievement index (IP). The achievement index (IP) is the average credit score which is the final unit of value that describes the value of the learning process each semester or a number that expresses achievement in the student's learning process in one semester. There are many benefits for students with a good grade point average, including speeding up the study period, making it easier to get scholarships and as a condition for applying for jobs. In this era of globalization, many companies recruit by looking for prospective employees who meet the terms and

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conditions set by the company, one of which is the cumulative achievement index (GPA) that must meet a certain minimum value (Sidabutar, 2020). With regard to the cumulative grade point average (GPA) which is a requirement when applying for a job, this is because the grade point average is one indicator of student success during lectures, although it is not absolute, it can be assumed that someone who has a high grade point average has a high grade point average. good ability in academics and will have an impact in the world of work (Tiara Dewi, Muhammad Amir Masruhim, 2016).

Student academic achievement is influenced by various factors, both internal factors (internal factors) and external factors (external factors). One of the external factors that affect student achievement is the campus environment. The influence of the campus environment on student achievement can be seen from the interaction between students and lecturers and students' perceptions of their alma mater environment (Sampoerna, 2002). Students' attitudes towards lecturers and the alma mater's environment can also affect their motivation in learning. The relationship between the factors or variables in this problem is not only a direct influence, but also an indirect effect, namely through other independent variables (Amir, 2019). These variables also cannot be measured directly or are called latent variables, so indicator variables (measured variables) are needed to form them. Structural Equation Model (SEM) can test a series of relationships that are relatively difficult to measure simultaneously.

The relationship in question is a relationship formed from one or more independent variables with one or more dependent variables. These variables can be latent variables or unmeasured variables, such as student attitudes towards the alma mater and student attitudes towards lecturers, which are formed from several explanatory variables and manifest variables, which are contained in the form of questions that can reflect latent variables (Lutfiwati, 2020). There are several reasons underlying the use of SEM including: First, the model being analyzed is relatively complex so it will be difficult to solve using the path analysis method in linear regression. Second, SEM has the ability to estimate the relationship between variables that are multiple relationships. Third, the error in each observation is not ignored but is still analyzed, so that SEM is accurate enough to analyze questionnaire data involving perceptions. Fourth, researchers can easily modify the model to improve the model that has been compiled to make it more statistically feasible. Fifth, SEM is able to analyze reciprocal relationships simultaneously (Prasetyo, 2013; Pravesti, 2016).

The purpose of this study was to analyze the effect of students' attitudes towards the subject, students' attitudes towards lecturers, and motivation to improve achievement by using the structural equation model. Determine which factors have the most influence on performance so that they can be improved.

## **METHOD**

### **Research Variable**

#### **Independent Variable**

There are two independent variables in this study, namely:

- A. Student attitudes towards the alma mater, which consists of 5 indicators, namely:
  1. Student's decision to choose campus ( $x_1$ ).
  2. Organizational activity ( $x_2$ ).
  3. Completeness of study room facilities ( $x_3$ ).
  4. Completeness of library facilities ( $x_4$ ).
  5. Completeness of computer laboratory facilities ( $x_5$ ).
- B. Attitudes towards lecturers, which consist of five indicators, namely:
  1. The level of student preference for lecturers ( $x_6$ ).
  2. Lecturer assessment system ( $x_7$ ).

3. Lecturer learning system ( $x_8$ ).
4. Lecturer assignment system ( $x_9$ ).
5. Relationship between students and academic supervisors ( $x_{10}$ ).

Dependent Variable

There are 2 dependent variables in this study, namely:

- A. Motivation, which consists of three indicators, namely:
  1. Desire to get a high GPA ( $y_1$ ).
  2. Desire to finish college on time ( $y_2$ ).
  3. Desire to continue S2 ( $y_3$ ).
- B. Achievement, which consists of two indicators, namely:
  1. GPA ( $y_4$ ).
  2. Achievements in other fields ( $y_5$ ).

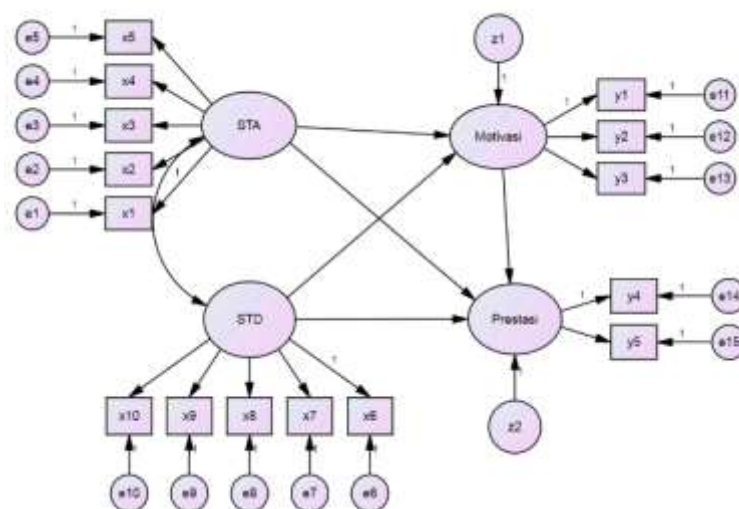
The data processing technique used is Structural Equation Modeling (SEM) with confirmatory analysis (CFA) method (Poerwati, 2015). CFA is a measurement model in which the observed variables (indicators) reflect one particular latent variable (latent dimension) (Manurung, 2017). There are 7 stages of SEM formation and analysis procedures, namely:

1. Establish a theoretical model as the basis for the SEM model. This model is a causal or causal model that states the relationship between dimensions or variables.
2. Build a path diagram of the causal relationship that has been formed based on the theoretical basis.
3. Divide the path diagram into a set of measurement models and structural models.
4. Selection of the input data matrix and estimating the proposed model.
5. Testing the unidimensionality of each construct with confirmatory factor analysis and estimating the Full Model Equation.
6. Testing the Evaluation of Structural Model Assumptions.
7. Interpreting the Model.

