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Implementation Of A Decision Support System In Determining Example Students At Madrasah Ibtidaiyah Darussalam Using The Simple Additive Weighting (SAW) Method

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Abstract In this modern era, rapid technological advancements increasingly have significant impacts on various aspects of life, including education, economy, politics, social, and cultural dimensions. The field of education can harness these advancements and technological progress to produce human resources ready to face the era of information and technology. The process of identifying outstanding students involves evaluating students based on various criteria set by the school. Recognizing exemplary students at Madrasah Ibtidaiyah Darussalam is crucial for fostering students' enthusiasm towards learning, as awards serve to boost their academic achievements. Efficient and accurate determination necessitates a robust decision-making system aimed at producing top-performing students. The Simple Additive Weighting (SAW) method, implemented using Laravel 10, is utilized in this system. A case study was conducted specifically at Madrasah Ibtidaiyah Darussalam. This information system for identifying outstanding students is envisioned to serve as a valuable tool for the school, enabling easy customization of criteria and selection of top students annually.

Keywords: *Decision Support System, Simple Additive Weighting, Website, SAW*

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Introduction

In this modern era, progress technology is getting faster and faster major impact on various aspects of life, including education, economic, political, social and cultural. Technological developments cannot be avoided because they will continue to develop along with increasing knowledge. (Safira, 2023). The world of education can use advances and technological progress to produce human resources who are ready to face the information and technology era. Schools are educational institutions that support education in the best way to maximize student potential. Exemplary students are students who are successful in academic and non-academic matters. (Sains, Hambali and Safitri, 2020).

The job of selecting exemplary students involves many criteria that must be considered. The determination of these criteria is determined by the school, and the process takes a long time to find out the results because of the large number of students in each school and it is necessary to select each student individually to determine the extraordinary students at that school. To overcome this, a decision support system is needed that can process student data and the criteria being compared. Madrasah Ibtidaiyah Darussalam, an Islamic Madrasah educational institution located in the Regency Sumenep and has been established for years In 1975 he realized that he had the most important role effective identification within managing and determining elections exemplary student. Selection of exemplary students This of course requires a process efficient and intuitively systematic identify the factors that plays a major and very crucial role in decision making right. Therefore, implementation poetic induition system (SPK) becomes a very suitable solution reileivan.

Based on the problems that occurred at Madrasah Ibtidaiyah Darussalam, the researcher was interested in conducting research with the title Implementation of a Decision Support System for Determining Exemplary Students at Madrasah Ibtidaiyah Darussalam Using the SAW Method in accordance with the requirements and standards in the process of Determining Exemplary Students at Madrasah Ibtidaiyah Darussalam which has criteria such as Assessment Spiritual, Attitude Assessment, Final Semester Assessment (PAS), Daily Assessment (PH) and Number of Attendance.

Literature Review

Decision Support System

Scott Morton first offered the idea of a "Management Decisions System" in the early 1970s, which refers to a decision support system (DSS) or Decision Support System (DSS). This system is tool based computers that use models and data to solve complex, unstructured problems and help people or organizations make decisions. (Haspita, 2019). Decision support systems are not a replacement for decision makers, but are additional tools that assist in the decision making process.

Simple Additive Weighting (SAW)

According to Fadila (2023), the SAW method, or better known as weighted addition, involves the basic concept of finding the results of the weighted addition of the performance assessment of each option on all attributes. To apply the SAW method, the initial step required is to normalize the decision matrix (X) into a scale that allows comparison with all assessments.

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Website

According to Yuhefizar in (Yanuardi & Permana, 2019) a website is a total of web pages contained in a domain that contain information. A website is a collection of pages related to other interrelated files (afdhal, 2019). From the description of several definitions of websites according to the experts above, the conclusion is that a website is a collection of pages that can display information or sites that are connected to the internet network so that they can be accessed by anyone throughout the world. There are several web-based applications, namely:

a. Web browser

According to Winarno and Utomo in (Yanuardi & Permana, 2019) a web browser is a tool used to view web pages. From the description of several definitions of web browsers, according to experts, the conclusion is that a web browser is a site that can provide information pages. A website is a location on the internet that presents a collection of information regarding the profile of the site owner.

b. Web servers

According to Lutfhi (cited in Afisina et al., 2020), a web server is software designed to offer database services and handle requests from web browsers, storing crucial data and information related to a website. It functions by receiving HTTP or HTTPS requests from clients (web browsers) and delivering results typically in the form of multiple web pages, commonly in HTML format (Afisina et al., 2020). According to some experts, a web server is a data service for processing and storing important data or information.

