



Design of A Decision Support System for Students' Extracurricular Choices using the TOPSIS Method at SMKN 1 Bukit Sundi

Afdal^{1*}, Yendi Putra², Yulhan³, Etika Melsyah Putri⁴

¹⁻⁴*Informatics Management, Faculty of Economics, Mahaputra Muhammad Yamin University, Solok, Indonesia*

**Corresponding author email: kingafdal1@gmail.com*

Abstract

Education not only emphasizes academic excellence but also requires the development of students' character, talents, and soft skills. Extracurricular activities play a crucial role in providing students with opportunities to explore their potential beyond the classroom. However, students often encounter difficulties in selecting the most suitable extracurricular activity, which may result in low motivation and reduced participation. To address this issue, a web-based Decision Support System (DSS) was developed using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). The system considers multiple criteria, namely interest, talent, academic achievement, parental support, physical condition, and equipment cost, to generate objective recommendations. The research was conducted at SMKN 1 Bukit Sundi with seven extracurricular alternatives, including Futsal, Volleyball, Pramuka, Paskibra, Marching Band, OSIS, PMR, and Randai. The system was implemented using PHP and MySQL, providing an automated process of normalization, weighting, calculation of ideal solutions, and ranking. Results showed that Futsal achieved the highest preference value (0.755846), followed by Volleyball and Pramuka, while Randai ranked lowest with a value of 0.223794. These findings indicate that student preferences are strongly aligned with sports and leadership activities, while traditional art forms are less favoured. The system proved to be consistent with manual calculations and successfully enhanced transparency, efficiency, and accessibility in extracurricular selection. Compared to alternative methods such as SAW, TOPSIS offered greater flexibility by accommodating both benefit and cost attributes simultaneously. This study contributes practically by providing a tool that supports schools and students in decision-making, and academically by extending the application of TOPSIS in vocational education.

Keywords: Decision support system, extracurricular selection, TOPSIS method, PHP, MySQL

1. Introduction

Education is the foundation for developing an intelligent and competitive generation. Beyond academic excellence, students must develop personal character, social skills, and innate talents to face the challenges of an increasingly complex and globalized world. Schools, as formal institutions, are expected to provide not only classroom learning but also opportunities that allow students to explore and develop their interests and potential. One of the most effective ways to achieve this goal is through extracurricular activities (Gryshchenko et al., 2021; BORŞA, 2022).

Extracurricular activities encompass a wide range of areas such as sports, arts, organizations, and religious programs. These activities contribute significantly to students' holistic development, offering a platform for fostering creativity, teamwork, leadership, and self-confidence. In the era of globalization, where the demand for soft skills such as communication, adaptability, and collaboration is increasingly important, extracurricular activities are no longer considered secondary but rather integral to education. Schools that successfully manage and promote extracurricular programs often gain greater recognition and trust from the community, as these programs contribute to producing well-rounded graduates (Wu & Fernando, 2023).

Despite their importance, many students face difficulties in choosing appropriate extracurricular activities that align with their interests, talents, and personal circumstances (Kakungulu Samuel, 2024). Wrong choices often result in lack of motivation, ineffective skill development, and even student disengagement. This highlights the need for structured mechanisms that guide students toward more accurate decisions, reduce the risk of mismatch, and ensure their participation is meaningful and sustainable.

Decision Support Systems (DSS) provide a technological solution to address these challenges. DSSs are designed to assist complex decision-making processes involving multiple criteria. By leveraging structured models and relevant data, DSSs can provide objective and measurable recommendations. Among the various methods available, the

Technique for Ordering Preferences by Similarity to the Ideal Solution (TOPSIS) has gained popularity due to its simplicity, computational efficiency, and ability to simultaneously consider both benefit and cost attributes (Ali et al., 2023).

The TOPSIS method operates by evaluating alternatives based on their proximity to the ideal positive solution and their distance from the ideal negative solution. This dual assessment allows alternatives to be ranked in a way that reflects strengths and weaknesses across multiple criteria (Madanchian, & Taherdoost, 2023). In the context of extracurricular selection, criteria such as interest, aptitude, academic achievement, parental support, physical condition, and equipment costs can be integrated into the TOPSIS framework, resulting in recommendations that are not only accurate but also tailored to each student's needs.

At SMKN 1 Bukit Sundi, extracurricular programs are diverse, ranging from Futsal and Volleyball to Scouting, Student Council (OSIS), and Marching Band. While the availability of options reflects the school's commitment to student development, it also poses challenges for student decision-making. Without proper guidance, students may choose activities that do not fully support their development. Therefore, implementing a Decision Support System (DSS) using the TOPSIS method offers a promising approach to ensuring students are directed to the most appropriate extracurricular activities.

