TEACHER PERFORMANCE ASSESSMENT DECISION SUPPORT MODEL WITH SWARA AND TOPSIS METHODS

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Abstract—*Teacher performance assessment is an important component of educational evaluation. This study develops a decision support model for teacher performance assessment at SMAN 12 Bandung using the Step-Wise Weight Assessment Ratio Analysis (SWARA) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods. SWARA was applied to determine the relative weights of nine teacher performance assessment criteria, while TOPSIS was used to calculate preference values and rank the evaluated teachers. The results showed variation in preference values among the evaluated teachers. Teacher 9 obtained the highest preference value of 0.991 and was ranked first, while Teacher 12 obtained a considerably lower preference value of 0.085. The resulting preference values provide a quantitative basis for comparing teacher performance according to the established assessment criteria. The combination of SWARA and TOPSIS therefore provides a structured decision support model for weighting assessment criteria and ranking teacher performance at SMAN 12 Bandung.*

Keywords: *decision support system, education, SWARA, teacher performance, TOPSIS.*

Abstrak—*Penilaian kinerja guru merupakan salah satu komponen penting dalam evaluasi pendidikan. Penelitian ini mengembangkan model pendukung keputusan untuk penilaian kinerja guru di SMAN 12 Bandung menggunakan metode Step-Wise Weight Assessment Ratio Analysis (SWARA) dan Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). Metode SWARA digunakan untuk menentukan bobot relatif dari sembilan kriteria penilaian kinerja guru, sedangkan TOPSIS digunakan untuk menghitung nilai preferensi dan menentukan peringkat guru yang dievaluasi. Hasil penelitian menunjukkan adanya variasi nilai preferensi antar guru yang dievaluasi. Guru 9 memperoleh nilai preferensi tertinggi sebesar 0,991 dan menempati peringkat pertama, sedangkan Guru 12 memperoleh nilai preferensi yang jauh lebih rendah, yaitu 0,085. Nilai preferensi yang dihasilkan memberikan dasar kuantitatif untuk membandingkan kinerja guru berdasarkan kriteria penilaian yang telah ditetapkan. Dengan demikian, kombinasi SWARA dan TOPSIS menghasilkan model pendukung keputusan yang terstruktur untuk pembobotan kriteria dan pemeringkatan kinerja guru di SMAN 12 Bandung.*

Kata Kunci*: sistem pendukung keputusan, pendidikan, SWARA, kinerja guru, TOPSIS.*

INTRODUCTION

Teachers have a crucial role in the Indonesian education system, not only as teachers but also as facilitators, motivators, and innovators in learning. With the advancement of technology, teachers are required to be able to integrate technology into learning methodologies and apply a more interactive approach to suit curriculum developments and the characteristics of the digital generation. (Marwanto, 2020).

According to (Pratiwi & Dewi, 2024), In Indonesia, many teachers have adapted to changes in this learning method, but there are still challenges in optimally implementing technology in learning. The study also raised the role of teachers who experience difficulties in providing technological facilities, difficulties in adjusting applications to learning materials, difficulties in designing learning media using mathematical applications, and difficulties in time management.

Based on survey data from the Ministry of Education, Culture, Research, and Technology (Kemdikbudristek) in 2023, 76% of teachers are active in intra-school communities, 61% in inter-school communities, and 79% are involved in cross-

regional communities through the Merdeka Mengajar Platform (PMM) which has an impact on employee performance. Although this participation rate shows efforts to adapt to technology, there are still significant challenges faced by teachers.

In addition, studies by Azizi SM, Putra, & Saman, 2024) highlighted that many teachers still have difficulty using technology, especially in remote areas with minimal internet access and supporting devices. These challenges include low digital literacy, limited technological infrastructure, and low motivation to adapt to change.

At SMAN 12 Bandung, teachers have tried to keep up with educational developments by utilizing technology in learning. They have started to implement more interactive methods and build effective communication with students to create a conducive learning atmosphere. However, there are still several challenges in increasing student learning motivation and optimizing the use of technology more optimally.

Teacher performance assessment is one of the important aspects in efforts to improve the quality of education in Indonesia. In the era of globalization, demands for the quality of education are increasing, so an objective, transparent, and accountable assessment system is needed (Salmon & Arfyanti, 2022). In practice in the field of education, performance assessments, especially for teachers, often still face several obstacles and problems, including the subjectivity of the assessor, unclear criteria, and an inefficient assessment process.

Teacher performance assessment is one of the important aspects in efforts to improve the quality of education in Indonesia because it greatly influences the education report card at an educational institution in every school in Indonesia. This is proven by the existence of accreditation assessments of schools that provide variables of teacher performance values for learning outcomes and classroom learning management. In the era of globalization, demands for the quality of education are increasing, so that an objective, transparent, and accountable assessment system is needed. In practice in the field of education, performance assessments, especially for teachers, often still face several obstacles and problems, including the subjectivity of the assessor, unclear criteria, and an inefficient assessment process (Putra & Novita, 2023), (Hapsari, 2023).

This study focuses on the development of a decision support system (DSS) for teacher performance assessment located at SMAN 12 Bandung, Indonesia, the existing system still uses a less concrete method so that it does not answer the results of the school's education report analysis, currently the proposal for a decision support system for teacher performance assessment is one alternative to meet the challenges and expectations of the results of the education report at SMAN 12 Bandung. This system adopts the SWARA and TOPSIS methods to overcome the problems that exist at SMAN 12 Bandung. According to (Santoso, Sriyasa, & Citra, 2024) stated that the SWARA method was used to determine the weight of the assessment criteria more objectively based on the opinion of the management team at SMAN 12 Bandung. Meanwhile, according to (Sukamto, Andriyani, & Wahyuni, 2021), the TOPSIS method is used to rank alternatives based on the weight of the criteria that have been set. The combination of these two methods can produce teacher performance assessments that are more accurate and relevant to school needs (Rifqi & Aldisa, 2023) and (Nisa, Dewanto, & Waliyansyah, 2021). Based on previous research related to the TOPSIS method combined with several methods, the application of this research is in the context of direct education at SMAN 12 Bandung through observations with various adaptations of the national education curriculum that occur in each teacher (Santoso et al., 2024), (Saputra & Setiawansyah, 2024), and (Sugiyanto, Maulana, & Sihananto, 2024). Thus, the system developed can be adjusted to the characteristics and specific needs of schools with updates to the national education curriculum implemented as part of a reference for other schools in Indonesia in implementing teacher performance assessments.

