

SPEARMAN'S RANK CORRELATION ANALYSIS METHOD TO IDENTIFY CHANGES IN THE GPA OF GRADUATES FROM THE 5TH BATCH OF THE TEACHING CAMPUS PROGRAM AT UNIVERSITAS BAKTI INDONESIA

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Abstract

This research uses data from graduate students who participated in the 5th Batch of the Teaching Campus Program at Bakti Indonesia University. The sample data used are the GPAs (Grade Point Averages) before and after participating in the program, which are processed by testing correlation analysis using the Spearman Rank method with the help of SPSS to determine the Spearman correlation coefficient (r_s) and manual calculation to determine the t_{value} that will be compared with $t_{\text{(table)}}$ the result with a significance level of 0.01. The data shows that the GPA values before and after participating in the Teaching Campus program have a $t_{\text{value}} \geq t_{\text{(table)}}$, which is $5.9718 \geq 2.807$ at a significant level of 0.01 (two-tail test). Therefore, H_0 is rejected, meaning there is a change in the GPAs of students who graduated from the 5th Batch of the Teaching Campus Program. Thus, students can improve their learning quality in facing problems in the field, as shown by the changes in GPA values before and after participating in the Teaching Campus program at Bakti Indonesia University.

Keywords: Teaching Campus Program, GPA, Spearman Rank Correlation

1. INTRODUCTION

The Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) has formulated the Independent Learning policy by providing opportunities for all university students to hone their skills in the field of education by directly engaging in target schools, namely elementary and junior high schools, as a step in preparing for a career in education. Therefore, the Teaching Campus program was formed, which has been implemented every semester. The benefits of the Teaching Campus program include the ability to convert activities into credits, expanding networks beyond the study program and university, exploring knowledge and skills in the field for more than one semester, and gaining knowledge directly from partner schools (Anita Agustiani, 2022) (Hermanto, 2024). Students participating in the Teaching Campus program will have the opportunity for course conversion and will receive a GPA (Grade Point Average) after the program is completed. From the perspective of student GPAs, one of the efforts undertaken is to identify changes in GPAs from the semester when students participated in the Teaching Campus program until the semester after they completed the program. Identification of these GPA changes can be done using the Spearman Rank correlation analysis method.

Spearman Rank Correlation Analysis is an analysis with correlation techniques used when exact quantitative measurements are difficult or impossible to perform

(Pramitasari, 2013)(Ruscio, 2008). The Spearman Rank method is used to find the level of relationship or test the significance of hypotheses if there are data variables that do not have to be the same, symbolized by r_s or ρ . This study uses the Spearman Rank correlation method to identify changes in student GPA when they participate in the Teaching Campus program and after participating in the 5th Batch Teaching Campus Program at Bakti Indonesia University.

Students of Universitas Bakti Indonesia participated in this teaching campus program from Cohorts 4 and 5, with student enthusiasm experiencing a significant increase. Initially, in Cohort 4, 29 students registered, but none passed. Then, students tried again, with approximately 109 students participating in the program, but only 25 students were declared qualified. In the Teaching Campus Program in the 5th Batch, students received UKT (tuition fees) and BBH (living allowance) to support the Teaching Campus program. They also received one Field Supervisor Lecturer (DPL) for each group consisting of 5 students from different university backgrounds, as well as one mentor teacher appointed by each placement school.

The data used in this research is the GPA (Grade Point Average) of students who graduated from the Teaching Campus Program in the 5th Batch at Universitas Bakti Indonesia. The data size used is 25 students. The data will then be processed using SPSS Software Application and also manually with Microsoft Excel software.

In the calculation of the Spearman Rank analysis method, variables will be determined at least on an ordinal scale so that the observed individuals are ranked in two sequential series. The analysis of the Spearman rank correlation coefficient has several calculation steps, including observing two variables to be measured, pairing the rankings calculated by the difference (d), squaring each of these ranking differences and then summing them up, and finally determining the correlation coefficient

2. RESEARCH METHODS

2.1. Concept of Correlation

The concept of correlation is a concept in statistics that explains the relationship or association between two or more variables (Rachmatin, S.Si., M.Si., 2007). The purpose of correlation analysis is to measure the strength and direction of the relationship between these variables. Here is a more detailed explanation of the concept of correlation:

2.1.1. Definition of Correlation

Correlation is a statistical measure that shows the extent to which two variables are related to each other or move together. Correlation can be positive or negative, depending on the direction of the relationship between these variables. The correlation coefficient is a numerical value used to measure the strength and direction of the relationship between two variables. The correlation coefficient is usually denoted by the letter " r " and its value ranges from -1 to 1

- A value of $r = 1$ indicates a perfect positive correlation, which means an increase or decrease in one variable will always be followed by an increase or decrease in the other variable with the same pattern.