Sublime text

According to Supono (2019:14) "Sublime Text is text editor software that is used to create or edit applications. Sublime Text has additional plugin features that make things easier for programmers. Apart from that, Sublime Text seems elegant for a syntax editor. Apart from being light, this IDE has a fast process of saving and opening files. It's not surprising that this IDE is the most widely used, especially among web-based programmers." Eric Haughee (2019) describes Sublime Text as a versatile code and text editor compatible with multiple operating systems through Python API technology. The application draws inspiration from Vim and is noted for its flexibility and robust capabilities. Sublime Text supports the enhancement of its functionalities through sublime-packages. Although not open source, Sublime Text offers many community-supported functional development features (packages) that are freely licensed for use." From the information provided, it can be inferred that Sublime Text is a versatile editor application designed for creating and editing applications using code and text across different operating system platforms, utilizing Python API technology.

PHP Myadmin

According to (Wijianto et al., 2019). “phpmyadmin is a user-friendly web application created by phpmyadmin.net. According to programming principles, a software application functions as a MySQL administrator accessible via a web browser, primarily for managing databases. Based on this description, it can be inferred that phpMyAdmin is utilized specifically for administering MySQL databases. Another according to (php official, 2019) "php (recursive acronym for php: hypertext preprocessor) is a widely-used open source general-purpose scripting language that is especially suitable for web development and can be embedded into html".

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MYSQL

According to Sibero (2019:97), MySQL, also pronounced as "My Sequel," functions as an RDBMS (Relational Database Management System), which is a system application responsible for data processing tasks. Additionally, Hidayatullah and Jauhari (2019:180) state that MySQL is widely utilized among web application developers, alongside other DBMS applications such as PostgreSQL (freeware), SQL Server, MS Access from Microsoft, DB2 from IBM, Oracle and Oracle Corp, Dbase, FoxPro, among others.From the explanations provided, it can be concluded that MySQL is a DBMS application used for data processing in the development of web applications.

Databases

According to AS and Shalahudin (2019:28) "a database system is a computerized system whose main objective is to maintain data that has been processed or information that is available when needed. In essence, a database is a medium for storing data so that it can be accessed easily and quickly."

JavaScript

According to Sibero (2019:150) "Java Script is a programming language developed to run on a web browser." Meanwhile, according to Irawan (2019:17) "Java Script is a script-based web programming language. Using Java script in web programming can create a web with a dynamic and interactive appearance and performance." Based on the definition above, the conclusion is that Java Script is a script-based programming language that was created and developed for the web with a dynamic and interactive display.

Research Methods

The SAW method is a technique used to determine the best choice among several alternatives based on multiple criteria, each of which has an assigned weight (importance level). Quoting from Andayati (2020) The following are the steps in applying the SAW method:

1. Determination of Criteria (Ci)
   Determine the criteria that will be used in decision making. These criteria must be relevant and cover all aspects necessary to evaluate alternatives.
2. Determining the Weight of Each Criteria (Wi)
   Determine the weight of each criterion. This weight reflects the level of importance of each criterion in decision making. As well as determining the type of each criterion (benefit or cost).
3. Decision Matrix Normalization (Rij)
   Change the value of each alternative for each criterion into a value on the same scale to produce a Normalized Matrix Value (R).

$$X = \begin{bmatrix} x11 & xij \\ x21 & xij \end{bmatrix} \quad (1)$$

$$Rij = \frac{Xij}{Max\ Xij} \quad \text{If j is a benefit attribute} \quad (2)$$

