IDENTIFYING TEACHER ENGAGEMENT FACTORS THROUGH PRINCIPAL COMPONENT ANALYSIS

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Abstract

Teacher engagement plays an important role in creating an effective learning environment, not only influencing student learning outcomes but also significantly impacting teacher motivation, job satisfaction, and emotional well-being. In the context of modern education, challenges such as technological developments, curriculum changes, and the dynamics of student needs require teachers to have a higher level of commitment and involvement in the teaching process. This study aims to identify the right indicators in strengthening teacher engagement based on a field survey conducted by interviewing 30 teachers.The method used in this study is Principal Component Analysis (PCA), which allows the reduction of multivariate data dimensions into several main components to find the main patterns that influence teacher engagement. Based on the interview results, 12 factors were found that influence teacher engagement. Through PCA analysis, this study succeeded in reducing the 12 factors into 4 main indicators, namely interpersonal, dedication, loyalty, and vigor.The discovery of these four main indicators has important practical and theoretical implications, especially in efforts to improve teacher engagement in various educational institutions. This study opens up opportunities for the development of intervention strategies that focus on strengthening interpersonal skills, dedication to duty, loyalty to the profession, and enthusiasm (vigor) in carrying out teaching responsibilities. Thus, the results of this study are expected to provide a significant contribution to improving the quality of education by strengthening teacher involvement.

***Keywords**: Teacher, Principal Component Analysis, Education.*

Abstrak

Keterlibatan guru memegang peranan penting dalam menciptakan lingkungan belajar yang efektif, tidak hanya memengaruhi hasil belajar siswa tetapi juga berdampak signifikan terhadap motivasi guru, kepuasan kerja, dan kesejahteraan emosional. Dalam konteks pendidikan modern, tantangan seperti perkembangan teknologi, perubahan kurikulum, dan dinamika kebutuhan siswa menuntut guru untuk memiliki tingkat komitmen dan keterlibatan yang lebih tinggi dalam proses pengajaran. Penelitian ini bertujuan untuk mengidentifikasi indikator yang tepat dalam memperkuat keterlibatan guru berdasarkan survei lapangan yang dilakukan dengan mewawancarai 30 orang guru. Metode yang digunakan dalam penelitian ini adalah Principal Component Analysis (PCA) yang memungkinkan reduksi dimensi data

multivariat menjadi beberapa komponen utama untuk menemukan pola utama yang memengaruhi keterlibatan guru. Berdasarkan hasil wawancara, ditemukan 12 faktor yang memengaruhi keterlibatan guru. Melalui analisis PCA, penelitian ini berhasil mereduksi 12 faktor tersebut menjadi 4 indikator utama, yaitu interpersonal, dedikasi, loyalitas, dan vigor. Ditemukannya keempat indikator utama tersebut memiliki implikasi praktis dan teoritis yang penting, terutama dalam upaya peningkatan keterlibatan guru di berbagai lembaga pendidikan. Penelitian ini membuka peluang bagi pengembangan strategi intervensi yang berfokus pada penguatan keterampilan interpersonal, dedikasi terhadap tugas, loyalitas terhadap profesi, dan semangat (vigor) dalam melaksanakan tanggung jawab mengajar. Dengan demikian, hasil penelitian ini diharapkan dapat memberikan kontribusi yang signifikan bagi peningkatan mutu pendidikan melalui penguatan keterlibatan guru.

Kata Kunci: Guru, Analisis Komponen Kepala Sekolah, Pendidikan.

A. INTRODUCTION

Teacher engagement in the educational process plays a crucial role in improving the quality of learning and student academic outcomes. Engagement is defined as a person's feeling of responsibility and concern for their work performance (Britt & Rouet, 2012). Teachers who are actively involved in curriculum development, teaching methods, and learning evaluation can create a more effective and responsive learning environment to student needs. Analysis of educational data shows that high teacher engagement is positively correlated with increased student achievement.

In addition, the use of statistics in education helps teachers identify patterns and trends in student learning outcomes, allowing for more targeted adjustments to teaching methods. Thus, teacher engagement is not only limited to classroom interactions, but also includes active participation in the analysis and application of educational data for continuous improvement.

Overall, increasing teacher engagement in various aspects of education is a strategic step to achieve better educational goals and ensure optimal development for each student. Teacher engagement can be said to be a state where members of an organization carry out their roles, work and express themselves physically, cognitively, emotionally to the organization where they work by showing their good performance (Febriansyah & Henndy Ginting, 2020).

Teachers are a profession that demands linkages and interdependence between abilities, competencies and roles in a single unit known as Engagement. Basically, efforts are needed to complement the programs that have been carried out so far by the government, namely photographing teacher performance with a new concept called teacher engagement (Prabowo et al, 2023; Riyadi, 2022).

Saks et al (2022) stated that engagement is directed at both individual performance output and organizational outcomes including organizational growth or productivity. Another study by Putri & Purnamasari (2021) stated that engagement is related to positive aspects of employee performance. Optimal teacher engagement behavior will have a positive impact on organizational performance. So the higher the teacher's engagement, the greater their productivity in doing their work and can improve the quality of learning. This study will measure indicators in increasing teacher engagement using the PCA method from the results of distributing questionnaires.

