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Decision Support System for Determining the Best PAUD Teacher Using the MOORA Method

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Abstract. Giving rewards is one of the efforts made to increase the motivation of PAUD Teacher to build better performance in educating early childhood. In this study we used a decision support system using the MOORA method to determine the best PAUD Teacher who is entitled to rewards without any jealousy from other unselected candidates. On the results of the alternative research Alexander Putra (A1) has a Yi Preference value of 0.4547, Siti Aisyah (A2) has an Yi Prefecture value of 0.04245, Amany Putri (A3) has the Yi Preférence value Of 0.4165, Inggrit (A5) has a value of 0,4104, and Asri Sulistya (A4) has a 0.4022 value. So the final result on the determination of the best PAUD teacher using the MOORA method in this study Alexander Putra (A1) who has the highest value among all other alternatives was chosen as the best MAUD teacher.

Keywords: Decision Support System, Best PAUD Teacher, MOORA.

1 Introduction

PAUD (Early Child Education) is a training program aimed at newborn children up to the age of 6 (six) years by providing educational stimulation to support the growth, physical development, and spiritual development of children so that they are ready to continue to the next level of education [1]. At the Early Childhood Education (PAUD) level, teachers have a very important role to build children's character well from an early age [2]. PAUD teachers are tasked with educating early childhood through the development of personality and desired values, one of them is the application of learning using the dimension of play while learning [3].

Evaluation activities for PAUD teachers are an activity that is commonly carried out in the world of education. The evaluation process aims to determine the performance of PAUD teachers and the quality they have while carrying out their duties in providing education to students. Through the performance appraisal activities carried out, rewards can be applied to PAUD teachers who have the best achievements. So that it can motivate other PAUD teachers to be able to provide better loyalty in the future [4]. The determination of the best PAUD teacher is not an easy thing, if the wrong decision is made then it can cause the occurrence of jealousy among other candidates who are not elected while having a better performance than the candidate who is elected as a recipient of rewards. Therefore, it is very necessary to have a well-computerized system to support the accurate decision-making process in determining the best PAUD teacher.

Decision Support System (DSS) is an interactive information system that can provide information, modeling, and data manipulation to help decision makers to solve problems in semi-structured and unstructured situations [5–8]. One method that can be implemented into a Decision Support System (DSS) is the MOORA (Multi-Objective Optimization on The Basis of Ratio Analysis) method [9–11].

The MOORA method is a multiobjective optimizing system that can have two or more attributes that are not related. The MOORA method was first introduced by a scientist named Braurers in 2004 to solve various problems in making difficult decisions [12]. Since its introduction by Braurers, MOORA has been widely used to solve decision-making problems to provide accurate and reliable results [13]. In Muhammad Fachrizal Anshary et al.'s research, it was concluded that the MOORA method has a good level of selectivity for solving decision-making problems with conflicting criteria [14]. Sriwahyuni Hutagalung et al. In his research, he said that the MOORA method could simplify the decision-making process by ranking accurate alternatives [15].

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2 Research Method

2.1 Research Stages

In the process of completing this research the author uses several stages in a structured manner as shown in the figure below:

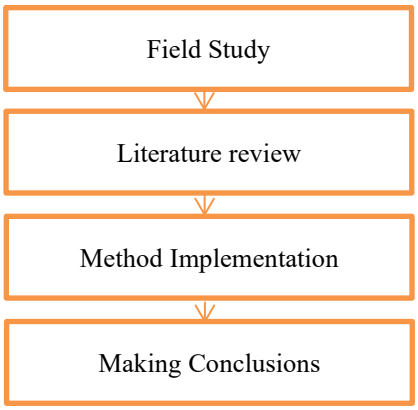

Figure 1. Research Stage

Information:

a. Field Study
   In this first stage, a field study process was carried out at the research location. At this stage the authors conducted interviews with informants at the intended research location to obtain data samples for determining the best PAUD teachers that had been completed previously using direct assessment from their leaders.
b. Literature review
   In this second stage, the process of collecting literature data related to the theory of Decision Support Systems (DSS), the Multi-Objective Optimization on The Basis of Ratio Analysis (MOORA) method, PAUD Teachers (Early Childhood Education), and other theories discussed by the author in this research.
c. Method Implementation
   In this third stage, the process of implementing the Multi-Objective Optimization on The Basis of Ratio Analysis (MOORA) method is carried out to solve decision-making problems in determining the best PAUD teacher.
d. Making Conclusions
   In this fourth stage, conclusions were drawn from the results and discussion related to solving the problem of determining the best PAUD Teacher with a Decision Support System (SPK) using Multi-Objective Optimization on The Basis of Ratio Analysis (MOORA) which was completed in this study.

2.2 Metode Multi-Objective Optimization on The Basis of Ratio Analysis (MOORA)

The steps carried out in the MOORA method to solve decision-making problems are [16]:

a. Matrix Value Determination
   The process of determining the matrix value in the MOORA method is carried out using the following formula:

$$X = \begin{bmatrix} X_{11} & X_{12} & X_{1n} \\ X_{21} & X_{22} & X_{2n} \\ X_{31} & X_{32} & X_{3n} \end{bmatrix} \quad (1)$$

b. Matrix Normalization
   After getting the matrix value, the matrix normalization process is carried out in the MOORA method using the following formula:

$$X *_{ij=Xij} / \sqrt{\left[\sum_{i=1}^{m} X_{ij}^2\right]} \quad (2)$$

c. Optimizing Attributes
   For multi-objective optimization, the normalized size is added when the attribute is favorable, and the normalized size is reduced when the attribute is unfavorable.

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$$Y_i = \sum_{j=1}^{g} - \sum_{j=g+1}^{n} X_{ij}^{x} \quad (3)$$

Where G is the number of attributes to be maximized, (n-g) is the number of attributes to be minimized, yi is the value of the normalized assessment results in alternative 1 for all attributes. After taking into account the weight attribute, equation 4 becomes:

$$Y_i = \sum_{j=1}^{g} W_j X_{1j}^{*} - \sum_{j=g+1}^{n} W_j W_{ij}^{*} \quad (4)$$

d. Ranking Results

The Yi value can be positive or negative depending on the maximum and minimum values that have been obtained in the decision matrix. The order of the ranking results, Yi represents the final choice. The best solution has the highest Yi value and the worst solution has the lowest Yi value. From the ranking results obtained, an alternative that has the highest Yi value will be determined as the best PAUD teacher.

3 Result and Discussion

3.1 Research Data

Based on the results of the field studies that have been carried out, the authors obtain research data used to determine the best PAUD teacher as shown in the table below:

Table 1. Criteria for Determining the Best PAUD Teacher

Code	Criteria	Weight Value	Attribute Description
C1	Discipline	27%	Benefit
C2	Educational Ability	26%	Benefit
C3	Personality	24%	Benefit
C4	Relations With Students	23%	Benefit

Table 2. Subcriteria for Determining the Best PAUD Teacher

Code	Criteria	Subcriteria	Subcriteria weight
C1	Discipline	Very good (SB)	30
		Good (B)	20
		Enough (C)	10
C2	Educational Ability	Very good (SB)	30
		Good (B)	20
		Enough (C)	10
C3	Personality	Very good (SB)	30
		Good (B)	20
		Enough (C)	10
C4	Relations With Students	Very good (SB)	30
		Good (B)	20
		Enough (C)	10

Table 3. Best PAUD Teacher Assessment Data Sample

No	Alternative	Criteria			
		C1	C2	C3	C4
1	Alexander Putra	SB	B	C	SB
2	Siti Aisyah	B	SB	B	C
3	Amany Putri	C	B	SB	B
4	Asri Sulistya	B	C	B	SB
5	Inggrit	SB	B	C	B

3.2 MOORA Method Implementation

The process of solving the problem of determining the best PAUD teacher uses the Multi-Objective Optimization on The Basis of Ratio Analysis (MOORA) method, namely:

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a. Matrix Value Determination