The purpose of this research is to design and implement a web-based DSS using PHP and MySQL that applies the TOPSIS method for extracurricular activity selection at SMKN 1 Bukit Sundi. This system is expected to automate processes such as normalization, weighting, determining the ideal solution, and ranking, resulting in efficient, accurate, and transparent recommendations. This research is expected to contribute to providing decision-making tools that assist students in selecting extracurricular activities objectively and support schools in managing student talent allocation more effectively.

2. Literature Review

2.1. Decision Support Systems (DSS)

Decision Support Systems (DSS) are computer-based systems designed to assist decision-makers in solving complex and multi-criteria problems. Taherdoost and Madanchian (2023) define DSS as a system that integrates data, analytical models, and user-friendly interfaces to support semi-structured decision-making. In education, DSS has been applied in contexts such as scholarship selection, student placement, and evaluation of academic performance. By processing diverse criteria simultaneously, DSS ensures objectivity and reduces human bias in decision-making.

2.2. Multi-Criteria Decision Making (MCDM)

Multi-Criteria Decision Making (MCDM) refers to methods used to evaluate alternatives based on several criteria, often with conflicting objectives. Commonly used MCDM methods include Simple Additive Weighting (SAW), Analytic Hierarchy Process (AHP), and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). Each has its strengths and weaknesses. SAW, for example, is simple but less effective in handling cost-type criteria. AHP is structured but time-consuming. TOPSIS, in contrast, is computationally efficient and accommodates both benefit and cost attributes simultaneously (Taherdoost & Madanchian, 2023).

2.3. TOPSIS Method

The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is a Multi-Criteria Decision Making (MCDM) method first introduced by Hwang and Yoon (1981). The fundamental principle of TOPSIS is that the best alternative should have the shortest distance to the positive ideal solution (best performance across criteria) and the farthest distance from the negative ideal solution (worst performance across criteria) (Taherdoost & Madanchian, 2023).

The steps of the TOPSIS method are as follows:

1. Step 1 Construct the Decision Matrix

A decision matrix is formed containing values of each alternative with respect to each criterion:

$$X = [x_{ij}] \quad i = 1, 2, \dots, m; \quad j = 1, 2, \dots, n. \quad (1)$$

where x_{ij} is the score of alternative i on criterion j , m is the number of alternatives, and n is the number of criteria.

2. Step 2 Normalize the Decision Matrix

Normalization ensures comparability across criteria:

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

where r_{ij} is the normalized score of alternative i on criterion j .

3. Step 3 Calculate the Weighted Normalized Matrix

Each normalized value is multiplied by the corresponding criterion weight:

$$y_{ij} = w_j \cdot r_{ij}. \quad (3)$$

where w_j is the weight of criterion j and $\sum_{j=1}^n w_j = 1$.

4. Step 4. Determine Positive Ideal Solution (A^+) and Negative Ideal Solution (A^-)

The positive ideal solution represents the best values for each criterion, while the negative ideal solution represents the worst values:

$$A^+ = \{y_1^+, y_2^+, \dots, y_n^+\}, \quad y_j^+ = \max(y_{ij}) \text{ for benefit, } \min(y_{ij}) \text{ for cost} \quad (4)$$

$$A^- = \{y_1^-, y_2^-, \dots, y_n^-\}, \quad y_j^- = \min(y_{ij}) \text{ for benefit, } \max(y_{ij}) \text{ for cost} \quad (5)$$

5. Step 5 Calculate the Distance of Each Alternative to A^+ and A^-

$$D_i^+ = \sqrt{\sum_{j=1}^n (y_{ij} - y_j^+)^2}. \quad (6)$$

$$D_i^- = \sqrt{\sum_{j=1}^n (y_{ij} - y_j^-)^2}. \quad (7)$$

6. Step 6 Calculate the Preference Value

The preference value indicates the closeness of an alternative to the ideal solution:

$$V_i = \frac{D_i^-}{D_i^+ + D_i^-}, \quad 0 \leq V_i \leq 1. \quad (8)$$

The higher the V , the closer the alternative is to the positive ideal solution, and thus the more preferable it is.

2.4. Previous Studies

Numerous studies have applied TOPSIS in educational and organizational contexts. Arslantaş et al. (2023) demonstrated its effectiveness in scholarship selection, while Fatmah et al. (2025) used SAW for extracurricular selection, although with limitations in handling cost attributes. More recently, Şahin and Kulaklı (2023) developed a web-based extracurricular DSS, highlighting the importance of transparent and accessible decision-making tools. Other applications of TOPSIS include staff recruitment, supplier selection, and medical diagnosis, proving its versatility across domains.

