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Decision Support System for Best Honorary Teacher Performance Assessment Using a Combination of LOPCOW and MARCOS

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Abstract−Teachers are the main pillars in the formation and development of future generations. They not only pass on knowledge, but also play an important role in guiding, inspiring, and shaping the character of students. The main problems in selecting the best honor teachers are limited resources and a less systematic evaluation process, lack of transparency and consistency in the selection process can also lead to dissatisfaction and injustice among honor teachers. Through the combination of LOPCOW and MARCOS, this research succeeded in producing a more accurate and accountable ranking in the selection of the Best Honorary Teacher. The LOPCOW approach provides a deep understanding of percentage changes against set criteria, while MARCOS assists in weighting compromise solutions that can optimally meet those criteria. Thus, the study provides a more holistic and detailed view of various aspects of teacher quality and performance, enabling better decision-making in selecting the Best Honorary Teachers who meet educational needs and advance student learning. The ranking results showed that the assessment results from the LOPCOW and MARCOS methods gave results, namely rank 1st with a final value of 0.3404446 obtained by SF Teachers, 2nd place with a final value of 0.3367384 obtained by LBS Teachers, and 3rd place with a final value of 0.3343083 obtained by ASB Teachers.

Keywords: Combination; LOPCOW; MARCOS; Selection; Best Honorary Teacher

1. INTRODUCTION

Teachers are the main pillars in the formation and development of future generations. They not only pass on knowledge, but also play an important role in guiding, inspiring, and shaping the character of students. With dedication, wisdom, and passion for advancing education, teachers create learning environments that support, motivate, and encourage students' intellectual and emotional growth[1]. Through their compassionate interactions and deep knowledge, teachers not only prepare students for the pursuit of academic success, but also help them become empathetic, creative, and competitive individuals in an ever-changing society[2]. Honor teachers are a vital part of the education system often working under financial constraints and little recognition. Despite facing economic challenges and job uncertainty, they remain passionate and dedicated in providing quality education to the students. Although their compensation may not be worth the effort and time they devote, honor teachers still devote themselves to creating an inspiring and supportive learning environment for their students. With limited resources, they demonstrate tremendous perseverance in seeking innovation and creative solutions to meet students' learning needs. Their services and sacrifices deserve recognition and appreciation, as they shape the future through tireless dedication. The selection of the best honor teachers is a process that requires an in-depth evaluation of their competence, dedication, and experience in educating students. Criteria considered include teaching quality, ability to motivate and inspire students, as well as ability to adapt to individual needs and classroom dynamics. In addition, aspects of personality such as integrity, empathy, and the ability to work together with colleagues, students, and parents are also important considerations. A transparent and objective selection process, involving input from various parties such as peers, students, and school staff, can ensure that the best teachers are selected to lead and inspire quality learning in an educational environment. The main problems in selecting the best honor teachers are limited resources and a less systematic evaluation process, lack of transparency and consistency in the selection process can also lead to dissatisfaction and injustice among honor teachers. Therefore, efforts need to be made to increase accountability, support professional development, and ensure a fair and objective selection process to ensure that the best teachers can be identified and given opportunities to thrive in their profession.

Research related to the selection of the best honorary teachers was conducted by Prayoga (2023) a decision support system that produces outputs and can help solve problems in making decisions on outstanding honorary teachers using the VIKOR method based on performance during teaching in carrying out tasks for better and brighter education at the school[3]. Further research was conducted by Faulah (2023) a decision support system that can help determine the best honorary teachers using the Weighted Product method, has a percentage value of 91%, so that it can be implemented[4]. Further research was conducted by Pradana (2023) this decision-making system uses the Simple Additive Weighting (SAW) method in measuring the performance of a teacher through the selection of exemplary teachers, honorary teachers must also always be motivated to be

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able to provide the best for their students so that the school can also improve the quality of their school[5]. Further research conducted by Sagala (2024) decision support system that applies the EDAS method with ROC weighting can help in determining the best teachers at SD Bhayangkari Rantauprapat, the results show that this system can facilitate the process of selecting the best teachers in a timely and objective manner[6]. The difference between previous research and research conducted in this study uses the Logarithmic Percentage Change-Driven Objective Weighting method as a weighting method to determine the weight of the criteria to be used, and The Measurement of Alternatives and Ranking According to Compromise Solution as a method in assessing the best honorary teachers. Based on previous research that has been conducted, the selection of the best honorary teachers is carried out using a decision support system approach to assist in decision making.

A decision support system (DSS) is a framework that combines technology, data, and modeling to help make more effective and efficient decisions[7]–[9]. By utilizing various analytical methods, such as statistical analysis, mathematical modeling, and artificial intelligence, DSS can assist in evaluating various options or alternatives and provide recommendations based on available information. DSS can be applied in a variety of contexts, from business and industry to health and education, to support complex decision-making processes. With the ability to crunch big data and present information in a structured manner, DSS enables users to make more informed and evidence-based decisions, which in turn can improve operational efficiency and end results. DSS also facilitates collaboration between stakeholders by providing a platform that allows sharing of information and shared understanding[10]. By taking into account a variety of factors and complex scenarios, DSS helps reduce the level of uncertainty and risk in decision making. In addition to providing analysis and recommendations, decision support systems also allow users to test different strategies and see their impact firsthand, allowing them to make smarter, results-oriented decisions. DSS becomes a valuable tool in dealing with decision-making challenges in dynamic and complex environments[11]–[13]. One method in DSS is Measurement of Alternatives and Ranking According to Compromise Solution.