The journal related to Principal Component Analysis (PCA) has been discussed by Nasution (2019). This study uses the PCA method to reduce the factors that influence teacher engagement so that 4 factors are obtained, namely interpersonal, dedication, loyalty and vigor.

B. RESEARCH METHODS

In this study, data was collected using interviews to determine the factors that influence engagement, after the data was collected, data analysis was carried out using Principal Component Analysis (PCA) with the following steps (Jolliffe, 2002)

1. Data cleaning: ensure data is free from errors and inconsistencies
2. Data normalization: change the data scale to the same
3. Correlation matrix: calculate the correlation matrix between variables
4. Eigenvalue and eigenvector: calculate the eigenvalue and eigenvector of the correlation matrix
5. Component selection: select the component with the highest eigenvalue
6. Component rotation: perform rotation to clarify interpretation
7. Interpretation of results: analysis of principal components and related variables

The method used in this study is a qualitative method. The method used in this study is the Principal Component Analysis (PCA) method. Principal Component Analysis (PCA) is one-way Identify patterns in correlated data and express information in a way that emphasizes similarities and differences, according to (Johnson & Wichern, 2002).

This method will analyze priority factors that are suspected of increasing and influencing teacher engagement from several factors that have been determined in the interview process. The PCA method is very useful in situations where it can improve teacher engagement obtained from the results of factor analysis. The data collection techniques used are interviews

and questionnaires (Abdillah & Hartono, 2015). The number of samples from this study was 30 permanent teachers at SMK. The data used includes primary data obtained from questionnaires

C. RESULTS AND DISCUSSION

The analysis process is based on a correlation matrix between variables. In order for factor analysis to be accurate, the variables collected must be correlated. To test that all variables are correlated, the following results can be seen:

a. Statistical Description.

The following are factors that are drivers or influence teacher engagement based on the results of interviews and distribution of instruments to 30 teacher respondents and the results of statistical description analysis.

Descriptive Statistics				
Factor Components	Code Factor	Mean	Std. Deviation	Analysis N
Principal encouragement	CV1	3,90	0,995	30
Objective assessment from the principal	CV2	3,53	1,167	30
Free communication	OW1	3,97	0,999	30
Free expression	OW2	3,80	1,095	30
Promotion the school	LV1	3,63	0,850	30
Maintaining data confidentiality	LV2	4,23	0,679	30
Working on time	VG1	4,37	0,669	30
Ontime doing assigments	VG2	4,33	0,661	30
Contribution to school activities	DD1	3,87	0,819	30
Doing work outside of main tasks	DD2	3,90	0,759	30
Active in culture	AB1	4,00	0,830	30
Focus on completing tasks	AB2	3,87	0,776	30

b. KMO (Kaiser-Meyer-Olkin) and Bartlett's Test

The KMO value is an index of the comparison of the distance between the correlation coefficient and the partial correlation coefficient as a whole. If the sum of the squares of the partial correlation coefficients between all pairs of variables is small compared to the sum of the squares of the correlation coefficients, it will produce a KMO value that is close to one. A small KMO value indicates that factor analysis is not the right choice. In order to carry out factor analysis, the KMO value is considered sufficient if it is greater than or equal to 0.5 (Santoso, 2000).

Bartlett's Test is a statistical test to test whether the variables involved are correlated with each other. In other words, the population correlation matrix is an identity matrix, namely a matrix where the elements on the diagonal are 1 while those outside the diagonal are 0 (zero).

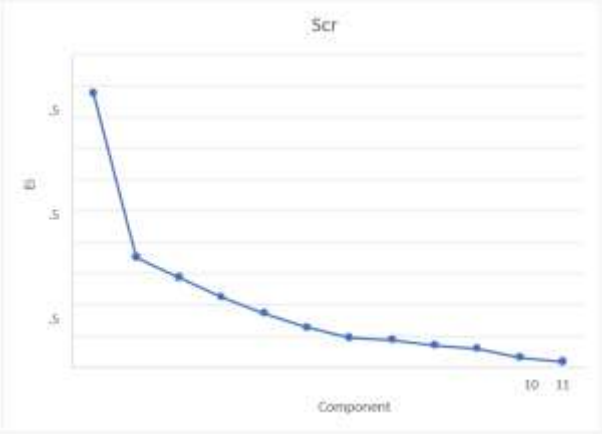
The KMO and Bartlett's Test values obtained based on the results of the SPSS 26 program are as follows.

