Advanced Journal of STEM Education, Vol. 3 No. 1 (2025) https://doi.org/10.31098/ajosed.v3i1.3372

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Research Paper

Design of a Decision Support System for Assessing Student Indiscipline Using the Web-Based Simple Additive Weighting (SAW) Method

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Received : January 15, 2025	Revised : May 19, 2025	Accepted : May 22, 2025	Online : May 31, 2025

Abstract

Student discipline is crucial for a conducive learning environment, yet many schools still assess indiscipline manually, leading to inefficiency. This research develops a web-based decision support system using the Simple Additive Weighting (SAW) method to objectively assess and rank student violations. The system helps educators manage offense data, assign weights to different violation criteria, and issue appropriate sanctions. Built with the Laravel framework for security and scalability, the system was tested with 50 teachers and administrators. Evaluation focused on usability, satisfaction, and the system's accuracy in ranking student indiscipline. Results showed that 85% of top-ranked students had frequent violations, while 90% of lowest-ranked students had few. The system enables teachers to review data, generate accurate reports, and issue warnings efficiently, reducing the time spent on manual assessments. However, it is currently limited to web platforms and lacks integration with mobile notifications like WhatsApp. Despite these limitations, the system significantly enhances discipline management and provides an objective, technology-driven solution for educational institutions.

Keywords: *Decision Support System, Student Indiscipline, Simple Additive Weighting (SAW), Web-Based Application, Educational Technology*

INTRODUCTION

Currently, the level of student discipline is a cause for concern, and not just a few occasional violations committed by students over time; many violations committed by students can affect their progress and achievement in class (Nasri & Usman, 2019; Student Discipline, n.d.). MA Al-Muddatsiriyah assesses student indiscipline and determines warnings manually, or does not yet have a special system for it. It can take a long time and is less than optimal. In that case, the existence of a decision support system on student indiscipline assessment can help counseling guidance teachers in determining undisciplined students and giving/determining sanctions given to undisciplined students (Integrating a Decision Support System into a School, 2002). Using the SAW method because the calculation is faster and can be used for solving decision-making systems by considering criteria and weights for calculations to determine the assessment of student indiscipline (Fitrul et al., 2019; Sanjaya & Narendra, 2023; Taherdoost, 2023).

The problem formulation of this research is how to design and build a web-based student indiscipline assessment decision support system using the simple additive weighting (SAW) method. The problems discussed are the student indiscipline assessment decision support system is website-based and uses Laravel as a framework for program development; This system uses the SAW (Simple Additive Weighting) ranking method to determine undisciplined students and determine warnings for undisciplined students; This research was conducted in the MA Al-Muddatsiriyah environment to obtain data as a reference in the research. The system built is

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expected to support decisions for the determination of undisciplined student warnings, as a follow-up for undisciplined students, and assist counseling guidance teachers in assessing undisciplined students.

LITERATURE REVIEW

Decision Support System

Decision Support Systems (DSS) are a subset of computer-based information systems specifically designed to assist in managerial decision-making processes, particularly in situations where decisions are semi-structured and require both analytical tools and human judgment. These systems serve as supportive instruments that provide relevant data, modeling capabilities, and interactive software to help decision-makers explore various alternatives and evaluate potential outcomes. However, it is important to note that DSS are not intended to replace the intuition, experience, or discretion of decision-makers, but rather to enhance and complement their decision-making capabilities (Chung et al., 2016; Hasan et al., 2017; Karo et al., 2024). A Decision Support System (DSS) should not be misunderstood as merely providing support for decisions; rather, it is a comprehensive system designed to transform raw data into meaningful information by applying relevance-based processing. This information then serves as a foundation to assist decision-makers in evaluating alternatives and selecting the most effective course of action. A well-developed DSS enhances the speed and accuracy of problem-solving, enabling organizations to respond promptly and effectively to various challenges (Abina et al., 2023; Peng & Pei, 2022).

Simple Additive Weighting (SAW)

The Simple Additive Weighting (SAW) method, often recognized as one of the most straightforward and widely used techniques in multi-criteria decision-making (MCDM), is designed to evaluate and rank alternatives based on a set of predefined criteria. Commonly abbreviated as SAW, this method functions by calculating a total score for each available option. This score is derived by summing the weighted performance values of each alternative across all relevant attributes or criteria. Each attribute in the decision matrix is assigned a specific weight that reflects its level of importance relative to the overall goal of the evaluation process.