The Measurement of Alternatives and Ranking According to Compromise Solution (MARCOS) method is an approach used in multi-criteria decision making to evaluate alternatives and compile rankings based on compromise solutions[14]–[17]. This method integrates several relevant criteria and their weight into the analysis, allowing stakeholders to consider various important aspects before making a decision. By utilizing mathematical techniques such as preference modeling and optimization, MARCOS allows users to find the best solution that accommodates existing preferences and constraints. Thus, MARCOS becomes a useful tool in situations where decisions have to be made in complex contexts involving a large number of different criteria and alternatives. The MARCOS method also makes it possible to take into account the degree of uncertainty and variability in the assessment. By providing a structured framework, MARCOS assists in evaluating the sensitivity of results to changes in parameters or conditions that may occur in the future[18]–[20]. In addition, MARCOS can also be adapted to the different preferences and goals of decision makers, making it possible to produce optimal solutions that suit existing needs and constraints. Thus, MARCOS provides a comprehensive and structured approach in overcoming complexity in multi-criteria decision making. One of the main disadvantages of the MARCOS method is its complexity in the application and interpretation of the results. Assessment processes involving multiple criteria and alternatives can be complex and time-consuming, especially if the required data is not fully or accurately available. In addition, MARCOS requires determining the exact weight for each criterion, which is often the subject of complex interpretation and consideration. Reliance on preferences and subjective judgments of decision makers can also affect the final outcome. In addition, MARCOS may be less effective in handling situations where there is high uncertainty or incomplete information. Therefore, the use of MARCOS requires a deep understanding of this method as well as its careful use to avoid bias and misinterpretation. To cover the weaknesses of the MARCOS method in weighting criteria, this study proposes the Logarithmic Percentage Change-Driven Objective Weighting method.

Logarithmic Percentage Change-Driven Objective Weighting (LOPCOW) is an approach used in multi-criteria decision making to determine the relative weights of various criteria[21]–[24]. This method focuses on changing the logarithmic percentage of each criterion from one alternative to another, rather than using absolute values or direct percentages. By accounting for logarithmic percentage changes, LOPCOW makes it possible to capture the sensitivity and impact of changes relative in the criteria to the overall results. This approach takes into account possible non-linearity and complex inter-criteria relationships, thus providing a more accurate representation of decision makers' preferences and priorities. By using LOPCOW, users can generate more detailed and informed assessments, which can enable more informed and effective decision-making in a variety of contexts. One of the main advantages of LOPCOW is its ability to capture changes in the relative sensitivity of each criterion to the final outcome, and provide a more holistic representation of decision makers' preferences, as well as improve precision in prioritizing and making decisions.

The combination of LOPCOW and MARCOS in the selection of the best honorary teachers offers some significant advantages. The use of LOPCOW can determine the relative weights of various criteria more accurately, allowing for a deeper understanding of the most important aspects of honorary teacher selection. LOPCOW also helps in capturing the relative sensitivity of each criterion to the final result. Then, by integrating the results from LOPCOW into the MARCOS framework, we can evaluate honorary teacher alternatives based on compromise solutions that take into account the weight of predetermined criteria. It helps to select the best

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honorary teacher who accommodates existing preferences and boundaries in a more holistic way. The combination of LOPCOW and MARCOS allows for more informed, accurate, and data-driven decision making in the selection of the best honorary teachers, which in turn can improve the quality of education and learning. In addition, the combination of LOPCOW and MARCOS can also help in minimizing subjective bias in the selection process of the best honorary teachers. Using structured, data-driven analysis methods, decisions can be made based on objective and measurable information, rather than just personal preferences or subjective perceptions. This can result in a fairer and more transparent selection process, and give confidence to all relevant parties that decisions are based on careful and comprehensive evaluation.

2. RESEARCH METHODOLOGY

2.1 Research Stages

The research stage is a series of steps needed to design, run, and present research results in a systematic and structured way[25], [26]. This stage helps in controlling the research process and ensuring that the study meets the required scientific standards. The stages of research form an essential framework for researchers to produce valid and meaningful knowledge. The stages of research carried out are as shown in Figure 1.

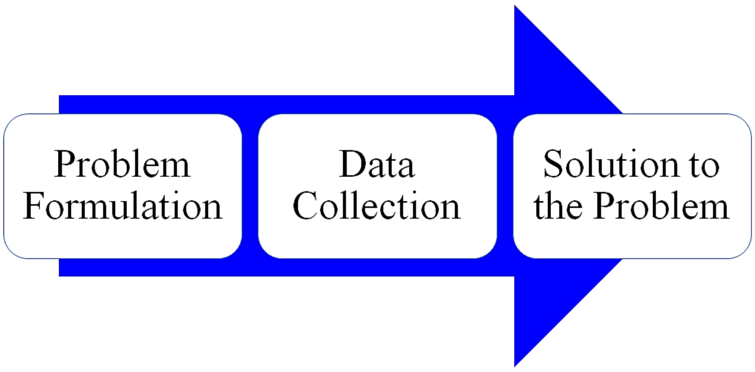

Figure 1. Research Stage

The stages of research Figure 1 show the process carried out, first, namely the formulation of problems in the selection of the best honorary teachers involving the identification of relevant challenges and needs in the honorary teacher selection process. The first stage is the problem formulation in this study is how to minimize bias in the selection process to ensure fairness and transparency in the selection of the best honorary teachers. Based on the formulation of the problem, the selection process for honorary teachers can be carried out more purposefully and efficiently, which in turn will support the improvement of the quality of education in the school. The second stage is data collection, the next step in the selection of the best honorary teacher is to identify relevant and important criteria in evaluating teacher candidates. These can include criteria such as teaching quality, work experience, interpersonal skills, commitment to learning, and adherence to educational standards. After the criteria data are obtained, then collecting assessment data in selecting the best honorary teacher involves various methods used to collect relevant information about teacher candidates. Rubric-based performance appraisals can also be used, where teachers are assessed based on certain pre-set criteria. Finally the last stage is, the use of decision support systems (DSS) in the selection of the best honorary teachers can provide a structured and measurable approach to solving complex problems. By implementing solutions using DSS using the process of selecting the best honorary teachers becomes more structured, efficient, and effective. This can assist schools in obtaining honorary teacher candidates who best suit their needs and support the improvement of the overall quality of education.

