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TOPSIS METHOD IMPLEMENTATION FOR STUDENT VIOLATION SANCTIONS AT SMAN 1 KISARAN

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Abstract: Secondary education plays an important role in shaping students' academic, social, and emotional skills and preparing them for further education or entering the workforce. One important aspect of education is the application of discipline through sanctions for violations of school rules. SMA Negeri 1 Kisaran currently still uses a manual system in recording and imposing sanctions, which is prone to errors, data loss, and is less efficient in decision making. This study aims to propose the implementation of a decision support system based on the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method to determine more objective and transparent sanctions. The results of the application of the TOPSIS method in the process of determining objective sanctions for students at SMA Negeri 1 Kisaran are based on factors such as attendance, neatness, diligence, and student behavior, resulting in more accurate and systematic decisions. This study shows that the application of the TOPSIS method increases efficiency in determining sanctions for students and supports a fairer and data-based coaching process in schools.

Keywords*:* decision support system; discipline; sanctions; TOPSIS.

Abstrak: Pendidikan menengah memiliki peran penting dalam membentuk keterampilan akademik, sosial, dan emosional peserta didik serta mempersiapkan mereka untuk pendidikan lebih lanjut atau masuk ke dunia kerja. Salah satu aspek penting dalam pendidikan adalah penerapan disiplin melalui sanksi terhadap pelanggaran aturan sekolah. SMA Negeri 1 Kisaran saat ini masih menggunakan sistem manual dalam pencatatan dan pemberian sanksi, yang rentan terhadap kesalahan, kehilangan data, serta kurang efisien dalam pengambilan keputusan. Penelitian ini bertujuan mengusulkan penerapan sistem pendukung keputusan berbasis metode Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) untuk menentukan sanksi yang lebih objektif dan transparan. Hasil dari penerapan metode TOPSIS dalam proses penentuan sanksi objektif pada peserta didik di SMA Negeri 1 Kisaran didasarkan pada faktor-faktor seperti kehadiran, kerapian, kerajinan, serta kelakuan siswa, sehingga menghasilkan keputusan yang lebih akurat dan sistematis. Studi ini menunjukkan bahwa penerapan metode TOPSIS meningkatkan efisiensi dalam menentukan sanksi bagi siswa serta mendukung proses pembinaan yang lebih adil dan berbasis data di sekolah.

Kata kunci*:* kedisiplinan; sanksi; sistem pendukung keputusan; TOPSIS.

INTRODUCTION

Senior high school is an educational level between primary and higher education that includes students aged 14–18 years. This education plays a crucial role in shaping academic, social, and emotional skills, as well as preparing students for further education or the workforce. Secondary education plays a crucial role

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in improving literacy, reducing social gaps, and fostering economic growth by producing a more competitive workforce[1]. Therefore, access to and the quality of secondary education become key factors in the development of individuals and society.

The purpose of discipline is to shape and maintain good behavior and instill a sense of responsibility so that students can comply with school regulations[2]. As a result, the learning and teaching process can take place effectively and efficiently, enabling students to achieve commendable academic performance. Every student is bound by various school rules and regulations that must be followed to help them understand the meaning and purpose of discipline[3].

Imposing sanctions or disciplinary actions on students who violate rules is one form of guidance. It is hoped that this sanction can serve as an effective disciplinary tool and teach students about the consequences of their actions[4]. The problem namely there is system of imposing sanctions on students who commit violations at SMA Negeri 1 Kisaran still uses a manual system, which involves recording all student violation sanctions in a large folio book.

This manual recording method in a large folio book has several significant drawbacks, including being prone to loss or damage, difficulty in data retrieval, and inefficiency in terms of time and effort. The purpose of this research is to apply the TOPSIS method in the process of determining student disciplinary sanctions at SMA Negeri 1 Kisaran by using the percentage of objectivity levels assigned to students according to the violations they have committed.

The previous research with the title "Implementation of the TOPSIS Method in Determining Student Violation Sanctions in Schools" by Umi Khaltsum and Ghofar Taufik (2023) shows that the decision support system using the TOPSIS method is effective in determining student violation sanctions [5].