To implement the SAW method, the decision matrix is first normalized to ensure that all values are on a comparable scale. This is particularly important when the criteria involve different units of measurement or value ranges. Once normalization is complete, each normalized value is multiplied by the weight assigned to its corresponding criterion. The resulting values for each alternative are then added together, producing a final score that represents the overall performance of the alternative. The alternative with the highest total score is typically considered the most preferred or optimal choice.

SAW is highly regarded for its simplicity and ease of application, making it suitable for a wide range of decision-making scenarios, from business strategy selection to product evaluation and resource allocation. Despite its simplicity, the method requires careful consideration when assigning weights and selecting criteria to ensure the outcomes are both objective and reflective of stakeholder preferences. Moreover, the SAW method assumes linear trade-offs between criteria, which may not always represent complex real-world preferences but can provide a useful approximation in many practical situations.

By employing SAW, decision-makers are equipped with a systematic and transparent framework to compare multiple alternatives efficiently, based on quantifiable metrics aligned with their goals (Eniyati, 2011; Sihombing et al., 2024). In this approach, it is essential to perform a normalization process on the decision matrix (X) to ensure that the values representing various alternatives are transformed onto a common scale. This step allows for fair and meaningful comparisons across all criteria and options being evaluated. The normalization can be carried out using the following mathematical formula:

$$rij \begin{cases} \dfrac{Xij}{\text{Max } Xij} \\ \dfrac{\text{Min } Xij}{Xij} \end{cases} \quad (1)$$

where j is a benefit attribute and j is a cost attribute

The preference value (Vi) of each alternative is given by :

$$Vi = \sum_{j=1}^{n} wj\, rij \quad (2)$$

Description:
Vi = Preference value
Wj = Rank weight
Rij = Normalized performance rating

A greater Vi score suggests that the alternative AI holds a higher level of preference compared to the others. The Simple Additive Weighting (SAW) method involves several key steps in its implementation process:

1) Identifying and listing all possible alternatives along with the relevant attributes or evaluation criteria.
2) Assigning appropriate weights to each criterion based on its level of importance in the decision-making context.
3) Ranking the alternatives by computing a weighted sum, ensuring that each criterion's weight accurately represents its significance and contributes proportionally to the final evaluation, thereby reflecting both priority and comparative distance among alternatives.

Discipline

Discipline can be understood as a pattern of behavior that evolves through internal development and is shaped by the need to align with established norms, regulations, and decisions. The term "discipline" is derived from the Latin word discere, which means "to learn." Over time, the concept of discipline has expanded and taken on multiple interpretations across various contexts. In its most fundamental sense, discipline refers to the ability and willingness to adhere to rules, demonstrate respect for authority, and submit to guidance and control. This perspective highlights discipline as a response to external expectations and structured systems of oversight.

Another interpretation views discipline as a form of self-governance, a process through which individuals cultivate personal orderliness, responsibility, and the capacity to act consistently and ethically even in the absence of direct supervision. This understanding emphasizes discipline as a tool for personal development, enabling individuals to act with purpose, manage impulses, and maintain focus on long-term goals. It is closely linked with concepts such as self-motivation, accountability, and perseverance.

Furthermore, discipline is often seen as an essential quality in professional and academic environments, where individuals are expected to carry out their duties with integrity, punctuality, and commitment. In this regard, discipline serves not only as a measure of compliance but also as an indicator of one's reliability and dedication to assigned responsibilities.

Ultimately, discipline can be concluded as a manifestation of personal accountability. It reflects a conscious choice to respect established standards and societal norms while fulfilling one's roles and responsibilities. Whether it stems from external enforcement or internal motivation, discipline remains a foundational value that supports order, productivity, and ethical behavior in both individual and collective settings (Beer et al., 2021; Minhua & Hock, 2024).