2.2 Stage of Research Framework

The Stage of Research Framework is a systematic approach used to plan, implement, and evaluate a research thoroughly. The stages of the research framework are a systematic process to guide the preparation of the conceptual structure of a study. A solid research framework also facilitates and helps to better understand research objectives, methods, and findings. Through this stage can build a solid conceptual framework, helping to direct the entire research process clearly and systematically. By following the procedures that have been established in the research framework, researchers can reduce the risk of bias and systematic errors, both in data collection and analysis, so that the results obtained are more accurate and objective. Each stage in this research framework is designed to ensure that the research process is carried out in a structured, transparent, and reliable manner. The stages of the research framework are made as in Figure 2.

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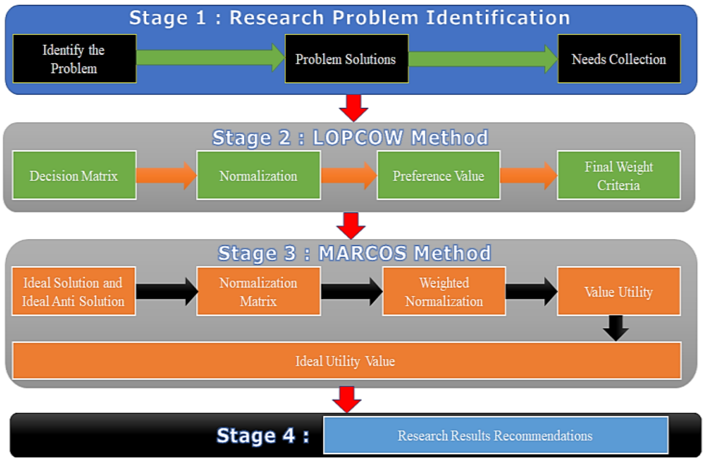

Figure 2. Stage of Research Framework

The stages of the research framework Figure 2 have four stages carried out, namely research problem identification, LOPCOW method, MARCOS method, and research result recommendations. A detailed explanation of each stage carried out will be explained below.

2.2.1 Stage 1: Research Problem Identification

Identification of research problems is a crucial initial stage in research development. At this stage, the researcher identifies the area or topic to be investigated clearly and in detail. This identification process involves careful study of the relevant literature, observation of phenomena of interest, as well as a deep understanding of the research problem. The main purpose of research problem identification is to identify knowledge gaps or unanswered questions in the existing literature, so that the planned research can make a significant contribution to the field. This step assists researchers in formulating clear and relevant research objectives, as well as forming a solid basis for the development of an in-depth and purposeful research framework.

a. Identify the Problem: The main issues in the selection of the best honor teacher include several aspects that need to be carefully considered. First, are clear and fair selection criteria. Without clear criteria, the selection process can be subjective and prone to bias. Second, is transparency and accountability in the selection process. A non-transparent selection process can generate mistrust and controversy among participants and the public. Third, is fairness in performance appraisal. Assessment should be based on objective and relevant criteria, and consider the context and challenges faced by honor teachers. Fourth, are the incentives and rewards it deserves. Honor teachers who are selected as the best must receive incentives appropriate for their contributions, including fair compensation and professional development opportunities. By addressing these issues, the process of selecting the best honor teachers can become more transparent, fair, and motivating, which will ultimately improve the quality of education and teacher welfare.
b. Problem Solution: The use of a Decision Support System (DSS) can be an effective solution in selecting the best honor teachers by providing a systematic and objective framework. Using DSS, selection criteria can be clearly defined and their weights can be adjusted to reflect the relative importance of each criterion. Data collection regarding teacher honor teacher performance can then be done and normalized to allow for fair comparisons. By applying the LOPCOW and MARCOS methods, SPK can generate a relative ranking of each honorary teacher candidate based on predetermined criteria. SPK allows the selection committee to make more objective and informed decisions, and minimize subjective bias in the selection process for the best honor teachers.
c. Needs Collection: Needs collection is a critical stage in this research. This process involves identifying and understanding deeply the needs of users, stakeholders, and the environment associated with the project. Steps in gathering needs include interviews with users and stakeholders, direct observation of existing processes, analysis of related documents, and the use of techniques such as questionnaires or focus group discussions. It aims to identify objectives, functional and non-functional needs, preferences, as well as constraints to be considered in this study. With comprehensive requirements collection, it can ensure that the resulting solution can meet the expectations and needs of users, and generate a positive impact in accordance with the research objectives.

2.2.2 Stage 2: LOPCOW Method

The LOPCOW method is a method used in multi-criteria decision making. This method is based on a logarithmic percentage change of the measured objective attribute value against an existing alternative. In the context of research or decision making, the LOPCOW method helps in determining the relative weight of each criterion by taking into account the logarithmic percentage change of each criterion against the existing

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preferences. The LOPCOW method can be used to overcome the problem of assessing different criteria in situations where the scale of values or preferences is not linear. The use of the LOPCOW method can provide advantages in overcoming the problem of nonlinearity and imbalance between the criteria used. By accounting for logarithmic percentage changes, this method can give more appropriate weights to each criterion, thus allowing decision makers to make more accurate and balanced decisions.