2.5. Research Gap

Despite the many applications of DSS and TOPSIS, there is limited research that specifically focuses on extracurricular selection in vocational schools. Existing works have largely concentrated on scholarships, academic performance, or higher education contexts. Additionally, while methods such as SAW and AHP have been tested, the integration of TOPSIS into a web-based system tailored for vocational school extracurricular decision-making remains underexplored.

2.6. Contribution of This Study

This study contributes practically and academically. Practically, it provides a web-based DSS using PHP and MySQL to help students at SMKN 1 Bukit Sundi select extracurriculars objectively and efficiently. Academically, it strengthens the application of TOPSIS as a reliable MCDM method in education, particularly in managing multi-criteria problems where both benefit and cost attributes must be considered simultaneously.

3. Materials and Methods

3.1. Research Objects

This study focuses on the extracurricular activity selection process at SMKN 1 Bukit Sundi, a vocational high school where students are required to participate in extracurricular activities as part of their holistic education. The challenge arises because students often find it difficult to select the extracurricular that matches their personal interests, talents, and resources. Without structured guidance, mismatches between students and activities may occur, leading to low participation rates and reduced effectiveness of extracurricular programs. For this reason, a Decision Support System (DSS) was designed using the TOPSIS method to ensure that students' decisions are objective, data-driven, and aligned with their potential.

3.2. Research Location and Data

The research was conducted at SMKN 1 Bukit Sundi, where data were collected from both primary and secondary sources. Primary data were obtained through interviews with teachers, observation of extracurricular activities, and questionnaires filled in by students. Secondary data were drawn from school documentation, including lists of extracurricular activities, student academic performance, and institutional guidelines on extracurricular participation. These data served as the foundation for building the decision matrix used in the TOPSIS process.

3.3. Decision Criteria

The selection of extracurricular activities was based on six carefully chosen criteria that reflect the personal, academic, and practical aspects of student life:

- 1) C1 - Interest: the degree of enthusiasm and personal preference a student shows toward an activity.
- 2) C2 - Talent/Initial Ability (Talent): the natural skill or prior knowledge that supports success in the activity.
- 3) C3 - Academic Achievement: a measure of academic consistency that ensures students can balance academic and extracurricular demands.
- 4) C4 - Parental Support (Parental Permission): the extent of encouragement and permission from parents for the student to join the activity.
- 5) C5 - Physical Condition: the student's health and stamina, which are particularly crucial for physically demanding activities such as sports.
- 6) C6 - Equipment Cost: the financial requirements of participating in the activity, which can affect accessibility.

These criteria were determined in consultation with school stakeholders and were assigned weights (w_j) based on expert judgment. The weights were normalized so that their sum equaled 1, in accordance with the requirements of the TOPSIS method

3.4. Alternatives

The extracurricular activities considered in this study are official programs offered by SMKN 1 Bukit Sundi. Eight alternatives were identified and evaluated using six decision criteria: interest, talent, academic achievement, parental support, physical condition, and equipment costs. These alternatives are as follows:

- 1) A1 – Volleyball: A team sport that emphasizes physical fitness, coordination, and teamwork. Requires a coach, training field, and adequate physical ability. Estimated cost: Medium.
- 2) A2 – Futsal: A mini-soccer activity focusing on stamina, agility, and technical skills. Requires stamina, futsal shoes, and training space. Estimated cost: Medium.
- 3) A3 – Randai: A traditional Minangkabau art form that integrates dance, theater, and martial elements. Requires artistic expression, costumes, and movement training. Estimated cost: Variable.
- 4) A4 – Tahfiz: An extracurricular activity dedicated to Qur'an recitation and memorization. Requires consistency, commitment, and strong parental support. Estimated cost: Low.
- 5) A5 – Marching Band: A musical performance group combining music and movement. Requires musical instruments, uniforms, and intensive practice. Estimated cost: High.
- 6) A6 – OSIS (Student Council): A student organization focusing on leadership and organizational skills. Requires communication ability, responsibility, and time commitment. Estimated cost: Low.
- 7) A7 – PMR (Youth Red Cross): An extracurricular program emphasizing first aid training, health education, and emergency readiness. Requires first aid knowledge and preparedness. Estimated cost: Low–Medium.
- 8) A8 – Scouting: An outdoor-based activity emphasizing leadership, independence, discipline, and survival skills. Requires camping equipment and routine outdoor activities. Estimated cost: Medium.

