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Decision Support System for Financial Aid for Underprivileged Students using the TOPSIS Method

Apprillia Yudha Pransiska[1)*], Angga Putra Juledi[2)], Syaiful Zuhri Harahap[3)]
[1,2,3)]Universitas Labuhanbatu, Indonesian
[1)] yudhapransiska30@gmail.com, [2)]anggapj19@gmail.com, [3)]syaifulzuhriharahap@gmail.com

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Abstract: The distribution of Financial Aid for Underprivileged Students is considered not to be on target due to the unmeasured selection process. So a decision-making system is needed that can select beneficiaries objectively. This research was conducted to assist the school in determining students who deserve this assistance. The purpose of this research is to build a decision-making system for selecting beneficiaries from poor students by applying the Technique for Order of Preference by Similarity to Ideal Solution method. The formulation of the problem is how to build a decision support system using the Technique for Order of Preference by Similarity to Ideal Solution method in selecting students who receive financial aid for underprivileged students. The method used goes through several stages, namely: determining alternatives and criteria, building a normalized decision matrix, building a weighted normalized decision matrix, determining positive and negative ideal solutions, determining the distance between ideal solutions, and determining preference values. There are 7 criteria used, namely social protection card recipients, total income, number of dependents, parental status, distance, class, and report card scores. The results showed that the highest preference value for each alternative was in alternative A3, with a score of 0.6665. While the lowest preference value is in alternative A20 with a score of 0.0719, From the results of the study, it was concluded that the Technique for Order of Preference by Similarity to Ideal Solution method can be used in making decisions on the selection of beneficiaries of poor students based on preference value rankings.

Keywords: Decision Support System; Financial Aid for Underprivileged Students; Labuhanbatu; Preference; TOPSIS.

INTRODUCTION

In an effort to equalize access to proper education and reduce the dropout rate, the government pays great attention to the poor. He attention is in the form of providing Financial Aid for Underprivileged Students (Winata, Marsono, & Nasyuha, 2018). This assistance is provided by the Government in the context of compensation for rising fuel prices, which have a direct impact on the economy of the poor (Rajagukguk, 2019). Although the School Operational Support program is expected to increase student participation, there are still many children who cannot attend school and are unable to continue their education to the next level of education. One of the reasons for this was the limited cost of education, which the school operation support fund could not afford (Nazar, 2022).

In implementing the financial aid for underprivileged students program, the selection committee at SD Negeri 07 Rantau Selatan District often faced problems related to determining students who were

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entitled to receive this assistance. Out of all existing students (grades 1–6), not all students from poor families can receive the financial aid for underprivileged students program due to the limited number of beneficiary quotas. Problems in determining financial aid for underprivileged students beneficiary students are caused by the similarity of data. The similarity of existing data can be a problem in determining which students are eligible to receive financial aid for underprivileged students so that the program is right on target, thereby avoiding subjective judgments (Akbar & 'Uyun, 2021). In addition, the determination of financial aid for underprivileged students beneficiary students by the school is still done manually, which has the potential to cause errors during the selection process (Winata et al., 2018). Seeing the problems faced by the school, a solution is proposed in the form of implementing a decision support system for selecting students who are entitled to receive financial aid for underprivileged students (Syaifuddin, Solikhin, & Riyanto, 2022). Decision support systems have been proven to be able to overcome problems in decision making with accurate, targeted, effective, and objective results (Nalatissifa & Ramdhani, 2020).

A decision support system certainly requires the right decision-making method in accordance with the problem at hand. The Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) method can assist in making the best decisions with faster and more accurate calculation results so that the resulting information can be used as a decision support (Nurelasari & Purwaningsih, 2020). The TOPSIS method was chosen because it is able to select the best alternative from a number of alternatives, in this case, the best alternative based on predetermined criteria (Winata et al., 2018). Compared to the Simple Additive Weighting method, the test results from the TOPSIS method are better, with an accuracy of 100% (Firdonsyah, Warsito, & Wibowo, 2022). Comparison with the TOPSIS-AHP, SAW-AHP, and SAW methods shows that the TOPSIS method is ranked second with an accuracy rate of 78% below the TOPSIS-AHP method (Firgiawan, Zulkarnaim, & Cokrowibowo, 2020).