Based on an analysis of previous studies relevant to this research, the SWARA method excels in determining the weighting of teacher performance assessment criteria more objectively based on input from the school management team. This approach allows each criterion to be evaluated and prioritized according to the specific needs of the school, making the assessment process more relevant. Additionally, SWARA is relatively simple to implement compared to other methods such as AHP, making it more accessible for educational institutions with limited technical resources. Its flexibility in adjusting priority criteria is also an advantage, especially when there are changes in policies or assessment standards within the education system.

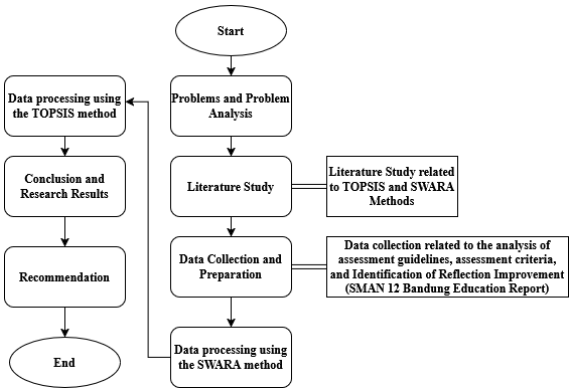
Meanwhile, the TOPSIS method is utilized to rank teachers based on the weight of criteria determined by SWARA. A key advantage of TOPSIS is its ability to provide transparent and objective ranking results by calculating the relative distance of each alternative to the ideal best and worst solutions. This approach enables teachers to be assessed across multiple performance aspects quantitatively, facilitating more accurate decision-making. Furthermore, TOPSIS is well-suited for

multi-criteria decision-making (MCDM) problems, making it applicable in various contexts with complex assessment criteria.

Although the combination of SWARA and TOPSIS has certain drawbacks, such as subjectivity in SWARA's weighting process and the need for valid quantitative data in TOPSIS, this study has been designed to minimize these limitations. Subjectivity can be reduced by involving an experienced school management team and using a more structured assessment standard, while data validity in TOPSIS can be maintained through systematic data collection. With continuous monitoring and periodic system updates, changes in weighting can be adjusted without requiring a complete recalculation. Therefore, this system maintains a high level of accuracy and serves as an effective solution for teacher performance assessment at SMAN 12 Bandung, as well as a reference for other schools in Indonesia.

This research can also contribute to the development of a more detailed teacher performance assessment system, especially in terms of increasing the objectivity and efficiency of the teacher assessment process in Indonesia. Therefore, this study aims to develop a teacher performance assessment decision support model at SMAN 12 Bandung by integrating the SWARA and TOPSIS methods. SWARA is used to determine the relative weights of the teacher performance assessment criteria, while TOPSIS is applied to calculate preference values and rank teachers based on the weighted criteria. The resulting model is intended to provide a structured quantitative approach for supporting teacher performance evaluation based on the assessment criteria used by SMAN 12 Bandung.

MATERIALS AND METHODS



Source: (Research Results, 2025)

Figure 1. Research Framework

Based Figure 1, this research uses a systematic approach to evaluate teacher performance at SMAN 12 Bandung. it is defined related to this research using a systematic approach to evaluate teacher performance at SMAN 12 Bandung. Starting with the identification of problems in the current teacher performance appraisal system, this study then conducted an in-depth literature review of the TOPSIS and SWARA methods. After that, data related to teacher performance assessment were collected and prepared for analysis. The SWARA method was used to determine the relative weight of each assessment criterion, while the TOPSIS method was used to calculate the preference value of each teacher based on the weight of the criteria. After the data was processed using both methods, the researcher then analyzed the results obtained. This analysis aims to identify the best performing teachers, identify factors that influence teacher performance, and identify areas that need improvement in the teacher performance appraisal system. Based on the results of the analysis, the researcher then provides recommendations that can be used to improve the quality of the teacher performance appraisal system at SMAN 12 Bandung. These recommendations can be in the form of changes to the assessment criteria, improvements to the assessment procedure, or the development of an information system that supports the assessment process.

Decision Support Systems (DSS) help provide information, provide predictions, and guide users in making better decisions and DSS implements decision-making theories from sciences such as operations research and management science, by utilizing computers to solve problems faster than previous manual calculations (Rifqi & Aldisa, 2023). According to (Mashuri & Mujianto, 2021), decision support systems have main characteristics such as directing organizational activities, supporting connected decisions, being flexible, consisting of data and models, using internal-external data, being able to analyze objectives and "what-if" scenarios, and relying on quantitative modeling techniques. Stepwise Weight Assessment Ratio Analysis (SWARA) introduced by Kersuline et al. in 2010 (Ramadhani & Satria, 2024). SWARA is a new method that has been widely used to determine the weight of criteria by involving experts in assessing and prioritizing criteria based on their level of importance.

SWARA excels because it is able to estimate expert opinions, organize data easily, enable effective collaboration, and offers simplicity and flexibility in adjusting criteria priorities according to needs and goals to be achieved (Arjuanda & Wibisono, 2024). The mathematical formula in the SWARA method for determining criterion weights was developed by previous researchers and comprises five main steps. First, the criteria are sorted based on the level of significance from the

highest to the lowest by summing the expert assessments for each criterion. Next, starting from the second criterion, respondents assess the relative importance of criterion compared to the previous criteria, resulting in a comparative importance value based on the average assessment. This value is used to calculate the coefficient using a certain formula. The next step is to recalculate the weight by multiplying the criterion value by the coefficient. These weights are then averaged to determine the relative weight for each evaluation criterion. This relative weight represents the level of significance of each criterion, taking into account the total number of criteria assessed. This process allows the SWARA method to accommodate expert knowledge-based evaluations with consistent and relevant weighting results to support decision making.

