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Comparison of SAW, AHP, and TOPSIS Methods in a Decision Support System for Teacher Performance Evaluation

Bernadete Deta^{1*}, Sesilia M. Ina Bedanaen¹

¹ Institut Keguruan dan Teknologi Larantuka, Flores Timur, Indonesia

* Corresponding author: Bernadete Deta (auran8150@gmail.com)

Abstract

Teachers are one of the important elements that schools must have in order to improve educational services. Teachers must always be motivated to provide the best educational services to their students, so that schools can improve the quality of schools to become great flagship schools. One effort to improve school quality is by evaluating teacher performance assessments. Conducting teacher performance assessments is an analytical process that aims to create better teaching and educational services. The teacher performance assessment process is still carried out manually and no specific methods are applied. This study applies a comparative analysis of Simple Additive Weighting (SAW), Analytical Hierarchy Process (AHP), and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methods, each generating alternative rankings to evaluate effectiveness and accuracy in teacher performance decision-making. Based on the results of the accuracy and suitability levels, the comparison of the total percentage of the SAW, AHP, and TOPSIS methods on both types of teacher performance regulations has the same suitability percentage of 99.99% and the same accuracy level of 100%, but there are differences in each resulting preference value.

Keywords

AHP, DSS, SAW, Teacher Performance Evaluation, TOPSIS.

1. Introduction

Teacher performance is one of the main pillars that determine the quality of education in an educational institution. Teachers not only serve as transmitters of learning material but also act as mentors, motivators, and role models for students in optimally developing their potential. Thus, the quality of education produced by a school is closely related to the quality of its teachers' performance (Mirdania & Nawindah, 2021; Pramana et al., 2022). This aligns with the view expressed by Darling-Hammond (2000), who stated that competent and highly dedicated teachers are capable of creating effective learning environments, thereby significantly improving students' academic achievement (Fariza et al., 2025).

Teacher performance is the work achieved by teachers in fulfilling their duties as professional educators in line with their competencies (Murkatik et al., 2020; Librado & Prabawa, 2024). It covers not only teaching outcomes but also attitudes, behavior, and contributions toward educational goals. High-performing teachers manage classrooms effectively, foster positive interactions, and provide optimal guidance to students (Harun, 2023; Amin & Kurniawan, 2025). As the spearhead of curriculum implementation, teacher performance directly affects student learning outcomes, making accurate and consistent evaluation essential for identifying strengths and weaknesses (Supardi & Mahdiana, 2023; Nuraeni et al., 2025). Teacher performance evaluation, defined as the assessment of past or current achievements in relation to future potential in schools focuses on pedagogical, personal, social, and professional competencies. Such evaluations guide teacher career development and support overall improvement of education quality (Normah et al., 2022; Gemawaty & Yuliani, 2023; Undiadi & Muhammad, 2025).

At Private Catholic Junior High School Santu Yusuf Larantuka, teacher performance evaluations are still conducted manually by the principal using basic spreadsheet software, such as Microsoft Excel. The method used has yet to employ a quantitative multi-criteria analysis approach capable of processing various assessment factors more objectively. Based on interviews with the principal, it was revealed that teacher evaluations sometimes suffer from inconsistency, with assessment results varying from time to time without a standardized basis. This condition poses a risk of unfairness and may reduce teachers' motivation, as evaluation parameters lack standardized calculation foundations (Pelletier & Rocchi, 2016; Gao et al., 2025).

The teacher performance evaluation system in schools generally considers four key factors: compliance with regulations, performance-based assessment, document-based evidence, and consistency in implementation (Rizky et al., 2022; Handayani, 2023). In practice, however, these aspects are not fully applied. Some teachers are undisciplined in preparing and submitting lesson plans, while inconsistencies appear in evaluation results across periods without clear justification. Such irregularities highlight the need for a more structured and accountable evaluation system supported by reliable decision-making methods (Firdaus & Bachtiar, 2021).