Each alternative was assessed against the six criteria to construct the decision matrix, which later served as the foundation for TOPSIS-based analysis.

3.5. Research Tools and Implementation

The DSS was implemented as a web-based system developed with PHP as the server-side programming language and MySQL as the database management system. This technological choice ensured accessibility, allowing both students and teachers to interact with the system through a web browser. The system automates the TOPSIS stages—ranging from data input, normalization, weighted calculation, determination of ideal solutions, to final ranking of alternatives. In addition, the system produces tabulated outputs and graphical visualizations to improve interpretability for users.

3.6. TOPSIS Methodology

The methodological foundation of this research follows the six stages of the TOPSIS algorithm, which have been outlined in Section 2.3. These include:

1. Constructing the decision matrix (X) with all alternatives and criteria.
2. Normalizing the decision matrix (R) to remove differences in scale.
3. Applying criterion weights to form the weighted normalized matrix (Y).
4. Identifying the positive ideal solution (A^+) and the negative ideal solution (A^-).
5. Calculating the Euclidean distances of each alternative to A^+ and A^- .
6. Computing the preference values (V_i) for each alternative, which serve as the basis for ranking.

The extracurricular activity with the highest V_i value is recommended as the most suitable choice for the student.

3.7. Research Framework

The overall research framework integrates both the data collection stage and the computational analysis stage. Data on student characteristics were collected, converted into numerical values, and entered into the system. The TOPSIS algorithm was then applied to calculate the rankings. The process ensures that the recommendations are transparent, objective, and repeatable. A flowchart was constructed to visualize the system workflow, from input to output, making the process easy to follow for system users.

4. Results and Discussion

4.1. System Implementation

A Decision Support System (DSS) for extracurricular selection was successfully developed as a web-based application using PHP and MySQL. This system integrates several functional modules, including login authentication, student data input, criteria input, TOPSIS calculations, and recommendation output. The implementation results can be seen in Figures 1 through 6.



Figure 1: Log in

proyek_ekskul_db_ekstrakurikuler

Administrator Logout

Data Siswa memilih Ekstrakurikuler

Data Siswa memilih Ekstrakurikuler [Tambah Data](#)

Data Siswa memilih Ekstrakurikuler

[Cetak Laporan](#)

Pemilihan Ekstrakurikuler Pada Sekolah SMK NEGERI 1 BUKIT SUNDI

Data

[Kriteria](#)

[Alternatif](#)

[Hasil Topsis](#)

NISN	NAMA	Jenis Kelamin	Kelas	PILIHAN
61496957	Roval	laki laki	X ATR	Ubah Hapus
61656638	ANDRE AGUSDI	laki laki	XII ATR	Ubah Hapus
67455427	M.Gazil Rasyid Sugra	laki laki	XI RPL A	Ubah Hapus
68075534	Agus Putra	laki laki	XI ATR	Ubah

Figure 2: Student input page

Alternatif

Data Alternatif [Tambah Alternatif](#)

Data Alternatif

ID ALTERNATIF	NAMA ALTERNATIF	PILIHAN
A1	Volly Ball	Ubah Hapus
A2	Futsal	Ubah Hapus
A3	Randai	Ubah Hapus
A4	Tahfiz	Ubah Hapus
A5	Marching Band	Ubah Hapus
A6	Osis	Ubah Hapus
A7	PMR	Ubah Hapus
A8	Pramuka	Ubah Hapus

Figure 3: Criteria value input page

proyek_ekskul_db_ekstrakurikuler

Administrator Logout

Kriteria

Data Kriteria [Tambah Kriteria](#)

Data Kriteria

Id Kriteria	Nama Kriteria	Bobot	Sifat	Pilihan
1	minat_siswa	0.25	benefit	Ubah Hapus
2	bakat	0.20	benefit	Ubah Hapus
3	prestasi akademik	0.10	benefit	Ubah Hapus
4	izin orang tua	0.15	benefit	Ubah Hapus
5	kondisi fisik	0.10	benefit	Ubah Hapus
6	biaya perlengkapan	0.05	cost	Ubah Hapus

Figure 4: TOPSIS calculation page

Figure 5: Recommendation page

Alternatif	C1 Minat	C2 Bakat	C3 Prestasi Akademik	C4 Dukungan/Izin Orang Tua	C5 Kondisi Fisik	C6 Biaya Perlengkapan
Volleyball	4	4	3	4	4	3
Futsal	5	4	3	4	4	3
Randai	2	3	3	2	3	2
Tahfiz	3	2	4	5	3	1
MarchingBand	2	5	3	3	3	5
OSIS	3	3	4	3	3	1
PMR	3	3	3	3	4	1
Pramuka	4	3	3	4	4	2