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$$Rij = \frac{Min\ Rij}{Rij} \quad \text{If j is a cost attribute} \qquad (3)$$

4. Preference Value (Vi) and Ranking
   Multiplying the normalized matrix value (R) of each alternative with the criteria weight (Wi) according to each criterion. Then sort the final value of each alternative based on the highest value.

$$Vi = \sum_{i=1}^{n} Wjrij \qquad (4)$$

Description:
V_i : ranking for each alternative
W_j : weight value of each criterion
r_{ij} : normalized performance rating value

Results and Discussion

SAW Calculation Simulation

Of the 67 assessment data for exemplary students at Madrasah Ibtidaiyah Darussalam at the top level for the 2022/2023 academic year, 5 sample data were used as an experiment to determine which students were crowned as exemplary students with the highest accumulative scores.

Table 1. *Dataset*

A_i	C_i				
	C1	C2	C3	C4	C4
A1	43	51	63	80	4
A2	56	60	69	84	12
A3	71	75	60	85	22
A4	58	44	59	68	5
A5	63	76	65	77	31

Source: students at Madrasah Ibtidaiyah Darussalam at the top level for the 2022/2023

Next, the SAW calculation process is carried out from the 5 sample data through the following steps:

a. Determination of Criteria (Ci)
   Identify the criteria that will be used to evaluate students in determining exemplary students.

Table 2. Criteria

Criteria Code	Criteria
C1	Spiritual Assessment
C2	Attitude Assessment
C3	End of Semester Assessment
C4	Daily Assessment
C5	presence

Source: students at Madrasah Ibtidaiyah Darussalam at the top level for the 2022/2023

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b. Determining the Weight of Each Criteria (Wi)

Determine the weight for each criteria according to level its interests. This weight reflects the extent of acriteria influence decisions end. As well as determining the type of attribute of each of the criteria that have been set.

Table 3. Criteria Weights & Attributes

Criteria Code	Criteria	Bobot	Atribut
C1	Spiritual Assessment	30%	Benefit
C2	Attitude Assessment	30%	Benefit
C3	Evaluation End of Semester	20%	Benefit
C4	Daily Assessment	15%	Benefit
C5	Presence	5%	Cost

Source: students at Madrasah Ibtidaiyah Darussalam at the top level for the 2022/2023

c. Decision Matrix Normalization (Rij)

The matrix normalization process is based on the adjustment equation with the type of attribute (benefit or cost) that has been determined for each criterion, so that the following normalized matrix is obtained:

1. For Spiritual Assessment Criteria

$$r1,1 = \frac{43}{\max\{43,56,71,58,63\}} = \frac{43}{71} = 0,61$$

$$r2,1 = \frac{56}{\max\{43,56,71,58,63\}} = \frac{56}{71} = 0,79$$

$$r3,1 = \frac{71}{\max\{43,56,71,58,63\}} = \frac{71}{71} = 1$$

$$r4,1 = \frac{58}{\max\{43,56,71,58,63\}} = \frac{58}{71} = 0,82$$

$$r5,1 = \frac{63}{\max\{43,56,71,58,63\}} = \frac{63}{71} = 0,89$$

2. For Attitude Assessment Criteria

$$r1,1 = \frac{51}{\max\{51,60,75,44,76\}} = \frac{51}{76} = 0,67$$

$$r2,2 = \frac{60}{\max\{51,60,75,44,76\}} = \frac{60}{76} = 0,79$$

$$r3,2 = \frac{75}{\max\{51,60,75,44,76\}} = \frac{75}{76} = 0,99$$

$$r4,2 = \frac{44}{\max\{51,60,75,44,76\}} = \frac{44}{76} = 0,58$$

$$r5,2 = \frac{76}{\max\{51,60,75,44,76\}} = \frac{76}{76} = 1$$

3. For Final Semester Assessment Criteria

$$r1,3 = \frac{63}{\max\{63,69,60,59,65\}} = \frac{63}{69} = 0,91$$

$$r2,3 = \frac{69}{\max\{63,69,60,59,65\}} = \frac{69}{69} = 1$$

$$r3,3 = \frac{60}{\max\{63,69,60,59,65\}} = \frac{60}{69} = 0,87$$

$$r4,3 = \frac{59}{\max\{63,69,60,59,65\}} = \frac{59}{69} = 0,86$$

$$r5,3 = \frac{65}{\max\{63,69,60,59,65\}} = \frac{65}{69} = 0,94$$

4. For Daily Evaluation Criteria

$$r1,4 = \frac{80}{\max\{80,84,85,68,77\}} = \frac{80}{85} = 0,94$$

$$r2,4 = \frac{84}{\max\{80,84,85,68,77\}} = \frac{84}{85} = 0,99$$

$$r3,4 = \frac{85}{\max\{80,84,85,68,77\}} = \frac{85}{85} = 1$$

$$r4,4 = \frac{68}{\max\{80,84,85,68,77\}} = \frac{68}{85} = 0,8$$

$$r5,4 = \frac{77}{\max\{80,84,85,68,77\}} = \frac{77}{85} = 0,91$$

5. For Attendance Criteria

$$r1,5 = \frac{\min\{4,12,22,5,31\}}{4} = \frac{4}{4} = 1$$

$$r2,5 = \frac{\min\{4,12,22,5,31\}}{12} = \frac{4}{12} = 0,33$$

$$r3,5 = \frac{\min\{4,12,22,5,31\}}{22} = \frac{4}{22} = 0,18$$

$$r4,5 = \frac{\min\{4,12,22,5,31\}}{5} = \frac{4}{5} = 0,8$$

$$r5,5 = \frac{\min\{4,12,22,5,31\}}{31} = \frac{4}{31} = 0,13$$

d. Preference Value (Vi) and Ranking

Determining the preference values from V1 to V15 is as follows:

V1 = (0,61 x 30%) + (0,67 x 30%) + (0,91 x 20%) + (0,94 x 15%) + (1 x 5%))
= 0,18 + 0,2 + 0,14 + 0,05 = **0,76**

V2 = (0,79 x 30%) + (0,79 x 30%) + (1 x 20%) + (0,99 x 15%) + (0,33 x 5%)
= 0,24 + 0,24 + 0,2 + 0,15 + 0,02 = **0,93**

V3 = (1 x 30%) + (0,99 x 30%) + (0,87 x 20%) + (1 x 15%) + (0,18 x 5%)
= 0,3 + 0,3 + 0,17 + 0,15 + 0,01 = **0,93**

V4 = (0,82 x 30%) + (0,58 x 30%) + (0,86 x 20%) + (0,8 x 15%) + (0,8 x 5%)
= 0,25 + 0,17 + 0,17 + 0,12 + 0,04 = **0,9**

From the results obtained from calculating the preference value (Vi), a ranking table can be created as follows:

Table 3. Ranking Determination

Alternatif (A_i)	Nilai	Ranking
A1	0,76	4
A2	0,84	3
A3	0,93	1
A4	0,75	5
A5	0,9	2

Based on the results from the table determining the ranking of exemplary students using the SAW method then it can be concluded that those who have the right to be elected become honor student is the 3rd alternative with the result of an accumulative value of "0.93".

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Interface Implementation

Home Page

The home page is designed to be as attractive as possible, making this system comfortable to use.

Figure 1. Home page

Login page

On this page admin and the user can input username and password for access the system.

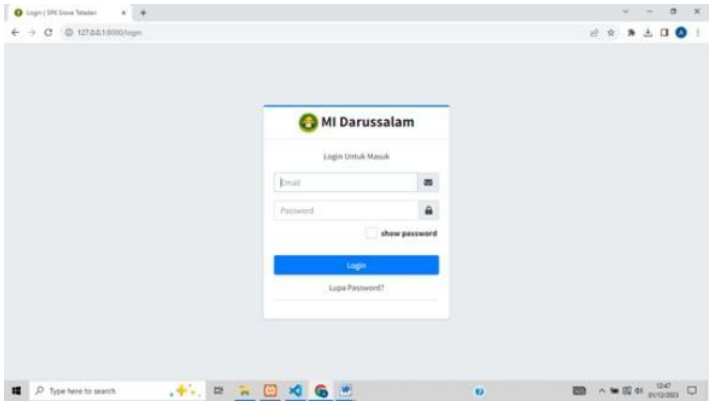

Figure 2. Login Page

Dashboard page

The menu contained in The dashboard consists of user data, student data, class data, data criteria, value data and results SAW which has a menu initial matrix, matrix normalization and results ranking.

