Analysis of external factors affecting students’ achievement
student of mathematics education of samudra university

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Abstract. The dominant external factors influencing student learning outcomes have been analyzed in this study. The participants of this study are year II and IV students of Mathematics Education FKIP Universitas Samudra in academic year of 2018/2019. Data collection used was questionnaire/questionnaire and interview. Approach and concept in this research using variable annotation with SPSS version 21. Interpretation of result of factor rotation indicate the formation of 3 factors together (main factor). The first to the third external factors that ranked first in the factors that are developing the results of the study of mathematics students FKIP Universitas Samudra in sequence is the community environment, school buildings, and campus environment.

1. Introduction
The influence of learning result can be seen from the low or high of student learning result [1]. The phenomenon of low learning outcomes, occurred in students who have followed the learning. The low learning outcome result in students having low grades and of course they are not expected by any department [2]. Most of the researcher around the GPA to measure the student performance [3]. Based on the card scores of study results (GPA) in 2018/2019, it is known that more than 70% of students get low semester test scores. Especially at the Samudra University campus represents the best in Langsa city that can be seen of the new admissions were always more demand than the other campuses in Langsa. Learning outcomes are the results achieved in the form of numbers or scores after being given tests and learning outcomes at the end of each lesson [4]. The value obtained by the students becomes a reference to see the mastery in receiving learning materials.

For the occurrence of learning in themselves students need conditions, both internal and external condition [5]. Base on social learning theory, there are internal and external factors that influence the students achievement: the family factor, age and gender, be fond hard work, high initiative, creative thinking, having perception of effort, believe in self effort, social factor, fate, and believe in fate [6]. This research analyzes the dominant external factors effect student achievement.

Efforts to improve student learning outcomes in the mathematics lessons should be done actively, effectively and pleasantly, accordance with the situation and condition of the students [7]. The first step to make it happen is by analyzing the factors that influence student learning outcomes [8]. Learning outcomes are influenced by internal factors and external factors. Internal factors are the factors that exist in the students themselves. The meanings of external factors are factors that exist outside the individual, such as environmental factors [9].

Several previous studies on the Analysis of External Factors Affecting Study Results Students in Mathematics Education include: [10] concluded that there are 5 factors that affect student GPA. The
five factors are Self Management Factors, Surrounding Environment Factors, External Condition Factors, Physical Condition Factors and Sports Factors. [11] there are eight factors that influence the learning achievement of FE UNP students including (a) teaching quality factors, which consist of lecturer creativity, lecturer understanding, availability of facilities and infrastructure, learning references and learning atmosphere on campus, (b) independence factors, factors which consists of competing desires, taking initiative, cooperation and preparation for learning (c) factors of internal conditions, consisting of the atmosphere of residence, family relationships and parents' attention, (d) work ethic factors, factors contained in this variable, namely willingness to learn, sincerity and ability to solve problems, (e) concentration factors, which consist of physical conditions, fatigue and attention to learning (f) dietary factors and desire to succeed, (g) supporting factors consisting of learning conditions, family economics and active in learning (h) parenting factors consisting of parental training. [12] initial ability, learning motivation, learning environment and learning facilities together, emphasize significantly the student learning achievement.

2. Methods
This research was conducted in Department of Mathematics Education (FKIP) Samudra University in 2019. Population in this research is all students of Mathematics education, Level II and Level IV FKIP Mathematics of Samudra University. The sampling technique used in this research is Purposive sampling.

The research method used survey method. Survey method is descriptive research with quantitative and qualitative approach [13]. The use of this method because the study aims to describe the results of the analysis of external factors, that dominate in mathematics’ students outcome.

Data collection use non-test techniques. the instruments used are questionnaires and interviews. Questionnaires and interviews are arranged referring to the variables studied (factors that influence the learning outcomes of Mathematics’ students) are disseminated to the respondents. data processing using SPSS 21 [14].

The steps of data analysis in factor analysis are: 1) formulating the problem; 2) identification of validity and correlation between variables (reliabilities); 3) analyze the variables 4) determine the method of factor analysis; 5) determine many factors with eigenvalue; 6) factor rotation; and 7) make interpretation of factor rotation results [15].

3. Result and Discussion
3.1 Identification of Validity and Correlation between Variables
Identification of validity and correlation between variables (reliabilities) is done based on assumption where validity is fulfilled with value of MSA (Measure of Sampling Adequacy), fulfilling validity value if obtained value of MSA more than 0.5. The correlation between independent variables known by Bartlett's Test with Chi-Square. The following shows the values of KMO (Kaiser-Mayer-Olkin) and Bartlett's Test in Table 1.

| Table 1. KMO And Bartlett’s Test |
|----------------------------------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | 0.770 |
| Bartlett's Test | Approx. Chi-Square | 403,112 |
| | Df | 66 |
| | Sig. | .000 |

Based on Table 1, the assumption of validity is fulfilled with the value of MSA (Measure of Sampling Adequacy) 0.770. MSA value obtained more than 0.5. So the value is valid. While the value of Bartlett's Test with Chi-Square is 403.112, the value of sig. = 0.000. Therefore the value of sig. less than 0.05
then the hypothesis of no correlated variables (H0) is rejected and H1 is accepted. So that it can be concluded that the validity test has been fulfilled and the variables that influence the learning outcomes of the students of FKIP Samudra University mathematics education are reliable, thus the two assumptions for factor analysis have been met and can be analyzed further. Table 1 shows that all variables conform the requirements for further analysis, since all variables in the analysis have MSA values greater than 0.5. Table 2 show that the MSA (Measure of Sampling Adequacy) value of each variable more than 0.5 shows that all variables conform the requirements for further analysis.