RESEARCH METHOD

Development Model

This research employed the Waterfall Model for system development (Chandra et al., 2022; Dwivedi et al., 2022). Figure 1 depicts the sequential stages involved in the software development process, which include the following:

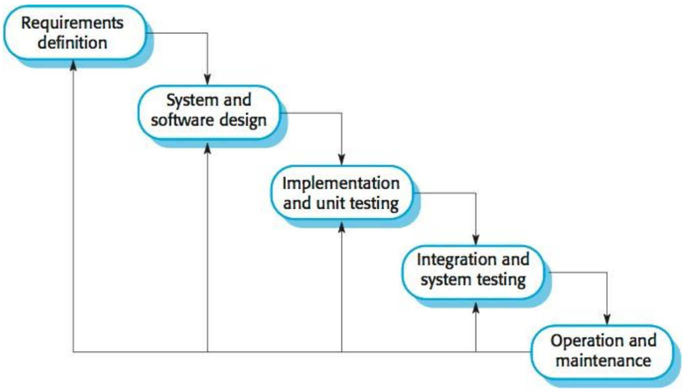

Figure 1. Waterfall Model Activity Stage

Requirement Definition

The initial phase is where project needs are gathered and documented. Stakeholders define functional and non-functional requirements through research, interviews, or surveys. In this project, the system is being developed for MA Al-Muddatsiriyah. The output is a Software Requirement Specification (SRS) document, serving as the foundation for the design, development, and testing phases.

System and Software Design

This phase involves transforming requirements into a structured system architecture. It includes high-level design (such as system structure and data flow) and detailed design (including database schema, algorithms, and interfaces). In the development of the system at MA Al-Muddatsiriyah, this stage ensures a well-defined blueprint before implementation, minimizing errors and enhancing system efficiency.

Implementation and Unit Testing

Involves coding the system based on the design specifications. Developers write and integrate modules, followed by unit testing to verify individual components. This ensures each unit functions correctly before progressing to integration and system testing, maintaining a structured, sequential development process. In this project, the system is being developed and implemented at MA Al-Muddatsiriyah to meet the institution's specific requirements and improve its operational efficiency.

Integration and System Testing

Integration and System Testing take place after the implementation phase, ensuring that individual modules function together as a complete system. This process includes integration testing to identify interface issues and system testing to validate overall functionality. Methods such as black-box testing are employed to verify compliance with design specifications and user requirements. In the development of the system at MA Al-Muddatsiriyah, these testing phases play a crucial role in ensuring reliability and effectiveness before deployment.

Operations and Maintenance

Involves the ongoing support and updates to the system after deployment. It focuses on fixing issues, enhancing system performance, and ensuring the system operates smoothly. This phase continues until the system is retired or replaced, ensuring long-term functionality.

Data Collection Methods

The following are the kinds of data that ought to be collected to carry out this research:

Observation

This method involves conducting direct observations at MA Al-Muddatsiriyah. By visiting the location in person, researchers can collect firsthand information about the environment, activities, and other relevant factors that contribute to the study. This approach allows for a more comprehensive understanding of the research context through direct visual and contextual analysis.

Interview

The interview was conducted by engaging with relevant sources at MA Al-Muddatsiriyah to gather valuable insights and information.

Literature Study

This stage involves gathering relevant information regarding theories and research findings within the same scientific field. The information is obtained from various sources, including books, academic journals, and articles available on the internet. This process aims to build a strong theoretical foundation and ensure a comprehensive understanding of the subject matter.

FINDINGS AND DISCUSSION

Problem Identification

MA Al-Muddatsiriyah serves as an educational institution that combines general and Islamic studies at the high school level, with the primary mission of nurturing students' character in alignment with the values and principles outlined in the Qur'an and Hadith. Despite its commitment to moral and academic development, the institution currently faces challenges related to student discipline. Instances of misconduct have been occurring with increasing frequency, raising concerns among educators due to their adverse effects on students’ personal growth and academic outcomes. At present, the school relies on a manual process to monitor disciplinary issues and deliver warnings, as it lacks an integrated system to manage such matters. This conventional method often proves inefficient, requiring considerable time and effort while yielding limited results in promoting behavioral improvement.