This study was designed to apply the TOPSIS method to a decision support system for selecting assistance for poor students at SD Negeri 07 Rantau Selatan, Labuhanbatu Regency. This research is important to do in an effort to assist the school in determining financial aid for underprivileged students beneficiaries objectively and on target. The difference with previous studies is in the criteria used. This study uses seven criteria, namely, social protection card recipients, total income, number of dependents, parental status, distance, class, and average report card scores. The purpose of this research is to build a decision-making system for selecting financial aid for underprivileged students recipients at SD Negeri 07 Rantau Selatan by applying the TOPSIS method, so that from the results of this study, the school can determine whether students are eligible or not to receive financial aid for underprivileged students based on an objective and accurate process. While the formulation of the problem in this study is whether the decision support system with the TOPSIS method can assist in making decisions for select financial aid for underprivileged students recipient students at SD Negeri 07 Rantau Selatan.

LITERATURE REVIEW

Bantuan Siswa Miskin is direct assistance in the form of cash that is given directly to students who meet the criteria set by the government. This criterion includes the number of siblings, parents' income levels, place of residence, means of transportation to school, and student grades (Cahyanu, Lestari, & Hermawan, 2019). The provision of financial aid for underprivileged students aims to prevent students from dropping out of school, support the Nine-Year Education Program (even up to high school), and support school programs funded by the state budget (Nazar, 2022). Based on data released by the National Team for the Acceleration of Poverty Reduction (TNP2K), the amount of financial aid for underprivileged students funds allocated per semester for this program is Rp. 225,000 for Elementary School (SD), Rp. 375,000 for Junior High School (SMP), and Rp. 500,000 for Senior High School (SMA). According to TNP2K, the financial aid for underprivileged students program is specifically for students who are economically disadvantaged, while students who are economically capable, despite their achievements, are not recipients of funds in this program (Nata & Apridonal, 2020).

A decision support system (DSS) is a computer-based system that combines the intellectual abilities of an expert with the ability of a computer to process data into information. To increase the effectiveness of decision-making, this system has the ability to solve problems and communicate in semi-structured and unstructured conditions by processing data interactively using various models to provide relevant

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information (Asrul & Zuhriyah, 2021). DSS is an interactive system that provides information, modeling, and data manipulation to help make decisions and guide future planning (Putri, Juledi, & Munthe, 2023). One of the goals of a decision support system is to assist the decision-making process by improving human and system performance, such as by reducing mental workload. This is not always achieved through process automation but also through facilitating decision-making (Gil, Wróbel, Montewka, & Goerlandt, 2020). DSS has several stages of the decision-making process, namely (a) intelligence, (b) design, (c) choice, and (d) implementation (Somya & Wardoyo, 2019).

Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) is a decision-making method that chooses the alternative that is closest to the positive ideal solution and farthest from the negative ideal solution (Santiary, Ciptayani, Saptarini, & Swardika, 2018). The positive ideal solution maximizes the profit attribute and minimizes the cost attribute, while the negative ideal solution minimizes the profit attribute and maximizes the cost attribute (Kristiana, 2018). This method is widely used to solve decision-making problems because the concept is simple, the computation is efficient, and TOPSIS takes into account the distance between the positive and negative ideal solutions by considering the distance relative to the positive ideal solution (Riandari, Hasugian Marto, & Taufik, 2017). The TOPSIS method uses the principle that the chosen alternative must be closest to the positive ideal solution and furthest from the negative ideal solution from a geometric point of view. To find out the relative closeness of the alternative to the optimal solution, relative distance is used (Muzakkir, 2017). In the TOPSIS method, the best value for the positive ideal solution will be selected, and the worst value for the negative ideal solution will be selected. In the end, the value of the positive and negative ideal solutions will be compared. It is hoped that more objective recommendations will be made through this assessment. Because it is simple, easy to understand, and computationally efficient, the TOPSIS method is also widely used. This method also has the ability to measure the performance of decision alternatives in a simple mathematical form (Handayani, Normah, & Wironoto, 2021).

METHOD

Activities and procedures carried out during research require an organized and systematic methodology. To carry out this research phase, the stages used are shown in Figure 1 (Handayani et al., 2021).