### Table 2. The MSA (Measure of Sampling Adequacy) Value of Each Variable

| Variables                  | Value MSA |
|----------------------------|-----------|
| Health (X1_1)              | 0.747     |
| disability (X1_2)          | 0.657     |
| Intelligence (X1_3)        | 0.757     |
| Caution (X1_4)             | 0.629     |
| Talent (X1_5)              | 0.576     |
| Maturity (X1_7)            | 0.522     |
| Readiness (X1_8)           | 0.857     |
| Weak (X1_9)                | 0.851     |
| Bored (X1_10)              | 0.847     |
| School environment (X2_11) | 0.694     |
| community environment (X2_12)| 0.836   |
| college building (X2_16)   | 0.764     |

### 3.2 Determine the Method of Factor Analysis

After performing a variable analysis, the next step is to determine the method used in the factor analysis. This research uses Principal Components Analysis (PCA) method. The results of data processing using Principal Components Analysis (PCA) can be seen in Communalities (role factor). In Communalities the formed factor is a unity, ie the role of each sub-variable can be explained by the factors that have been formed (Component). The results of Communalities can be seen in Table 3.

### Table 3. Communalities

| Variables                  | Initial | Extraction |
|----------------------------|---------|------------|
| Health (X1_1)              | 1.000   | .900       |
| disability (X1_2)          | 1.000   | .454       |
| Intelligence (X1_3)        | 1.000   | .960       |
| Caution (X1_4)             | 1.000   | .514       |
| Talent (X1_5)              | 1.000   | .680       |
| Maturity (X1_7)            | 1.000   | .572       |
| Readiness (X1_8)           | 1.000   | .588       |
| Weak (X1_9)                | 1.000   | .777       |
| Bored (X1_10)              | 1.000   | .889       |
| School environment (X2_11) | 1.000   | .621       |
| community environment (X2_12)| 1.000 | .625   |
| college building (X2_16)   | 1.000   | .194       |

Communalities show some variance that can be explained by extracted factors (factors formed). Each variable correlates with the factors that are formed. In other words, the communality shows that the number of variants contributed by another variable in the analysis using the Principal Components Analysis (PCA) method. Each variable has a communality value of 1 (one).
Table 3 shows the X13 (Intelligence) variable is the largest factor composing variable with a value of 0.960 or about 96.0%. While variable X16 (Building School) is a constituent variables smallest factor with a value of 0.194 or about 19.4%.

### 3.3 Determine Many Factors with Eigenvalue

To determine the number of factors formed from the remaining variables can be determined by the value of eigenvalue. Based on the theory that eigenvalue values are greater than or equal to 1 (one) to be included as a shared factor. By using SPSS 21 software, we get eigenvalue as shown in Table 4.

**Table 4.** Total Variance Explained

| Component | Initial Eigenvalues | Extraction Sums of Squared Loadings | Rotation sums of |
|-----------|---------------------|------------------------------------|------------------|
|           | Total | % of Variance | Cumulative (%) | Total | % of Variance | Cumulative (%) | Total |
| 1         | 4.848 | 40.398 | 40.398 | 4.848 | 40.398 | 40.398 | 3.984 |
| 2         | 1.639 | 13.662 | 54.060 | 1.639 | 13.662 | 54.060 | 2.007 |
| 3         | 1.288 | 10.730 | 64.790 | 1.288 | 10.730 | 64.790 | 1.783 |
| 4         | 0.929 | 7.742 | 72.531 |         |        |        |     |
| 5         | 0.900 | 7.503 | 80.035 |         |        |        |     |
| 6         | 0.756 | 6.296 | 86.331 |         |        |        |     |
| 7         | 0.545 | 4.538 | 90.869 |         |        |        |     |
| 8         | 0.451 | 3.758 | 94.626 |         |        |        |     |
| 9         | 0.375 | 3.127 | 97.753 |         |        |        |     |
| 10        | 0.160 | 1.334 | 99.087 |         |        |        |     |
| 11        | 0.079 | 0.655 | 99.742 |         |        |        |     |
| 12        | 0.031 | 0.258 | 100.000 |        |        |        |     |

Extraction Method: Principal Component Analysis.

Table 4 shows there are 3 components (joint factors) that have eigenvalue value more than 1 (one) i.e factor 1, 2 and 3 respectively with eigenvalue 4.848, 1.639 and 1.288. Percentage of each factor that is equal to 40.398, 13.662 and 10.730. From these results it can be concluded there are 3 factors together that can be formed from this analysis.