Based on the results of research and observation, the decision support system using the TOPSIS method to determine the level of discipline and sanctions for student violations at SMP Negeri 1 Bosar Maligas concludes that the system designed using the TOPSIS method will facilitate guidance and counseling teachers in calculating the scoring points for student violation data[6].

In the research titled "Decision Support System for Determining Criminal Threats Using the Technique For Order Performance of Similarity (TOPSIS) Method," an accuracy level of 85.71% was achieved [7].

In previous research that applied the SMART (Simple Multi Attribute Rating Technique) method in a decision support system to determine sanctions for bullying perpetrators in schools. This research was conducted due to the numerous cases of bullying that are not addressed with appropriate sanctions, causing the perpetrators to feel safe to continue their actions[8].

In previous research, this study discusses the development of a Decision Support System (DSS) to determine traffic violation fines at the Cirebon District Court using the Rule Base Expert method. This system is designed to improve the accuracy of judges' decisions in determining final fines, as well as to assist staff in systematically verifying data, reducing manual work, and speeding up the judicial process[9].

This research focuses on the implementation of the TOPSIS method in a decision support system to determine student violation sanctions at SMA

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Negeri 1 Kisaran. Unlike previous research that only examined the application of TOPSIS in other contexts such as determining criminal threats and student discipline in junior high schools, this study develops and tests the effectiveness of the TOPSIS method in the high school environment.

Moreover, the designed system is capable of enhancing transparency and objectivity in the imposition of sanctions based on criteria such as attendance, neatness, diligence, and discipline, which have not been extensively explored in previous research. Thus, this research provides

Decision Support System is an action in making a decision that cannot be solved by humans and is ultimately assisted by a computerized system[10].The TOPSIS method is a multi-criteria decision-making technique commonly used to solve complex problems[11]. This method helps determine the best alternative by considering the relative proximity to the ideal positive and negative solutions in the process of determining sanctions for students.

METHOD

The data collection techniques in this study were conducted through interviews, observations, and literature studies. Interviews were used to obtain data from sources related to the determination of sanctions for student violations at SMA Negeri 1 Kisaran, while observations were carried out by directly observing the research object.

In addition, documentation was used to collect data from various related documents. A literature review was also conducted by gathering information from books, journals, and lecture materials containing theories relevant to this study.

Application of The TOPSIS Method

The steps in structuring the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method algorithm[10]:

Constructing a Decision Matrix in normalized form using the established formula:

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

Computing the normalized weight values from the decision matrix:

$$V_{ij} = R_{ij} \cdot W_j \quad (2)$$

Determining the Positive Ideal Solution (PIS) and Negative Ideal Solution (NIS):

Positive Ideal Solution (PIS):

$$A^+ = \left\{V_1^+, V_2^+, \ldots.., V_n^+\right\} \quad (3)$$

Negative Ideal Solution (NIS):

$$A^- = \left\{V_1^-, V_2^-, \ldots.., V_n^-\right\} \quad (4)$$

Calculating the distance between each alternative and the ideal solutions:

The distance between option and the ideal positive solution is expressed as:

$$D_i^+ = \sqrt{\sum_{j=1}^{n} \left(V_{ij} - A_j^+\right)^2} \quad (5)$$

The distance between option and the ideal negative solution is expressed as:

$$D_i^- = \sqrt{\sum_{j=1}^{n} \left(V_{ij} - A_j^-\right)^2} \quad (6)$$

Computing the preference values for each alternative to determine rankings:

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

Range Data of Criteria

Here is the range of criteria for determining sanctions for student violations using the TOPSIS method.

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Table 1. Criteria Weights

No	criteria code	criteria	weight value	attribute
1	K1	Absence	5	Benefit
2	K2	Neatness	3	Cost
3	K3	Diligence	4	Cost
4	K4	Discipline	4	Cost

Table 2 . Range of Neatness

Neatness Category	Neatness Percentage	Point
Very Neat	91% - 100%	5
Neat	76% - 90%	4
Fair	61% - 75%	3
Less Neat	41% - 60%	2
Not Neat	0% - 40%	1

Table 3. Range of Diligence

Diligence Category	Diligence Percentage	Point
Very Diligent	91% - 100%	5
Diligent	76% - 90%	4
Fair	61% - 75%	3
Less Diligent	41% - 60%	2
Lazy	0% - 40%	1