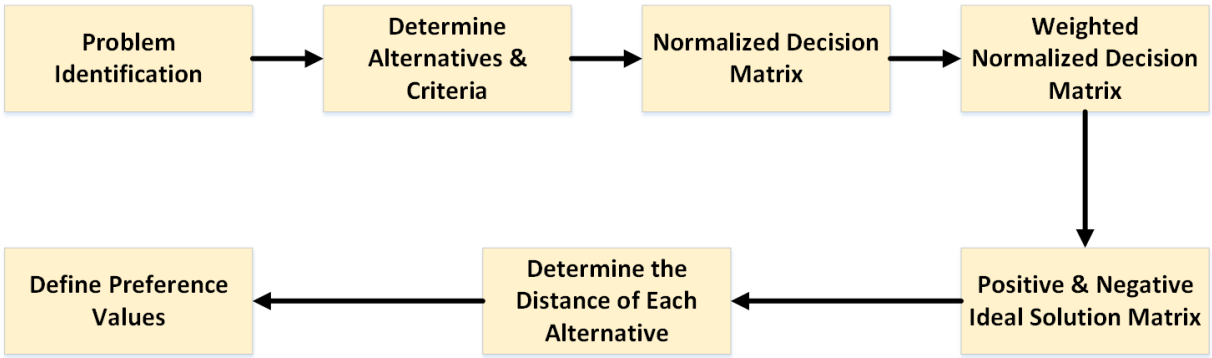

Fig 1. Research Stages

The data used in this study was obtained through observation and interviews. Observation, namely seeing the object under study directly, is used to conduct direct interviews with schools to obtain data on financial aid for underprivileged students acceptance. Literature study is carried out by conducting literature research from various sources, such as books, magazines, articles, journals, or documents related to the subject under study.

The procedure for implementing the TOPSIS method in this study will be measured and tested through the following stages (Santiary et al., 2018):

Determine Alternatives

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Before calculating with TOPSIS, the alternative variables and criteria used are determined in advance. The alternative used is data on prospective financial aid for underprivileged students, totaling 25 students from grade 1 to grade 6.

Define Criteria

There are seven criteria used in selecting financial aid for underprivileged students beneficiary students, namely: Recipients of the Social Protection Card (SPC), Total income of parents, Number of dependents of parents, Status of parents, Distance, Class, and Average Rapot score.

Building a Normalized Decision Matrix

In TOPSIS, the performance of each alternative is calculated using equation 1.

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

Description:

- r_{ij} is the i-th alternative normalized decision matrix and the j-th criterion
- x_{ij} is the measurement of the i-th alternative and the j-th criterion

Building a Weighted Normalized Decision Matrix

$$y_{ij} = w_j r_{ij} \quad (2)$$

Description:

- y_{ij} to determine weighting
- r_{ij} is the normalized decision matrix
- w_j is the criterion weight

Determine the Positive Ideal Solution Matrix and the Negative Ideal Solution matrix

$$A^+ = (y_1^+, y_2^+, \dots, y_n^+) \quad (3)$$

$$A^- = (y_1^-, y_2^-, \dots, y_n^- \quad (4)$$

Description:

- A^+ is the positive ideal solution
- A^- is the negative ideal solution
- y is a weighted normalized matrix

Determine the Distance Between Each Alternative of the Positive and Negative Ideal solutions

$$D_i^+ = \sqrt{\sum_{j=1}^{n}(y_i^+ - y_{ij})^2; i = 1,2, \dots m} \quad (5)$$

$$D_i^- = \sqrt{\sum_{j=1}^{n}(y_{ij} - y_i^-)^2; i = 1,2, \dots m} \quad (6)$$

Description:

- D_i^+ is the shortest distance to the positive ideal solution
- D_i^- is the shortest distance to the negative ideal solution

Define the preference value for Each alternative

TOPSIS requires the weight value of each alternative (A_i) on each criterion.

$$V_i = \frac{D_i^-}{D_i^- + D_i^+} \quad (7)$$

Description:

- V_i is preference
- D_i^+ is the shortest distance to the positive ideal solution
- D_i^- is the shortest distance to the negative ideal solution

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Conclusions will be drawn based on the results of the research, and based on the results of the preference value of each alternative, ranking will be carried out from the highest preference value (first rank) to the smallest preference value (last rank).

RESULT

This study has implemented the stages and procedures as presented in the method section by using the Technique for Order of Preference by Similarity to the Ideal Solution method. The results of this study will systematically describe the results of the research stages described in the previous Methods section.