One potential solution for improving teacher performance evaluation is the application of a Decision Support System (DSS) using multi-criteria decision-making methods. A DSS is a computer-based system that helps decision-makers address complex problems by considering multiple criteria (Galuh & Siregar, 2025). In this context, a DSS can process assessment data across various indicators, ensuring results that are more objective, consistent, and accountable. Three methods commonly applied are Simple Additive Weighting (SAW), Analytical Hierarchy Process (AHP), and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) (Laurentinus & Rizan, 2022).

SAW is a straightforward weighted-sum method, valued for its simplicity but limited by reliance on subjectively determined weights (Latifah & Diartono, 2023;

Nasyuha et al., 2025). AHP, developed by Saaty and Windy (1980), determines weights through pairwise comparisons and ensures consistency, though it becomes time-consuming with many criteria (Annisa et al., 2018). TOPSIS evaluates alternatives based on closeness to ideal solutions, offering balanced results but requiring precise normalization (Andriyani & Hafiz, 2018).

By applying the right DSS method, schools can avoid subjective bias in evaluations, strengthen fairness, and ensure that each teacher is assessed based on clear and measurable criteria (Ibrahim & Surya, 2019). Ultimately, this will have a positive impact on the quality of teaching and the achievement of educational goals. This study aims to analyze and compare the accuracy and effectiveness of the SAW, AHP, and TOPSIS methods in a DSS for teacher performance evaluation at SMPSK Santu Yusuf Larantuka. The study will examine whether these three methods produce the same or different teacher rankings and identify the method that provides the most accurate and consistent information. The results are expected to serve as a basis for the school to adopt a more objective and transparent evaluation method that can enhance teacher motivation and performance.

2. Methods

This study conducts a comparative analysis of the Simple Additive Weighting (SAW), Analytical Hierarchy Process (AHP), and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) methods to evaluate teacher performance at SMPSK St. Yusuf Larantuka, focusing on their effectiveness and accuracy in generating rankings for eight teacher alternatives. The evaluation process begins with SAW, which starts by defining decision criteria and assigning suitability ratings for each teacher based on four criteria for Regulation Number 30 (Service Orientation, Commitment, Teamwork, Work Initiative) and five for Regulation Number 46 (adding Integrity). Each criterion is assigned a weight reflecting its importance, summing to one, and the decision matrix is normalized by dividing each score by the maximum (for benefit attributes) or minimum (for cost attributes) value in its column to calculate the normalized performance rating (r_{ij}). The final preference value (V_i) is computed by summing the products of normalized ratings and their weights, with the highest V_i indicating the best teacher, as outlined by the formula:

$$\begin{array}{ll} \text{For benefit attributes:} & \text{For cost attributes} \\ r_{ij} = \frac{x_{ij}}{\max x_{ij}} \text{ if } j \text{ is a benefit attribute} & r_{ij} = \frac{\min x_{ij}}{x_{ij}} \text{ if } j \text{ is a cost attribute} \end{array}$$

Where

- r_{ij} = Normalized performance rating
- x_{ij} = Row and column elements of the matrix
- $\max x_{ij}$ = Maximum value for each column
- $\min x_{ij}$ = Minimum value for each column

The normalized performance ratings (r_{ij}) form a normalized matrix (R). The final preference value (V_i) is obtained by summing the products of the normalized matrix elements and their corresponding preference weights (W) in the column matrix. The highest V_i value is selected as the best alternative.

$$V_i = \sum_{j=1}^n w_j r_{ij}$$

Where

- V_i = Final value of the alternative
- w_j = Weight value
- r_{ij} = Normalized value
- n = Number of criteria