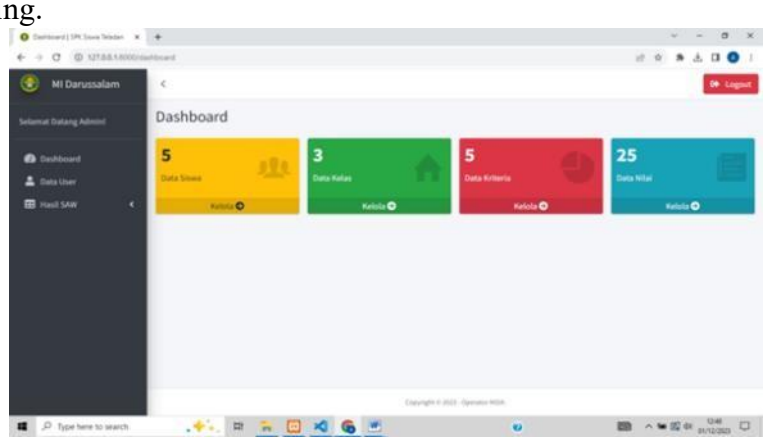

Figure 3. Dasboard Page

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User Data Page

On this page the Admin can manage user data according to needs. This page consists of features to add user data, edit user data and delete user data.

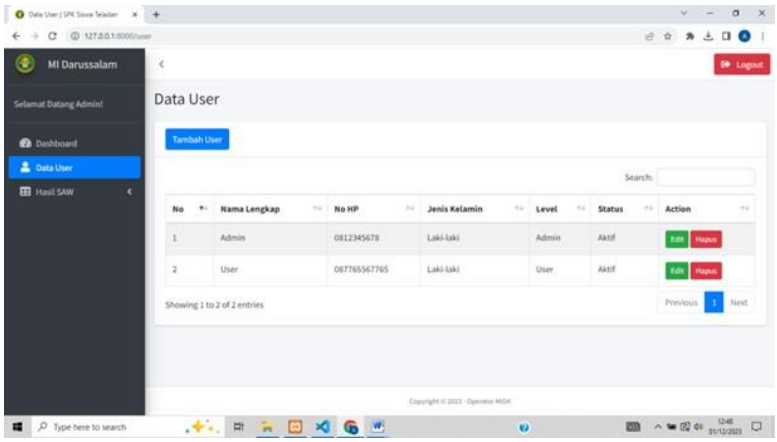

Figure 4. User data page

Student Data Page

On this page the Admin can manage student data according to needs, this page consists of features to add student data, edit student data and delete student data.

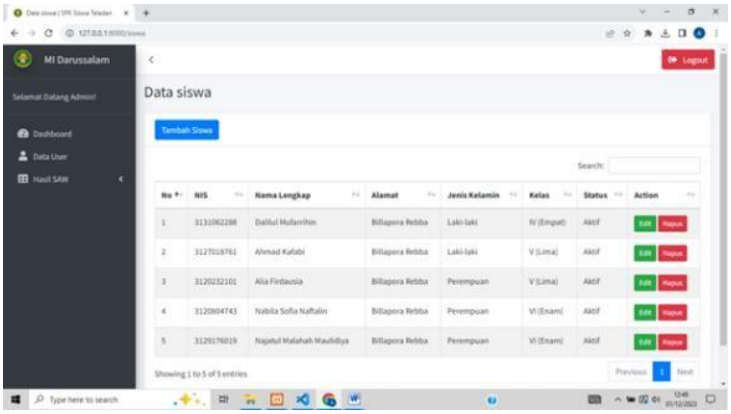

Figure 5. Student Data Page

Class Data Page

On this page the Admin can manage class data according to needs, this page consists of features to add class data, edit class data and delete class data.

