

Implementation of the AHP-SMARTER Method in the Decision Support System for Giving Sanctions for Violation of Student Disciplines

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Abstract – Violations of school rules are often carried out by students, including lack of respect for teachers, students who are not on time, often late for class, skipping classes, jumping fences, smoking and not paying attention to the rules and other regulations in school. This study aims to build a decision support system for violations of student discipline that has the ability to analyze each of the criteria and sub-criteria that have been determined by the school. In this case, students who violate school rules will be punished and given sanctions so as to provide an output value of priority intensity which results in a system that provides an assessment of violations against students. The method used in building this decision support system is by combining the Analytical Hierarchy Process (AHP) method and the Simple Multi Attribute Rating Technique Exploiting Rank (SMARTER) method. Weighting criteria using the AHP method and for ranking using the SMARTER method. The system created can be used to assist in processing data on violations of school rules. With this decision support system, it is hoped that policy makers will have no difficulty in determining what types of actions and sanctions will be given to students who violate school rules.

Keywords – *Decision Support System, AHP Method, SMARTER Method, School Rules*

I. INTRODUCTION

Each school has its own policy in determining the level of student discipline. The Integrated Islamic Vocational High School (SMK) of Generasi Muslim Cendikia (GMC) still uses a system of calculating points for violations and determining the sanctions for violations that are still manual, namely by recording all events or student problems into a book. The decision support system suggested by the counseling guidance teacher is a system that makes it easier to evaluate the level of student discipline and sanctions for violations effectively and efficiently. Giving sanctions by teachers in the teaching process is influenced by several factors, namely the seriousness factor in learning, consequences, delinquency at the school level, and family stability factors.[2]. Education in Indonesia not only prioritizes the development of cognitive aspects or knowledge of students, but also pays attention to individual development as a whole person[4].

SMK-IT GMC is a vocational school that has quite a lot of students. Every school must have rules and regulations that must be obeyed and followed by every student but not infrequently these rules and regulations are violated, the violations that often occur are students who are not on time, often late for class, skipping class time, jumping fences, smoking and so on.

According to[5]The system of sanctions for violations of the rules in some schools is still in the form of warning letters and direct reprimands to students. Along with presents development of technology and communication a new challenge that can make guidance and counseling more practical. One of them is a Decision Support System which

is an approach to decision making[6]. The method that can support solving this problem is by combining the Analytical Hierarchy Process (AHP) method and the Simple Multi Attribute Rating Technique Exploiting Rank (SMARTER) method.

The system built can be used to assist in processing data on violations of school rules, especially student violations[3]. Although basically there are rules and sanctions that have been implemented in schools, the sanctions are still handled in the usual way without clear differences between the violations committed and the sanctions given (different violations the sanctions are almost the same).

Therefore, researchers want to design a decision support system for sanctions for violating student rules. Every student who violates the rules will be given sanctions so that it can provide a deterrent effect and increase the values of decency and order in the school environment. This is useful to facilitate decision making related to disciplinary issues.

II. RESEARCH METHODOLOGY

A. Decision Support System

Decision Support Systems (DSS) are usually built to support a solution to a problem or to an opportunity. Decision Support System (DSS) applications are used in decision making[7]. Decision Support System (DSS) application uses a flexible, interactive and adaptable CBIS (Computer Based Information System), which was developed to support solutions to unstructured specific management problems[8].

B. AHP (Analytical Hierarchy Process)



This method was first developed by Saaty (Saaty, 1980)[9]. The hierarchical model stated by Saaty is a functional hierarchical model with the main input being human perception.

In general, the steps in using the AHP method for solving a problem are as follows[10]:

- Defining the problem and determining the desired solution.
- Determining the priority of elements
- Synthesis

The things to do in this step are:

- Sum the values of each column in the K matrix.
- Divide each value from the column by the corresponding column total to obtain a normalized matrix.
- Sum the values of each row and divide by the number of elements to get the priority weight value.

- Measuring Consistency

The things that are done in this step are as follows:

- Each value in the first column is multiplied by the priority weight of the first element, then each value in the second column is multiplied by the priority weight of the second element and so on.
- Sum each row (\sum row).
- The result of the sum of the rows is divided by the priority element in question so that it gets Lambda.

$$\lambda = \frac{\sum \text{row}}{\text{priority}} \quad (1)$$

- Sum Lambda (λ) and the result is divided by the number of elements present, the result is called λ max.

$$\lambda_{\max} = \frac{\sum \lambda}{n} \quad (2)$$

- Calculate Consistency Index (CI) with formula:

$$CI = \frac{(\lambda_{\max} - n)}{n - 1} \quad (3)$$

- Compare Consistency Ratio (CR) with formula:

$$CR = CI/RC \quad (4)$$

Table1. Random Consistency Value (RC)

N	1.2	3	4	5	6	7	8
Rin	0.00	0.58	0.90	1.12	1.24	1.32	1.41

- Checking hierarchy consistency

C. Simple Multi Attribute Rating Technique Exploiting Rank (SMARTER)

According to[2]states that SMARTER is a multi-criteria decision-making technique based on the theory that each alternative consists of a number of criteria that have values and each criterion has a weight that describes its importance when compared to other criteria. This weighting is used to assess each alternative in order to obtain the best alternative. SMARTER uses a linear additive model to predict the value of each alternative. The analysis involved is transparent so this method provides a high level of understanding of the problem and can be accepted by decision makers[1].