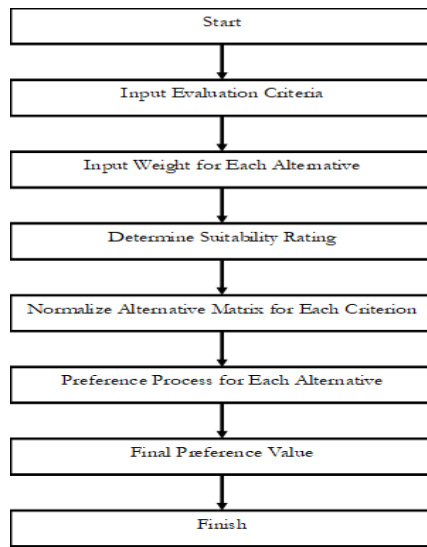


Figure 1. SAW Method Workflow

The SAW method’s workflow, depicted in Figure 1, involves setting criteria, weighting alternatives, normalizing values, and ranking based on preference scores, ensuring a straightforward yet effective decision-making process.

The AHP method follows by establishing criteria and determining their relative importance through pairwise comparisons using a 1–9 scale, where 1 indicates equal importance and 9 denotes absolute dominance. A pairwise comparison matrix is constructed, normalized to derive eigenvector values representing priority weights, and subjected to a consistency test to ensure reliable judgments. Consistency is assessed using the Consistency Index (CI), calculated as:

$$CI = \frac{\lambda_{max} - n}{n - 1} \qquad CR = \frac{CI}{CR}$$

Where

- n = Number of Elements (Criteria)
- λ_{max} = Maximum Eigenvalue
- RI = Index Ratio (RI is a random value obtained from the Random Consistency Index table at a certain n, shown in the following table.

This process, including comparisons for alternatives under each criterion, ensures logical and consistent rankings, as emphasized by Saaty and Wind (1980). The Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) method begins with determining the criteria and alternatives as the foundation for decision-making. The next step is constructing a normalized decision matrix to standardize

the data, followed by calculating the weighted normalized matrix using the given criteria weights. The formulas to measure the normalized decision matrix and weighted normalized decision matrix can be seen below:

Normalized Decision Matrix

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

Where :

r_{ij} = Normalized performance rating

x_{ij} = Row and column elements of the matrix

Weighted Normalized Decision Matrix

$$v_{ij} = x_{ij} \cdot w_j$$

The TOPSIS method starts by defining criteria and alternatives, constructing a normalized decision matrix by dividing each element by the square root of the sum of squares for its column, followed by weighting using predefined criteria weights. Positive and negative ideal solutions are identified based on maximum (benefit) or minimum (cost) values, and Euclidean distances from these ideals are calculated using formulas:

Positive Distance =

$$S_i^+ = \sqrt{\sum_{i=1}^n (y_i^+ - y_{ij})^2} \quad i = 1, 2, \dots, n$$

Negative Distance =

$$S_i^- = \sqrt{\sum_{i=1}^n (y_i^- - y_{ij})^2} \quad i = 1, 2, \dots, n$$

Where :

S_i^+ = distance to positive ideal solution

S_i^- = distance to negative ideal solution

Preference Value for Each Alternative:

$$V_i = \frac{S_i^-}{S_i^- + S_i^+}$$

Where :