Based on the analysis above, it is concluded that there are several formulas in the stages of the SWARA assessment procedure in this study. First, is to sort the criteria from the most important to the least important according to the decision maker, second is to determine the comparative coefficient (S_j) with the formula:

$$S_j = \frac{w_j}{w_{\{j-1\}}} \quad (1)$$

S_j=comparative importance value assigned by the decision maker

Third, calculate the coefficient value (K_j) after calculating the comparative coefficient with the formula:

$$Kj = \begin{cases} 1 & j = 1 \\ Sj + 1 & j > 1 \end{cases} \quad (2)$$

Fourth, determine the temporary weight q_j using the formula:

$$Qj = \begin{cases} 1 & j = 1 \\ \frac{Qj-1}{Kj} & j > 1 \end{cases} \quad (3)$$

Finally, calculate the average/average weight of qj to obtain the relative weight of the assessment evaluation criteria:

$$Wj = \frac{Qj}{\sum_{j=1}^{n} Qj} \quad (4)$$

The first calculation functions to determine the comparative importance between consecutive criteria, providing a basis for assessing the change in importance from one criterion to the next. The second calculation functions to convert the comparative assessment into a coefficient that represents the adjustment required for determining the importance of each criterion. The third calculation functions to determine the temporary weight of each criterion sequentially by adjusting the weight of the preceding criterion according to the calculated coefficient. Finally, the fourth calculation functions to normalize all temporary weights, producing the relative weights of the assessment criteria that can be used as the final criterion weights in the subsequent decision-making process.

The TOPSIS method is a decision-making technique that determines the best alternative based on its proximity to the positive ideal solution and its distance from the negative ideal solution (Anis, Saputra, & Khotop, 2024), (Riansyah, Prasetyani, Habibullah, Kurni, & Rosyani, 2023). This method considers predetermined criteria to produce optimal decisions. The final result provides the best alternative that best suits the needs and objectives of the evaluation.

According to (Sawyerr, Fasina, Adedeji, Adeniran, Oke, & Rajan, 2023) and (Simanjorang, 2022) the TOPSIS method determines the best alternative based on the proximity to the positive ideal solution and the distance from the negative ideal solution. The steps include normalizing the decision matrix to produce a value, then creating a weighted normalized decision matrix by considering the criteria weights (Damanik, Suendri, & Ikhwan, 2024), (Syah, Sanjaya, Lestari, & Putra, 2023), and (Hasibuan & Abdy, 2024). Furthermore, the positive and negative ideal solution matrices are calculated based on the nature of the benefits and costs, followed by calculating the distance between the alternatives and the ideal solution (Trinaldo & Pakereng, 2023). Finally, the preference value is calculated, where the alternative with the highest value becomes the top priority.

In addition, the analysis of the stages of the formula related to the TOPSIS method can be concluded into the following stages. First, Create a normalized decision matrix of the results of the SWARA analysis with the formula:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \quad (5)$$

Second, determine the normalized weight decision matrix with the formula:

$$v_{ij} = w_j \times r_{ij} \quad (6)$$

Third, determine the positive and negative ideal solutions using the formula:

$$A^+ = \{v_1^+, v_2^+, \ldots, v_n^+\} \quad (7)$$

$$v_j^+ = \max v_{ij}\ (j \in J), \min v_{ij}\ (j \in J') \quad (8)$$

$$A^- = \{v_1^-, v_2^-, \dots, v_n^-\} \quad (9)$$

$$v_j^- = \min v_{ij}\ (j \in J), \max v_{ij}\ s(j \in J') \quad (10)$$

Fourth, calculate the ideal positive and negative distance from the results of the analysis above, using the formula:

$$D_i^+ = \sqrt{\sum_{j=1}^{n}\left(v_{ij} - v_j^+\right)^2} \quad (11)$$

$$D_i^- = \sqrt{\sum_{j=1}^{n}\left(v_{ij} - v_j^-\right)^2} \quad (12)$$

And finally, at the TOPSIS analysis stage, namely calculating the preference score using the formula:

$$C_i = \frac{D_i^-}{D_i^+ + D_i^-} \quad (13)$$

The functions of Equations (5)–(13) are sequentially applied to transform the initial decision matrix into the final preference score of each alternative in the TOPSIS method. Equation (5) functions to normalize the decision matrix by eliminating the influence of different measurement units and scales among the criteria, thereby making the values comparable across all alternatives. Equation (6) functions to incorporate the criterion weights obtained from the SWARA method into the normalized decision matrix, producing a weighted normalized decision matrix that reflects the relative importance of each criterion. Equations (7)–(10) function to determine the positive ideal solution and negative ideal solution for each criterion. The positive ideal solution represents the most desirable performance across the criteria, while the negative ideal solution represents the least desirable performance. The determination of these ideal solutions considers the characteristics of each criterion, namely whether the criterion is classified as a benefit or a cost criterion, so that the appropriate maximum or minimum value is selected. Equations (11) and (12) function to measure the Euclidean distance of each alternative from the positive and negative ideal solutions, respectively. These calculations indicate how close each alternative is to the best possible solution and how far it is from the worst possible solution. Finally, Equation (13) functions to calculate the preference score of each alternative based on its relative proximity to the positive ideal solution. The resulting preference score represents the overall performance of each alternative, where a higher score indicates that the alternative is relatively closer to the positive ideal solution and farther from the negative ideal solution. Therefore, Equations (5)–(13) provide a sequential mechanism for normalizing the decision data, incorporating SWARA-derived criterion weights, identifying ideal solutions, measuring the distance of alternatives from those solutions, and ultimately obtaining the preference score used to rank the alternatives.

RESULTS AND DISCUSSION

Identify and sort the criteria

Based on the Education Unit Curriculum (KSP) as a guideline for the implementation of teaching and learning activities (KBM) at SMAN 12 Bandung for the 2024/2025 Academic Year, Teacher Performance Assessment based on Identification Reflection Improvement (SMAN 12 Bandung Education Report Card):

Tabel 1. Assessment Criteria

No	Criteria Code	Criteria	Attribute
1	KR1	The teacher explains the material clearly and easily understood, facilitating student understanding without difficulty.	Benefits
2	KR2	Teachers are actively involved in the learning process, motivating students to participate and ask questions.	Benefits
3	KR3	Teachers are able to maintain classroom discipline without using actions that demean or make students uncomfortable.	Cost
4	KR4	Teachers provide constructive input to help students' academic and personal development.	Benefits
5	KR5	Teachers welcome students' questions and ideas openly, creating a classroom atmosphere that supports discussion and exchange of ideas.	Benefits
6	KR6	Teachers give assignments and tests that are appropriate to the material and provide sufficient instructions.	Cost
7	KR7	Teachers use technology effectively to enhance students' learning experiences.	Cost
8	KR8	The teacher provides a sense of security and comfort when communicating with me, both inside and outside of learning.	Benefits
9	KR9	Teachers use a variety of methods during learning.	Benefits

Source: (Research Results, 2025)

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In Table 1, it can be defined as follows A good teacher is actively engaged in the learning process, fostering a supportive and inclusive classroom environment. They motivate students to participate and ask questions, while maintaining discipline in a way that respects student dignity. The teacher provides constructive feedback to support students' academic and personal growth, and welcomes student ideas and questions, creating a conducive atmosphere for discussion and idea exchange. They effectively utilize various teaching methods and technology to enhance the learning experience. Furthermore, they establish a sense of security and comfort in their communication with students, both inside and outside the classroom.