The model used in SMART is shown in the equation:

$$U(ai) = \sum_{j=1}^k Wj Ui(ai) \quad (5)$$

Information :

Wj = The weighting value of the J-th criterion of the k criteria.

$U(ai)$ = The utility value of the I-th criterion for the I-th criterion

Where $I = 1, 2, \dots, m$

The steps of the SMARTER method are as follows[3]:

- Determine the number of criteria for the decision to be taken.
- Giving weight to each criterion by using an interval of 1-100 for each criterion with the most important priority.
- Calculating the normalization of each criterion by comparing the value of the weight of the criteria with the number of weights of the criteria, using the formula:

$$NWj = \frac{Wj}{\sum_{n=1}^k Wn} \quad (6)$$

Information :

NWj = Normalization of J-th criterion weights

Wj =J-th criterion weight

k = Number of criteria

Wn = The weight of the N-th criterion.

- Provide a criterion value for each alternative
- Calculates final grades and performs rankings using the SMARTER model.

D. Research Stages

To assist in the preparation of this research, it is necessary to have a clear framework for the stages[11]. This framework is the steps that will be taken in solving the problems that will be discussed.



Figure 1. Research Stages



- a. Identification of problems that occur in SMK-IT Generasi Muslim Cendikia is the current system that is still not standardized in this case different violations (mild and severe) but the handling is the same and the sanctions given are sometimes the same as other violations. In giving sanctions, there is only a warning and a statement letter, so there are several procedures that are not in accordance with the procedures that should have been applied to students.
- b. In this study, data collection was done by interview, observation and literature study. At this stage, it is done to find out, get data and information that will later support this research[12].

Observation Method

Observations were carried out directly at SMK-IT GMC by looking at the daily lives of students and teachers as well as existing problems to find out the types of violations and sanctions that students received if they violated the rules and regulations.

Interview Method

Interviews were conducted by asking directly to the Guidance Counseling teacher who directly handles problematic students at SMK-IT GMC.

Library Study Method

Literature study is done by reading various kinds of information related to the research title. Researchers took reference sources from national scientific journals and books from the internet.

- c. The problem analysis step is needed to determine recommendations for sanctions for violations of school rules committed by students. With this data analysis, a clear picture of the problems discussed will be obtained[7].
- d. Decision Support System Design, this stage is the activity carried out to make the formulation of the model, the selection of what criteria are taken into consideration for decision makers to decide the best alternative, measure and predict the results that occur.[4].
- e. In this study, the authors implement the AHP-SMARTER method so that they are able to provide recommendations for sanctions for violations of school regulations committed by students. This phase translates the design results into software.

- f. The process of testing the application using blackbox. Testing is done by testing all existing navigation, this test ensures that the processes carried out produce output that is in accordance with the design that has been made[13].
- g. Conclusions are drawn after the design, implementation, and testing stages have been completed[14]. This stage discusses the results of the final goal to be achieved, namely the creation of a decision support system application that can later benefit schools related to the provision of appropriate sanctions in accordance with existing standard procedures.[13].

E. Research Material

The research material used to make a decision support system for the awarding of sanctions for student discipline violations is by using the AHP-SMARTER method. With

the object of research SMK-IT Generasi Muslim Cendikia.

F. Design Model

Research with the application of the SMARTER Method in determining the sanctions for violations which will be combined with the AHP method, will use linear sequential in the design model. The activities in linear sequential are:



Figure 2. Linear Sequential Model[15]

- a. Requirements analysis is the stage of analyzing the needs needed in making software
- b. The design stage is the translation stage of the analyzed data into a form that is easily understood by users.
- c. Coding is the stage of translating data that has been designed using a particular programming language.
- d. Testing is the stage of testing the software that has been made.

III. RESULTS AND DISCUSSION

The implementation of this system is carried out using two process methods, namely weighting criteria using the AHP method and ranking using the SMARTER method.

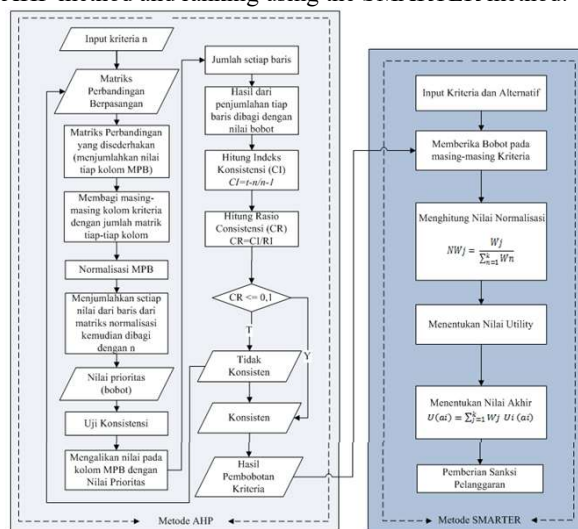


Figure 3. AHP-SMARTER Method Completion Flowchart

The dotted line indicates the transfer of the calculation process from the AHP method to the SMARTER method, indicating the separation between the AHP process and the SMARTER process. In the AHP method, after the weights are obtained, it will be continued by testing the consistency. The goal is whether the weights are consistent or not. If the weights are consistent, it will result in weighting, and if not, it will return to the pairwise comparison matrix. After the weight is obtained, it will be continued with ranking using the SMARTER method[1]. The weights obtained in the AHP method will be used as weights on the criteria.