V_i = final score used to determine the ranking of all alternatives

S_i^+ = distance to positive ideal solution

S_i^- = distance to negative ideal solution

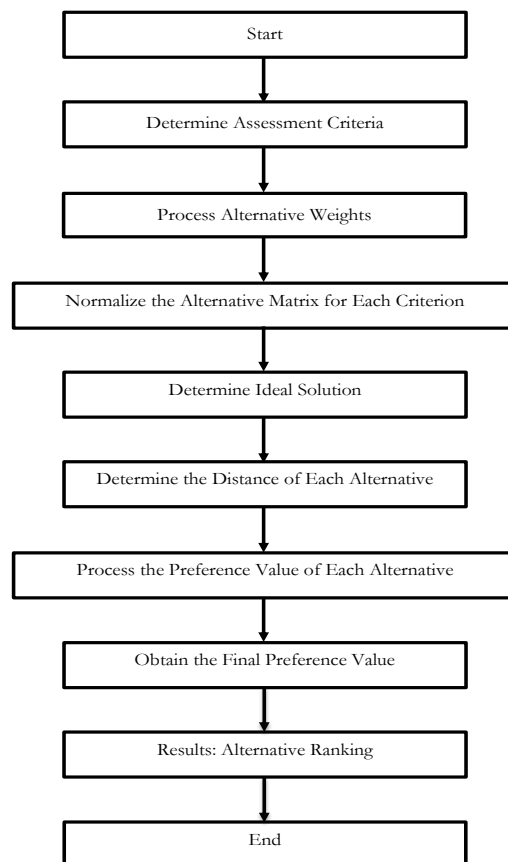


Figure 2. TOPSIS Method Workflow

The preference value (C_i), with higher values indicating better alternatives, as shown in Figure 2's workflow of normalizing, weighting, and ranking. This study compares the rankings from SAW, AHP, and TOPSIS to assess their suitability and accuracy, providing a robust framework for objective teacher performance evaluation.

4. Results

According to Kristanto (2018) data processing refers to the time used to describe the transformation of raw data into useful information. In this study, the researcher employed the SAW, AHP, and TOPSIS methods. These methods are decision-making techniques used in the process of selecting the best alternative. Teacher performance appraisal at SMPS K St. Yusuf Larantuka is conducted based on a performance assessment format consisting of four criteria in Regulation Number 30 and five criteria in Regulation Number 46. The assessment criteria in Regulation Number 30 are related to the Work Performance of Civil Servants (*Pegawai Negeri Sipil/PNS*), while those in Regulation Number 46 are related to the Performance of Civil Servants. In the SAW and TOPSIS methods, the determination of weights is decided by the decision-maker, while in the AHP method, weights are determined based on a comparison of criteria. The determination of weights in the decision support system for teacher performance assessment at SMPS K St. Yusuf Larantuka using SAW, AHP, and TOPSIS was carried out by the researcher through interviews or agreement with the Principal of SMPS K St. Yusuf Larantuka as the decision-maker.

Data process for Regulation Number 30 use SAW Method. The agreed-upon weights and attribute criteria are presented in the following Table 1.

Table 1. Attribute Table for Criteria

Alternative	Service Orientation	Commitment	Teamwork	Work Initiative	Total Weight
Weight	35	30	20	15	100
Importance	0.35	0.30	0.20	0.15	1
Attribute Type	Benefit	Benefit	Benefit	Benefit	-

Table 2. Preference and Ranking Results

Ranking Results	Preference	Rank
AP	1	1
DP	0.995360825	2
VB	0.989690722	3
PT	0.979381443	5
BT	0.949484536	7
HL	0.965979381	6
YK	0.979381443	5
MK	0.986597938	4

For Regulation Number 30, the SAW method was applied using predefined criteria weights determined through interviews with the school principal. The criteria, Service Orientation (weight 0.35), Commitment (0.30), Teamwork (0.20), and Work Initiative (0.15), were identified as benefit attributes, meaning higher scores indicate better performance. These weights reflect the relative importance of each criterion in assessing teacher performance, as shown in Table 2. The decision matrix was normalized by dividing each alternative’s score by the maximum value in its respective column, ensuring comparability across criteria. The final preference values were calculated by multiplying normalized scores by their corresponding weights and summing the results. Table 2 presents the preference values and rankings for eight teachers, with AP achieving the highest score of 1.000, securing first place, followed by DP (0.995) in second, and BT (0.949) in eighth. This ranking reflects the SAW method’s straightforward weighted-sum approach, which prioritizes simplicity but is sensitive to extreme values.