In this section, matrix values are determined to identify all relevant evaluation attributes. The results of the matrix values for solving the problem of determining the best PAUD teacher in this study are:

$$X = \begin{bmatrix} 30 & 20 & 10 & 30 \\ 20 & 30 & 20 & 10 \\ 10 & 20 & 30 & 20 \\ 20 & 10 & 20 & 30 \\ 30 & 20 & 10 & 20 \end{bmatrix}$$

b. Matrix Normalization

In this section, the matrix normalization process is carried out using formula (2). The results of calculating the matrix normalization value for determining the best PAUD teacher in this study are:

C1 $= \sqrt{30^2 + 20^2 + 10^2 + 20^2 + 30^2}$
$= \sqrt{900 + 400 + 100 + 400 + 900}$
$= \sqrt{2700}$
= 51,96152423

$A_{11} = 30/51{,}96152423 = 0{,}5773$
$A_{21} = 20/51{,}96152423 = 0{,}3849$
$A_{31} = 10/51{,}96152423 = 0{,}1924$
$A_{41} = 20/51{,}96152423 = 0{,}3849$
$A_{51} = 30/51{,}96152423 = 0{,}5773$

C2 $= \sqrt{20^2 + 30^2 + 20^2 + 10^2 + 20^2}$
$= \sqrt{400 + 900 + 400 + 100 + 400}$
$= \sqrt{2200}$
= 46,9041576

$A_{12} = 20/46{,}9041576 = 0{,}4264$
$A_{22} = 30/46{,}9041576 = 0{,}6396$
$A_{32} = 20/46{,}9041576 = 0{,}4264$
$A_{42} = 10/46{,}9041576 = 0{,}2132$
$A_{52} = 20/46{,}9041576 = 0{,}4264$

C3 $= \sqrt{10^2 + 20^2 + 30^2 + 20^2 + 10^2}$
$= \sqrt{100 + 400 + 900 + 400 + 100}$
$= \sqrt{1900}$
= 43,58898944

$A_{13} = 10/43{,}58898944 = 0{,}2294$
$A_{23} = 20/43{,}58898944 = 0{,}4588$
$A_{33} = 30/43{,}58898944 = 0{,}6882$
$A_{43} = 20/43{,}58898944 = 0{,}4588$
$A_{53} = 10/43{,}58898944 = 0{,}2294$

C4 $= \sqrt{30^2 + 10^2 + 20^2 + 30^2 + 20^2}$
$= \sqrt{900 + 100 + 400 + 900 + 400}$
$= \sqrt{2700}$
= 43,58898944

$A_{14} = 30/51{,}96152423 = 0{,}5773$
$A_{24} = 10/51{,}96152423 = 0{,}1924$
$A_{34} = 20/51{,}96152423 = 0{,}3849$
$A_{44} = 30/51{,}96152423 = 0{,}5773$
$A_{54} = 20/51{,}96152423 = 0{,}3849$

Based on the calculation above, the results obtained from matrix normalization for determining the best PAUD teacher are as follows:

$$Xij = \begin{bmatrix} 0{,}5773 & 0{,}4264 & 0{,}2294 & 0{,}5773 \\ 0{,}3849 & 0{,}6396 & 0{,}4588 & 0{,}1924 \\ 0{,}1924 & 0{,}4264 & 0{,}6882 & 0{,}3849 \\ 0{,}3849 & 0{,}2132 & 0{,}4588 & 0{,}5773 \\ 0{,}5773 & 0{,}4264 & 0{,}2294 & 0{,}3849 \end{bmatrix}$$

c. Optimizing Attributes

For multi-objective optimization, the normalized size is added in the maxim case for favorable attributes and subtracted in the minimization case for unfavorable attributes.