## RESULT AND DISCUSSION

### SEM Diagram

Drawing up causality from the existing theoretical studies, draw a path diagram of the causal relationship between constructs and their indicators. Image of relationship between constructs can be seen in Figure 1 below:



**Figure 1.** Causality Relationship Path Diagram Model

The structural equation of the path diagram is expressed in the following form :

$$prestasi = \beta_1 STA + \beta_2 STD + \beta_3 Motivasi + z_2$$

While the specifications for

Exogenous construct of attitude towards alma mater

$$x_1 = \lambda_1 STA + e_1$$

$$x_2 = \lambda_2 STA + e_2$$

$$x_3 = \lambda_3 STA + e_3$$

$$x_4 = \lambda_4 STA + e_4$$

$$x_5 = \lambda_5 STA + e_5$$

Exogenous construct Attitude Toward Lecturers (STD)

$$x_6 = \lambda_6 STD + e_6$$

$$x_7 = \lambda_7 STD + e_7$$

$$x_8 = \lambda_8 STD + e_8$$

$$x_9 = \lambda_9 STD + e_9$$

$$x_{10} = \lambda_{10} STD + e_{10}$$

The endogenous construct of Motivation

$$y_1 = \lambda_{11} motivation + e_{11}$$

$$y_2 = \lambda_{12} motivation + e_{12}$$

$$y_3 = \lambda_{13} motivation + e_{13}$$

The endogenous construct of Performance

$$y_4 = \lambda_{14} performance + e_{14}$$

$$y_5 = \lambda_{15} performance + e_{15}$$

Sum standardized loading for :

$$\text{Performance} = 0,766 + 0,635 = 1,401$$

$$\text{Motivation} = 0,601 + 0,345 + 0,706 = 1,652$$

$$\text{STD} = 0,581 + 0,761 + 0,709 + 0,637 + 0,501 = 3,189$$

$$\text{STA} = 0,413 + 0,337 + 0,719 + 0,611 + 0,773 = 2,853$$

Sum Measurement Error for :

$$\text{Performance} = 0,234 + 0,365 = 0,599$$

$$\text{Motivation} = 0,399 + 0,655 + 0,294 = 1,348$$

$$\text{STD} = 0,419 + 0,239 + 0,291 + 0,363 + 0,499 = 1,811$$

$$\text{STA} = 0,587 + 0,663 + 0,281 + 0,389 + 0,227 = 2,147$$

Reability Calculation

$$\text{Performance} = \frac{(1,401)^2}{(1,401)^2 + 0,599} = 0,77$$

$$\text{Motivation} = \frac{(1,652)^2}{(1,652)^2 + 1,348} = 0,7$$

$$\text{STD} = \frac{(3,189)^2}{(3,189)^2 + 1,811} = 0,85$$

$$\text{STA} = \frac{(2,853)^2}{(2,853)^2 + 2,147} = 0,79$$

The calculation of construct reliability above shows that all dimensions and indicators of the research construct have a standard load factor value of  $> 0.70$ , so all of them have good validity. The relationship between model variables can be seen in the following table:

**Table 1. Relationship Between Variables**

Hubungan Antar Variabel	Angka Korelasi	Keterangan Besar Angka Korelasi
STA with $x_1$	0,413	STA with $x_1$ enough
STA with $x_2$	0,337	STA with $x_2$ poor
STA with $x_3$	0,719	STA with $x_3$ high

Hubungan Antar Variabel	Angka Korelasi	Keterangan Besar Angka Korelasi
STA with $x_4$	0,611	STA with $x_4$ high
STA with $x_5$	0,773	STA with $x_5$ high
STD with $x_6$	0,581	STD with $x_6$ enough
STD with $x_7$	0,761	STD with $x_7$ high
STD with $x_8$	0,709	STD with $x_8$ high
STD with $x_9$	0,637	STD with $x_9$ high
STD with $x_{10}$	0,501	STD with $x_{10}$ enough
Performance with $y_1$	0,601	Performance with $y_1$ high
Performance with $y_2$	0,345	Performance with $y_2$ poor
Performance with $y_3$	0,706	Performance with $y_3$ high
Performance with $y_4$	0,766	Performance with $y_4$ excellence
Performance with $y_5$	0,635	Performance with $y_5$ high

The selection of models in this data processing chooses an alternative model of the Maximum Likelihood (ML) estimation method. The consideration in choosing Maximum Likelihood (ML) is the number of respondents as many as 100 people is the recommended minimum number. Maximum Likelihood (ML) is also the most widely used estimation method for processing with the Structural Equation Modeling (SEM) method.

## CONCLUSION

From the results of data processing and calculations in the previous chapter, it can be concluded as follows:

The results of the structural equation model obtained by the full model to form the following achievements:

$$performance = 0,084 STA + 0,267 STD + 0,014 motivation$$

The measurement model obtained by Achievement shows that the most influencing factor is STD, which is 0.267. STA factor affects 0.084 and motivation is 0.014.

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