Table 3. Pairwise Comparison Between Criteria

Criteria	Service Orientation	Commitment	Teamwork	Work Initiative
Service Orientation	1	3	5	7
Commitment	0.333333333	1	3	5
Teamwork	0.333333333	0.2	1	3
Work Initiative	0.142857143	0.2	0.333333333	1
Total	1.80952381	4.4	9.33333333	16

The AHP method for Regulation Number 30 involved constructing a pairwise comparison matrix to determine criteria weights, using Saaty’s 1–9 scale to assess relative importance. Table 3 illustrates this matrix, showing, for example, that Service Orientation is three times more important than Commitment (value of 3) and seven times more important than Work Initiative (value of 7). The matrix was normalized to calculate eigenvector values, representing the priority weights of each criterion. Consistency was verified using the Consistency Index (CI) and Consistency Ratio (CR), ensuring reliable judgments ($CR \leq 0.1$). Pairwise comparisons were also conducted for alternatives under each criterion, such as

Commitment, where Adrianus P. Balun outperformed others. The AHP process, though more complex due to multiple comparison matrices, ensures consistency in weight determination, with final rankings aligning closely with SAW, as seen in later comparisons.

Table 4. Alternative Values

Alternative	C1	C2	C3	C4
A1	97	97	97	97
A2	97	96	97	96
A3	96	96	96	96
A4	95	95	95	95
A5	91	92	95	91
A6	95	93	93	93
A7	95	95	95	95
A8	96	95.5	96	95

For the TOPSIS method under Regulation Number 30, the process began with raw alternative scores, as shown in Table 4, where each teacher (A1 to A8) was scored across the four criteria (e.g., A1 scored 97 across all criteria, while A5 ranged from 91 to 95). These scores were normalized by dividing each element by the square root of the sum of squares for its column, followed by weighting using the same criteria weights as SAW (Service Orientation: 0.35, Commitment: 0.30, Teamwork: 0.20, Work Initiative: 0.15).

Table 5. Weighted Normalized Decision Matrix

Alternative	Service Orientation	Commitment	Teamwork	Work Initiative
A1	12.59950615	10.83558427	7.181541157	5.42827319
A2	12.59950615	10.72387721	7.181541157	5.37231161
A3	12.46961434	10.72387721	7.107504651	5.37231161
A4	12.33972252	10.61217016	7.033468144	5.316350031
A5	11.82015526	10.277049	7.033468144	5.092503714
A6	12.33972252	10.38875605	6.88539513	5.204426872
A7	12.33972252	10.61217016	7.033468144	5.316350031
A8	12.46961434	10.66802369	7.107504651	5.316350031

Table 5 displays the weighted normalized decision matrix, with values such as 12.600 for A1's Service Orientation, reflecting the weighted contribution of each criterion. Positive and negative ideal solutions were identified based on maximum and minimum values for benefit criteria, and Euclidean distances were calculated to determine each alternative's closeness to the ideal solutions. The preference values derived from these distances formed the basis for TOPSIS rankings, which are compared later.

For SAW, the normalization process involved dividing each teacher's score by the maximum value (97) for each criterion, producing a normalized matrix used in Table 4. For AHP, eigenvalue normalization yielded weights like 0.536 for Service Orientation, and consistency checks confirmed CR values below 0.1, indicating reliable judgments. For TOPSIS, the normalization divisors were calculated as the square root of the sum of squared scores per criterion, and ideal solution matrices identified maximum and minimum weighted values. Distances to these ideal solutions were computed to derive preference values, ensuring a robust ranking process.

For Regulation Number 46, the SAW method used five criteria: Service Orientation (weight 0.30), Integrity (0.25), Commitment (0.20), Discipline (0.15), and Teamwork (0.10). The normalization process, similar to Regulation No. 30, divided scores by the maximum value (86) per criterion, followed by weighting and

summation to rank alternatives. AHP for Regulation Number 46 involved pairwise comparisons, with Service Orientation rated seven times more important than Teamwork. Alternative comparisons under criteria like Commitment showed A1's dominance. TOPSIS followed a similar process to Regulation Number 30, with normalized and weighted normalized matrices leading to ideal solution distances. These steps, though not tabulated, produced consistent rankings across methods, mirroring Regulation Number 30's outcomes.