The first stage in the LOPCOW method is to create a decision matrix, the decision matrix is made with the following equation.

$$X = \begin{bmatrix} x_{11} & x_{21} & x_{2n} \\ x_{12} & x_{22} & x_{2n} \\ x_{m1} & x_{m2} & x_{mn} \end{bmatrix} \quad (1)$$

The decision matrix is made in the form of rows and columns. Each row in the decision matrix represents an existing alternative, while the column represents the criteria used. The second stage in the LOPCOW method is to calculate the normalization of the matrix using the following equation.

$$n_{ij} = \frac{x_{ij}}{m+\sum_{i=1}^{m} x_{ij}^2} \quad (2)$$

The normalization matrix is calculated for each alternative based on all existing criteria, the symbol m represents the number of criteria for each existing alternative, while x_{ij} is the value of the decision matrix. The third stage in the LOPCOW method is to calculate the preference value using the following equation.

$$PV_{ij} = 100 * \left| \frac{\sqrt{\sum_{i=1}^{m} n_{ij}^2}}{\ln\frac{m}{\sigma}} \right| \quad (3)$$

The preference value is symbolized by PV_{ij}, the symbol m represents the number of criteria for each existing alternative, while x_{ij} is the value of matrix normalization, ln used to represent natural logarithms, and σ is the standard deviation for each criterion. The final stage in the LOPCOW method is to calculate the final weight of each criterion using the following equation.

$$w_j = \frac{PV_{ij}}{\sum_{j=1}^{n} PV_{ij}} \quad (4)$$

The final weight value is symbolized by w_j. The LOPCOW method has the advantage of overcoming the problem of complexity in decision making by integrating various criteria and taking into account logarithmic percentage changes.

2.2.3 Stage 3: MARCOS Method

The MARCOS method is one of the multi-criteria decision-making methods used in Decision Support Systems (DSS). The MARCOS method allows users to assess and compare various alternatives based on a predefined set of criteria. By using MARCOS, users can make more informed and measurable decisions, as it allows them to consider multiple criteria simultaneously and find solutions that optimize compromises between conflicting criteria. The MARCOS method is often used in decision-making processes where there are many alternatives, and decisions must be made based on a series of conflicting criteria. This method involves measuring and evaluating alternatives against various criteria and then ranking those alternatives to identify the most suitable compromises.

The stages in the MARCOS method are determining the ideal solution and the ideal anti-solution based on the assessment data that has been carried out using the following equation.

$$AAI = min_{x_{ij}};\ AI = max_{x_{ij}} \quad (5)$$

$$AAI = max_{x_{ij}};\ AI = min_{x_{ij}} \quad (6)$$

The equation in determining the ideal solution and the anti-ideal solution has 2 equations, for equation (5) it is used for criteria with the type of benefit, and equation (6) is used for criteria with the type of cost. The next process normalizes the matrix using the following equation.

$$n_{ij} = \frac{x_{ij}}{x_{ai}} \quad (7)$$

$$n_{ij} = \frac{x_{ai}}{x_{ij}} \quad (8)$$

The equation in normalizing the matrix has 2 equations, for equation (7) used for criteria with the type of benefit, and equation (8) is used for criteria with the type of cost. Next, multiply the weight with the normalization results using the following equation.

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$$v_{ij} = w_j * n_{ij} \quad (9)$$

The next step determines the alternative utility value (K_i) obtained from (S_i) using the following equation.

$$S_i = \sum_{i=1}^{n} v_{ij} \quad (10)$$

$$K_i^- = \frac{S_i}{S_{aai}} \quad (11)$$

$$K_i^+ = \frac{S_i}{S_{ai}} \quad (12)$$

The final stage calculates the ideal utility value, the anti-ideal utility value, and the final utility value using the following equation.

$$f_{(k_i^-)} = \frac{K_i^+}{K_i^+ + K_i^-} \quad (13)$$

$$f_{(k_i^+)} = \frac{K_i^-}{K_i^+ + K_i^-} \quad (14)$$

$$f_{(k_i)} = \frac{K_i^+ + K_i^-}{1 + \frac{1 - f_{(k_i^+)}}{f_{(k_i^+)}} + \frac{1 - f_{(k_i^-)}}{f_{(k_i^-)}}} \quad (15)$$

2.2.4 Stage 4: Research Result Recommendations

Ranking results from MARCOS to choose the alternative that best suits the needs and preferences that have been set. Thus, it can be ensured that the decisions taken produce the most favorable results. by implementing these recommendations, research results using MARCOS can be used effectively to support better decision-making and generate positive impact in relevant contexts.

3. RESULT AND DISCUSSION

A Decision Support System (DSS) for the best honorary teacher performance appraisal using a combination of LOPCOW and MARCOS can be a powerful and holistic approach. With LOPCOW, honorary teacher performance appraisal criteria can be determined and weights can be assigned according to importance. Furthermore, MARCOS is used to assess each honorary teacher based on predetermined criteria, and then rank alternatives based on compromise scores between these criteria. The integration between LOPCOW and MARCOS allows DSS to produce comprehensive, objective, and structured performance appraisals. With this approach, decisions about the selection of the best honorary teachers can be made more precisely, transparently, and accurately, thereby improving the quality of education and teaching staff development.

3.1 Data Collection Criteria and Assessment Data

The collection of criteria data and assessment data is a crucial stage in the evaluation and decision-making process. This step involves identifying relevant criteria for assessing a particular entity or process. In addition, data collection also includes the selection of appropriate methods to collect the necessary information, ranging from surveys to direct observation. With meticulous and systematic data collection, decision makers can produce accurate and reliable information to evaluate performance, make strategic decisions, and identify areas that need improvement. The results of the data collection carried out are shown in table 1.