Determining Criteria Weights

Tabel 2. Relative Importance Coefficient

Criteria	Order of Priority	S_j (Relative Importance Coefficient)
KR1	1	0.00
KR2	2	0.10
KR3	3	0.15
KR4	4	0.10
KR5	5	0.05
KR6	6	0.05
KR7	7	0.05
KR8	8	0.10
KR9	9	0.10

Source: (Research Results, 2025)

Table 2 presents the relative importance coefficient S_j for each criterion based on the established priority order. The first criterion, KR1, is assigned an S_j value of 0 because it has the highest priority. For the subsequent criteria, the S_j values represent the comparative importance of each criterion relative to the previous criterion, as determined by the decision maker. These values are then used to calculate the adjustment coefficient Kj in the next stage of the SWARA method.

Determining Adjustment Factors

Based on Table 3, the adjustment coefficient K_j is calculated using $K_j = 1 + S_j$ for each criterion after the first criterion. A higher S_j value results in a higher K_j value. The K_j coefficient is subsequently used to calculate the recalculated weight Q_j sequentially in the SWARA weighting process.

Tabel 3. Adjustment Factors

No	Criteria	Order of Priority	S_j (Relative Importance Coefficient)	K_j (Adjustment Factor) $(1+S_j)$
1	KR1	1	0.00	1.00
2	KR2	2	0.10	1.10
3	KR3	3	0.15	1.15
4	KR4	4	0.10	1.10
5	KR5	5	0.05	1.05
6	KR6	6	0.05	1.05
7	KR7	7	0.05	1.05
8	KR8	8	0.10	1.10
9	KR9	9	0.10	1.10

Source: (Research Results, 2025)

Determining Accumulative Priority Value

Based Table 4, the recalculated weight Q_j is obtained by dividing the previous Q_j-1 value by K_j, where $Q_1 = 1$. This value represents the relative weight before the normalization process is carried out. The calculation formula is $\sum Q_j = 1.0000 \times K_j$. For example, based on the table, the first criterion (KR1) has $S_j = 0.00$, so that $K_j = 1.00$ dan $Q_j = 1.0000$. For the next criteria, Q_j calculated based on the results of multiplication by K_j, generate total value $Q_j = 8.3631$ for all criteria.

Tabel 4. Accumulative Priority Value

No	Criteria	Order of Priority	S_j (Relative Importance Coefficient)	K_j (Adjustment Factor) $(1+S_j)$	Q_j(Accumulative Priority Value)
1	KR1	1	0.00	1.00	1.0000
2	KR2	2	0.10	1.10	0.9091
3	KR3	3	0.15	1.15	0.8696
4	KR4	4	0.10	1.10	0.9091
5	KR5	5	0.05	1.05	0.9524
6	KR6	6	0.05	1.05	0.9524
7	KR7	7	0.05	1.05	0.9524
8	KR8	8	0.10	1.10	0.9091
9	KR9	9	0.10	1.10	0.9091
			Total		8.3631

Source: (Research Results, 2025)

Tabel 5. Normalization Weight

No	Criteria	Order of Priority	S_j (Relative Importance Coefficient)	K_j (Adjustment Factor) $(1+S_j)$	Q_j(Accumulative Priority Value)	Normalization Weight (W_j)
1	KR1	1	0.00	1.00	1.0000	0.1196
2	KR2	2	0.10	1.10	0.9091	0.1087
3	KR3	3	0.15	1.15	0.8696	0.1040
4	KR4	4	0.10	1.10	0.9091	0.1087
5	KR5	5	0.05	1.05	0.9524	0.1139
6	KR6	6	0.05	1.05	0.9524	0.1139

No	Criteria	Order of Priority	S_j (Relative Importance Coefficient)	K_j (Adjustment Factor) (1+S_j)	Q_j(Accumulative Priority Value)	Normalization Weight (W_j)
7	KR7	7	0.05	1.05	0.9524	0.1139
8	KR8	8	0.10	1.10	0.9091	0.1087
9	KR9	9	0.10	1.10	0.9091	0.1087
			Total		8.3631	1.0000

Source: (Research Results, 2025)

Determining Normalization Weight

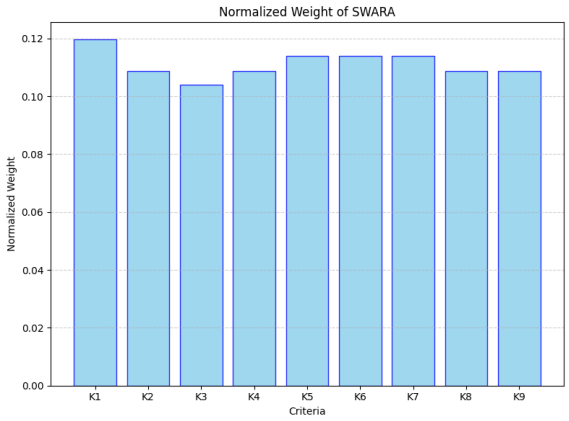
In the Table 5, Normalized Weight (W_j) is obtained by dividing Q_j by the total Q_j. The formula is: $W_j = Q_j$ / (Total Q_j). This value represents the final weight of each criterion after the normalization process. For example, for the first criterion (KR1), which has Q_j = 1.0000 and total Q_j = 8.3631, the normalized weight is 1.0000 / 8.3631 = 0.1196. This normalization process aims to obtain more measurable relative weights, allowing for comparisons between criteria. In the given table, S_j (Relative Importance Coefficient) reflects the difference in importance levels between criteria. S_j for the first criterion is 0, as it is considered the most important. For subsequent criteria, the Sj value is assigned based on the decision-maker's judgment, ranging from 0 to 0.3 or more, depending on how important the criterion is relative to others. For example, Sj for the second criterion is 0.10, indicating a slight difference in importance compared to the first criterion.

K_j (Adjustment Factor) is calculated using the formula $K_j = 1 + S_j$, reflecting the impact of adjusting the importance level of the previous criterion. A criterion with a higher S_j value will result in a larger K_j. Q_j (Cumulative Priority Value) is calculated as the product of the previous Q_j value and K_j, starting with Q_j = 1.0000 for the first criterion. Q_j represents the relative weight before normalization. After all Qj values are calculated, the next step is to normalize them to obtain the Normalized Weight (W_j), which is used as the final weight of the criteria.