- A value of $r = -1$ indicates a perfect negative correlation, which means an increase in one variable will always be followed by a decrease in the other variable, and vice versa.
- A value of $r = 0$ indicates no correlation between two variables, which means changes in one variable have no relationship with changes in the other variable.

2.1.2. Types of Correlation In this research

There are several commonly used types of correlation, including:

- Pearson Correlation: Used to measure the linear relationship between two numeric variables.
- Spearman Correlation: Used to measure the monotonic relationship between two numeric or ordinal variables.
- Kendall Correlation: Used to measure the monotonic relationship between two numeric or ordinal variables, but more robust against outlier values.
- For the interpretation of correlation coefficients, the values are as follows:
 1. 0.00 - 0.19: Very weak correlation
 2. 0.20 - 0.39: Weak correlation
 3. 0.40 - 0.59: Moderate correlation
 4. 0.60 - 0.79: Strong correlation
 5. 0.80 - 1.00: Very strong correlation (Robert Kurniawan, 2016).

2.1.3. Applications of Correlation

Correlation analysis is used in various fields, such as research, business, economics, and social sciences. Some examples of correlation applications include:

- Analyzing the relationship between variables in a study or research.
- Determining factors that influence a dependent variable in regression analysis.
- Identifying correlated variables for modeling or prediction purposes.

In research using correlation analysis, it does not always indicate a cause-and-effect relationship between variables. Correlation only shows the existence of a relationship or association between these variables, but it cannot directly conclude a causal relationship.

2.1.4. Advantages of Spearman's Rank Correlation

Spearman's Rank Correlation is a nonparametric method that does not require strict assumptions like Pearson's Correlation. This method can be used for data measured on an ordinal scale, as well as data that are not normally distributed or do not meet other assumptions.

Spearman's Rank Correlation, also known as Spearman's rank-order correlation, is a nonparametric statistical method used to measure the strength and direction of the relationship between two ordinal variables. This method has several advantages that make it popular in various research fields. Here are the advantages of Spearman's Rank Correlation:

a. No Assumption of Normal Distribution

One of the main advantages of Spearman's Rank Correlation is that it does not require the assumption that data comes from a normal distribution. This makes it a very useful method when the data distribution is unknown or does not meet the normality assumption. In other words, Spearman's Rank Correlation is robust against violations of the normality assumption.

b. Can Handle Ordinal Data

Spearman's Rank Correlation is specifically designed to measure the relationship between ordinal variables or ranked data. This makes it very useful in situations where data is collected in the form of rankings or orders, such as in preference surveys, assessments, or Likert scales. This method provides an effective way to analyze relationships between variables that cannot be directly measured numerically.

c. Resistant to Outliers

Spearman's Rank Correlation is relatively resistant to extreme values or outliers in the data. Because this method uses ranks instead of actual values, outliers do not have a large impact on the final result. This makes Spearman's Rank Correlation more robust and reliable in situations where data may contain some extreme values that could affect other methods sensitive to outliers.

d. Easy to Interpret

The interpretation of Spearman's Rank Correlation is relatively easy and intuitive. The correlation coefficient ranges from -1 to +1, where values close to -1 indicate a strong negative relationship, values close to +1 indicate a strong positive relationship, and a value of zero indicates no relationship between variables. This interpretation is similar to the more commonly used Pearson's correlation coefficient, making it easy to understand for researchers and practitioners.

e. Not Limited to Linear Relationships

Another advantage of Spearman's Rank Correlation is that it is not limited to measuring linear relationships between variables. Spearman's Rank Correlation can detect monotonic relationships, where if one variable increases, the other tends to increase or decrease consistently, but not necessarily in the form of a perfect linear relationship.

f. Can Be Used for Small Samples

Spearman's Rank Correlation can be used with relatively small samples, as long as the sample size is large enough to allow for diverse rankings. This makes it a useful method in situations where sample size is limited or it's difficult to obtain larger samples.

g. Flexibility in Handling Tied Ranks

In some cases, there are equal or tied ranks in the data. Spearman's Rank Correlation provides methods for handling these tied ranks, such as corrections for tied values or using average ranks. This provides flexibility in handling data that may not be handled by other methods.