Simpan

Figure 6: Questionnaire page

As illustrated in Figure 1, the system requires users to log in before accessing its functionality. Once authenticated, administrators or teachers can enter student information, as shown in Figure 2. The system then allows input of decision criteria scores in Figure 3 and processes them automatically using the TOPSIS algorithm in Figure 4. The recommendation page in Figure 5 displays ranked alternatives, while an additional page supports questionnaire input in Figure 6. This design ensures that the system is user-friendly, secure, and capable of producing results consistent with manual TOPSIS calculations.

4.2. Decision Matrix and Normalization

The first computational step is constructing the decision matrix (X), which contains student alternatives and their scores across six criteria. The criteria considered were: interest (C1), talent (C2), academic achievement (C3), parental support (C4), physical condition (C5), and equipment cost (C6).

2. Matriks Normalisasi (R)

Alternatif	C1	C2	C3	C4	C5	C6
A1 Volleyball	0.417029	0.406138	0.323498	0.392232	0.400000	0.408248
A2 Futsal	0.521286	0.406138	0.323498	0.392232	0.400000	0.408248
A3 Randai	0.208514	0.304604	0.323498	0.196116	0.300000	0.272166
A4 Tahfiz	0.312772	0.203069	0.431331	0.490290	0.300000	0.300000
A5 MarchingBand	0.208514	0.507673	0.323498	0.294174	0.300000	0.680414
A6 OSIS	0.312772	0.304604	0.431331	0.294174	0.300000	0.136083
A7 PMR	0.312772	0.304604	0.323498	0.294174	0.400000	0.136083
A8 Pramuka	0.417029	0.304604	0.323498	0.392232	0.400000	0.272166

Figure 7: Final decision matrix results

2. Matriks Normalisasi (R)

Alternatif	C1	C2	C3	C4	C5	C6
A1 Volleyball	0.417029	0.406138	0.323498	0.392232	0.400000	0.408248
A2 Futsal	0.521286	0.406138	0.323498	0.392232	0.400000	0.408248
A3 Randai	0.208514	0.304604	0.323498	0.196116	0.300000	0.272166
A4 Tahfiz	0.312772	0.203069	0.431331	0.490290	0.300000	0.300000
A5 MarchingBand	0.208514	0.507673	0.323498	0.294174	0.300000	0.680414
A6 OSIS	0.312772	0.304604	0.431331	0.294174	0.300000	0.136083
A7 PMR	0.312772	0.304604	0.323498	0.294174	0.400000	0.136083
A8 Pramuka	0.417029	0.304604	0.323498	0.392232	0.400000	0.272166

Figure 8: Normalization matrix

Figure 7 displays the decision matrix, while Figure 8 presents the normalized decision matrix (R) obtained using Equation (2). Normalization ensures comparability among criteria with different scales (e.g., academic scores vs. financial costs). The results confirm that C1- Interest and C2 - Talent have the strongest influence on the decision outcome, consistent with stakeholder prioritization.

4.3. Weighted Normalized Matrix

After normalization, the criterion weights (W_j) were applied to generate the weighted normalized matrix (Y) using Equation (3). Figure 9 shows the weighted matrix, which highlights the relative contribution of each criterion.

3. Matriks Ternormalisasi Terbobot (Y)

Bobot: C1=0.25, C2=0.20, C3=0.10, C4=0.15, C5=0.10, C6=0.05

Alternatif	C1	C2	C3	C4	C5	C6
A1 Volleyball	0.104257	0.081228	0.032350	0.058835	0.040000	0.020412
A2 Futsal	0.130322	0.081228	0.032350	0.058835	0.040000	0.020412
A3 Randai	0.052128	0.060921	0.032350	0.029417	0.030000	0.013608
A4 Tahfiz	0.078193	0.040614	0.043133	0.073543	0.030000	0.006804
A5 MarchingBand	0.052128	0.101535	0.032350	0.044126	0.030000	0.034021
A6 OSIS	0.078193	0.060921	0.043133	0.044126	0.030000	0.006804
A7 PMR	0.078193	0.060921	0.032350	0.044126	0.040000	0.006804
A8 Pramuka	0.104257	0.060921	0.032350	0.058835	0.040000	0.013608

Figure 9: weighted normalized matrix

For example, activities strongly aligned with student interests and talents received higher weighted scores, while activities requiring high equipment costs were penalized accordingly. This stage is crucial to ensure that subjective preferences (e.g., interest) and objective limitations (e.g., costs) are balanced systematically.