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Optimal Value C1
$A_{11} = 0{,}5773 * 0{,}27 = 0{,}1559$
$A_{21} = 0{,}3849 * 0{,}27 = 0{,}1039$
$A_{31} = 0{,}1924 * 0{,}27 = 0{,}0519$
$A_{41} = 0{,}3849 * 0{,}27 = 0{,}1039$
$A_{51} = 0{,}5773 * 0{,}27 = 0{,}1559$
Optimal Value C2
$A_{12} = 0{,}4264 * 0{,}26 = 0{,}1109$
$A_{22} = 0{,}6396 * 0{,}26 = 0{,}1663$
$A_{32} = 0{,}4264 * 0{,}26 = 0{,}1109$
$A_{42} = 0{,}2132 * 0{,}26 = 0{,}0554$
$A_{52} = 0{,}4264 * 0{,}26 = 0{,}1109$
Optimal Value C3
$A_{13} = 0{,}2294 * 0{,}24 = 0{,}0551$
$A_{23} = 0{,}4588 * 0{,}24 = 0{,}1101$
$A_{33} = 0{,}6882 * 0{,}24 = 0{,}1652$
$A_{43} = 0{,}4588 * 0{,}24 = 0{,}1101$
$A_{53} = 0{,}2294 * 0{,}24 = 0{,}0551$
Optimal Value C4
$A_{14} = 0{,}5773 * 0{,}23 = 0{,}1328$
$A_{24} = 0{,}1924 * 0{,}23 = 0{,}0442$
$A_{34} = 0{,}3849 * 0{,}23 = 0{,}0885$
$A_{44} = 0{,}5773 * 0{,}23 = 0{,}1328$
$A_{54} = 0{,}3849 * 0{,}23 = 0{,}0885$
Based on the calculation above, the following attribute optimization matrix results are obtained:

$$Xwj = \begin{bmatrix} 0{,}1559 & 0{,}1109 & 0{,}0551 & 0{,}1328 \\ 0{,}1039 & 0{,}1663 & 0{,}1101 & 0{,}0442 \\ 0{,}0519 & 0{,}1109 & 0{,}1652 & 0{,}0885 \\ 0{,}1039 & 0{,}0554 & 0{,}1101 & 0{,}1328 \\ 0{,}1559 & 0{,}1109 & 0{,}0551 & 0{,}0885 \end{bmatrix}$$

The next step is to calculate the Yi value using formula (4). The calculation results for the Yi value are as follows:
Preference Value Yi A1 = 0,1559 + 0,1109 + 0,0551 + 0,1328 = 0,4547
Preference Value Yi A2 = 0,1039 + 0,1663 + 0,1101 + 0,0442 = 0,4245
Preference Value Yi A3 = 0,0519 + 0,1109 + 0,1652 + 0,0885 = 0,4165
Preference Value Yi A4 = 0,1039 + 0,0554 + 0,1101 + 0,1328 = 0,4022
Preference Value Yi A5 = 0,1559 + 0,1109 + 0,0551 + 0,0885 = 0,4104

d. Ranking Results

The alternative ranking is based on the results of calculating the Yi Preference values that have been obtained in the previous stage, namely:

Table 4. Ranking Results

Code	Alternative	Preference Value Yi	Ranking
A1	Alexander Putra	0,4547	1
A2	Siti Aisyah	0,4245	2
A3	Amany Putri	0,4165	3
A5	Inggrit	0,4104	4
A4	Asri Sulistya	0,4022	5

Based on the information shown in the ranking results table above, it can be seen that the alternative Alexander Putra (A1) has a Yi Preference value of 0.4547, Siti Aisyah (A2) has a Yi Preference value of 0.4245, Amany Putri (A3) has a Yi Preference value 0.4165, English (A5) has a value of 0.4104, and Asri Sulistya (A4) has a value of 0.4022. So that in determining the best PAUD teacher using the MOORA method in this study Alexander Putra (A1) who had the highest score among all the other alternatives was selected as the best PAUD teacher.

4 Conclusion

a. The MOORA method can be used for the decision-making process in determining the best PAUD teacher.
b. The results of this study indicate that the best PAUD teacher selected based on the application of the MOORA method is Alexander Putra (A1) with a Yi Preference value of 0.4547.
c. The MOORA method can be considered for use as a decision-making method in solving a wider range of problems in the future.