Table 1. Alternative Data for FINANCIAL AID FOR UNDERPRIVILEGED STUDENTS Recipient Students

Student (Alternative)	SPC recipients	Total Income (Rp)	Number of Dependents (people)	Orphan	Distance (Km)	Level	Report Average Score
Student 1	Yes	750,000	1	YP	1.5	1	76.67
Student 2	Yes	1,250,000	2	Y	5	1	82.54
Student 3	Yes	950,000	2	Y	4	1	83.08
Student 4	Yes	1,200,000	2	L	2	1	85.94
Student 5	Yes	900,000	1	P	7	1	86.81
Student 6	No	850,000	1	L	3	2	87.88
Student 7	Yes	1,000,000	2	L	9	2	87
Student 8	No	900,000	1	L	8	2	73.97
Student 9	Yes	1,300,000	3	L	10	2	74.25
Student 10	Yes	1,250,000	2	P	6	2	73
Student 11	Yes	850,000	1	Y	0.5	3	75.52
Student 12	Yes	850,000	1	Y	7	3	77
Student 13	No	1,500,000	1	L	3	3	73.87
Student 14	Yes	1,000,000	2	YP	1.2	3	76.25
Student 15	No	900,000	1	L	0.6	4	84.29
Student 16	Yes	750,000	1	L	0.25	4	80.77
Student 17	Yes	1,200,000	3	L	2.2	4	80.5
Student 18	No	800,000	2	L	0.6	4	81.13
Student 19	Yes	900,000	2	L	0.85	5	76.9
Student 20	No	1,000,000	1	L	1.35	5	78.84
Student 21	Yes	1,500,000	2	P	0.7	5	73.47
Student 22	Yes	950,000	1	Y	0.2	5	80.64
Student 23	Yes	800,000	1	Y	0.9	6	76.81
Student 24	Yes	1,000,000	2	P	4	6	77.06
Student 25	No	800,000	1	L	2.3	6	84.69

Table 1 displays alternative data, which is data on prospective financial aid for underprivileged students beneficiary students. There are 25 alternative students, consisting of students in grades 1 to 6. Seven criteria are used with each sub-criterion, which will be explained in the next table.

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Table 2. Assessment criteria

Criteria Code	Description	Weight
C1	SPC recipients	4
C2	Total Income	4
C3	Number of Dependents	4
C4	Orphan	3
C5	Distance	3
C6	Level	2
C7	Report Average Score	2

Table 2 shows the assessment criteria that apply in schools and are used to determine whether financial aid for underprivileged students recipient students are eligible or not. There are seven criteria used to determine whether or not a student is eligible to receive financial aid for underprivileged students, namely: Recipient of Social Protection Card, Total Income of Parents, Total Dependents of Parents, Status of Parents: Still Complete (L), Orphan (YP), Orphan (Y), and Orphan (F), Distance from home to school, Class, and Average Score of Report Card in an Even Semester. For each existing criterion, the preference weight value is determined. This weighting aims to determine the level of importance of a criterion used. The weight value of each criterion is determined on a scale of 1–4 based on the level of importance of the criteria, namely, 1 = Less Important, 2 = Quite Important, 3 = Important, and 4 = Very important.

Table 3. Weighting Value of Criteria and Sub Criteria

Criteria Code	Sub Criteria	Weight
C1	Recipient	4
	Not Recipients	1
C2	≤ Rp. 500,000	4
	Rp. 500,000 – Rp. 1,000,000	3
	≥ Rp. 1,000,000	1
C3	≥ 4 children	4
	3 children	3
	2 children	2
	1 children	1
C4	Yatim Piatu (YP)	4
	Yatim (Y)	3
	Piatu (P)	3
	Lengkap (L)	1
C5	> 10 Km	4
	5 – 10 Km	3
	3 – 4.9 Km	2
	0 – 2.9 Km	1
C6	1 – 2 grade	4
	3 – 4 grade	3
	5 – 6 grade	2
C7	85.00 – 100	4
	75.00 – 84.99	3
	65.00 – 74.99	2
	0 – 64.99	1

Table 3 shows the weighting of the criteria values by describing each of the subcriteria used. Recipients of a social protection card (C1) are an absolute requirement for prospective financial aid for underprivileged students recipients. This criterion is an indicator to serve as a reference for other criteria,

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such as whether prospective financial aid for underprivileged students recipients are KPS recipients or not. Parents' total income (C2) is seen from the average amount of income per month. The number of parents' dependents (C3) is determined based on the number of siblings of financial aid for underprivileged students beneficiary students who are still in school or who are still paid for by their parents. Parents' status (C4) is seen from the condition of the parents, whether they are still there, one of them has died, or both parents have died. Distance (C5) is a measure of how far the location is from the house to the school, which is calculated based on kilometers. Class (C6) is the class size of prospective financial aid for underprivileged students recipient students. The average report card score (C7) can be seen from each semester's scores of students who are prospective recipients of financial aid for underprivileged students.