Decision Support System Criteria and Alternatives

The criteria used in this decision support system are as follows:



Table 2. Violation Criteria

No	Criteria	Type of Violation	Point
1	C1	Attendance at school	
		a Absence without explanation 1-3 times	5
		b Absence without explanation 4-6 times	10
		c Absence without explanation 7-10 times	15
	d Absence without explanation more than 10 times	20	
2	C2	School Uniform	
		a Uniforms not in accordance with the terms of the day of use	5
		b Not wearing shoes at school	5
		c Wearing a hat in class or hijab is not uniform	5
	d Incomplete attribute	5	
3	C3	Leaving School	
		a In effective hours without explanation	10
	b Permission to leave and not return to school is not in the school's interest	15	
4	C4	Courtesy of Association	
		a Jump over the fence	15
		b Dating in the school environment	20
		c Mocking/ threatening/ hitting teachers/ employees	50
	d Caught pregnant, pregnant, married	10	
5	C5	Discipline	
		a Male student wear earrings, bracelets, necklaces, tattoos	10
		b Male student with long hair, dyeing hair other than black	20
		c Bringing books, magazines, tapes, VCDs is prohibited	25
		d Smoking or carrying a smoking device in the school environment	30
		e Smoking outside the school environment wears school attributes	30
		f Bring a cellphone and use it during class hours	30
		g Getting into fights or molesting fellow students	50
		h Carrying and using illegal drugs and beverages	75
		i Arrested for a crime and proven	10
		j Carrying sharp weapons & firearms, thereby harming and threatening the safety of others	10

Table 3. School Action

No	Action Code	Point Range	School Action
1	T0	0.1 – 0.9	Verbal Reprimand
2	T1	1 – 10	Held coaching by Guidance teachers and homeroom teachers
3	T2	11 – 25	Parents are called to school, Coaching is held by Guidance Counseling teachers and homeroom teachers, Make guidance statements
4	T3	26 – 40	Parents are called to school, Guidance is held by the Guidance Counseling teachers and homeroom teacher, Makes a guidance statement and gives the 1st Warning Letter to parents/guardians
5	T4	41 – 55	Parents are called to school, Guidance is held by the Guidance Counseling teachers and homeroom teacher, Makes a guidance statement and gives

No	Action Code	Point Range	School Action
6	T5	56– 75	a 2nd warning letter to parents/guardians Parents are called to school, Guidance from the principal is witnessed by the homeroom teacher, Counseling Guidance teacher and students, Makes a statement letter stamped 6000 about willingness to be issued if the score is above 75 and does not go up class
7	T6	76 – 100	Parents are called to school, students are returned to parents

Table 4. Type of Sanction

No	Sanction Code	Point Range	Type of Sanction
1	S0	0.1 – 0.9	Doing Cleaning
2	S1	1 – 10	Not allowed to follow class hours until the change of lessons
3	S2	11 – 25	Make a statement known to the homeroom teacher and parents/guardians
4	S3	26 – 40	1st Warning Letter and 2 day suspension
5	S4	41 – 55	2nd Warning Letter and 5 day suspension
6	S5	56– 75	Stay in class
7	S6	75 – 100	Expelled from school

The alternatives used in this decision support system are as follows:

This alternative set is the students of SMK-IT GMC, as a sample taken as many as 5 students, so that if there are 5 alternative decisions, then these alternatives can be written as $A = \{A_i | i = 1, 2, 3, 4, 5\}$ with:

- A1: Student 1
- A2: Student 2
- A3: Student 3
- A4: Student 4
- A5: Student 5

Calculation Using AHP Method

The next stage is to determine the priority of the elements by compiling criteria and sub-criteria in the form of a pairwise comparison matrix[8]. To find out the results of the weighting of the criteria used in calculating the priority of criteria and sub-criteria with the AHP method, it is necessary to search for values. How to get a value that can be with a certainty value or by conducting a survey through several respondents using a questionnaire sheet[11]. The value of certainty is a value that is directly given for certain criteria, while the value of the questionnaire is the value obtained from the assessment given by the respondent where each respondent gives a different preference value using a scale of 1-9 [8].

Determining the priority of elements by compiling these criteria in the form of a pairwise comparison matrix[9].

Table 5. Pairwise comparison matrix

	C1	C2	C3	C4	C5
C1	1.000	0.500	0.500	0.500	0.500
C2	2.000	1.000	0.500	0.500	0.333
C3	2.000	2.000	1.000	0.500	0.500
C4	2.000	2.000	2.000	1.000	0.500
C5	2.000	3.000	2.000	2.000	1.000
Total	9.000	8.500	6.000	4.500	2.833



Next is to calculate the value of the criteria column elements, where each criterion column element is divided by the number of matrices for each column in table 5, then add up the row matrix of the values of each element.