With these advantages, Spearman's Rank Correlation becomes a highly useful choice in various fields of research, such as mathematics, social sciences, psychology, economics, and many more. This method provides a robust and efficient way to analyze relationships between ordinal variables or ranked data, without requiring strict assumptions about data distribution (Tresliyana et al., 2004) (Primohadi Syahputra & Mulya, 2022)

2.1.5. Working Principle and Calculation of Spearman's Rank

Correlation Spearman's Rank Correlation works by first converting data into ranks. After the data is converted into ranks, the correlation coefficient is calculated based on the rank differences between data pairs. The smaller the rank difference, the stronger the correlation between the two variables. The calculation of Spearman's Rank Correlation uses the following steps:

1. Sort the data from each variable separately
2. Assign ranks to the data, with rank 1 for the smallest value and so on
3. Calculate the rank differences (d) between data pairs
4. Square the rank differences (d^2)
5. Sum the squared rank differences ($\sum d^2$)
6. Calculate the Spearman's correlation coefficient (r_s) using the formula:

$$r_s = 1 - \frac{6 \sum_{i=1}^n d^2}{n(n^2-1)} \dots\dots\dots 1)$$

where:

- r_s is the Spearman's rank correlation coefficient
- d is the difference between ranks
- n is the number of data pairs
- $\sum d^2$ is sum of squared rank differences

7. Calculate t_{value} by comparing it with t_{table} , where t_{value} uses the formula:

$$t_{\text{value}} = r_s \sqrt{\frac{n-2}{1-r_s^2}} \dots\dots\dots 2)$$

Description:

- n is number of data points
- r_s is value of Spearman's Rank Correlation Coefficient (Ruscio, 2008) (Muhammad Firdaus, 2019)

2.1.6. Interpretation of Spearman's Rank Correlation Coefficient

The value of Spearman's rank correlation coefficient (r_s) ranges from -1 to +1, with the following interpretations:

- a. $r_s = 1$, perfect positive correlation
- b. $r_s = -1$, perfect negative correlation
- c. $r_s = 0$, no correlation
- d. $0 < r_s < 0.5$, weak positive correlation
- e. $0.5 \leq r_s < 0.8$, moderate positive correlation
- f. $r_s \geq 0.8$, strong positive correlation
- g. $-0.5 < r_s < 0$, weak negative correlation

- h. $-0.8 \leq r_s \leq -0.5$, moderate negative correlation
 $r_s \leq -0.8$, strong negative correlation (Simanjuntak et al., 2020)

2.1.7. Significance Test and Assumptions of Spearman's Rank Correlation

1) Significance Test

The significance test in Spearman's Rank Correlation is used to determine whether the correlation obtained from the sample data is statistically significant or not. In other words, the significance test helps to test the null hypothesis (H_0) which states that there is no relationship between the variables being tested.

Hypotheses:

$H_0: \rho = 0$ (no correlation between two variables)

$H_1: \rho \neq 0$ (there is a correlation between two variables)

To test the significance, the test statistic value (r_s) is compared with the critical value from the t-Student distribution or standard normal distribution, depending on the sample size. If the test statistic value exceeds the critical value, then the null hypothesis (H_0) is rejected, which means that the correlation found is statistically significant.

2) Assumptions of Spearman's Rank Correlation

To use Spearman's Rank Correlation validly, several assumptions must be met:

- a) The variables being tested must be on an ordinal or rank scale.
- b) The relationship between variables must be monotonic, meaning that as the value of variable X increases, the value of variable Y also increases or decreases consistently.
- c) The sample taken must be independent and representative of the population.
- d) There should be no tied ranks, or if there are, a correction adjustment for tied ranks must be used.
- e) The data distribution need not be normal or symmetric, but it must be continuous.
- f) There should be no outliers or extreme values that significantly influence the correlation results.
- g) There should be no autocorrelation or serial correlation between observations in the data.

If these assumptions are met, then the results of Spearman's Rank Correlation can be trusted and used to interpret the strength and direction of the relationship between the two variables being tested. However, if there are violations of assumptions, then the interpretation of correlation results must be done carefully or using other more appropriate methods.