Table 4. Alternative Match Rating on Criteria

Alternative	Criteria						
	C1	C2	C3	C4	C5	C6	C7
A1	4	3	1	4	1	4	3
A2	4	1	2	3	3	4	3
A3	4	3	2	3	2	4	3
A4	4	1	2	1	1	4	4
A5	4	3	1	3	3	4	4
A6	1	3	1	1	2	4	4
A7	4	1	2	1	3	4	4
A8	1	3	1	1	3	4	2
A9	4	1	3	1	3	4	2
A10	4	1	2	3	3	4	2
A11	4	3	1	3	1	3	3
A12	4	3	1	3	3	3	3
A13	1	1	1	1	2	3	2
A14	4	1	2	4	1	3	3
A15	1	3	1	1	1	3	3
A16	4	3	1	1	1	3	3
A17	4	1	3	1	1	3	3
A18	1	3	2	1	1	3	3
A19	4	3	2	1	1	2	3
A20	1	1	1	1	1	2	3
A21	4	1	2	3	1	2	2
A22	4	3	1	3	1	2	3
A23	4	3	1	3	1	2	3
A24	4	1	2	3	2	2	3
A25	1	3	1	1	1	2	3

From the results of the alternatives, criteria, and weighting of the criteria values, as well as the alternative suitability ratings on the criteria shown in Table 4, the calculations are carried out according to the stages of the TOPSIS method. The results of the TOPSIS calculations are presented in the tables below.

Normalized Decision Matrix

Matrix normalization is done by calculating the value of the normalized performance rating (r_{ij}) of the alternative Ai. By using equation 1, the results of the normalized decision matrix can be seen in Table 5.

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Table 5. Normalized Decision Matrix Results

Alternative	Criteria						
	C1	C2	C3	C4	C5	C6	C7
A1	0.2329	0.2563	0.1187	0.3443	0.1037	0.2481	0.1987
A2	0.2329	0.0854	0.2374	0.2582	0.3111	0.2481	0.1987
A3	0.2329	0.2563	0.2374	0.2582	0.2074	0.2481	0.1987
A4	0.2329	0.0854	0.2374	0.0861	0.1037	0.2481	0.2649
A5	0.2329	0.2563	0.1187	0.2582	0.3111	0.2481	0.2649
A6	0.0582	0.2563	0.1187	0.0861	0.2074	0.2481	0.2649
A7	0.2329	0.0854	0.2374	0.0861	0.3111	0.2481	0.2649
A8	0.0582	0.2563	0.1187	0.0861	0.3111	0.2481	0.1325
A9	0.2329	0.0854	0.3560	0.0861	0.3111	0.2481	0.1325
A10	0.2329	0.0854	0.2374	0.2582	0.3111	0.2481	0.1325
A11	0.2329	0.2563	0.1187	0.2582	0.1037	0.1861	0.1987
A12	0.2329	0.2563	0.1187	0.2582	0.3111	0.1861	0.1987
A13	0.0582	0.0854	0.1187	0.0861	0.2074	0.1861	0.1325
A14	0.2329	0.0854	0.2374	0.3443	0.1037	0.1861	0.1987
A15	0.0582	0.2563	0.1187	0.0861	0.1037	0.1861	0.1987
A16	0.2329	0.2563	0.1187	0.0861	0.1037	0.1861	0.1987
A17	0.2329	0.0854	0.3560	0.0861	0.1037	0.1861	0.1987
A18	0.0582	0.2563	0.2374	0.0861	0.1037	0.1861	0.1987
A19	0.2329	0.2563	0.2374	0.0861	0.1037	0.1240	0.1987
A20	0.0582	0.0854	0.1187	0.0861	0.1037	0.1240	0.1987
A21	0.2329	0.0854	0.2374	0.2582	0.1037	0.1240	0.1325
A22	0.2329	0.2563	0.1187	0.2582	0.1037	0.1240	0.1987
A23	0.2329	0.2563	0.1187	0.2582	0.1037	0.1240	0.1987
A24	0.2329	0.0854	0.2374	0.2582	0.2074	0.1240	0.1987
A25	0.0582	0.2563	0.1187	0.0861	0.1037	0.1240	0.1987

Weighted Normalized Decision Matrix

To make a weighted normalized decision matrix, the preference weight (w_i) must be multiplied by the normalized matrix (r_{ij}). The weighted normalized decision matrix is calculated using equation 2. The results are shown in Table 6.