Problem-Solving Identification

In response to the issues identified above, a comprehensive Student Indiscipline Assessment Support System was designed and developed to assist in recognizing students exhibiting undisciplined behavior. This system empowers the school administration to take timely and suitable actions to address these behaviors, including the issuance of formal warnings or other corrective measures. To achieve this, the system utilizes the Simple Additive Weighting (SAW) method, which facilitates the ranking of students based on the severity and frequency of their indiscipline. This enables the school to assign appropriate warnings or interventions based on each student's specific level of misbehavior. The system is implemented as a web-based platform, utilizing the robust Laravel framework to ensure scalability and ease of access. The various criteria considered for evaluating student indiscipline are detailed in Table 1, providing a clear and structured approach to the assessment process.

Table 1. Criteria Categories

Criteria Category	**Code**	**Score**
Tardiness	A	5
Attendance	B	5
Clothing	C	5
Personality	D	8
Orderliness	E	8
Smoking	F	10
Ponography	G	10
Sharp Weapons	H	10
Drugs and Liquor	I	10
Fighting / Brawl	J	10
Intimidation/Threats with violence	K	10
Worship	L	9

Table 2 displays a comprehensive list of violations, which are categorized according to their severity levels. These violations are integral components of the assessment criteria used in the Student Indiscipline Assessment Support System, helping to evaluate student behavior effectively. Each violation type is carefully classified to support a structured and systematic ranking process, which is carried out using the Simple Additive Weighting (SAW) method. This approach ensures that the severity of the violations is accurately considered, enabling the school to determine and implement the most appropriate follow-up actions based on the rankings. By utilizing this method, the system ensures a fair and consistent evaluation, promoting a structured approach to handling student discipline.

Table 2. Type of Violation

Category	**Types of Violations**	**Score**
Tardiness	Late for the first hour after	2
	5 minutes after the bell rings	2
	Must follow *tadarus* every first hour	2
	Late to the flag ceremony	2
	Late entry after the break	3
	Late for Zuhr prayer	5
Attendance	Any absence without explanation	3
	Absence by making false statements	20
	Any skipping of class hours	10
	Every absence from optional extracurricular activities without explanation	2

Category	Types of Violations	Score
	Every absence from compulsory extracurricular activities without explanation	3
Clothing	Not wearing a uniform	10
	Wearing the uniform is not neat / not inserted	5
	Not wearing a ceremonial hat during the ceremony	2
	Wearing sandals/slippers or shoes made into sandals	5
	Not wearing plain black shoes	5
	Wearing tight-fitting clothes (Crotch and Baggy)	20
	Especially for girls wearing short sleeves and not wearing a	20
	Wearing a hat that is not a school hat in the madrasah environment	3
	Wearing cutbray / torn pants or cingkrang pants	3
	Do not wear OSIS / Location / name tag / Madrasah uniform / Batik / Sports uniforms	5
	Not wearing white socks 3/4 calf	2
	Wearing a jacket/vest / sweater, unless sick with a doctor's certificate	5
	Wearing a belt that is not black/large	2
	Not wearing a Muslim/Muslimah uniform on Friday	10
	Wearing a Muslimah uniform is not by the madrasah regulations	3
	Wearing a sports uniform when attending KBM instead of Penjasorkes.	3
Personality	Excessive adornment for girls	2
	Male students wear bracelets, necklaces, piercings, etc.	3
	Male students have their hair covering their shirt collar/ears	4
	Hair cut but not neat or with gel	2
	Painted hair	5
	Spewing obscene words among students	4
	Saying obscene words in front of/in the hearing of parents	2
	Hurting other people's feelings	5
	Threatening fellow students/teachers	25
	Stealing	100
	Receiving guests during class without the teacher's permission in	10
	Entering another class without the teacher's permission in the	10
	Lying to parents/teachers	20
	Dating	20
	Fighting parents/teachers	50
	Coming home late without notification from the madrasah	25
	Hanging out in a shop/Mall/Supermarket/*Warnet*/Game Center while wearing a madrasah uniform	50
Order	Defacing, scribbling on school property, teachers, employees, friends, and others	50
	Carrying tip ex	2
	Damaging objects belonging to the school, teachers, and friends	50
	Fighting with friends inside or outside the classroom	25
	Making noise in the classroom when PBM is taking place	10