Topsis Analyst

The first step in the analysis process using the TOPSIS method is to import data from an Excel file containing information related to 60 teachers at SMAN 12 Bandung. The data is taken from a file named GuruSMAN12BDG.xlsx, where this file stores the values that will be used in the calculation. Next, the weights for each criterion are calculated based on the SWARA (Step-Wise Weight Assessment Ratio Analysis) method. In this example, the weights obtained have values such as 0.1196, 0.1087, and so on, which reflect the relative importance of each criterion.

To visualize the distribution of weights for each criterion, a bar graph is created using the matplotlib library. The criteria are labeled as K1 to K9, according to the number of weights. This graph depicts the normalized weights in light blue, providing a visual view of the differences in importance between criteria. The horizontal axis shows the criterion labels, while the vertical axis shows the normalized weight values. With the addition of titles, axis labels, and gridlines, this graph provides an easy-to-understand representation of the weighting of the criteria in the TOPSIS analysis which is depicted in Figure 2 below.



Source: (Research Results, 2025)

Figure 2. Normalized Weight Results from SWARA

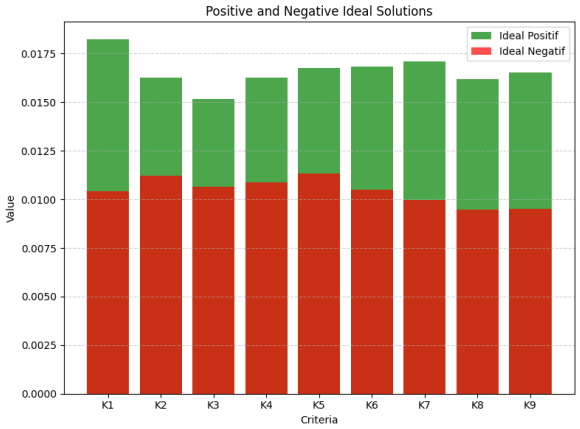
The second step in the TOPSIS analysis process is the normalization of the decision matrix. At this stage, the assessment data contained in the Excel file is taken from the second column to the last column using the .iloc function. These values are then processed into a decision matrix to be normalized. Normalization is done by dividing each element of the decision matrix by the square root of the sum of the squares of the elements in its column. To avoid potential division by zero, divisors with a zero value are replaced with small values (1e-10).

The result of this normalization process is a matrix whose values are all in the range between 0 and 1, allowing for a fairer comparison between criteria. Based on the calculation, the average of the normalized value is 0.12847258169486725, while the standard deviation is 0.012706786349125952. This value shows how the data is distributed after the normalization process, providing a basis for the next analysis steps in the TOPSIS method.

The third step is to calculate the weighted matrix by multiplying the values of the

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Vol. 22, No. 2 September 2026 | DOI: 10.33480/pilar.v22i2.6446

normalization matrix by the weights of each criterion. The results of this weighted matrix are then used in the fourth step to determine the positive and negative ideal solutions. The positive ideal solution is obtained from the maximum value in each column of the weighted matrix, while the negative ideal solution is taken from the minimum value. To visualize the results, a bar graph is created to illustrate the comparison between the values of the positive ideal solution (in green) and the negative ideal solution (in red) for each criterion. This graph makes it easier to interpret the data by showing how each criterion approaches the ideal solution in the TOPSIS analysis which is depicted in Figure 3 below.



Source: (Research Results, 2025)

Figure 3. Positive and Negative Ideal Solutions

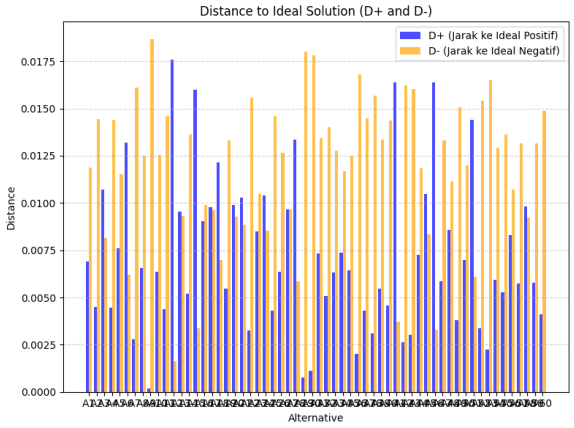
The fifth step in the TOPSIS method is to calculate the distance of each alternative to the positive ideal solution (D+) and the negative ideal solution (D-). This distance is calculated using the Euclidean formula, where the previous positive and negative ideal solution values are used as references. The D+ value reflects how far the alternative is away from the positive ideal condition, while D- shows how close the alternative is to the negative ideal condition.

The results of this calculation are then arranged in a table, where each alternative is labeled A1 to A60. This table contains two main columns: "D+ (Distance to Positive Ideal)" and "D- (Distance to Negative Ideal)". This data provides important insights into the analysis, because alternatives with low D+ and high D- tend to be better at approaching the ideal solution. The results of the table can also be used as a basis for subsequent steps in determining the final ranking which is depicted in Table 6 and Figure 4 below.

Tabel 6. Results Calculating the Distance to the Ideal Solution (D+ and D-)

Alternative	D+ (Distance to Positive Ideal)	D- (Distance to Negative Ideal)
A1	0.00692	0.011875
A2	0.00448	0.014448
A3	0.01073	0.008143
A4	0.00447	0.014405
A5	0.00760	0.011513
A6	0.01318	0.006201
A7	0.00279	0.016099
A8	0.00654	0.012500
A9	0.00016	0.018663
A10	0.00638	0.012543
A11	0.00437	0.014580
A12	0.01757	0.001635
A13	0.00956	0.009299
A14	0.00518	0.013632
A15	0.01598	0.003380
A16	0.00905	0.009881
A17	0.00979	0.009611
A18	0.01215	0.00700
A19	0.00547	0.013321
A20	0.00988	0.009266
A21	0.01030	0.008835
A22	0.00327	0.015587
A23	0.00848	0.010486
A24	0.01040	0.008530
A25	0.00430	0.014608
A26	0.00637	0.012659
A27	0.00966	0.009646
A28	0.01334	0.005868
A29	0.00077	0.018026
A30	0.00110	0.017816
A31	0.00735	0.013434
A32	0.00509	0.014031
A33	0.00632	0.012774
A34	0.00736	0.011680
A35	0.00644	0.012500
A36	0.00199	0.016813
A37	0.00431	0.014491
A38	0.00311	0.015678
A39	0.00548	0.013373
A40	0.00456	0.014380
A41	0.01638	0.003736
A42	0.00263	0.016247
A43	0.00301	0.016017
A44	0.00726	0.011851
A45	0.01049	0.008355
A46	0.01638	0.003275
A47	0.00584	0.013315
A48	0.00857	0.011146
A49	0.00379	0.015074
A50	0.00700	0.011993
A51	0.01439	0.006089
A52	0.00337	0.015429
A53	0.00225	0.016516
A54	0.00593	0.012940
A55	0.00527	0.013612
A56	0.00829	0.010726
A57	0.00575	0.013145
A58	0.00980	0.009233
A59	0.00579	0.013168
A60	0.00409	0.014877