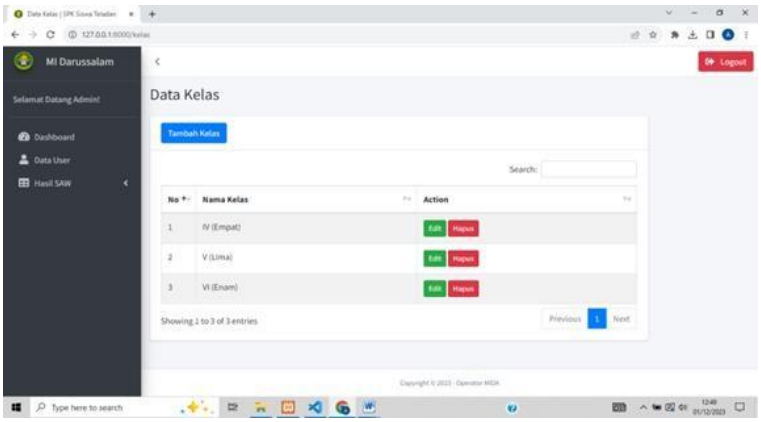

Figure 6. Class Data Page

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Criteria Data Page

On this page the Admin can manage criteria data according to needs, this page consists of features to add criteria data, edit criteria data and delete criteria data.

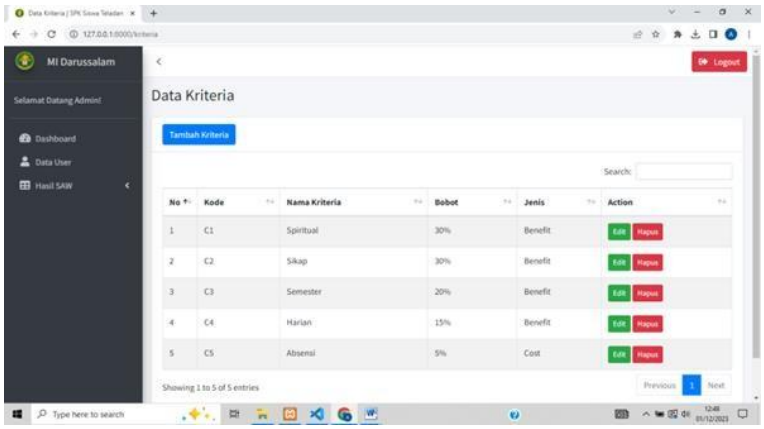

Figure 7. Criteria data page

Value Data Page

On this page Admin and Users can manage value data according to their needs, this page consists of features to add value data, edit value data and delete value data.

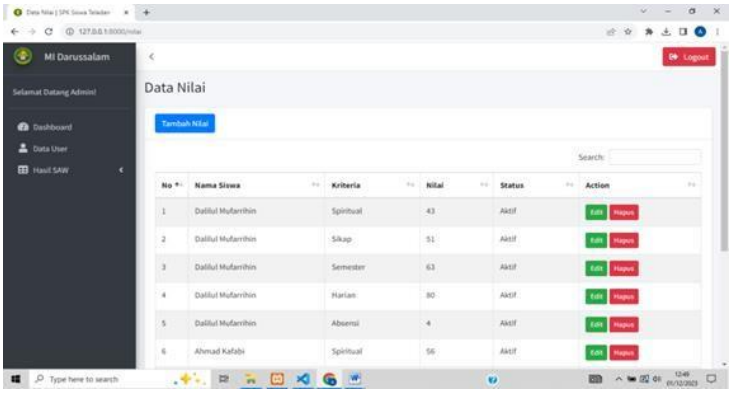

Figure 8. Value data page

Initial Matrix Page

On this page, Admins and Users can see the initial matrix data, namely the overall data from several original values that have been input.