Table 6. Normalization Matrix of Criteria Element Values

	C1	C2	C3	C4	C5	Total
C1	0.111	0.059	0.083	0.111	0.176	0.541
C2	0.222	0.118	0.083	0.111	0.118	0.652
C3	0.222	0.235	0.167	0.111	0.176	0.912
C4	0.222	0.235	0.333	0.222	0.176	1.190
C5	0.222	0.353	0.333	0.444	0.353	1.706
Total	1.000	1.000	1.000	1.000	1.000	5.000

After determining the number of criteria columns, the next step is to calculate the priority value of the criteria or create a criteria consistency matrix with the formula for the number of criteria elements divided by the number of criteria in this case 5.

Table 7. Average matrix of criteria consistency normalization

	C1	C2	C3	C4	C5	Priority
C1	0.111	0.059	0.083	0.111	0.176	0.108
C2	0.222	0.118	0.083	0.111	0.118	0.130
C3	0.222	0.235	0.167	0.111	0.176	0.182
C4	0.222	0.235	0.333	0.222	0.176	0.238
C5	0.222	0.353	0.333	0.444	0.353	0.341
Total	1.000	1.000	1.000	1.000	1.000	1.000

The next stage is to multiply the elements in the pairwise comparison matrix column multiplied by the priority value results in Table 7, the multiplication results are then added up per each row.

Table 8. The summation matrix of each row

	C1	C2	C3	C4	C5	Quantity Per Line
C1	0.108	0.065	0.091	0.119	0.171	0.554
C2	0.216	0.130	0.091	0.119	0.114	0.671
C3	0.216	0.261	0.182	0.119	0.171	0.949
C4	0.216	0.261	0.365	0.238	0.171	1.250
C5	0.216	0.391	0.365	0.476	0.341	1.789

The next step is to add up the matrix of the sum of each row in Table 6 with the result of the "priority" value in Table 8.

Table 9. The sum of the number of elements per line with the priority value

	Quantity Per Line	Priority	Result
C1	0.554	0.108	0.662
C2	0.671	0.130	0.801
C3	0.949	0.182	1.131
C4	1.250	0.238	1.488
C5	1.789	0.341	2.130
		t =	5.194
		CI =	0.048
		IR =	1.12
		CR =	0.043
		Consistence	

From table 8, the following values are obtained:
 $t = (1/5) * ((0.554/0.108) + (0.671/0.130) + (0.949/0.182) + (1.250/0.238) + (1.789/0.341)) = 5.194$
 For $n = 5$ obtained $RI_6 = 1.12$ so that:
 $CI = (5.194 - 5) / (5 - 1) = 0.048$
 $RI_6 = 1.12$
 $CR = (CI/RI_6) = -0,048/ 1.2 = -0.043$
 Therefore $CR \leq 0,1$ then the consistency ratio of the calculation is acceptable (consistent).

From the results of the calculations in the table above, the value of the preference weights can show that the most important weight order criteria with a weight of 34.1%. Next are the criteria for Politeness in Association with a weighted value of 23.8%, the criteria for leaving school with a value of 18.2%, the criteria for school uniforms 13.0% and the criteria for school attendance with a weighting value of 10.8%.

Table 10. Criteria Weight Preference

No	Criteria	(%) Weight	Weight (Wj)
1	Attendance at school	10.8 %	0.108
2	School uniform	13.0 %	0.130
3	Leaving school	18.2 %	0.182
4	Courtesy of association	23.8 %	0.238
5	Discipline	34.1 %	0.341
Total		100%	1

Calculation Using the SMARTER Method
 Weighting on SMART uses a scale between 0 and 1, making it easier to calculate and compare values for each alternative[1]. The model used in SMART is shown in

Table 11. Criteria Weight Preference

No	Criteria	Type of Violation	Point	Weight Wj
1	C1	Attendance at school		
	a	Absence without explanation 1-3 times	5	10.8 %
	b	Absence without explanation 4-6 times	10	
	c	Absence without explanation 7-10 times	15	
	d	Absence without explanation more than 10 times	20	
2	C2	School Uniform		
	a	Uniforms not in accordance with the terms of the day of use	5	13.0 %
	b	Not wearing shoes at school	5	
	c	Wearing a hat in class or hijab is not uniform	5	
	d	Incomplete attribute	5	
3	C3	Leaving School		
	a	In effective hours without explanation	10	18.2 %
	b	Permission to leave and not return to school is not in the school's interest	15	
4	C4	Courtesy of Association		
	a	Jump over the fence	15	23.8 %
	b	Dating in the school environment	20	
	c	Mocking/ threatening/ hitting teachers/ employees	50	
5	C5	Discipline		
	a	Male student wear earrings, bracelets, necklaces, tattoos	10	34.1 %
	b	Male student with long hair, dyeing hair other than black	20	
	c	Bringing books, magazines, tapes, VCDs is prohibited	25	
	d	Smoking or carrying a smoking device in the school environment	30	
	e	Smoking outside the school environment wears school attributes	30	
	f	Bring a cellphone and use it during class hours	30	
	g	Getting into fights or molesting fellow students	50	



h	Carrying and using illegal drugs and beverages	75
i	Caught pregnant, pregnant, married	100
j	Arrested for a crime and proven	100
k	Carrying sharp weapons & firearms, thereby harming and threatening the safety of others	100

Sample Calculation Using the SMARTER Method
NIS : 1719

Name : Supriadi

Type of Violation :

1. Do not enter without information 4 days a week
2. Incomplete attribute
3. Permission to leave and not return to school and not in the interest of the school
4. Jump over the fence
5. Bring cellphones to school and use them during class hours