Source: (Research Results, 2025)



Source: (Research Results, 2025)

Figure 4. Distance to Ideal Solution (D+ and D-)

The results of the TOPSIS method application show preference rankings based on the calculation of positive ideal distance (D+) and negative ideal distance (D-) which reflect the extent to which the criteria owned by each teacher are close to or far from the ideal condition. In the final results table, it can be seen that Teacher 9 is ranked first with the highest preference value, followed by Teacher 29 and Teacher 30, indicating that they have better performance compared to other teachers. On the other hand, Teacher 45 and Teacher 40 are ranked lower, indicating lower performance based on the evaluation of various criteria.

This ranking is arranged by sorting the preference values calculated using a comparison between the D+ and D- distances. The D+ value indicates the distance from the alternative to the positive ideal solution, while D- measures the distance to the negative ideal solution. Thus, the resulting preference ranking (V) provides an objective picture of the teachers who have the best performance based on all observed criteria. In this case, the smaller the D+ value and the larger the D- value, the higher the preference value (V) obtained.

This table provides very useful information to assess the overall performance of teachers, showing variations in the fulfillment of the established criteria. By using the TOPSIS method, the assessment process can be carried out systematically and objectively, providing a clearer picture of who meets the ideal standards and who still needs improvement in various aspects of their performance. The data is in Table 7 below.

Tabel 7. Sort the Teacher Assessment Preference Values at SMAN 12 Bandung

Teacher	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	Criteria 6	Criteria 7	Criteria 8	Criteria 9	D+	D-	Preferensi (V)
Teacher 9	4.9175 25773	4.9175 25773	4.8144 3299	4.9072 16495	4.9175 25773	4.8350 51546	4.8659 79381	4.9484 53608	4.8659 79381	0.0001 64812	0.0186 62837	0.9912 46276
Teacher 29	4.8607 59494	4.8354 43038	4.8481 01266	4.8101 26582	4.8860 75949	4.8227 8481	4.7468 35443	4.8607 59494	4.7848 10127	0.0007 71401	0.0180 25775	0.9589 61861
Teacher 30	4.6923 07692	4.8461 53846	4.7435 89744	4.8461 53846	4.8205 12821	4.8717 94872	4.7692 30769	4.8974 35897	4.7948 71795	0.0011 00427	0.0178 1609	0.9418 272
Teacher 36	4.7093 02326	4.7674 4186	4.6744 18605	4.7790 69767	4.7906 97674	4.7325 5814	4.5348 83721	4.7674 4186	4.6511 62791	0.0019 92594	0.0168 13092	0.8940 43006
Teacher 53	4.6363 63636	4.7402 5974	4.6493 50649	4.7662 33766	4.7402 5974	4.6233 76623	4.5844 15584	4.7142 85714	4.6883 11688	0.0022 50142	0.0165 15565	0.8800 92881
Teacher 42	4.7021 2766	4.5744 68085	4.5106 38298	4.6382 97872	4.7553 19149	4.6914 89362	4.5531 91489	4.7021 2766	4.6489 3617	0.0026 31134	0.0162 46695	0.8606 23078
Teacher 7	4.5909 09091	4.6666 66667	4.7727 27273	4.6666 66667	4.7575 75758	4.6363 63636	4.4545 45455	4.8030 30303	4.4848 48485	0.0027 91745	0.0160 99465	0.8522 19886
Teacher 43	4.6881 72043	4.6559 13978	4.5591 39785	4.5483 87097	4.7526 88172	4.3548 3871	4.5806 45161	4.8172 04301	4.6236 55914	0.0030 11523	0.0160 17454	0.8417 40174
Teacher 38	4.5757 57576	4.6262 62626	4.5555 55556	4.5353 53535	4.6464 64646	4.6666 66667	4.5555 55556	4.6565 65657	4.5252 52525	0.0031 11802	0.0156 7799	0.8343 88695
Teacher 22	4.6780 82192	4.5684 93151	4.6712 32877	4.5547 94521	4.6369 86301	4.6027 39726	4.4041 09589	4.5547 94521	4.5958 90411	0.0032 7091	0.0155 87375	0.8265 53168
Teacher 52	4.5416 66667	4.5416 66667	4.6666 66667	4.625	4.625	4.5416 66667	4.5833 33333	4.5	4.5416 66667	0.0033 65286	0.0154 28906	0.8209 40098
Teacher 49	4.3333 33333	4.5833 33333	4.6666 66667	4.5833 33333	4.5833 33333	4.4583 33333	4.5833 33333	4.625	4.5	0.0037 906	0.0150 74302	0.7990 66
Teacher 60	4.6470 58824	4.4117 64706	4.4901 96078	4.5686 27451	4.4705 88235	4.6274 5098	4.2941 17647	4.5882 35294	4.4509 80392	0.0040 93382	0.0148 76914	0.7842 21486
Teacher 25	4.5384 61538	4.4807 69231	4.4423 07692	4.5192 30769	4.5384 61538	4.25	4.5576 92308	4.5576 92308	4.4423 07692	0.0042 9858	0.0146 08194	0.7726 43376
Teacher 37	4.5350 31847	4.4777 07006	4.5732 48408	4.4394 90446	4.5286 6242	4.4203 82166	4.3566 87898	4.5222 92994	4.4522 29299	0.0043 09494	0.0144 90714	0.7707 74146
Teacher 11	4.5428 57143	4.4285 71429	4.4857 14286	4.3714 28571	4.4857 14286	4.5428 57143	4.5428 57143	4.3428 57143	4.5142 85714	0.0043 67471	0.0145 79937	0.7694 95075
Teacher 2	4.3009 70874	4.4660 19417	4.3398 05825	4.4174 75728	4.5825 24272	4.5922 3301	4.4563 1068	4.6213 59223	4.4466 01942	0.0044 82021	0.0144 47993	0.7632 32055