3. RESULTS AND DISCUSSION

In this study, we used data from the graduates of Campus Teaching Batch 5 at Bakti Indonesia University, which can be presented in Table 1 as follows:

**Table 1. GPA (Grade Point Average) Before and After
for Campus Teaching Batch 5 Graduate Students**

No	Student Name	Study Program	GPA	
			Before	After
1	AKZ	Information Systems	3.00	3.57
2	DCO	Management	3.61	3.61
3	HDL	Management	3.68	3.65
4	HDA	Management	3.87	3.87
5	IN	Primary School Teacher Education	3.73	3.71
6	IDC	Accounting	3.48	3.78
7	KA	Management	3.74	3.61
8	KZ	Management	3.87	3.87
9	KN	Law Science	4.00	4.00
10	LH	PG-Early Childhood Education	4.00	3.82
11	MIH	Informatics System	3.00	3.57
12	MMH	Maths Education	3.86	4.00
13	MRF	Primary School Teacher Education	4.00	3.71
14	NCW	Primary School Teacher Education	3.86	3.86
15	NAS	Management	3.74	3.61
16	PA M.P	Management	3.87	3.87
17	PSF	Nursing Science	3.76	3.70
18	RAD	Legal Science	4.00	4.00
19	RAP	Primary School Teacher Education	3.77	4.00
20	SPC A.	Information Systems	2.90	3.57
21	SN	Primary School Teacher Education	3.86	3.86
22	SNR	Primary School Teacher Education	3.77	4.00
23	TEU	Management	3.65	3.61
24	VMH	Maths Education	4.00	4.00
25	YSD	Management	3.87	3.87

From the data in Table 1, it is found that the students of the 5th Batch Teaching Campus consist of 25 students from several study programs, namely 3 students from the Informatics System program, 9 students from the Management program, 6 students from the Elementary School Teacher Education program, 1 student from the Accounting program, 2 students from the Law program, 1 student from the Early Childhood Education

program, 2 students from the Mathematics Education program, and 1 student from the Nursing program. Meanwhile, the average GPA before was 3.7156, and the average GPA after was 3.788. There were 5 students with a GPA of 4.00 before the implementation of the KM 5 program, and 6 students after the implementation of the KM 5 program.

The results of research data processing using SPSS can be seen in Table 2.

Tabel 2. Correlations

			GPA Before	GPA After
Spearman's rho	GPA before	Correlation Coefficient	1.000	.796**
		Sig. (2-tailed)	.	.000
		N	25	25
	GPA after	Correlation Coefficient	.796**	1.000
		Sig. (2-tailed)	.000	.
		N	25	25

** . Correlation is significant at the 0.01 level (2-tailed).

From the data processing results, it was obtained that:

1. Hypothesis:
Ho: $\rho=0$ (no significant change)
H1: $\rho \neq 0$ (there is a significant change)
2. Significance test of the r_s value with SPSS assistance obtained that the value of $r_s=0.796$
3. Using the t-value, we obtained t-value = 5.9718 and t-table value ($t_{0.05;25-2}$) = 2.807

The conclusion of the test is that because the t-value $\geq$ t-table, which is $5.9718 \geq 1.714$ at the significance level of 0.01 (two-tail test), Ho is rejected, meaning there is a change in the GPA of students who graduated from the Kampus Mengajar (Teaching Campus) Program Batch 5.

4. CONCLUSION

Conclusion Based on the research on the Kampus Mengajar program in Indonesia, the researchers can conclude that with the Kampus Mengajar program, students gain several things as follows: 1Teaching experience: Students gain direct experience in teaching at schools, especially in 3T (Frontier, Outermost, and Disadvantaged) areas. 2Skill development: This program helps students develop skills such as leadership, communication, classroom management, and problem-solving. 3Social contribution: Students contribute to improving the quality of education in areas in need, helping to address educational disparities. 4Academic credit: Participation in this program can be recognized as part of the curriculum with a maximum of 20 credits, such as in the Independent Learning - Independent Campus (MBKM) program. 5Professional network: Students can build networks with teachers, principals, and local education officials. 6Cultural understanding: They gain a better understanding of cultural diversity and

educational challenges in Indonesia. 7Innovation development: Students are encouraged to develop innovative learning methods and tools. 8Financial support: There are typically allowances or scholarships to cover living expenses during the program. 9Career preparation: This experience can strengthen resumes and prepare students for careers in education or other sectors. Character building: The program fosters empathy, social responsibility, and resilience in facing challenges.

It is shown that by comparing the GPA values before and after participating in the Teaching Campus program, the data testing with $t\text{-value} \geq t\text{-table}$, which is $5.9718 \geq 2.807$ at a significance level of 0.01 (two-tail test), leads to the rejection of H_0 . This means there is a change in the GPA of students who graduated from the 5th Batch Teaching Campus program. Therefore, students can experience an Improvement in Learning Quality when facing problems in the field, as indicated by the change in GPA values before and after participating in the Teaching Campus programs.

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