Calculations using the SMARTER method are as follows :

a. Finding the utility value is as follows:

Utility value formula :

$$U_i(a_i) = 100 \frac{(C_{max} - C_{min})}{(C_{max} - C_{min})} \% \quad (7)$$

Information:

$U_i(a_i)$ = the utility value of the 1st criterion for the i-th criterion

C_{max} = maximum criterion value

C_{min} = minimum criterion value

How to get the utility value as follows:

1. School Attendance Criteria

$$U_i(a_i) = 100 \frac{(10 - 5)}{(20 - 5)} \%$$

$$U_i(a_i) = 100 \frac{(5)}{(15)} \%$$

$$U_i(a_i) = 100 \cdot 0.3333 \%$$

$$U_i(a_i) = 33.33$$

2. School Uniform Criteria

$$U_i(a_i) = 100 \frac{(5 - 5)}{(5 - 5)} \%$$

$$U_i(a_i) = 100 \frac{(0)}{(0)} \%$$

$$U_i(a_i) = 100 \cdot 0 \%$$

$$U_i(a_i) = 0$$

3. Criteria for Leaving School

$$U_i(a_i) = 100 \frac{(15 - 10)}{(15 - 10)} \%$$

$$U_i(a_i) = 100 \frac{(5)}{(5)} \%$$

$$U_i(a_i) = 100 \cdot 1 \%$$

$$U_i(a_i) = 100$$

4. Criteria for Courtesy of Association

$$U_i(a_i) = 100 \frac{(15 - 15)}{(50 - 15)} \%$$

$$U_i(a_i) = 100 \frac{(0)}{(35)} \%$$

$$U_i(a_i) = 100 \cdot 0 \%$$

$$U_i(a_i) = 100$$

5. Order Criteria

$$U_i(a_i) = 100 \frac{(30 - 10)}{(100 - 10)} \%$$

$$U_i(a_i) = 100 \frac{(20)}{(90)} \%$$

$$U_i(a_i) = 100 \cdot 0.2222 \%$$

$$U_i(a_i) = 22.22$$

b. The result value is obtained from:

Formula = Value of utility x normalization

1. School Attendance Criteria

$$\text{Result} = 33.33 \times 0.108 = 3.60$$

2. School Uniform Criteria

$$\text{Result} = 0 \times 0.13 = 0$$

3. Criteria for Leaving School

$$\text{Result} = 100 \times 0.182 = 18.2$$

4. Criteria for Courtesy of Association

$$\text{Result} = 0 \times 0.238 = 0$$

5. Order Criteria

$$\text{Result} = 22.22 \times 0.341 = 7.58$$

c. Looking for the Final Result of SMARTER Calculation

$$= U(a_i) \sum_{j=1}^m NW_j U_i(a_i) \quad (8)$$

$$\text{Result} = 3.60 + 0 + 18.2 + 0 + 7.58$$

$$= 29.38$$

NIS : 3454

Name : Muhamad Sunardi

Type of Violation :

1. Did not enter / did not attend without explanation / alpha more than 3 times
2. Hijab is not uniform
3. Uniforms not in accordance with the terms of the day of use

Calculation using the SMARTER method

a. Finding the utility value is as follows:

1. School Attendance Criteria

$$U_i(a_i) = 100 \frac{(5 - 5)}{(20 - 5)} \%$$

$$U_i(a_i) = 100 \frac{(0)}{(15)} \%$$

$$U_i(a_i) = 100 \cdot 0 \%$$

$$U_i(a_i) = 0$$

2. - School Uniform Criteria

$$U_i(a_i) = 100 \frac{(5 - 5)}{(5 - 5)} \%$$

$$U_i(a_i) = 100 \frac{(0)}{(0)} \%$$

$$U_i(a_i) = 100 \cdot 0 \%$$

$$U_i(a_i) = 0$$

- School Uniform Criteria

$$U_i(a_i) = 100 \frac{(5 - 5)}{(5 - 5)} \%$$

$$U_i(a_i) = 100 \frac{(0)}{(0)} \%$$



$$U_i(a_i) = 100 \cdot 0\%$$

$$U_i(a_i) = 0$$

5. Order Criteria

$$U_i(a_i) = 100 \frac{(50 - 10)}{(100 - 10)}\%$$

$$U_i(a_i) = 100 \frac{(40)}{(90)}\%$$

$$U_i(a_i) = 100 \cdot 44.44\%$$

$$U_i(a_i) = 44.44$$

b. The result value is obtained from:

Formula = Value of utility x normalization

1. School Attendance Criteria

$$\text{Result} = 0 \times 0.108 = 0$$

2. -School Uniform Criteria

$$\text{Result} = 0 \times 0.13 = 0$$

- School Uniform Criteria

$$\text{Result} = 0 \times 0.13 = 0$$

5. Order Criteria

$$\text{Result} = 44.44 \times 0.341 = 15.15$$

c. Finding the Final Result of SMARTER Calculation

$$= U(a_i) \sum_{j=1}^m NW_j U_i(a_i)$$

$$\text{Result} = 0 + 0 + 0 + 15.15 = 15.15$$

Table 12. SMARTER Calculation Result

No	Student Name	Criteria	Point	Normalizati on
1	Supriadi	C1.b	10	0.108
		C2.d	5	0.130
		C3.b	15	0.182
		C4.a	15	0.238
		C5.f	30	0.341
2	Muhamad Sunardi	C1.a	5	0.108
		C2.a	5	0.130
		C2.c	5	0.130
		C5.g	50	0.341
		C3.a	15	0.182
3	Lalu Akbar Hasibuan	C4.a	15	0.238
		C5.d	30	0.341
		C5.f	30	0.341
		C1.c	15	0.108
		C2.d	5	0.130
4	Roy Ardianto Putra	C5.f	30	0.341
		C1.a	5	0.108
		C3.b	15	0.182
		C4.a	15	0.238
		C5.b	20	0.341
5	Rumlan Hasanudin	C5.e	30	0.341
		C1.c	15	0.108
		C2.c	5	0.130
		C2.d	5	0.130
		C3.a	10	0.182
6	Maulana Gilang Apriano	C1.d	20	0.108
		C2.a	5	0.130
		C3.b	15	0.182
		C5.f	30	0.341
		C1.c	15	0.108
7	Wahyuni Sawitri	C2.c	5	0.130
		C2.d	5	0.130
		C3.a	10	0.182
		C1.d	20	0.108
		C2.a	5	0.130
8	Marhan Ristu	C3.b	15	0.182
		C5.f	30	0.341
		C1.d	20	0.108
		C2.d	5	0.130
		C4.a	15	0.238
9	Lalu Fikto Alanda Sofia	C4.b	20	0.238
		C1.d	20	0.108
		C2.d	5	0.130
		C4.a	15	0.238
		C4.b	20	0.238

Table 13. Advanced SMARTER Calculation Results

Utility Value	Final Result	Action	Type of Sanction
33.33	0	100	29.38
0	0	0	T3
0	0	0	S3
22.22	0	0	15.15
0	0	0	T2
0	0	0	S2
44.44	0	0	33.36
100	0	0	T3
0	0	0	S3
22.22	0	0	14.78
22.22	0	0	T2
66.67	0	0	S2
0	0	0	29.57
22.22	0	0	T3
0	0	0	S3
11.1	0	0	14.78
22.22	0	0	T2
66.67	0	0	S2
22.22	0	0	25.4
66.67	0	0	T3
0	0	0	S3
100	0	0	29
100	0	0	T3
0	0	0	S3
22.22	0	0	7.58
100	0	0	T1
0	0	0	S1
0	0	0	14.13
0	0	0	T2
0	0	0	S2

Table 14. Value Range

No	Value Range	Information
1	1 – 10	Normal
2	11 – 25	Slight/Light
3	26 – 40	Medium
4	41 – 55	Heavy Enough
5	56 – 74	Heavy
6	75 – 100	Very Heavy

Use Case Diagram

- In the Use Case Diagram below, there are 4 actors who play a role in the running of the program. The first actor is the BK teacher, the BK teacher can do the login process, manage data such as student data, violation data, witness data, action data, summons, and change passwords.
- The second actor is students, in this system students can log in and view their own data.
- The third actor is the principal, in this system the principal can log in and see all the existing data. The principal also received a report
- The fourth actor is the student's guardian, in this system the student's guardian can log in and view the data on rules, violations, sanctions and student/children's own data. Guardians of students can also receive summons.



NIS	Nama Siswa	Kelas	Jurusan	JK	Tempat Lahir	Tanggal Lahir	Alamat	Nama Ayah	Nama Ibu
1777	Nurul Hidayah	XII	AP2	IP	Pengapung	2002-11-20	KIJIG	H Hidayah	Hj Muzanti
1779	Piangga Cahaya Widaya	XII	AP2	L	Mong 1	2001-02-28	Mong 1	Salim	Minatip
1780	RANI SEPTIA KINGSURUM	XII	AP2	IP	KUKUN	2001-12-17	KUKUN	AMAZ RANI	MIATRE

Figure 8. Student Data Form

Display of Violation Data Form

On the violation data page, each violation is directly inputted by selecting the criteria for the violation, the type of violation, the point of violation and the percentage of weight that has been normalized into decimal form.

Kode Pelanggaran	Jenis Pelanggaran	Point	Persentase	Aksi
C1 - Kehadiran di Sekolah	a. Tidak masuk / tidak hadir tanpa keterangan' alpha 3-9 kali	5	0.100	Ubat / Hapus
C1 - Kehadiran di Sekolah	b. Tidak masuk / tidak hadir tanpa keterangan' alpha 4-6 kali	10	0.100	Ubat / Hapus
C1 - Kehadiran di Sekolah	c. Tidak masuk / tidak hadir tanpa keterangan' alpha 7-10 kali	15	0.100	Ubat / Hapus
C1 - Kehadiran di Sekolah	d. Tidak masuk / tidak hadir tanpa keterangan' alpha lebih dari 10 kali	20	0.100	Ubat / Hapus
C2 - Seragam Sekolah	a. Seragam tidak sesuai dengan ketentuan hari pengembangannya	5	0.130	Ubat / Hapus
C2 - Seragam Sekolah	b. Tidak berpakaian memakai sandal selama di sekolah	5	0.130	Ubat / Hapus
C2 - Seragam Sekolah	c. Memakai topi dalam kelas / tidak memakai seragam	5	0.130	Ubat / Hapus
C2 - Seragam Sekolah	d. Akibat tidak lengkap	5	0.130	Ubat / Hapus
C3 - Meninggalkan Sekolah	a. Pada jam absen tanpa keterangan	10	0.100	Ubat / Hapus
C3 - Meninggalkan Sekolah	b. Ditun keluar dan tidak kembali lagi ke sekolah / bujukan kesetengah sekolah	15	0.100	Ubat / Hapus

Figure 9. Violation Data Form

Display of Rules of Conduct

The fields on the code of conduct data page are the code of conduct and the name of the code of conduct.