Teacher	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	Criteria 6	Criteria 7	Criteria 8	Criteria 9	D+	D-	Preferensi (V)
Teacher 4	4.3	4.6153 84615	4.4384 61538	4.5307 69231	4.6615 38462	4.3769 23077	4.3230 76923	4.6692 30769	4.4076 92308	0.0044 72877	0.0144 05407	0.7630 67615
Teacher 40	4.5617 97753	4.5056 17978	4.5168 53933	4.4269 66292	4.4606 74157	4.4382 02247	4.1685 39326	4.5730 33708	4.5168 53933	0.0045 5888	0.0143 80094	0.7592 85796
Teacher 32	4.5802 46914	4.4444 44444	4.5308 64198	4.4197 53086	4.4320 98765	4.3456 79012	4	4.5555 55556	4.5185 18519	0.0050 93142	0.0140 31474	0.7336 86575
Teacher 14	4.4321 60804	4.4673 36683	4.4020 1005	4.4824 1206	4.4723 61809	4.3618 09045	4.1557 78894	4.5125 62814	4.2914 57286	0.0051 81443	0.0136 32103	0.7245 89794
Teacher 55	4.3622 04724	4.4094 48819	4.4173 22835	4.2677 16535	4.4724 40945	4.3307 08661	4.4015 74803	4.3070 86614	4.4960 62992	0.0052 72294	0.0136 11834	0.7208 08189
Teacher 39	4.3571 42857	4.3428 57143	4.4142 85714	4.3	4.4857 14286	4.4857 14286	4.3428 57143	4.4142 85714	4.1571 42857	0.0054 75861	0.0133 72983	0.7094 85565
Teacher 19	4.3539 82301	4.3982 30088	4.3982 30088	4.3362 83186	4.4247 78761	4.4424 77876	4.2212 38938	4.4424 77876	4.2654 86726	0.0054 69716	0.0133 2149	0.7089 21502
Teacher 57	4.2621 35922	4.2621 35922	4.3009 70874	4.3592 23301	4.4757 28155	4.3398 05825	4.4854 36893	4.3883 49515	4.1747 57282	0.0057 54625	0.0131 45058	0.6955 17387
Teacher 47	4.2696 62921	4.2247 19101	4.1123 59551	4.2022 47191	4.4494 38202	4.5617 97753	4.3932 58427	4.5393 25843	4.2696 62921	0.0058 39695	0.0133 14957	0.6951 29143
Teacher 59	4.1369 86301	4.4520 54795	4.6575 34247	4.5068 49315	4.3835 61644	4.4246 57534	4.0410 9589	4.4246 57534	4.3013 69863	0.0057 93012	0.0131 67551	0.6944 7047
Teacher 54	4.2222 22222	4.2323 23232	4.3838 38384	4.3232 32323	4.3333 33333	4.4242 42424	4.3636 36364	4.3838 38384	4.2323 23232	0.0059 27594	0.0129 39663	0.6858 26406
Teacher 33	4.1333 33333	4.3333 33333	4.3555 55556	4.3777 77778	4.1777 77778	4.1333 33333	4.6	4.3777 77778	4.2	0.0063 21851	0.0127 74462	0.6689 49109
Teacher 26	4.1276 59574	4.1347 51773	4.2836 87943	4.1702 12766	4.3971 63121	4.3546 09929	4.3900 70922	4.4822 69504	4.2198 58156	0.0063 73187	0.0126 58706	0.6651 31224
Teacher 10	4.3333 33333	4.1666 66667	4.3333 33333	4.3333 33333	4.3333 33333	4.3333 33333	4.3333 33333	4.3333 33333	4	0.0063 78341	0.0125 43474	0.6629 10706
Teacher 35	4.3770 4918	4.3524 59016	4.2540 98361	4.2459 01639	4.2786 88525	4.4918 03279	4.0819 67213	4.1475 40984	4.2213 11475	0.0064 39277	0.0124 99622	0.6599 97302
Teacher 8	4.4444 44444	4.2222 22222	4.3703 7037	4.2222 22222	4.2962 96296	4.5185 18519	4.1481 48148	4.0740 74074	4.1111 11111	0.0065 44556	0.0124 99685	0.6563 49845
Teacher 31	4.45	4.05	4.2	3.9	4.35	4.85	4.85	4.25	3.6	0.0073 45257	0.0134 33628	0.6465 03777
Teacher 1	4.2656 25	4.2734 375	4.3515 625	4.2812 5	4.3125	4.2734 375	4.1015 625	4.1875	3.9921 875	0.0069 15615	0.0118 75032	0.6319 65032
Teacher 50	4.32	4.1733 33333	4.36	4.1866 66667	4.16	4.2333 33333	3.9466 66667	4.3266 66667	4.2866 66667	0.0069 96995	0.0119 93271	0.6315 48353
Teacher 44	3.92	4.2	4.2	4.2	4.36	3.96	4.32	4.36	4.36	0.0072 62883	0.0118 5115	0.6200 23502
Teacher 34	4.3802 8169	4.2957 74648	4.2394 3662	4.0985 91549	4.1408 4507	4.3802 8169	3.9859 15493	4	4.1408 4507	0.0073 57874	0.0116 79767	0.6135 0917
Teacher 5	4.0882 35294	4.0588 23529	4.3529 41176	4.1470 58824	4.0882 35294	4.0588 23529	4.4117 64706	4.0588 23529	4.2352 94118	0.0075 97691	0.0115 13353	0.6024 4502
Teacher 48	3.6470 58824	4.5588 23529	4.1764 70588	4.3823 52941	4.4705 88235	4.2647 05882	3.5294 11765	4.5294 11765	3.8529 41176	0.0085 72409	0.0111 45635	0.5652 50538
Teacher 56	4.0390 2439	3.9804 87805	4.0048 78049	4.0390 2439	4.2	4.2390 2439	4.0341 46341	4.3219 5122	3.9414 63415	0.0082 93472	0.0107 25587	0.5639 38884
Teacher 23	4.1986 30137	4.1369 86301	4.4589 0411	4.0479 45205	4.1780 82192	4.0616 43836	4.0273 9726	3.9041 09589	3.7602 73973	0.0084 84608	0.0104 86437	0.5527 60109
Teacher 16	3.9837 39837	4.3008 13008	4.2439 02439	4.2357 72358	4.1463 41463	4.0650 4065	3.6260 1626	4.0894 30894	3.6991 86992	0.0090 50197	0.0098 81275	0.5219 49617
Teacher 27	3.3673 46939	4.0612 2449	4.2653 06122	4.0408 16327	4.1836 73469	3.8979 59184	3.9795 91837	4.2448 97959	4.0204 08163	0.0096 63614	0.0096 45788	0.4995 38406
Teacher 17	3.5333 33333	4.2	4.1666 66667	4.1	4.2666 66667	3.7	4.2333 33333	4.2333 33333	3.5333 33333	0.0097 8963	0.0096 11299	0.4954 04057
Teacher 13	3.7113 40206	3.9896 90722	4.1649 48454	3.9690 72165	4.0721 64948	3.9278 35052	3.9381 4433	4.0412 37113	3.9587 62887	0.0095 64219	0.0092 99088	0.4929 72306
Teacher 58	3.9892 47312	3.9139 78495	4.0537 63441	3.8924 73118	4.1827 95699	4.2150 53763	3.8602 15054	3.6666 66667	3.7526 88172	0.0098 02886	0.0092 32833	0.4850 26758
Teacher 20	3.6226 41509	3.8962 26415	4.1037 73585	3.9339 62264	3.9433 96226	3.9339 62264	4.2264 15094	3.9433 96226	3.9339 62264	0.0098 81375	0.0092 65981	0.4839 3006
Teacher 21	3.9130 43478	3.8260 86957	3.7608 69565	3.7391 30435	4.0217 3913	4.0217 3913	4	3.8695 65217	3.8043 47826	0.0102 99076	0.0088 35082	0.4617 43967
Teacher 24	3.6913 58025	3.8148 14815	3.9629 62963	3.8641 97531	4.0617 28395	4	3.9259 25926	3.9135 80247	3.7407 40741	0.0103 96647	0.0085 30455	0.4507 00521
Teacher 45	3.7433 15508	3.8128 34225	4.0534 75936	3.8823 52941	4.0695 18717	3.8556 14973	3.7700 53476	3.9197 86096	3.7914 4385	0.0104 93524	0.0083 55416	0.4432 83063
Teacher 3	3.7089 55224	3.9626 86567	3.8134 32836	3.9701 49254	3.9477 61194	3.8059 70149	3.7089 55224	4.0373 13433	3.7238 80597	0.0107 26561	0.0081 43033	0.4315 42568