Tabel 1 Nilai KMO dan Bartlett't Test.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,603
Bartlett's Test of Sphericity	Approx. Chi-Square	150,328
	Df	66
	Sig.	0,000

From table 1 above, it can be seen that the KMO value of 0.603 is greater than 0.5 and the Bartlett's Test significance value of 0.000 is smaller than α which is 0.05. This shows that the relationship between the variables is significant and the sample size used is included in the good category. So that further research can be carried out.

c. Scree Plot


Scr
Component
10
11

Based on the image above, it can be seen that the components/factors that have an eigenvalue > 1 are found in components 1, 2, 3 and 4. In other words, there are 4 factors formed.

d. Determining the Number of Factors

The purpose of factor analysis is to find new variables called factors that are correlated and independent of each other. The number of these factors is less than the original variables. In this study, the author determines the number of factors formed based on the eigenvalue value which is greater than or equal to one

Based on the results of factor analysis using the SPSS 26 program, four main factors can increase teacher engagement. Table 3 shows the factors formed after the factor analysis was carried out.

Tabel 3 Faktor yang Terbentuk Berdasarkan Nilai *Eigenvalue*

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,384	36,537	**36,537**	4,384	36,537	36,537	2,530	21,083	21,083
2	1,757	14,641	**51,178**	1,757	14,641	51,178	2,441	20,346	41,428
3	1,438	11,983	**63,161**	1,438	11,983	63,161	2,087	17,393	58,822
4	1,122	9,348	**72,509**	1,122	9,348	72,509	1,643	13,688	72,509
5	0,859	7,162	79,671						
6	0,640	5,336	85,008						
7	0,474	3,954	88,961						
8	0,435	3,625	92,586						
9	0,349	2,912	95,498						
10	0,299	2,489	97,987						
11	0,154	1,282	99,268						
12	0,088	0,732	100,000						

Extraction Method: Principal Component Analysis.

Based on table 3 above, it can be seen in the total column in the initial Eigenvalue. This number shows the size of the eigenvalue. Factors with eigenvalues > are feasible factors and factors that are formed. From the output, it is known that there are only 4 factors with each eigenvalue > 1. For the fifth factor, because the value is 0.859 (<1), the factor cannot form a factor (Hakim, 2016). Factor 1 has an eigenvalue of 4.384 and a percent of variance of 36.537%, meaning that factor 1 is able to explain 36.537% of the total number of factors that will affect teacher engagement. Factor 2 has an eigenvalue of 1.757 and a percent of variance

of 14.641%, meaning that factor 2 is able to explain 14.641% of the total number of factors that will affect teacher engagement. Factor 3 has an eigenvalue of 1.438 and a percent of variance of 11.983%, meaning that factor 3 is able to explain 11.983% of the total number of factors that will affect teacher engagement. Factor 4 has an eigenvalue of 1.122 and a percent of variance of 9.348%, meaning that factor 4 is able to explain 9.348% of the total number of factors that will affect teacher engagement. Furthermore, the total variance obtained from the four factors was 72.509%.

e. Component Matrix

The following table is a factor matrix table after factor rotation using the varimax rotation method.

Table 4. Component Matrix to determine the Principal Component Group

Component Matrix[a]				
	Component			
Factor	1	2	3	4
CV1	**0,611**	0,355	0,267	-0,338
CV2	0,616	-0,059	0,066	**0,647**
OW1	**0,637**	0,357	-0,051	0,473
OW2	**0,788**	0,039	0,163	-0,089
LV1	**0,486**	-0,737	0,160	0,072
LV2	-0,729	**0,518**	0,101	0,062
VG1	0,017	0,324	**0,833**	0,031
VG2	0,389	**0,578**	-0,459	0,001
DD1	**0,720**	-0,300	0,104	-0,420
DD2	-0,713	-0,371	-0,208	**0,188**
AB1	-0,475	-0,129	**0,565**	0,283
AB2	**0,659**	-0,065	-0,142	0,238
Extraction Method: Principal Component Analysis. a. 4 components extracted.				

Based on Table 4 of the SPSS 26 Output above, it is stated that the variables CV1, OW1, OW2, LV1, DD1 and AB2 are only correlated quite strongly with Factor 1. While the variables LV2 and VG2 are correlated quite strongly with Factor 2. Furthermore, VG1 and AB1 are correlated quite strongly with Factor 3. Finally, CV2 and DD2 are correlated quite strongly with Factor 4.

f. Interpretation of Main Factor Analysis

The interpretation of the results of the factor analysis is based on the value or magnitude of the factor loading that has been previously explained. Thus, the 12 variables have been reduced to 4 main factors that can influence teacher engagement, namely:

Factor 1 is the encouragement of the principal, free communication, free opinion, actively promoting the school, contributing to school activities, and focusing on doing assignments. Thus, this first main component factor can be named a conducive work environment.

Factor 2 is Keeping data confidential and Ontime doing assignments. Thus, the second main component factor is self-dedication.

Factor 3 is being on time at work and active in cultural activities at school. Thus the third main component factor is loyalty to the job. Factor 4 is an objective assessment of the principal and doing work outside the main or ordered tasks. Thus the fourth main component factor is vigor or enthusiasm for wor.

D. CONCLUSION AND SUGGESTIONS

Four main component factors were found that can influence and increase teacher engagement, namely (1) a conducive work environment; (2) self-dedication; (3) work loyalty, and (4) vigor or enthusiasm.

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