Category	Types of Violations	Score
	Jumping over the school fence to exit/enter	10
	Not carrying out K3 / Class Duty	25
	Carrying a cell phone with a camera, without the permission of the teacher, for the benefit of learning, as evidenced by a certificate	50
	Activating cell phones during learning	25
	Not reading the Qur'an during *tadarus* activities (instead of playing around or doing homework during tadarus)	10
	Doing activities outside of learning in the classroom (e.g., playing ball, playing cards, throwing chalk)	10
	Being outside the classroom during effective lessons	10
	Disorderly during the ceremony	20
	Leaving the class during the change of class hours, except with the teacher's permission or to summon the teacher, by	5
Smoking	Bringing cigarettes into school	10
	Smoking cigarettes in school/around school	30
Pornography	Bringing books, magazines, stencils, tapes, CDs, and pornographic	25
	Selling books, magazines, stencils, CDs, and pornographic photos	50
	Viewing pornographic photos, tapes, and CDs	25
Sharp Weapons	Carrying sharp weapons/fire without permission	100
	Selling sharp/fire weapons	100
Drugs and Liquor	Using sharp weapons/fire to hurt others	100
	Getting drunk at school	100
	Bringing drugs/liquor to school	100
	Using drugs, alcohol inside or outside school	100
Fighting	Fighting/ brawl with other school students	100
	Fighting between students/classes of MA. Al-Muddatsiriyah has a wide impact	100
	Fighting between students of the MA. Al-Muddatsiriyah has no	50
	Being a provocateur of fights	50
Intimidation/Threats with Violence	Threatening and intimidating the principal, teachers, and	100
	Persecuting, ganging up on the principal, teachers, and employees	100
	Being a provocateur against teachers, principals, and employees	100
	Threatening and intimidating a student or group of students of MA.	100
Worship	Disturbing a friend who is practicing worship	15
	Teasing or intimidating friends of different religions	20

Calculation Process of Simple Additive Weighting Algorithm (SAW)

The following outlines the steps involved in the calculation of the Simple Additive Weighting Algorithm, which utilizes the benefit formula. These steps are presented in detail in Table 3, providing a clear and structured approach to the process.

Table 3. Data on the Number of Violations Committed

Weight	2	2	2	2	3	5	3	20	10	...	20

Value	5%	5%	5%	5%	5%	5%	5%	5%	5%		9%
#	**c0**	**c1**	**c2**	**c3**	**c4**	**c5**	**c6**	**c7**	**c8**	**...**	**c78**
A1	2	2	1	0	1	1	0	0	0		0
A2	0	0	0	1	2	1	0	0	1		0
A3	1	1	1	1	2	1	0	0	1		0
A4	0	0	1	1	1	1	0	0	0		0
MAX	2	2	1	1	2	1	0	0	1		0

Based on the data presented in Table 3 above, the normalization process is performed by dividing the value of each criterion for the alternative by the maximum value observed across all alternatives. This approach ensures a standardized scale for comparison, as illustrated in the subsequent Table 4 below.

Table 4. Normalization of Number of Violations

#	c0	c1	c2	c3	c4	c5	c6	c7	c8	...	c78
A1	1	1	1	0	0,5	1	0	0	0		0
A2	0	0	0	1	1	1	0	0	1		0
A3	0,5	0,5	1	1	1	1	0	0	1		0
A4	0	0	1	1	0,5	1	0	0	0		0

Table 5 presents the outcome of normalizing the total for each criterion, achieved by dividing the sum of each criterion by its corresponding maximum value. This normalization process ensures that all criteria are scaled proportionally, allowing for a more consistent and comparative analysis across different parameters.

Table 5. Normalization with Weights

#	c0	c1	c2	c3	c4	c5	c6	c7	c8	...	c78
A1	2	2	2	0	1,5	5	0	0	0		0
A2	0	0	0	2	3	5	0	0	10		0
A3	1	1	2	2	3	5	0	0	10		0
A4	0	0	2	2	1,5	5	0	0	0		0

The values presented are the outcomes of multiplying the normalization process results by the predefined weights, which are detailed in Table 4. This operation ensures that each factor's significance, as determined in Table 4, is appropriately integrated into the final calculations displayed in Table 6.