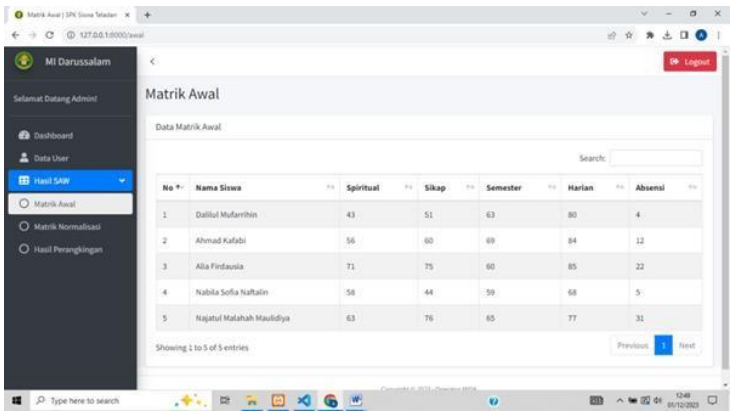

Figure 9. Initial matrix page

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Normalization Matrix Page

On this page Admin and Users can view matrix data normalization, namely original value data that has been processed using the decision matrix normalization formula to produce normalized matrix values.

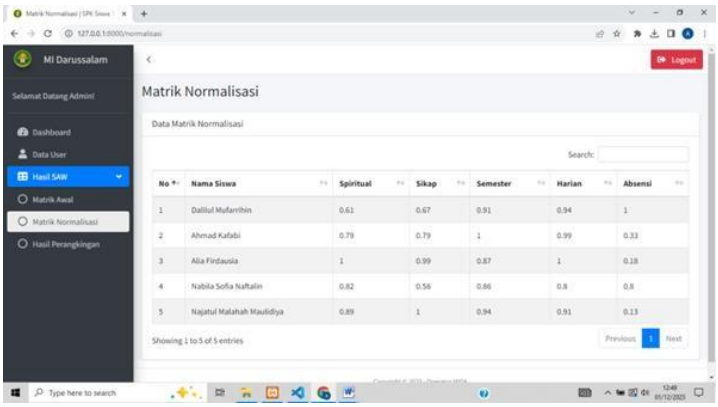

Figure 10. Normalization matrix page

Ranking Results Page

On this page Admin and Users can see ranking results data, namely final value data that has gone through several stages of the SAW method process.

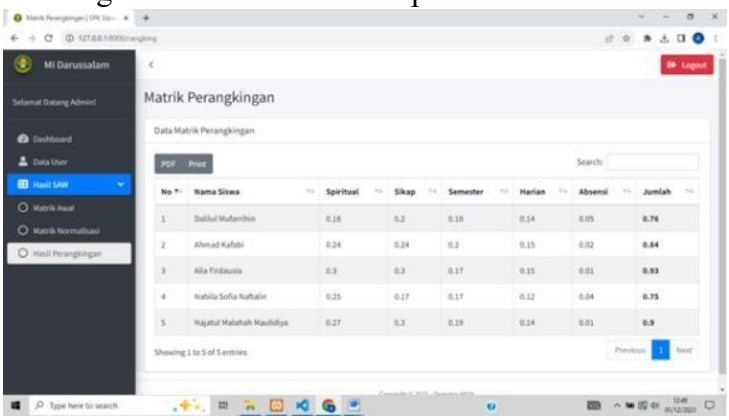

Figure 11. Ranking Results

Conclusions

Based on discussion from previous chapters can be withdrawn some conclusions as follows:

a) This research produces results decision support system determination of exemplary students in Madrasah Ibtidaiyah Darussalam.
b) There are 2 access roles on this research, namely admin and user. Admin can manage overall data, while the user can only fill in the value data and view final score results.
c) Application of the SAW method used to process data student grades so it will be generate rankings from processing the data.

In this research, the researcher realized that there were still many shortcomings in this system, therefore further development was needed, such as adding new features and adding different methods so that it could be compared with this research method. Hopefully this thesis can be useful for readers and become a reference, especially for our juniors in the future.

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