Table 1. Honorary Teacher Assessment Data Collection

Candidate Name	Teaching Quality	Presence	Discipline	Responsibility	Communication	Classroom Management
GP	85	88	90	98	90	95
AH	80	86	93	97	94	98
SM	90	89	90	96	95	96
JP	94	90	92	97	93	97
HB	98	87	91	98	92	95
ASB	93	89	92	96	90	98
YPA	95	92	94	97	94	96
TNS	84	89	89	95	93	97
APS	88	88	90	98	95	96
SF	92	89	81	97	94	94
WKR	87	90	90	98	93	94
FYD	88	87	89	98	95	96

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Candidate Name	Teaching Quality	Presence	Discipline	Responsibility	Communication	Classroom Management
LBS	89	84	86	96	95	96
IMS	90	88	88	95	93	97
EPS	88	83	90	98	96	95

Table 1 assessment data is obtained from collecting needs with the school in assessing the performance of honorary teachers, honorary teacher performance assessments are carried out every semester by the school to determine the learning process carried out by honorary teachers. This assessment data is used to determine the best honorary teacher each semester conducted by the school.

3.2 Determination of Criteria Weights Using the LOPCOW Method

The LOPCOW method is an approach that allows determining the weight of criteria by taking into account logarithmic percentage changes of existing criteria. By applying the LOPCOW method, it can determine the weight of criteria objectively based on logarithmic percentage changes of existing criteria. This enables more informed and accurate decision-making in a variety of contexts, including in the assessment of the best honorary teachers. The first stage in LOPCOW is to create a decision matrix based on table 1 assessment data using (1), the results of the decision matrix are as follows.

$$X=\begin{bmatrix} x_{1,1} & x_{2,1} & x_{3,1} & x_{4,1} & x_{5,1} & x_{6,1} \\ x_{1,2} & x_{2,2} & x_{3,2} & x_{4,2} & x_{5,2} & x_{6,2} \\ x_{1,3} & x_{2,3} & x_{3,3} & x_{4,3} & x_{5,3} & x_{6,3} \\ x_{1,4} & x_{2,4} & x_{3,4} & x_{4,4} & x_{5,4} & x_{6,4} \\ x_{1,5} & x_{2,5} & x_{3,5} & x_{4,5} & x_{5,5} & x_{6,5} \\ x_{1,6} & x_{2,6} & x_{3,6} & x_{4,6} & x_{5,6} & x_{6,6} \\ x_{1,7} & x_{2,7} & x_{3,7} & x_{4,7} & x_{5,7} & x_{6,7} \\ x_{1,8} & x_{2,8} & x_{3,8} & x_{4,8} & x_{5,8} & x_{6,8} \\ x_{1,9} & x_{2,9} & x_{3,9} & x_{4,9} & x_{5,9} & x_{6,9} \\ x_{1,10} & x_{2,10} & x_{3,10} & x_{4,10} & x_{5,10} & x_{6,10} \\ x_{1,11} & x_{2,11} & x_{3,11} & x_{4,11} & x_{5,11} & x_{6,11} \\ x_{1,12} & x_{2,12} & x_{3,12} & x_{4,12} & x_{5,12} & x_{6,12} \\ x_{1,13} & x_{2,13} & x_{3,13} & x_{4,13} & x_{5,12} & x_{6,13} \\ x_{1,14} & x_{2,14} & x_{3,14} & x_{4,14} & x_{5,14} & x_{6,14} \\ x_{1,15} & x_{2,15} & x_{3,15} & x_{4,15} & x_{5,15} & x_{6,15} \end{bmatrix}$$

$$X=\begin{bmatrix} 85 & 88 & 90 & 98 & 90 & 95 \\ 80 & 86 & 93 & 97 & 94 & 98 \\ 90 & 89 & 90 & 96 & 95 & 96 \\ 94 & 90 & 92 & 97 & 93 & 97 \\ 98 & 87 & 91 & 98 & 92 & 95 \\ 93 & 89 & 92 & 96 & 90 & 98 \\ 95 & 92 & 93 & 97 & 94 & 96 \\ 84 & 89 & 89 & 95 & 93 & 97 \\ 88 & 88 & 90 & 98 & 95 & 96 \\ 92 & 89 & 81 & 97 & 94 & 94 \\ 87 & 90 & 90 & 98 & 93 & 94 \\ 88 & 87 & 89 & 98 & 95 & 96 \\ 89 & 84 & 86 & 96 & 95 & 96 \\ 90 & 88 & 88 & 95 & 93 & 97 \\ 88 & 83 & 90 & 98 & 96 & 95 \end{bmatrix}$$

The second stage of the LOPCOW method is to calculate matrix normalization based on the decision matrix that has been made using (2), the results of matrix normalization are as follows.

$$n_{11}=\frac{x_{1;1}}{15+(x_{1,1}^2+x_{1,2}^2+x_{1,3}^2+x_{1,4}^2+x_{1,5}^2+x_{1,6}^2+x_{1,7}^2+x_{1,8}^2+x_{1,9}^2+x_{1,10}^2+x_{1,11}^2+x_{1,12}^2+x_{1,13}^2+x_{1,14}^2+x_{1,15}^2)}=\frac{85}{15+120174}=\frac{85}{120189}=0.00071$$

The result of the overall calculation of the matrix normalization is as in table 2.