Table 6. Value Multiplication Result Data

#	c0	c1	c2	c3	c4	c5	c6	c7	c8	...	c78	Total
A1	0,1	0,1	0,1	0	0,1	0,3	0	0	0		0	0,625
A2	0	0	0	0,1	0,2	0,3	0	0	0,5		0	1
A3	0,05	0,05	0,1	0,1	0,2	0,3	0	0	0,5		0	1,2
A4	0	0	0,1	0,1	0,1	0,3	0	0	0		0	0,525

Table 7 is the result of the SAW (Simple Additive Weighting) calculation, where the results of the multiplication in Table 6 are multiplied by the percent value in Table 4 above and produce a range of warnings that will be given to students who violate the predetermined points.

Table 7. Warning Range

Point	Warning
1-25	Warning I
26-50	Warning II
51-75	Warning III

Table 8 presents the final ranking results, which are derived from the calculations and procedures outlined in Tables 4 through 7. These earlier tables detail the various steps and methodologies used to arrive at the rankings, providing a comprehensive overview of the data processing and analysis leading to the outcomes.

Table 8. Ranking Results

Alternative	Ranking	SAW	Point	Warning
A1	3	0.625	18	Warning I
A2	2	1	23	Warning I
A3	1	1.2	29	Warning II
A4	4	0.525	12	Warning I

System Flowchart Diagram

A flowchart diagram is a diagram that describes the workflow associated or a system being created. This diagram can be used as a process or description in problem-solving. The following is a flowchart diagram of the Decision Support System for Student Indiscipline Assessment with the Simple Additive Weighting (SAW) Method shown in Figure 2.

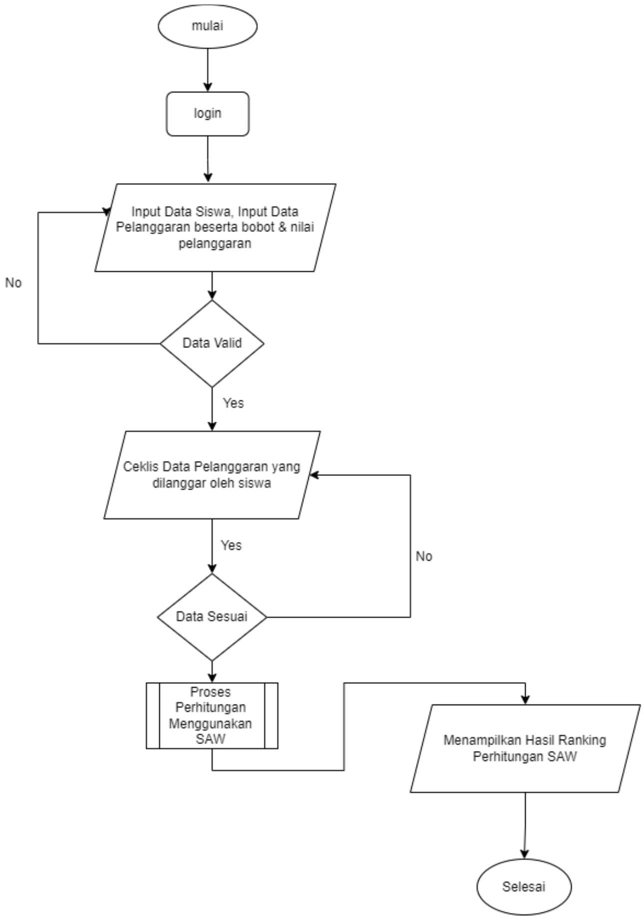

Figure 2. Flowchart Diagram of SAW Calculation

System Database Design

The design of system databases is one example of data modelling. The process of data modelling teaches system builders about the flow of data and the contents of database table columns. Figure 3 depicts the design of the database system that is based on the Physical Data Model.