Kode Tata Tertib	Nama Tata Tertib	Aksi
A - Kewajiban Siswa	1. Siswa masuk sebelum jam pelajaran dimulai jam 07.35. Wisd dan pulang jam 14.15, kecuali hari libur/mas' pulang jam 11.15 Wisd.	Ubat / Hapus
A - Kewajiban Siswa	2. Menggunakan bahasa seragam: a. Serin dan Selaya (Pulih-Abu dan Topi b. Ratu dan Kamis; (Pakaian seragam: lumJCM'at' (Pakaian Intaj) d. Sabtu; (Pakaian Pramuka	Ubat / Hapus
A - Kewajiban Siswa	3. Mengikuti kegiatan sekolah seperti: Upacara, Intaj dan kegiatan kegiatan lain yang ditentukan sekolah.	Ubat / Hapus
A - Kewajiban Siswa	4. Menjaga kebersihan ruang kelas dan lingkungan sekolah.	Ubat / Hapus
A - Kewajiban Siswa	5. Menjaga ketertarikan sarana dan prasana sekolah.	Ubat / Hapus
A - Kewajiban Siswa	6. Menggunakan bahasa yang santun terutama bahasa Indonesia yang baik dan benar.	Ubat / Hapus
A - Kewajiban Siswa	7. Meminta (dan terima) bekal, kelas ada keperluan yang sangat urgen dan dituntut pada buku gilat.	Ubat / Hapus
A - Kewajiban Siswa	8. Hadir dalam setiap upacara/RS (SPS) minimal 90%.	Ubat / Hapus

Figure10. Rules of Conduct Form

Sanction Form Display

The sanction data page is filled with inputting the sanction code, point range and type of sanction.

Kode Sanksi	Rentang Point	Jenis Sanksi	Aksi
S0	0.1-0.9	Teguran Lisan	Ubat / Hapus
S1	1-10	Tidak dibenarkan mengikuti jam pelajaran setelah penggantian pelajaran	Ubat / Hapus
S2	11-25	Membuat pernyataan sbektah oleh wali kelas/orang tua/wali murid	Ubat / Hapus
S3	26-40	SP 1 dan dikorsng 2 hari	Ubat / Hapus
S4	41-55	SP 2 dan dikorsng 5 hari	Ubat / Hapus
S5	56-75	Tinggal kelas	Ubat / Hapus

Figure 11. Sanction Form

Action Data Form Display

The action data page is filled with inputting the action code, point range and type of action.

Kode Tindakan	Rentang Point	Jenis Tindakan	Aksi
T0	0.1-0.9	Diberikan Teguran oleh guru BK	Ubat / Hapus
T1	1-10	Diberikan pembinaan oleh guru BK dan wali kelas	Ubat / Hapus
T2	11-25	Orang tua dipanggil ke sekolah. Diberikan pembinaan oleh guru BK dan wali kelas. Membuat pernyataan sbektah.	Ubat / Hapus

Figure12. Action Form

Violator Data Input Form Display

On the violator's data input page, all student data already exists so that if there are students who violate the admin immediately look for the student's name and click the violating button.

NIS	Nama Siswa	TTL	Kelas	Jurusan	Aksi
1719	SUPIRI	Batang, 2002-02-22	XII	IPA	Pelanggaran
1720	SURBATI	LOKAI, 2002-05-26	XII	IPA	Pelanggaran
1721	TAURMAN ADHAR	HAWUN, 2002-06-02	XII	IPA	Pelanggaran
1722	Abdul Rahman	BERAH, 2001-06-21	XII	AP1	Pelanggaran
1723	ANUS MARA	Gumung Batu, 2001-12-31	XII	AP1	Pelanggaran
1724	AYUN ARFIN	Sengkot, 2003-02-17	XII	AP1	Pelanggaran
1725	BAIQ NEDA YASNITA	BUN GUHBUK, 2002-12-23	XII	AP1	Pelanggaran
1726	BAIQ SOVIANTI	BUNURU, 2002-09-24	XII	AP1	Pelanggaran
1727	Dani Triana Ramdani	Lemah, 2002-11-18	XII	AP1	Pelanggaran

Figure 13. Violator Data Input Form

After selecting the violating student, it will be processed by selecting the criteria for the violation and the type of violation then the violation process.