Ideal Solutions and Distance Measurement

The positive ideal solution (A^+) and negative ideal solution (A^-) were determined, as shown in Figure 10. For the benefit-type criterion (C1–C5), the maximum value was chosen as the ideal, while for the cost-type criterion (C6), the minimum value was selected.

Kode	A^+	A^-
C1	0.130322	0.062128
C2	0.101535	0.040814
C3	0.043133	0.032360
C4	0.073543	0.029417
C5	0.040000	0.030000
C6	0.006804	0.034021

Figure 10: Positive (A^+) and Negative (A^-) Ideal Solution Page

Distances from each alternative to both A^+ and A^- were calculated using Equations (6) and (7). Figure 11 shows these distances, indicating how close or far each extracurricular activity is from the optimal solution.

Alternatif	D^+ (ke A^+)	D^- (ke A^-)
A2 Futsal	0.034090	0.099207
A1 Volleyball	0.042913	0.080283
A8 Pramuka	0.060296	0.068875
A5 MarchingBand	0.089087	0.077558
A4 Tahfidz	0.086351	0.060954
A6 OSIS	0.079121	0.048960
A7 PMR	0.079224	0.048793
A3 Randai	0.109822	0.028793

Figure 11: alternative distance pages to A^+ and A^-

4.4. Preference Values and Rankings

Finally, the preference values (V_i) are calculated using Equation (8). Figure 12 summarizes these preference values, while Figures 13 to 15 show the ranking results and a summary of the preference values and rankings for each alternative, presented in Table 1.

Alternatif	D^+	D^-	V_i
A1 Volleyball	0.040119	0.074280	0.649307
A2 Futsal	0.030498	0.094416	0.755846
A3 Randai	0.099867	0.028793	0.223794
A4 Tahfidz	0.080801	0.059021	0.422117
A5 MarchingBand	0.089088	0.062672	0.412966
A6 OSIS	0.073023	0.046531	0.389207
A7 PMR	0.073134	0.046356	0.387949
A8 Pramuka	0.052036	0.067171	0.563480

Figure 12: preference values page

7. Ranking Alternatif

Alternatif	V_i	Peringkat
A2 Futsal	0.755846	1
A1 Volleyball	0.649307	2
A8 Pramuka	0.563480	3
A4 Tahfiz	0.422117	4
A5 MarchingBand	0.412966	5
A6 OSIS	0.389207	6
A7 PMR	0.387949	7
A3 Randai	0.223794	8

Figure 13: alternative rankings page

Hasil Akhir

[Data hasil akhir](#) [Tambah hasil](#) [Ubah hasil](#) [Hapus hasil](#)

Data Hasil TOPSIS

Pilih Data yang Akan Diubah

ID Alternatif	Nama Alternatif	Nilai Preferensi	Peringkat	Nama Siswa	Aksi
A1	Volly Ball	0.649307	2	Agus Putra	Ubah
A2	Futsal	0.755846	1	Agus Putra	Ubah
A3	Randai	0.223794	8	Agus Putra	Ubah
A4	Tahfiz	0.422117	4	Agus Putra	Ubah
A5	Marching Band	0.412966	5	Agus Putra	Ubah
A6	Osis	0.389207	6	Agus Putra	Ubah
A7	PMR	0.387949	7	Agus Putra	Ubah
A8	Pramuka	0.56348	8	Agus Putra	Ubah

Figure 14: modified final results page

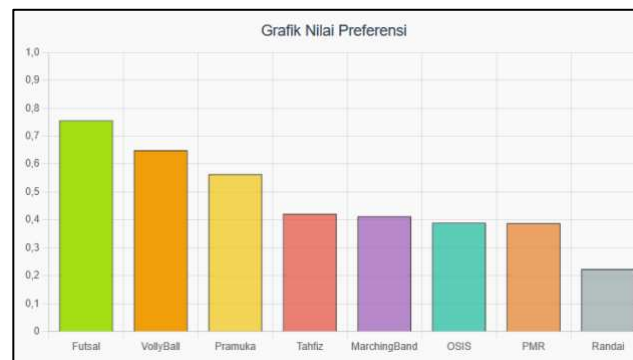
Peringkat	ID Alternatif	Nama Alternatif	Nama Siswa	NISN	Nilai Preferensi
1 🏆					
1	A2	Futsal	Agus Putra	68075534	0.755846
2					
2	A1	VollyBall	Agus Putra	68075534	0.649307
3					
3	A8	Pramuka	Agus Putra	68075534	0.563480
4					
4	A4	Tahfiz	Agus Putra	68075534	0.422117
5					
5	A5	MarchingBand	Agus Putra	68075534	0.412966
6					
6	A6	OSIS	Agus Putra	68075534	0.389207
7					
7	A7	PMR	Agus Putra	68075534	0.387949
8					
8	A3	Randai	Agus Putra	68075534	0.223794