Table 4. Range of Discipline

Discipline	Discipline Percentage	Point
Very Good	91% - 100%	5
Good	76% - 90%	4
Fair	61% - 75%	3
Poor	41% - 60%	2
Very Poor	0% - 40%	1

Table 5. Range of Absence

Total Absences (Day)	Absence Percentage	Absence Category	Point
91 - 100 days	91% - 100%	Very Good	1
76 - 90 days	76% - 90%	Good	2
61 - 75 days	61% - 75%	Fair	3
41 - 60 days	41% - 60%	Poor	4
0 - 40 days	0% - 40%	Very Poor	5

RESULT AND DISCUSSION

The results of using the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution). the names of the listed students will be assigned criterion weights based on the assessment criteria range for each criterion, which is referred to as factor evaluation. As shown in the table below:

Table 6. Initial Weighted Alternative

Students	(k1)	(k2)	(k3)	(k4)
Elizabeth	1	4	5	3
Tree Putra	2	4	4	5
Salim Feri	3	4	5	3
Firly	3	3	2	3
Faris	2	5	4	3
Mirakel	5	2	2	1
Yoel	2	5	5	3
Dimas Lubis	2	5	4	5
Bima	1	5	3	4
Goklas	5	2	3	2
Fawwaz	5	2	3	2
Dzaki	3	4	3	2
Anindhiya	1	5	3	5
Rifki Padli	3	3	2	2
Dava	2	5	4	4
Denominator	11,57	15,6	14	13

The purpose of normalization is to convert the values in the decision matrix to the same scale, ensuring that all criteria can be compared fairly. This process helps prevent bias that may arise due to differences in units or scales between different criteria.

Table 7. Normalized Decision Matrix

Alternate	Students	Criteria			
		K1	K2	K3	K4
A1	Elizabeth Purba	0,0863	0,2560	0,3571	0,2307
A2	Tree Putra	0,1727	0,2560	0,2857	0,3846

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Alternate	Students	Criteria			
		K1	K2	K3	K4
A3	Salim Feri	0,2591	0,2560	0,3571	0,2307
A4	Firly Wirawan	0,2591	0,1920	0,1428	0,2307
A5	Faris Setiawan	0,1727	0,3200	0,2857	0,2307
A6	Mirakel Titus	0,4319	0,1280	0,1428	0,0769
A7	Yoel Simanjuntak	0,1727	0,3200	0,3571	0,2307
A8	Dimas Lubis	0,1727	0,3200	0,2857	0,3846
A9	Bima At-Thariq	0,0863	0,3200	0,2142	0,3076
A10	Goklas Panjaitan	0,4319	0,1280	0,2142	0,1538
A11	Fawwaz Maulana	0,4319	0,1280	0,2142	0,1538
A12	Dzaki Prasetyo	0,2591	0,2560	0,2142	0,1538
A13	Anindhiya Syahbana	0,0863	0,3200	0,2142	0,3846
A14	Rifki Padli	0,2591	0,1920	0,1428	0,1538
A15	Dava Alfarizi	0,1727	0,3200	0,2857	0,3076

Table 8. Weighted Normalized Decision Matrix

Ideal Solution	K1	K2	K3	K4
Y+	2,159	0,384	0,571	0,307
Y-	0,431	0,9602	1,4285	1,5384

Next, in the TOPSIS method, the distance between each alternative and two ideal solutions. The results are as in table:

Table 9. Distance to Positive and Negative Solutions

Alternate	D+	D-
A1	2,0605	0,6446
A2	1,9151	0,5523
A3	1,4167	1,0778
A4	1,0778	1,4167
A5	1,6481	0,8042
A6	0	2,3593
A7	1,7676	0,7518
A8	1,9627	0,5178
A9	2,0617	0,6490
A10	0,4198	2,1202
A11	0,4198	2,1202
A12	1,1884	1,5584
A13	2,4120	0,7662
A14	0,9792	1,8626
A15	2,0444	0,6661

This preference value indicates how close an alternative is to the expected best solution, where the higher the value, the better the alternative:

Table 10. Result of TOPSIS Method

Alternate	Students	Value	Rank	Sanction
A6	Mirakel Titus	1,000	1	Called in with parents & Expelled from school
A11	Fawwaz Maulana	0,835	2	Called in with parents & Expelled from school
A10	Goklas Panjaitan	0,835	3	Called in with parents & Expelled from school
A14	Rifki Padli	0,627	4	Called in with Parents & Returned to parents for 1 day
A12	Dzaki Prasetyo	0,575	5	Called in with Parents & Returned to parents for 1 day
A4	Firly Wirawan	0,568	6	Called in with Parents & Returned to parents for 1 day

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Alternate	Students	Value	Rank	Sanction
A3	Salim Feri	0,432	7	Called in with Parents
A5	Faris Setiawan	0,328	8	Called in with Parents
A7	Yoel Simanjuntak	0,298	9	Called in with Parents
A15	Dava Alfarizi	0,252	10	Called in with Parents
A9	Bima At-Thariq	0,239	11	Called in with Parents
A1	Elizabeth Purba	0,238	12	Statement Letter
A2	Tree Putra	0,224	13	Statement Letter
A8	Dimas Lubis	0,209	14	Statement Letter
A13	Anindhiya Syahbana	0,205	15	Statement Letter

Table 11. Presentation of the implementation of the TOPSIS method

Sanction	Range of Point	Total of Sanction	Presentage
Statement Letter	0 - 0,250	4	26%
Called in with Parents	0,25 - 0,500	5	33%
Called in with Parents & Returned to parents for 1 day	0,501 - 0,750	3	20%
Called in with parents & Expelled from school	0,751-1	3	20%
Total of Presentage			99%

Black Box Testing

The system that has been created is then tested for features with the hope that the system will run well as expected. Then after the feature runs perfectly, it is implemented by the school.

Table 12. Black Box Testing Table

No	The Function	The Result Test
1	Student Data Page	Successful
2	Add Student Data	Successful
3	Edit Student Data	Successful
4	Delete Student Data	Successful
5	Criteria Data Page	Successful
6	Add Criteria Data	Successful
7	Edit Criteria Data	Successful
8	Delete Criteria Data	Successful
9	Weight Data Page	Successful
10	Add Weight Data	Successful
11	Edit Weight Data	Successful
12	Delete Weight Data	Successful
13	Sanction Process Page	Successful
14	Calculation Process Results	Successful
15	Logout	Successful

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Main Page

The main page is the initial display of the student violation sanction system at SMA Negeri 1 Kisaran using the TOPSIS method, which can be accessed by the admin, counseling staff, and the principal.

Image 1. Main Page

Criteria Data Page

The Criteria page appears when selecting the Criteria Data menu on the main page.

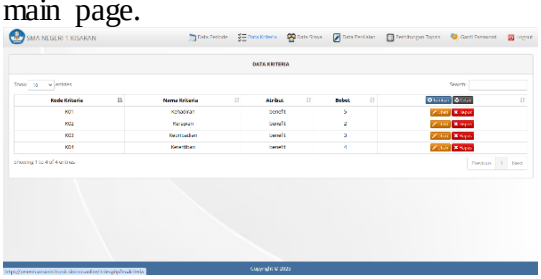


Image 2. Criteria Data Page

Student Data Page

The Student Data page appears when selecting the Student Data menu on the main page.

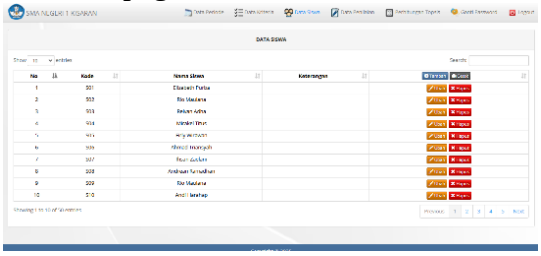


Image 3. Student Data Page

TOPSIS Calculation Page for Admin, Counseling and Principal

The TOPSIS calculation page will be displayed when clicking the TOPSIS calculation menu on the main page

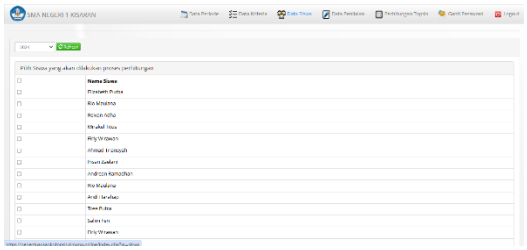


Image 6. TOPSIS Calculation Page for Admin, Counseling, and Principal

TOPSIS Method Ranking

Ranking using the TOPSIS method is the final step in developing a Decision Support System that utilizes the TOPSIS method. Below is an image of the TOPSIS Method ranking.