Table 2. Results of Matrix Normalization Calculations

Candidate Name	Teaching Quality	Presence	Discipline	Responsibility	Communication	Classroom Management
GP	0.00071	0.00076	0.00075	0.00070	0.00069	0.00069
AH	0.00067	0.00074	0.00077	0.00069	0.00072	0.00071
SM	0.00075	0.00077	0.00075	0.00068	0.00072	0.00069
JP	0.00078	0.00078	0.00076	0.00069	0.00071	0.00070
HB	0.00082	0.00075	0.00075	0.00070	0.00070	0.00069
ASB	0.00077	0.00077	0.00076	0.00068	0.00069	0.00071
YPA	0.00079	0.00079	0.00078	0.00069	0.00072	0.00069
TNS	0.00070	0.00077	0.00074	0.00067	0.00071	0.00070
APS	0.00073	0.00076	0.00075	0.00070	0.00072	0.00069
SF	0.00077	0.00077	0.00067	0.00069	0.00072	0.00068
WKR	0.00072	0.00078	0.00075	0.00070	0.00071	0.00068
FYD	0.00073	0.00075	0.00074	0.00070	0.00072	0.00069
LBS	0.00074	0.00072	0.00071	0.00068	0.00072	0.00069
IMS	0.00075	0.00076	0.00073	0.00067	0.00071	0.00070
EPS	0.00073	0.00072	0.00075	0.00070	0.00073	0.00069

Table 2 is the result of calculating the normalization of the matrix from all alternatives to existing criteria, matrix normalization simplifies data analysis by eliminating different unit scales, thus allowing a fairer comparison between the various elements in the matrix.

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The third stage of the LOPCOW method is to calculate the preference value using (3), the result of calculating the preference value is as follows.

$$PV_1 = 100 * \left| \frac{\sqrt{\sum_{i=1}^{m} n_{1,1;1;15}{}^2}}{\ln \frac{15}{\sigma n_{1,1;1;15}}} \right| = 100 * \left| \frac{0.002884385}{\ln 173424.361} \right| = 100 * \left| \frac{0.002884385}{12.0635} \right| = 100 * 0.0002391 = 0.02391$$

The results of the calculation of preference value as a whole as in table 3.

Table 3. Results of Preference Value

Criteria	Teaching Quality	Presence	Discipline	Responsibility	Communication	Classroom Management
PV	0.02391	0.02315	0.02360	0.01934	0.02102	0.01964

Table 3 is the result of calculating preference value from all existing criteria, preference value is the result of direct comparison between various existing criteria and reflects the level of preference or priority of each criterion based on the results of matrix normalization.
The last stage in the LOPCOW method is to calculate the final weight of each criterion using (4), the final weight calculation results are as follows.

$$w_1 = \frac{PV_1}{PV_1+PV_2+PV_3+PV_4+PV_5+PV_6} = \frac{0.02391}{0.13065} = 0.183$$

$$w_2 = \frac{PV_2}{PV_1+PV_2+PV_3+PV_4+PV_5+PV_6} = \frac{0.02315}{0.13065} = 0.1772$$

$$w_3 = \frac{PV_3}{PV_1+PV_2+PV_3+PV_4+PV_5+PV_6} = \frac{0.02360}{0.13065} = 0.1806$$

$$w_4 = \frac{PV_4}{PV_1+PV_2+PV_3+PV_4+PV_5+PV_6} = \frac{0.01934}{0.13065} = 0.148$$

$$w_5 = \frac{PV_5}{PV_1+PV_2+PV_3+PV_4+PV_5+PV_6} = \frac{0.02102}{0.13065} = 0.1609$$

$$w_6 = \frac{PV_6}{PV_1+PV_2+PV_3+PV_4+PV_5+PV_6} = \frac{0.01964}{0.13065} = 0.1503$$

The results of the calculation above are the final results of determining the weight of criteria using the LOPCOW method based on assessment data from honorary teachers that have been carried out.

3.3 MARCOS Method in Determining the Best Honorary Teacher

The Measurement of Alternatives and Ranking According to Compromise Solution (MARCOS) method is an approach used in assessing the performance of honorary teachers to determine who is the best among them. This method refers to an approach that combines various relevant assessment criteria. The MARCOS method does the calculation that each teacher is assessed based on these various criteria, and then given a ranking based on a compromise solution that can cover various aspects of their performance. This approach allows to weigh various relevant factors and provides a more comprehensive picture of the performance of honorary teachers, MARCOS also provides opportunities for self-development of honorary teachers.

The stages in the MARCOS method are to determine the ideal solution and the ideal anti-solution based on the assessment data that has been carried out using (5) because all criteria are beneficial, the results of the ideal solution and the ideal anti-solution are as follows.

$$AI_{1,1;1,15} = max_{x_{1,1;1,15}} = 98$$

$$AAI_{1,1;1,15} = min_{x_{1,1;1,15}} = 80$$

The results of the calculation of the overall ideal and anti-ideal values are as in table 4.

Table 4. Results of Ideal and Anti-Ideal Values

Candidate Name	Teaching Quality	Presence	Discipline	Responsibility	Communication	Classroom Management
AI	98	92	94	98	96	98
GP	85	88	90	98	90	95
AH	80	86	93	97	94	98
SM	90	89	90	96	95	96
JP	94	90	92	97	93	97
HB	98	87	91	98	92	95
ASB	93	89	92	96	90	98

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YPA	95	92	94	97	94	96
TNS	84	89	89	95	93	97
APS	88	88	90	98	95	96
SF	92	89	81	97	94	94
WKR	87	90	90	98	93	94
FYD	88	87	89	98	95	96
LBS	89	84	86	96	95	96
IMS	90	88	88	95	93	97
EPS	88	83	90	98	96	95
AAI	80	83	81	95	90	94

Table 4 is the result of calculating the ideal and anti-ideal overalls of each alternative for all criteria, ideal and anti-ideal overall values are used to assess the performance of alternatives in a multi-criterional context, allowing the identification of alternatives that are closest to ideal conditions and most distant from anti-ideal conditions, thus facilitating more informed and objective decisions. The next process normalizes the matrix using the following equation.

$$n_{1,1} = \frac{x_{1,1}}{x_{ai1}} = \frac{85}{98} = 0.8673$$

The result of the overall calculation of the matrix normalization is as in table 5.