Figure 15: final topsis ranking results page

Table 1: Preference values and rankings of extracurricular activities

Alternative	(D ⁺)	(D ⁻)	($V_i = \frac{D^-}{D^+ + D^-}$)	Rank
A2 – Futsal	0.030498	0.094416	0.755846	1
A1 – Volleyball	0.040119	0.074280	0.649307	2
A8 – Pramuka	0.052036	0.067171	0.563480	3
A4 – Tahfiz	0.080801	0.059021	0.422117	4
A5 – Marching Band	0.089088	0.062672	0.412966	5
A6 – OSIS	0.073023	0.046531	0.389207	6
A7 – PMR	0.073134	0.046356	0.387949	7
A3 – Randai	0.099867	0.028793	0.223794	8

The results in Table 1 show that Futsal (A2) is ranked first with a score of 0.755846, while Randai (A3) is ranked last with a score of 0.223794. Additionally, Figure 16 presents a bar chart of the preference values, providing a clear visualization of how each extracurricular compares.

**Figure 16:** preference value graph

4.5. Interpretation of Results

The analysis shows that Futsal (A1) and Volleyball (A2) emerged as the top-ranked extracurricular activities. These results reflect students' high interest and talent in sports, coupled with strong parental support and relatively low costs. Scouting (A5) also received a high ranking due to its alignment with leadership and teamwork criteria, which remain valued by students and parents.

Conversely, Randai (A3) received the lowest ranking, likely due to its lower popularity among students and less alignment with modern educational goals, despite its cultural significance. Similarly, OSIS (A6) and PMR (A7) received lower rankings, reflecting moderate interest and higher demands in terms of responsibility or workload.

4.6. System Evaluation

The system evaluation was conducted using Black Box Testing. The results are shown in Table 2.

Table 2: Black Box testing

No	Feature Name	Enter	Expected Output	Result
1	Admin Login	Correct Username and Password	Log in to the dashboard page	Success
2	Student Data Input	Name, Class, and	Data is saved in the database	Success
3	Criteria Score Input	Grades C1, C2, C3, C4, C5, C6	Data is saved and ready to be processed	Success
4	TOPSIS Process	Student Data and Criteria	Calculation results and recommendations appear	Success
5	View Recommendations	Click the Results button	Students with the highest VI are displayed	Success

Table 2 confirms that all functions, including login, input, calculations, and ranking displays, operated as expected without error. In addition, feedback from teachers indicates that this system significantly simplifies the process of guiding students in choosing extracurricular activities, making it faster, more objective and more transparent.

4.7. Discussion

The findings of this study reaffirm the robustness of TOPSIS as a multi-criteria decision-making method in educational contexts. Numerous studies have employed TOPSIS in domains requiring systematic evaluation of

alternatives across diverse criteria. For example, Arslantaş et al. (2023) applied TOPSIS to scholarship selection, demonstrating its ability to balance academic performance, financial need, and extracurricular involvement in producing objectives and fair recommendations. This highlights the versatility of TOPSIS in educational decision-making processes that demand transparency and accountability.

In comparison, Fatmah et al. (2025) utilized the Simple Additive Weighting (SAW) method for extracurricular selection. While SAW proved useful in producing rankings, its limitation lies in handling cost-type criteria, since the method assumes all criteria contribute additively and proportionally. This drawback indicates that SAW is less flexible than TOPSIS in situations where both benefit and cost attributes must be evaluated simultaneously, such as when equipment cost is a relevant factor in student activity selection.

Şahin and Kulaklı (2023) further advanced this field by developing a web-based DSS for extracurricular selection. Their study emphasizes the importance of accessibility and transparency in the decision-making process. By digitizing the evaluation mechanism, their system enabled broader participation from students and teachers while reducing subjectivity in guidance. This aligns with the approach of the present study, where a web-based system was also implemented to provide real-time, automated recommendations tailored to student preferences and conditions.