Table 6. Weighted Normalized Decision Matrix Results

Alternative	Criteria						
	C1	C2	C3	C4	C5	C6	C7
A1	0.9316	1.0252	0.4747	1.0328	0.3111	0.4961	0.3974
A2	0.9316	0.3417	0.9494	0.7746	0.9333	0.4961	0.3974
A3	0.9316	1.0252	0.9494	0.7746	0.6222	0.4961	0.3974
A4	0.9316	0.3417	0.9494	0.2582	0.3111	0.4961	0.5298
A5	0.9316	1.0252	0.4747	0.7746	0.9333	0.4961	0.5298
A6	0.2329	1.0252	0.4747	0.2582	0.6222	0.4961	0.5298
A7	0.9316	0.3417	0.9494	0.2582	0.9333	0.4961	0.5298
A8	0.2329	1.0252	0.4747	0.2582	0.9333	0.4961	0.2649
A9	0.9316	0.3417	1.4241	0.2582	0.9333	0.4961	0.2649
A10	0.9316	0.3417	0.9494	0.7746	0.9333	0.4961	0.2649
A11	0.9316	1.0252	0.4747	0.7746	0.3111	0.3721	0.3974
A12	0.9316	1.0252	0.4747	0.7746	0.9333	0.3721	0.3974
A13	0.2329	0.3417	0.4747	0.2582	0.6222	0.3721	0.2649
A14	0.9316	0.3417	0.9494	1.0328	0.3111	0.3721	0.3974

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A15	0.2329	1.0252	0.4747	0.2582	0.3111	0.3721	0.3974
A16	0.9316	1.0252	0.4747	0.2582	0.3111	0.3721	0.3974
A17	0.9316	0.3417	1.4241	0.2582	0.3111	0.3721	0.3974
A18	0.2329	1.0252	0.9494	0.2582	0.3111	0.3721	0.3974
A19	0.9316	1.0252	0.9494	0.2582	0.3111	0.2481	0.3974
A20	0.2329	0.3417	0.4747	0.2582	0.3111	0.2481	0.3974
A21	0.9316	0.3417	0.9494	0.7746	0.3111	0.2481	0.2649
A22	0.9316	1.0252	0.4747	0.7746	0.3111	0.2481	0.3974
A23	0.9316	1.0252	0.4747	0.7746	0.3111	0.2481	0.3974
A24	0.9316	0.3417	0.9494	0.7746	0.6222	0.2481	0.3974
A25	0.2329	1.0252	0.4747	0.2582	0.3111	0.2481	0.3974

Positive Ideal Solution Matrix and Negative Ideal Solution Matrix

Based on equation 3, the positive ideal solution (A^+) is obtained from the maximum value in the weighted normalized matrix (table 6) for each criterion. The results are shown in Table 7.

Table 7. Positive Ideal Solution Matrix Result

Positive Ideals	C1	C2	C3	C4	C5	C6	C7
A^+	0.9316	1.0252	1.4241	1.0328	0.9333	0.4961	0.5298

Meanwhile, equation 4 is the negative ideal solution (A^-), which is obtained from the minimum value in the weighted normalized matrix (table 6) for each criterion. The results are shown in Table 8.

Table 8. Negative Ideal Solution Matrix Result

Negative Ideals	C1	C2	C3	C4	C5	C6	C7
A^-	0.2329	0.3417	0.4747	0.2582	0.3111	0.2481	0.2649

The Distance Between the Values of Each Alternative from the Positive and Negative Ideal Solutions

The positive ideal distance (D^+) is the distance between the weighted values and the positive ideal solution (A^+), which is calculated using equation 5. Meanwhile, the negative ideal distance (D^-) is determined by calculating the distance between the weighted values and the negative ideal solution (A^-) using equation 6. The results of the positive and negative ideal solution distances are presented in Table 9.