Table 6. Comparison Results for Regulation Type Number 30

Teacher Name	SAW Result	Rank	TOPSIS Result	Rank	AHP Result	Rank
AP	1	1	1	1	0.250527	1
DP	0.995360	2	0.887579	2	0.212726	2
VB	0.989690	3	0.816245	3	0.152507	3
PT	0.979381	5	0.63365	5	0.091429	5
BT	0.949484	8	0.126049	8	0.029064	8
HL	0.965979	7	0.460464	7	0.056678	7
YK	0.979381	6	0.63365	6	0.083769	6
MK	0.986597	4	0.765929	4	0.123295	4

The comparative analysis of SAW, AHP, and TOPSIS for Regulation Number 30 is summarized in Table 6, which shows preference values and rankings for all three methods. Adrianus P. Balun consistently ranked first across all methods (SAW: 1.000, TOPSIS: 1.000, AHP: 0.251), while Bibiana Toe ranked eighth (SAW: 0.949, TOPSIS: 0.126, AHP: 0.029). The methods showed high agreement on top and bottom ranks but slight variations in middle ranks, such as Perada T. Lusua and Yohana M. Kedang (both ranked 5th and 6th in SAW and TOPSIS). These variations stem from methodological differences: SAW's linear summation is sensitive to extreme values, AHP emphasizes consistent pairwise judgments, and TOPSIS balances distances to ideal solutions. TOPSIS's approach, measuring closeness to the best and worst conditions, provides a balanced evaluation, making it slightly more representative in this context, though SAW's simplicity and AHP's consistency remain valuable.

From an accuracy perspective, all methods achieved a 100% accuracy level, with a 99.99% suitability percentage, indicating robust performance. SAW's strength lies in its simplicity, requiring minimal computational resources, but it risks rank reversal with small data changes. AHP ensures consistent judgments but is time-consuming with many criteria. TOPSIS, while computationally intensive, offers intuitive results by focusing on ideal solution distances, as supported by Krislock and Wolkowicz (2012). The choice of method depends on the decision-makers needs: SAW for quick calculations, AHP for rigorous consistency, and TOPSIS for balanced evaluations. This study underscores the applicability of all three methods in teacher performance evaluation, with TOPSIS recommended for its comprehensive approach, though SAW and AHP remain contextually relevant.

5. Discussion

The comparative analysis of the Simple Additive Weighting (SAW), Analytical Hierarchy Process (AHP), and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) methods in evaluating teacher performance at SMPSK St. Yusuf Larantuka reveals a high degree of consistency across all three methods, with a suitability percentage of 99.99% and an accuracy level of 100%, as shown in Table 19. This consistency underscores the robustness of these multi-criteria decision-making (MCDM) methods in handling complex evaluation tasks, aligning with findings by Nasyuha et al. (2025), who demonstrated that SAW, AHP, and TOPSIS

produce reliable outcomes when applied with identical inputs. The slight variations in preference values, particularly in middle rankings (e.g., Perada T. Lusia and Yohana M. Kedang), highlight the unique strengths of each method. SAW's simplicity, as noted by Cahyapratama and Sarno (2018), allows for rapid calculations but is sensitive to extreme values, which may explain minor ranking differences. AHP's rigorous pairwise comparisons, as described by Saaty and Wind (1980), ensure consistent judgments but demand more computational effort, particularly with multiple criteria. TOPSIS, by measuring distances to ideal solutions, offers a balanced approach, as supported by Krislock and Wolkowicz (2012), making it particularly effective in this context due to its ability to account for both best and worst performance scenarios.