Table 5. Results of Matrix Normalization Calculations

Candidate Name	Teaching Quality	Presence	Discipline	Responsibility	Communication	Classroom Management
AI	1	1	1	1	1	1
GP	0.8673	0.9565	0.9574	1	0.9375	0.9694
AH	0.8163	0.9348	0.9894	0.9898	0.9792	1.0000
SM	0.9184	0.9674	0.9574	0.9796	0.9896	0.9796
JP	0.9592	0.9783	0.9787	0.9898	0.9688	0.9898
HB	1	0.9457	0.9681	1	0.9583	0.9694
ASB	0.9490	0.9674	0.9787	0.9796	0.9375	1
YPA	0.9694	1	1	0.9898	0.9792	0.9796
TNS	0.8571	0.9674	0.9468	0.9694	0.9688	0.9898
APS	0.8980	0.9565	0.9574	1	0.9896	0.9796
SF	0.9388	0.9674	0.8617	0.9898	0.9792	0.9592
WKR	0.8878	0.9783	0.9574	1	0.9688	0.9592
FYD	0.8980	0.9457	0.9468	1	0.9896	0.9796
LBS	0.9082	0.9130	0.9149	0.9796	0.9896	0.9796
IMS	0.9184	0.9565	0.9362	0.9694	0.9688	0.9898
EPS	0.8980	0.9022	0.9574	1	1	0.9694
AAI	0.8163	0.9022	0.8617	0.9694	0.9375	0.9592

Table 5 is the result of calculating the normalization of the matrix from all alternatives to existing criteria, matrix normalization simplifies data analysis by eliminating different unit scales, thus allowing a fairer comparison between the various elements in the matrix.
Next, perform weight multiplication with normalization results using (9), the weight multiplication results are as follows.

$$v_{11} = w_1 * n_{1,1} = 0.183 * 0.8673 = 0.1587$$

The overall result of weight multiplication is as in table 6.

Table 6. Results of Weight Multiplication

Candidate Name	Teaching Quality	Presence	Discipline	Responsibility	Communication	Classroom Management
AI	0.183	0.1772	0.1806	0.148	0.1609	0.1503
GP	0.1587	0.1695	0.1729	0.1480	0.1508	0.1457
AH	0.1494	0.1656	0.1787	0.1465	0.1575	0.1503
SM	0.1681	0.1714	0.1729	0.1450	0.1592	0.1472
JP	0.1755	0.1733	0.1768	0.1465	0.1559	0.1488
HB	0.183	0.1676	0.17484	0.148	0.1542	0.1457
ASB	0.1737	0.1714	0.1768	0.1450	0.1508	0.1503
YPA	0.1774	0.1772	0.1806	0.1465	0.1575	0.1472

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Candidate Name	Teaching Quality	Presence	Discipline	Responsibility	Communication	Classroom Management
TNS	0.1569	0.1714	0.1710	0.1435	0.1559	0.1488
APS	0.1643	0.1695	0.1729	0.1480	0.1592	0.1472
SF	0.1718	0.1714	0.1556	0.1465	0.1575	0.1442
WKR	0.1625	0.1733	0.1729	0.1480	0.1559	0.1442
FYD	0.1643	0.1676	0.1710	0.1480	0.1592	0.1472
LBS	0.1662	0.1618	0.1652	0.1450	0.1592	0.1472
IMS	0.1681	0.1695	0.1691	0.1435	0.1559	0.1488
EPS	0.1643	0.1599	0.1729	0.1480	0.1609	0.1457
AAI	0.1494	0.1599	0.1556	0.1435	0.1508	0.1442

Table 6 is the result of calculating the overall weight multiplication of each alternative for all criteria, this value is obtained from the multiplication between the normalization of the matrix and the weight of the criteria that have been calculated by the LOPCOW method.

The next step determines the alternative utility values (K_i) (11) and (12) obtained from (S_i) using (10), the calculation result is as follows.

$$S_1 = \sum_{i=1}^{n} v_{1,1;6,1} = 0.1587 + 0.1695 + 0.1729 + 0.148 + 0.1508 + 0.1457 = 0.9457$$

$$K_1^- = \frac{S_1}{S_{aai}} = \frac{0.9457}{0.9034} = 1.0469$$

$$K_1^+ = \frac{S_i}{S_{ai}} = \frac{0.9457}{1} = 0.9457$$

The overall results are as shown in table 7.

Table 7. Results of Alternative Utility Values

Candidate Name	S_i	K_i^-	K_i^+
AI	1		
GP	0.9457	1.0469	0.9457
AH	0.9480	1.0495	0.9480
SM	0.9638	1.0669	0.9638
JP	0.9768	1.0813	0.9768
HB	0.9733	1.0774	0.9733
ASB	0.9680	1.0715	0.9680
YPA	0.9865	1.0920	0.9865
TNS	0.9474	1.0487	0.9474
APS	0.9612	1.0640	0.9612
SF	0.9470	1.0484	0.9470
WKR	0.9568	1.0591	0.9568
FYD	0.9573	1.0598	0.9573
LBS	0.9447	1.0457	0.9447
IMS	0.9547	1.0569	0.9547
EPS	0.9517	1.0535	0.9517
AAI	0.9034		

Table 7 is the result of calculating the overall alternative utility values, alternative utility values are calculated to evaluate how well each alternative meets the criteria that have been set, by comparing these alternatives against ideal and anti-ideal solutions. Alternative utility values to provide a systematic and objective evaluation framework, allowing decision makers to assess and rank alternatives more accurately by considering the balance between diverse criteria.