### 3.4 Factor Rotation

Before interpreting the result of a factor, the step to be taken is the factor rotation to know the correlation between the factor and the variable, and only the correlation with values above 0.30 is considered to be correlated strongly enough. The result of factor correlation with variable before factor rotation can be seen in Table 5.
Table 5. Component Matrix\(^a\) (Before Rotation)

| Variables                | Component |
|--------------------------|-----------|
|                          | 1         | 2         | 3         |
| Health (X1)              | .838      | .444      | .018      |
| disability (X1)          | .325      | -.499     | -.315     |
| Intelligence (X1)        | .929      | .304      | -.066     |
| Caution (X1)             | .419      | -.321     | .484      |
| Talent (X1)              | -.377     | .621      | -.389     |
| Maturity (X1)            | -.217     | .319      | .650      |
| Readiness (X1)           | .696      | .260      | .189      |
| Weak (X1)                | .846      | .230      | -.083     |
| Bored (X1)               | .926      | .095      | -.148     |
| School environment       | -.495     | .465      | .399      |
| community environment    | .656      | -.367     | .246      |
| college building (X2)    | .275      | -.170     | .299      |

Extraction Method: Principal Component Analysis

Table 5 shows factor 1 correlated with the variables X1, X10, X11, X18, X1, X14, and X12, while factor 2 correlates with the variables X13, X1, X17, and X13. Furthermore factor 3 correlates with the variables X21 and X210. Based on these results it can be seen that variables correlate with many factors, such as X1, and X13 which correlate with factors 1 and 2. X17, and X11, correlate with factors 2 and 3 while X14 variables correlate with factors 1 and 3. In such circumstances it cannot be concluded how many factors are formed. Therefore, factor rotation should be performed. The result of factor rotation can be seen in Table 6. Table 6 shows factor 1 strongly correlated with variables X1, X11, X10, X19, and X18. Factor 2 correlated strongly with the variables X14. While Factor 3 correlated strongly with variables X17. From these results it can be concluded that each variable is only correlated to one factor only so it is easy to interpret.

Table 6. Rotated Component Matrix\(^a\)

| Variables                | Component |
|--------------------------|-----------|
|                          | 1         | 2         | 3         |
| Health (X1)              | .946      | .064      | -.007     |
| disability (X1)          | .040      | .214      | -.638     |
| Intelligence (X1)        | .955      | .152      | -.157     |
| Caution (X1)             | .164      | .697      | .018      |
| Talent (X1)              | .020      | -.794     | .221      |
| Maturity (X1)            | -.061     | .169      | .735      |
| Readiness (X1)           | .718      | .259      | .074      |
| Weak (X1)                | .848      | .151      | -.189     |
| Bored (X1)               | .850      | .219      | -.344     |
| School environment       | -.208     | -.205     | .732      |
| community environment    | .357      | .257      | -.257     |
| college building (X2)    | .130      | .420      | .024      |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization

Rotation convergent in 5 iteration
3.5 Interpretation of Factor Rotation Results

After rotation of the factors, the last step in factor analysis is to interpret the variables into shared factors that have been formed. Based on the result of factor rotation then formed 3 factors together (main factor) which is described as follows:

(a) The main factor in the factors that influence the learning outcomes of the students of FKIP Samudra University mathematics education. This factor has eigenvalue value (Table IV) that is equal to 4.848 and able to explain variant or diversity of observed variables that is equal to 40.398%. The variables that make up the external factor is X2_12 (Community Environment).

(b) The second factor in factors influencing the learning outcomes of the students of FKIP Samudra University mathematics education is a factor that has an eigenvalue value of 1.639. Able to explain the variant or diversity of the variables that have been observed in advance that amounted to 13.662%. The variables that make up the external factor are X2_16 (College Building).

(c) The third factor in the factors that influence the learning outcomes of the students of FKIP Samudra University mathematics education is a factor that has eigenvalue value of 1.288. Able to explain variant or diversity of variables that have been observed in advance that is equal to 10.730%. The variables that make up this factor are the variables X1_11 (Campus Environment) and X1_2 (Community Environment). From the description of the factors above, it can be concluded that the external factors that affect the results of the study of mathematics education students FKIP Unsam social environmental factors.

3.6 Interview Results

Interviews were conducted to support the results of questionnaire data analysis. Interviews with 10 students found the influence of external factors on mathematics learning outcomes. External factors on the social environment, if the college environment is calm then students easily follow the lecture to get good grades, neighbours and friends also support about college and not apart from the motivation of parents and family to encourage lectures to obtain good study results. Aspects of non-social environment, if the lecture room is not hot students easily follow the lecture accompanied by complete props and easily follow the lecture. The weather factor is not very influential for students to go to college.

4. Conclusion

Based on the results of research on factor analysis affecting the results of the study of mathematics education students FKIP, it can be concluded that the first to the third external factors that ranked first in the factors that are developing the results of the study of mathematics students FKIP Samudra University in sequence is the community environment, school buildings, and campus environment.

5. References

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