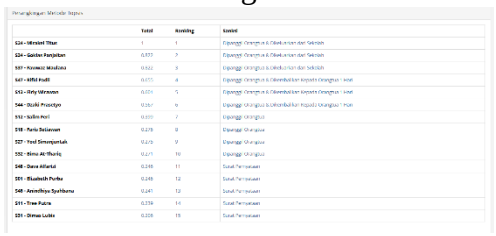
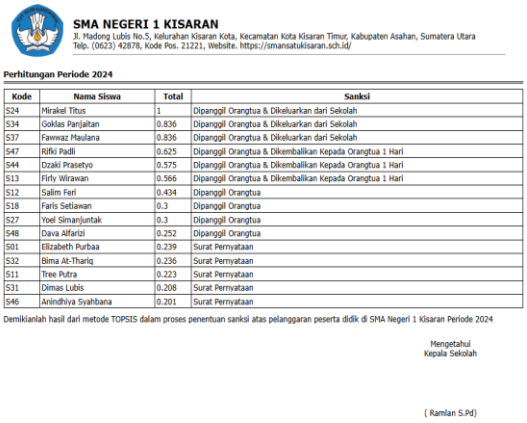


Image 7 Final Result Data Display

Report Page

The print page will appear when the user selects and clicks the print button on the system page. The print page displays the results of the sanction determination process for student violations at SMA Negeri 1 Kisaran using the TOPSIS method



SMA NEGERI 1 KISARAN
Jl. Madong Lubis No.5, Kelurahan Kisaran Kota, Kecamatan Kota Kisaran Timur, Kabupaten Asahan, Sumatera Utara
Telp. (0623) 42878, Kode Pos. 21221, Website. https://smansatukisaran.sch.id/

Perhitungan Periode 2024

Kode	Nama Siswa	Total	Sanksi
S24	Mirakel Titus	1	Dipanggil Orangtua & Dikeluarkan dari Sekolah
S34	Goklas Panjaitan	0.836	Dipanggil Orangtua & Dikeluarkan dari Sekolah
S37	Fawwaz Maulana	0.836	Dipanggil Orangtua & Dikeluarkan dari Sekolah
S47	Rifki Padli	0.625	Dipanggil Orangtua & Dikembalikan Kepada Orangtua 1 Hari
S44	Dzaki Prasetyo	0.575	Dipanggil Orangtua & Dikembalikan Kepada Orangtua 1 Hari
S13	Firly Wirawan	0.566	Dipanggil Orangtua & Dikembalikan Kepada Orangtua 1 Hari
S12	Salim Feri	0.434	Dipanggil Orangtua
S18	Faris Setiawan	0.3	Dipanggil Orangtua
S27	Yoel Simanjuntak	0.3	Dipanggil Orangtua
S48	Dava Alfarizi	0.252	Dipanggil Orangtua
S01	Elizabeth Purbaa	0.239	Surat Pernyataan
S32	Bima At-Thariq	0.236	Surat Pernyataan
S11	Tree Putra	0.223	Surat Pernyataan
S31	Dimas Lubis	0.208	Surat Pernyataan
S46	Anindhiya Syahbana	0.201	Surat Pernyataan

Demikianlah hasil dari metode TOPSIS dalam proses penentuan sanksi atas pelanggaran peserta didik di SMA Negeri 1 Kisaran Periode 2024

Mengetahui
Kepala Sekolah

(Ramlan S.Pd)

Image 8 Print Page

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CONCLUSION

This research successfully designed a Decision Support System (DSS) to assist in determining sanctions for students at SMA Negeri 1 Kisaran by identifying violation criteria, criteria weights, and an objective and systematic decision-making mechanism. The system is implemented using the TOPSIS method to rank sanctions based on predetermined criteria weights. Developed using the PHP programming language and MySQL database, this system helps the school determine sanctions more accurately

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