Table 9. Positive Ideal Distance Results

Alternative	Positive Ideal Distance (D_i^+)	Negative Ideal Distance (D_i^-)
A1	1.1428	1.2784
A2	0.8813	1.2026
A3	0.6374	1.2740
A4	1.2960	0.9193
A5	0.9839	1.3194
A6	1.4444	0.8341
A7	1.1369	1.1101
A8	1.4352	0.9570
A9	1.0665	1.3558
A10	0.9107	1.1953
A11	1.1782	1.1202
A12	1.0005	1.2814

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A13	1.6245	0.3349
A14	1.0548	1.1604
A15	1.5523	0.7072
A16	1.3862	0.9941
A17	1.2195	1.1927
A18	1.3166	0.8517
A19	1.1365	1.0946
A20	1.7096	0.1325
A21	1.1305	0.9900
A22	1.1976	1.1133
A23	1.1976	1.1133
A24	0.9670	1.0462
A25	1.5671	0.6962

Preference Value for Each Alternative

After determining the ideal positive and negative ideal distance values, the preference value of each alternative is calculated using equation 7. The results of calculating the preference value are shown in Table 10.

Table 10. Preference Value

Alternative	Preference Value
A1	0.5280
A2	0.5771
A3	0.6665
A4	0.4150
A5	0.5728
A6	0.3661
A7	0.4940
A8	0.4000
A9	0.5597
A10	0.5676
A11	0.4874
A12	0.5615
A13	0.1709
A14	0.5238
A15	0.3130
A16	0.4176
A17	0.4944
A18	0.3928
A19	0.4906
A20	0.0719
A21	0.4669
A22	0.4818
A23	0.4818
A24	0.5197
A25	0.3076

After obtaining the preference value of each alternative, the ranking is determined based on the order of the preference value, from the largest to the smallest. The ranking results are shown in Table 11.

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Table 11. Ranking Results

Ranking	Alternative	Preference Value
1	A3	0.6665
2	A2	0.5771
3	A5	0.5728
4	A10	0.5676
5	A12	0.5615
6	A9	0.5597
7	A1	0.5280
8	A14	0.5238
9	A24	0.5197
10	A17	0.4944
11	A7	0.4940
12	A19	0.4906
13	A11	0.4874
14	A23	0.4818
15	A22	0.4818
16	A21	0.4669
17	A16	0.4176
18	A4	0.4150
19	A8	0.4000
20	A18	0.3928
21	A6	0.3661
22	A15	0.3130
23	A25	0.3076
24	A13	0.1709
25	A20	0.0719

Table 11 shows the results of the alternative data ranking of prospective financial aid for underprivileged students recipients, which was carried out using the TOPSIS method. From the data results, the highest preference value (rank 1) is in the 3rd alternative (A3) with a score of 0.6665. While the lowest preference value (rank 25) is in the 20th alternative (A20) with a score of 0.0719. The results of this ranking can be used by the school to accurately and unbiasedly determine financial aid for underprivileged students beneficiary candidates.

DISCUSSIONS

This research has implemented a decision support system using the TOPSIS method to assist in determining recipients of financial aid for underprivileged students based on the criteria used. The purpose of this system is to ensure that the distribution of financial aid for underprivileged students funds is carried out objectively and on target. The result of this system is a ranking of the names of students who are eligible to receive financial aid for underprivileged students funds.

The use of the TOPSIS method in this study was limited to the application of formulations in the form of manual calculation results. It needs to be developed further to the stage of making the application so that it makes it easier for schools to use the TOPSIS method in implementing a decision support system for financial aid for underprivileged students beneficiary selection. The application of the TOPSIS method in this study can also be developed by adding other criteria that are deemed necessary according to user needs. In addition, it is necessary to distinguish which criteria are included in the benefit category and which criteria are included in the cost category. In terms of weighting criteria, besides using scale-based weighting, percentage-based weighting can also be done. Another alternative that can be taken in implementing a decision support system is to compare the TOPSIS method with other decision support system methods to obtain maximum results.

* Apprillia Yudha Pransiska

CONCLUSION

The TOPSIS method can be used in making decisions regarding financial aid for underprivileged students beneficiaries at SD Negeri 07 Rantau Selatan, Labuhanbatu Regency. After the analysis using the TOPSIS method is complete, the system can accurately determine whether or not students are eligible to get a financial aid for underprivileged students based on preference score rankings. Hopefully, this research contributes to helping determine students who are eligible to get financial aid for underprivileged students quickly and can help schools select students who are eligible to get financial aid for underprivileged students funds.

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* Apprillia Yudha Pransiska