Proses Pelanggaran Siswa

Tanggal Kejadian: 16/04/2021

NIS: 1651

Nama Siswa: Rang Widawati

Kelas: XI

Jurusan: SMA

Kriteria Pelanggaran

No	Kriteria Pelanggaran	Jenis Pelanggaran	Poin	Aksi
1	C1 - Kehadiran di Sekolah	a. Tidak masuk / tidak hadir tanpa keterangan/ alpha 1-3 kali	5	<input type="checkbox"/>
2	C1 - Kehadiran di Sekolah	b. Tidak masuk/ tidak hadir tanpa keterangan/ alpha 4-6 kali	10	<input type="checkbox"/>
3	C1 - Kehadiran di Sekolah	c. Tidak masuk/ tidak hadir tanpa keterangan/ alpha 7-10 kali	15	<input type="checkbox"/>
4	C1 - Kehadiran di Sekolah	d. Tidak masuk/ tidak hadir tanpa keterangan/ alpha lebih dari 10 kali	20	<input type="checkbox"/>

Figure 14. Student Violation Filling Page

After the violation process will be summed up all types of violations committed then will be shown the type of sanctions that will be given and the actions that will be taken by the Counseling Guidance teacher.

Display of Violation Point Calculation Result Form

The results obtained after all violations are processed are the display of the number of points, the sanctions obtained and the actions to be taken by the Counseling Guidance teacher. After the calculation results appear, the Admin can print the results by clicking the print results button.

Proses Pelanggaran Oleh Siswa

Proses pelanggaran berhasil dilakukan sebanyak 8 pelanggaran

Hasil perhitungan point pelanggaran

37.75

Biodata SALLY KARLINA

NIS: 1748

Nama: SALLY KARLINA

Kelas: XI

Jurusan: API

TTL: Kuta, 2001-08-01

Alamat: Kuta II

Nama Ayah: MURNAN

Nama Ibu: Garing

Pelanggaran yang dilakukan :

No	Kriteria Pelanggaran	Jenis Pelanggaran	Poin	Persentase
1	C1 - Kehadiran di Sekolah	b. Tidak masuk/ tidak hadir tanpa keterangan/ alpha 4-6 kali	10	0.108
2	C1 - Kehadiran di Sekolah	b. Tidak masuk/ tidak hadir tanpa keterangan/ alpha 7-10 kali	15	0.160
3	C2 - Seragam Sekolah	c. Memakai topi dalam kelas/ jilbab tidak seragam	5	0.130
4	C2 - Seragam Sekolah	d. Absen/ tidak lengkap	5	0.130

Figure 15. Violation Point Calculation Results Page

After the violation committed by the student is processed, the admin can print the violation card.

DINAS PENDIDIKAN DAN KEBUDAYAAN
YAYASAN GENERASI MUSLIM CENDEKIA
SMK-IT GMC

KARTU PELANGGARAN SISWA
TANGGAL 2021-09-06

Data Siswa

Nama: SALLY KARLINA
Tempat Lahir: Kuta, 2001-08-01
Kelas: XI
Jurusan: API
Jenis Kelamin: P
Alamat: Kuta II
Nama Ayah: MURNAN
Nama Ibu: Garing

Daftar Pelanggaran

No	Kriteria Pelanggaran	Jenis Pelanggaran	Poin	Persentase
1	C1 - Kehadiran di Sekolah	b. Tidak masuk/ tidak hadir tanpa keterangan/ alpha 4-6 kali	10	0.108
2	C1 - Kehadiran di Sekolah	c. Tidak masuk/ tidak hadir tanpa keterangan/ alpha 7-10 kali	15	0.160
3	C2 - Seragam Sekolah	c. Memakai topi dalam kelas/ jilbab tidak seragam	5	0.130
4	C2 - Seragam Sekolah	d. Absen/ tidak lengkap	5	0.130
5	C3 - Masing-masing Pelanggaran Sekolah	b. Bekerja dan tidak kembali lagi ke sekolah/ bukan kepentingan sekolah	15	0.162
6	C4 - Sopan Santun Pergaulan	a. Melompat pagar	15	0.25
7	C5 - Ketertiban	d. Merokok/ membawa alat untuk merokok di lingkungan sekolah	30	0.25
8	C5 - Ketertiban	e. Memakai di luar lingkungan sekolah	30	0.25

Hasil perhitungan point pelanggaran

37.75

Sanksi yang didapatkan berdasarkan point: (S3) - SP 1 dan skorsing 2 hari

Tindakan yang dilakukan berdasarkan point: (T3) - Orang tua dipanggil ke sekolah. Dilakukan pembinaan oleh guru BK dan wali kelas. Membuat pernyataan bimbingan dan membuat surat pernyataan 1 untuk orang tua/ wali murid.

Pangung, 2021-09-06
Mengetahui Guru BK/Wali Kelas

Figure 16. Violation Result Print Form page

IV. CONCLUSION

Based on the research carried out up to the stage of designing, implementing, and testing the software, it can be concluded that from testing the process of calculating student discipline violations with the AHP-SMARTER method, it can be used and is able to provide the right solution in making decisions about giving sanctions to participants. students who violate school rules. From the results of this study, the 5 highest violations committed by students were taken by looking at the first violation point 78.5 sanctions given S6 and actions taken by T6, the two students with 46.5 violation points with S4 sanctions and T4 sanctions, the third students with 31.25 violation points with S3 sanctions and T3 sanctions, the four students with 21.5 violation points with S2 sanctions and T2 actions and the five students with violation points 15.75 with a S2 sanction and T2 action. The decisions taken by the Counseling Guidance Teachers, homeroom teachers and principals can be accounted for with the support of model calculations in the decision support system.

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