The final stage calculates the ideal utility value, the anti ideal utility value, and the final utility value using (13), (14), and (15), the results are shown in the following table 8.

Table 8. Results of the Ideal Utility Value, the Anti Ideal Utility Value, and the Final Utility Value

Candidate Name	FK_i^-	FK_i^+	FK_i
GP	0.4746299	0.5254203	0.332226796
AH	0.4745932	0.5254068	0.332186759
SM	0.4745913	0.5253595	0.332150542
JP	0.3786047	0.5254130	0.255044972
HB	0.4746184	0.5253816	0.332189028
ASB	0.4746261	0.5282667	0.334308254
YPA	0.4746211	0.5253789	0.332189271

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Candidate Name	FK_i^-	FK_i^+	FK_i
TNS	0.4746255	0.5253745	0.332189668
APS	0.4746198	0.5253802	0.332189152
SF	0.4846146	0.5254084	0.340444601
WKR	0.4746267	0.5253733	0.332189775
FYD	0.4745922	0.5254078	0.332186668
LBS	0.4801547	0.5253718	0.336738435
IMS	0.4745973	0.5254027	0.332187128
EPS	0.474616	0.5253840	0.33218881

The results of table 8 are the final results of calculations using the MARCOS method, the final values obtained from each alternative will be used in alternative ranking.

3.4 Recommendations for the Best Honorary Teacher Ranking Results

The results of research in the selection of the best honorary teachers confirm that the quality of teaching and commitment to student progress are the main factors that distinguish the candidates. The factors that form the basis of selection such as teaching quality, presence, discipline, responsibility, communication, and classroom management are the main determinants in determining the achievement of a teacher. This research highlights the importance of looking deep into an individual's qualities as educators, rather than simply measuring the amount of experience or academic achievement. The ranking results in the assessment of the best honorary teacher as shown in figure 3.

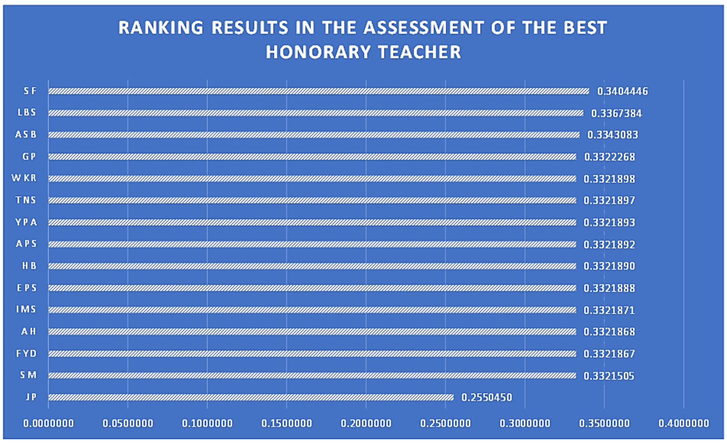

Figure 3. Ranking Results in the Assessment of the Best Honorary Teacher

The ranking results of figure 3 show that the assessment results from the LOPCOW and MARCOS methods give results, namely rank 1st with a final value of 0.3404446 obtained by SF Teachers, 2nd place with a final value of 0.3367384 obtained by LBS Teachers, and 3rd place with a final value of 0.3343083 obtained by ASB Teachers.

This study used a combined approach of LOPCOW and MARCOS in evaluating the selection of the Best Honorary Teacher. The LOPCOW method is used to identify percentage changes against established criteria, allowing researchers to weigh the relative importance of each criterion in teacher selection. Furthermore, the MARCOS method is used to rank alternatives based on compromise solutions that optimize the need for meeting predefined criteria. The results showed that the quality of teaching, innovative learning approaches, and the ability to build good relationships with students and colleagues were the determining factors in determining the Best Honorary Teacher. With this approach, the study provides a comprehensive and detailed look at assessing and selecting the best teachers in an educational context. Through the combination of LOPCOW and MARCOS, this research succeeded in producing a more accurate and accountable ranking in the selection of the Best Honorary Teacher. The LOPCOW approach provides a deep understanding of percentage changes against set criteria, while MARCOS assists in weighing compromise solutions that can optimally meet those criteria. Thus, the study provides a more holistic and detailed view of various aspects of teacher quality and performance, enabling better decision-making in selecting the Best Honorary Teachers who meet educational needs and advance student learning.

4. CONCLUSION

This study used a combined approach of LOPCOW and MARCOS in evaluating the selection of the Best Honorary Teacher. The LOPCOW method is used to identify percentage changes against established criteria, allowing researchers to weigh the relative importance of each criterion in teacher selection. Furthermore, the

MARCOS method is used to rank alternatives based on compromise solutions that optimize the need for meeting predefined criteria. The results showed that the quality of teaching, innovative learning approaches, and the ability to build good relationships with students and colleagues were the determining factors in determining the Best Honorary Teacher. With this approach, the study provides a comprehensive and detailed look at assessing and selecting the best teachers in an educational context. Through the combination of LOPCOW and MARCOS, this research succeeded in producing a more accurate and accountable ranking in the selection of the Best Honorary Teacher. The LOPCOW approach provides a deep understanding of percentage changes against set criteria, while MARCOS assists in weighing compromise solutions that can optimally meet those criteria. Thus, the study provides a more holistic and detailed view of various aspects of teacher quality and performance, enabling better decision-making in selecting the Best Honorary Teachers who meet educational needs and advance student learning. The ranking results showed that the assessment results from the LOPCOW and MARCOS methods gave results, namely rank 1st with a final value of 0.3404446 obtained by SF Teachers, 2nd place with a final value of 0.3367384 obtained by LBS Teachers, and 3rd place with a final value of 0.3343083 obtained by ASB Teachers.

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