The application of these methods addresses the limitations of the manual evaluation system previously used at SMPSK St. Yusuf Larantuka, which relied on basic spreadsheets and lacked standardized criteria, as highlighted in the introduction. By implementing a Decision Support System (DSS) with SAW, AHP, and TOPSIS, the study provides a more objective and transparent evaluation process, reducing inconsistencies noted by Pelletier and Rocchi (2016) in subjective teacher assessments. The high accuracy of all methods suggests that they can effectively process multi-criteria data, such as Service Orientation and Commitment, as seen in Tables 1, 2, and 3. For instance, Adrianus P. Balun's consistent top ranking across methods in Table 6 reflects the methods' ability to identify standout performers reliably. However, the choice of method in Table 6 depends on practical needs. SAW's straightforward approach, as applied by Ibrahim and Surya (2019), suits resource-constrained settings, while AHP's structured comparisons, as used by Buggingo and Ndimubenshi (2025), are ideal when consistency is paramount. TOPSIS, as demonstrated by Lamrini et al. (2023), excels in balancing multiple criteria, making it suitable for comprehensive evaluations, as evidenced by its clear differentiation of teacher performance.

The findings also highlight the importance of criteria weighting, as seen in Table 5 for AHP and the predefined weights for SAW and TOPSIS. The emphasis on Service Orientation (0.35 in Regulation Number 30) aligns with Darling-Hammond's (2000) assertion that teacher dedication significantly impacts student outcomes. The slight ranking variations, as noted by Handayani (2023), suggest that method selection should consider data characteristics and decision-maker preferences. For example, TOPSIS's distance-based approach may better capture nuanced performance differences, where middle ranks varied slightly. This study builds on prior work by Annisa et al. (2018) and Andriyani and Hafiz (2018), who compared MCDM methods in similar contexts, reinforcing that no single method is inherently superior but rather context-dependent.

The implications of this study are significant for educational institutions seeking to enhance teacher performance evaluation. Implementing a DSS with SAW, AHP, or TOPSIS can improve fairness and transparency, addressing issues of inconsistency and bias noted by Firdaus and Bachtiar (2021). Schools like SMPSK St. Yusuf Larantuka can adopt TOPSIS for its balanced approach, as supported by Table 19's results, or SAW for simplicity in smaller settings, as suggested by Galuh and Siregar (2025). These methods can guide professional development by identifying strengths and weaknesses, aligning with Supardi and Mahdiana's (2023) emphasis on evaluation-driven improvement. Furthermore, the high consistency across methods suggests that schools can confidently select any of these approaches, tailoring their choice to available resources and evaluation goals, ultimately enhancing teacher motivation and educational quality, as advocated by Gao et al. (2025).

6. Conclusion

Based on the research conducted, several important conclusions can be drawn. A comparison between the Simple Additive Weighting (SAW), Analytical Hierarchy Process (AHP), and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) methods on two types of teacher performance assessment regulations using eight alternative teacher data and weights for each criterion as the basis of calculation shows that the three methods have a very high level of consistency. The calculation results indicate that the consistency percentage for SAW, AHP, and TOPSIS is the same, namely 99.99%, while the accuracy level reaches 100%.

Nevertheless, this study also found variations in the preference values produced by each method. This difference indicates that although the three methods generate almost identical final rankings, the data processing mechanisms and mathematical approaches used still give unique characteristics to the assessment results. On the other hand, there are also similarities in preference values for some alternatives, which reinforces the evidence that the three methods can work consistently in the context of teacher performance evaluation.

Considering these findings, it can be concluded that none of the methods showed inaccuracies in the context of this study. The three methods SAW, AHP, and TOPSIS are reliable and feasible to be applied in the teacher performance assessment system at SMPSK St. Yusuf Larantuka. This provides flexibility for decision-makers to choose a method that aligns with technical needs, data processing preferences, or available resources. In addition, the similarity in the accuracy level obtained demonstrates that the application of these multi-criteria decision-making methods can enhance transparency, objectivity, and accountability in the teacher performance evaluation process.

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Data Disclosure Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.



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