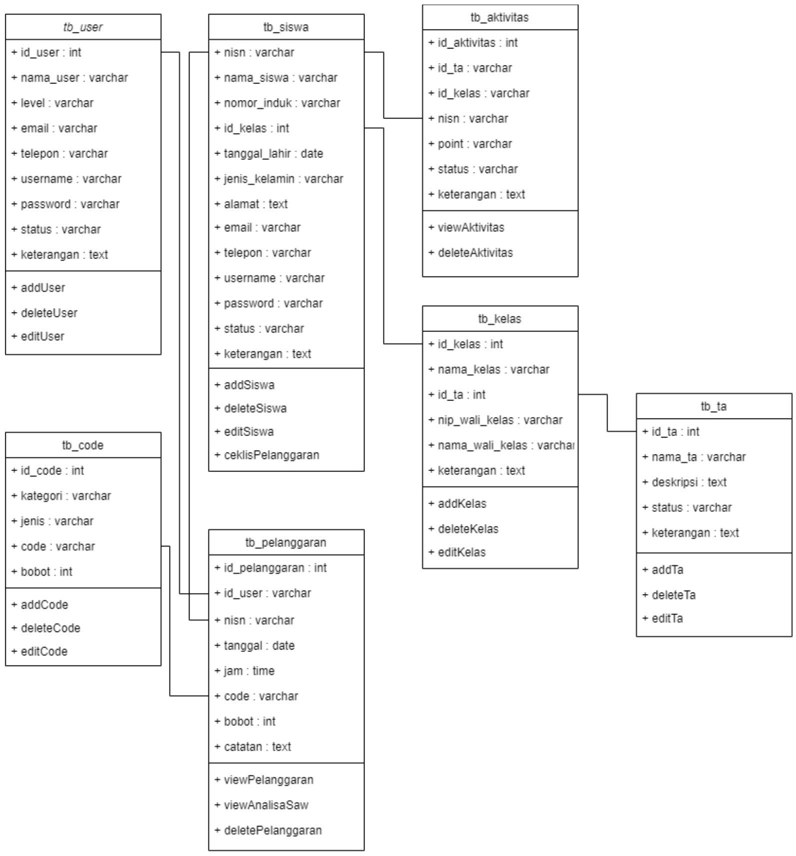

Figure 3. Physical Data Model Database System

Hardware and Software Requirements

In order to put the newly developed system into operation, a number of components, including hardware and software, are utilised.

Hardware

Hardware generates data, programmes, and outputs. A server supporting this application has these hardware specs:

a. Processor: Intel Core i7
b. Memory: 16.0GB Dual-Channel
c. Hard Disk: 2794GB Seagate and 931GB Seagate
d. Monitor: 1920x1080 pixels
e. Keyboard 108 keys
f. Mouse: Optic PS/2

Software

In developing this application, the author uses software with the following specifications:

a. Operating System: Windows 11
b. Programme Package:
   - XAMPP (Apache, MySQL)
   - Bootstrap 5.0
   - Laravel 10
   - Notepad++

- Google Chrome, Mozilla Firefox, Mozilla Firefox Developer.

System Implementation Results

As may be seen in Figure 4 below, the following are some of the implementation achievements that have been achieved in the form of page views on the web:

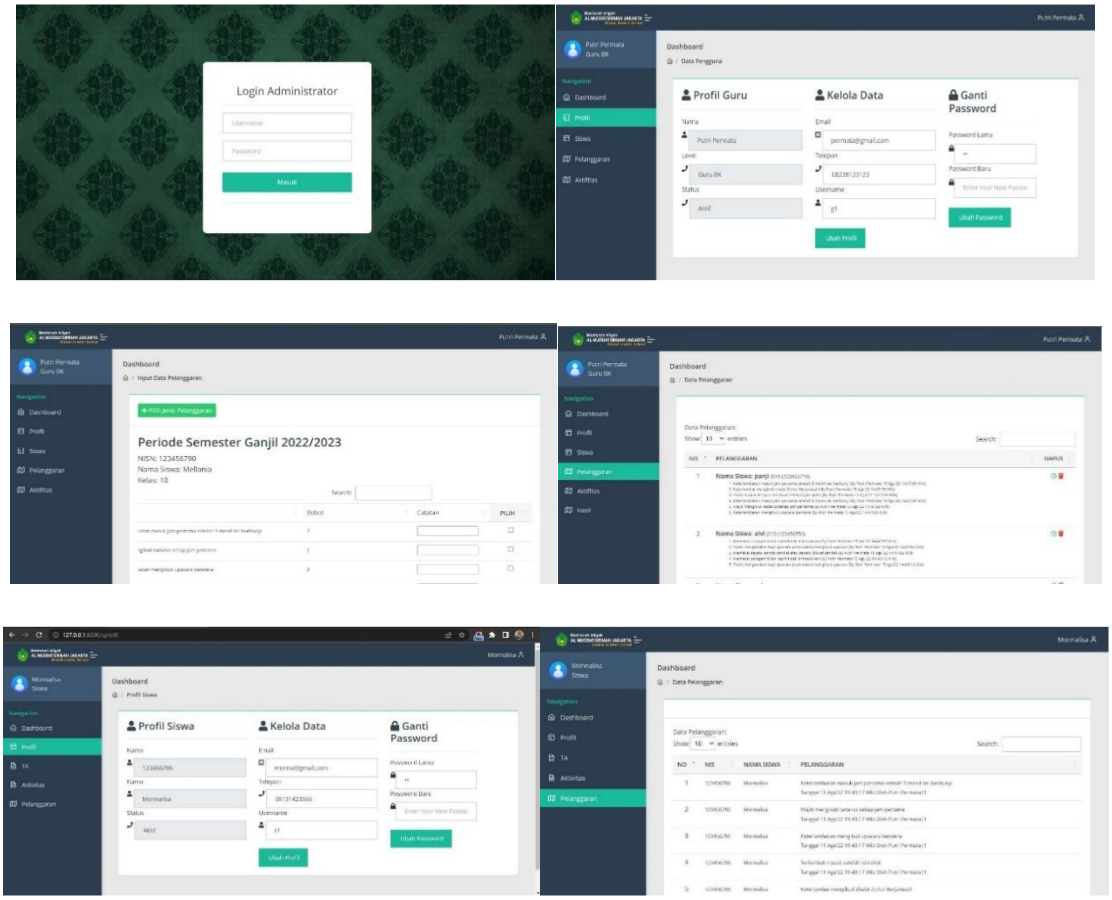

Figure 4. Application Display Results in Internet Browser

The system undergoes rigorous testing to verify its functionality. This research utilizes black-box testing, a method focused on evaluating the system based on its inputs and expected outputs. The test scenarios are designed using this approach, and the results are presented in Table 9.

Table 9. Application Trial Results

No Test	Testing Results
1	The user successfully registers and logs into the system using the account that has been created.
2	Administrators can enter student violation data with various predefined categories.
3	The system successfully manages criteria weights to customize the Simple Additive Weighting (SAW) method.
4	The system calculates student violation rankings with the SAW method accurately based on the given criteria weights.
5	The system displays a ranking list of students who commit violations from highest to lowest.

No Test	Testing Results
6	The system successfully provides warning notifications to students who have a certain level of offense
7	Administrators, teachers, and school staff can access the features according to their access rights.
8	The system can generate student offense reports in PDF and CSV formats for school needs.
9	The system can be accessed well on various devices such as desktops, tablets, and smartphones.
10	Data entered into the system remains secure and does not suffer from loss or unauthorized manipulation

CONCLUSIONS

The design of a Decision Support System (DSS) for assessing student indiscipline using the Web-Based Simple Additive Weighting (SAW) method at MA Al-Muddatsiriyah has proven to be an effective approach in addressing the challenges associated with managing student behavior. The system integrates a user-friendly interface with the SAW method, which facilitates the objective assessment of student discipline based on various predefined criteria. By automating the decision-making process, the system improves efficiency and accuracy, allowing administrators and educators to make informed decisions regarding student disciplinary actions.

The use of the SAW method ensures that all relevant factors are considered and weighted according to their importance, providing a comprehensive and fair evaluation of student behavior. This approach minimizes human bias and subjectivity in the assessment process, promoting transparency and fairness. Additionally, the web-based nature of the system makes it accessible from various devices, offering flexibility to users.

LIMITATION & FURTHER RESEARCH

For further improvement, it is suggested that the system be expanded to include a feedback mechanism where students can review and discuss the assessment results. This will promote engagement and allow students to learn from the feedback provided. Moreover, incorporating machine learning algorithms could enhance the system's ability to predict future student behavior based on historical data, providing proactive solutions for discipline management.

Further research could explore the integration of additional methods of decision-making, such as Multi-Criteria Decision Analysis (MCDA), to compare and enhance the SAW method's effectiveness in evaluating student indiscipline. Investigating the system’s application in different educational settings, as well as its potential for scalability to larger institutions, could provide valuable insights into its versatility and impact. Additionally, studying the impact of the DSS on student behavior and academic performance would be beneficial to determine the long-term effects of such systems in educational environments.

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