References

[1] Yenti Y, Maswal A. Pentingnya Peran Pendidik dalam Menstimulasi Perkembangan Karakter Anak di PAUD. Jurnal Pendidikan Tambusai 2021;5:2045–2051.
[2] Maghfiroh, Shofia Suryana D. Pembelajaran di Pendidikan Anak Usia Dini. Jurnal Pendidikan Tambusai 2021;05(01):1561.
[3] Putri S, Edwarman E. Analisis Faktor-Faktor Yang Mempengaruhi Kinerja Guru PAUD Kabupaten Seluma. EKOMBIS REVIEW: Jurnal Ilmiah … 2023;11(1):971–982.
[4] Rafie M, Sanjaya MR, Lestari E, Wijaya B. Perancangan Sistem Pendukung Keputusan Pemilihan Guru Terbaik Dengan Pendekatan User Centered Design 2023;5(2):132–140.
[5] Harahap MAK, Hardisal H, Ahyuna A, Rahim R. Leveraging the Decision Support System and Simple Additive Weighting Method for Optimal Retail Location Identification. JINAV: Journal of Information and Visualization 2022;3(2):174–180. https://doi.org/10.35877/454ri.jinav1485.
[6] Marbun N, Zarlis M, Sembiring RW. Analisis Kinerja SMARTER Pada Sistem Pendukung Keputusan Pemilihan Tukang Las Terbaik Untuk Menerima Penghargaan 2022;6:1282–1289. https://doi.org/10.30865/mib.v6i3.4095.
[7] Alam Bhuiyan MM, Hammad A. A Hybrid Multi-Criteria Decision Support System for Selecting the Most Sustainable Structural Material for a Multistory Building Construction. Sustainability (Switzerland) 2023;15(4). https://doi.org/10.3390/su15043128.
[8] Hidayat S, Tulus, Sirait P. Weighting Optimization of Decision Matrix in Fuzzy TOPSIS Using SMARTER Method. Journal of Physics: Conference Series 2019;1235(1). https://doi.org/10.1088/1742-6596/1235/1/012034.
[9] Dwi Arista R. Multi Objective Optimization in The Basic of Ratio (Moora) In Supporting Decision Making in Measuring Employee Performance Level Case Study PT. Padi Saga Utama. International Journal of Science, Technology & Management 2023;4(1):204–211. https://doi.org/10.46729/ijstm.v4i1.698.
[10] Tugiono MSH. Sistem Pendukung Keputusan Menentukan Unit Kearsipan Terbaik Menggunakan Metode MOORA. Jurnal Sistem Informasi Tgd 2022;1(2):62–72.
[11] Eri Novitasari Situmeang, Yopi Hendro Syahputra A. Implementasi Metode MOORA (Multi Objective Optimization On The Basis Of Ratio Analysis) Dalam Sistem Pendukung Keputusan Menentukan Pengawas (Mandor) Yang Layak Mendapatkan 2020(April).
[12] Fitry AF Togatorop M. Penerapan Metode MOORA dalam Penentuan Karyawan Terbaik 2022;3(2):1–6. https://doi.org/10.47065/josyc.v3i2.1282.
[13] Naufal R, Mubaroq F, Prasanti ED, Novita Y, Sihaloho B, Wijayanto ED. Sistem Pendukung Keputusan Untuk Menentuan Desa Paling Maju dengan Menggunakan Metode MOORA 2023;4(2):419–427. https://doi.org/10.47065/josyc.v4i2.3130.
[14] Anshary MF, Yakub S. Decision Support System Pemilihan Wilayah Potensial Dalam Pemasaran Produk Menggunakan Metode MOORA 2023;2:229–238.
[15] Sriwahyuni Hutagalung, Dinda Saputri Gea, Dwina Pri Indini M. Penerapan Metode MOORA Dalam Pemilihan Bimbingan Belajar Terbaik 2023;3(1):1–7.
[16] Mesran M, Pardede SDA, Harahap A, Siahaan APU. Sistem Pendukung Keputusan Pemilihan Peserta Jaminan Kesehatan Masyarakat (Jamkesmas) Menerapkan Metode MOORA. Jurnal Media Informatika Budidarma 2018;2(2):16–22. https://doi.org/10.30865/mib.v2i2.595.