Beyond education, TOPSIS has also been applied successfully in other organizational contexts such as staff recruitment, supplier evaluation, and medical diagnosis. These applications demonstrate that TOPSIS is not limited to academic selection but serves as a generalizable tool for structured decision-making where multiple quantitative and qualitative criteria are involved. The cross-domain adaptability of TOPSIS validates its appropriateness for complex educational settings such as extracurricular selection in vocational schools.

The results of this study contribute by bridging these prior applications with the specific challenges faced at SMKN 1 Bukit Sundi. Unlike previous research focusing primarily on scholarship allocation or higher education contexts, this study highlights extracurricular activity selection at the vocational school level—a domain where structured decision support has been limited. By incorporating criteria such as interest, talent, parental support, and cost, the model developed here provides a more holistic framework for aligning student choices with institutional goals.

The discussion underscores two main contributions: first, the confirmation that TOPSIS is effective in balancing benefit and cost criteria within student activity selection; and second, the demonstration that implementing this method in a web-based DSS context significantly improves transparency, efficiency, and student engagement.

5. Conclusion

The results of this study demonstrate that the application of the TOPSIS method in a web-based Decision Support System effectively assists students at SMKN 1 Bukit Sundi in selecting extracurricular activities according to their interests, talents, academic achievements, parental support, physical condition, and financial considerations. The entire process from the construction of the decision matrix, normalization, weighting, determination of positive and negative ideal solutions, calculation of distances, and calculation of preference values was successfully implemented and produced consistent outcomes with manual calculations. The ranking showed that Futsal emerged as the most recommended extracurricular with the highest preference value, followed by Volleyball and Pramuka, while Randai obtained the lowest score, indicating less alignment with the criteria used. The implementation of a web-based system using PHP and MySQL ensured that the decision-making process was transparent, objective, and efficient, thus simplifying the work of teachers and guiding students toward more accurate choices. Compared with previous methods such as SAW, TOPSIS proved more flexible in handling both benefit and cost attributes simultaneously, strengthening its relevance as a reliable multi-criteria decision-making tool in educational contexts.

References

- Ali, R., Hussain, A., Nazir, S., Khan, S., & Khan, H. U. (2023). Intelligent decision support systems—An analysis of machine learning and multicriteria decision-making methods. *Applied Sciences*, 13(22), 12426.
- Arslantaş, O., Gümüş, M., & Özder, E. H. (2023). Scholarship recipient selection for higher education with AHP, SAW and TOPSIS. *Journal of Turkish Operations Management*, 7(2), 1685-1700.
- BORŞA, S. V. (2022). Education 4.0 and the need for Competitive Intelligence in University management. *L'Europe Unie*, 18(18), 51-58.
- Fajri, V., & Anwar, M. (2021). Development of a Multi-Criteria Decision Support System for Scholarship Selection Based on the Analytical Hierarchy Process (AHP) Method. *Jurnal Teknik Komputer dan Informatika*, 1(1), 1-21.
- Fatmah, A., Lia, E. A., Az-zarro, F., Dewi, H. C., Hermawan, L. A. S. A., & Rosyani, P. (2025). Comparison of Decision Support Systems in Selecting Extracurricular Activities Using SAW, WP, and TOPSIS Methods. *Contemporary Journal of Applied Sciences*, 3(5), 241-254.
- Gryshchenko, I., Ganushchak-Efimenko, L., Shcherbak, V., Nifatova, O., Zos-Kior, M., Hnatenko, I., ... & Martynov, A. (2021).

Making use of competitive advantages of a university education innovation cluster in the educational services market. *European journal of sustainable development*, 10(2), 336-336.

- Kakungulu Samuel, J. (2024). The role of extracurricular activities in student development. *Eurasian Experiment Journal of Humanities and Social Science*, 5(2), 26-30.
- Madanchian, M., & Taherdoost, H. (2023). A comprehensive guide to the TOPSIS method for multi-criteria decision making. Madanchian M, Taherdoost H. A comprehensive guide to the TOPSIS method for multi-criteria decision making. *Sustainable Social Development*, 1(1), 2220.
- Şahin, Y., & Kulaklı, A. (2023). Evaluation of open and distance education websites: a hybrid multi-criteria decision-making approach. *Systems*, 11(2), 58.
- Taherdoost, H., & Madanchian, M. (2023). Multi-criteria decision making (MCDM) methods and concepts. *Encyclopedia*, 3(1), 77-87.
- Wu, Y., & Fernando, Y. (2023). Development of Student's Innovation Skills through Extracurricular Activities. *Journal of E-business and Management Science*, 1(2), 170-180.