Teacher	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	Criteria 6	Criteria 7	Criteria 8	Criteria 9	D+	D-	Preferensi (V)
Teacher 18	3.96	3.76	4	3.72	3.8	3.76	3.32	3.6	3.56	0.012150498	0.007000383	0.365538428
Teacher 6	3.6052 63158	3.5131 57895	3.6315 78947	3.5789 47368	3.5526 31579	3.9078 94737	3.5657 89474	3.7894 73684	3.3421 05263	0.013183925	0.006200663	0.319875913
Teacher 28	3.34	3.52	3.71	3.6	3.72	3.82	3.77	3.51	3.42	0.013337758	0.005806809	0.305536637
Teacher 51	2.8918 91892	3.4054 05405	3.5945 94595	3.5675 67568	3.5945 94595	3.4594 59459	4.1081 08108	3.8108 10811	3.3783 78378	0.014387524	0.006089089	0.297367965
Teacher 41	3.2558 13953	3.3953 48837	3.7441 86047	3.2790 69767	3.3255 81395	3.5581 39535	2.8372 09302	3.6976 74419	2.8604 65116	0.016378983	0.003735764	0.185722662
Teacher 15	3	3.6764 70588	3.6470 58824	3.4411 76471	3.7058 82353	3.2058 82353	3.3529 41176	3.5	2.7941 17647	0.015982195	0.003379746	0.174556158
Teacher 46	2.81	3.39	3.73	3.33	3.39	3.23	3.43	3.46	3.15	0.016384091	0.003274687	0.166576307
Teacher 12	2.9806 94981	3.4555 98456	3.4015 44402	3.3243 24324	3.3629 34363	3.0386 10039	3.1505 79151	2.8996 139	3.0849 42085	0.017573638	0.001603521	0.085127953

Source: (Research Results, 2025)

Based on the results of the TOPSIS analysis above, it can be concluded that several teachers at SMAN 12 Bandung showed very good performance, with a preference value (V) approaching 1, such as Teacher 9 who achieved a value of 0.991. This shows that teachers with high preference values have consistent performance across all assessed criteria. Conversely, several teachers with low preference values, such as Teacher 12, had much lower values (0.085). This may indicate areas for improvement in their performance, which can be influenced by various factors, ranging from teaching methods to interactions with students. Teachers with low scores need special attention to improve the quality of their teaching. For this reason, data-based interventions, such as training or mentoring, can be effective steps to improve performance.

The follow-up plan for SMAN 12 Bandung related to teacher performance assessment using SWARA and TOPSIS is to conduct further evaluation of the results obtained. Teachers with low preference values need to receive appropriate professional development programs, such as training in more effective teaching methodologies or coaching in terms of classroom management. In addition, these results can be used to design reward policies for teachers with the best performance to increase motivation. Schools can also consider the preparation of a more structured feedback system, where teachers can identify their strengths and weaknesses based on the assessment results, and get suggestions for more focused self-development. The use of this data can also be a consideration in annual evaluations that are more based on achievements and performance results, not just on subjective assessments.

CONCLUSION

The results of the analysis using the SWARA and TOPSIS methods show that the teacher performance assessment at SMAN 12 Bandung produces different preference values between one teacher and another. The SWARA method is used to determine the relative weight of each assessment criterion, while the TOPSIS method is used to calculate the preference value and determine the ranking of each teacher based on the established criteria. Based on the final calculation results, Teacher 9 obtained the highest preference score of 0.991 and was ranked first, followed by Teacher 29 and Teacher 30. Meanwhile, Teacher 12 obtained a lower preference score of 0.085. These results show that the combination of SWARA and TOPSIS can provide a quantitative basis for comparing teacher performance based on the criteria used in the assessment process.

The results of this evaluation can be used as supporting information for SMAN 12 Bandung in conducting further teacher performance assessments. The ranking results can also be used as a reference for identifying teachers who require further evaluation based on their preference values. For future research, further evaluation can be carried out by comparing the results with other decision-making methods, reviewing the stability of the criteria weights, and validating the ranking results using other teacher performance assessment measures.

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