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Decision Support System for Teacher Performance Assessment at State Vocational High School 7 Kupang City Using the MOORA Method

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Abstract

SMK Negeri 7 Kupang City is an educational institution that has four leading departments and aims to improve the quality of education and produce competent graduates. One important aspect that influences the success of education is teacher performance. However, teacher performance assessments in this school are still carried out conventionally, which rely on manual recording and data analysis that are prone to human error. This process takes a long time, high accuracy, and has the potential to result in unfairness in the assessment. Therefore, this study aims to develop a decision support system for teacher performance assessment using the MOORA Method (Multi-Objective Optimization on the basis of Ratio Analysis). The results of the study are a website-based support system that can simplify the process of teacher performance assessment, reduce errors in calculations, and provide a stronger basis for principals in making decisions related to human resource development.

Keywords: *MOORA Method, Performance Assessment, Decision Support System, Teacher Performance, Website.*

1. Introduction

SMK Negeri 7 Kupang City is one of the educational institutions located on Jalan Bougenville RT 11 RW 04, Penkase Oeleta Village, Alak District, Kupang City, East Nusa Tenggara. With 27 teaching staff (teachers), this school has four excellent majors, namely Commercial Ship Engineering (TKN), Commercial Ship Nautical (NKN), Computer and Network Engineering (TKJ), and Nautical Fishing Vessel (NKPI). As an educational institution, SMK Negeri 7 Kupang City is committed to improving the quality of education and producing competent graduates in their respective fields.

A decision support system is an information system used to support decision-making in an organization or business. The benefits of a decision support system include providing mechanisms for making more informed decisions, timely resolutions, and greater efficiency in dealing with issues that are balanced with organizational and social approaches. Due to the easy handling, collection and analysis of data, it allows the end user to make more informed decisions faster. Decision support systems (DSS) encourage faster and smarter decisions based on objective data, rather than on subjective criteria or personal instincts. They offer decision-makers insights and proposed actions based on the problem diagnosis, previous actions taken, the results of those actions and other relevant contextual info (Andoyo, et.al, 2021).

The Multi-Objective Optimization on the Basis of Ratio Analysis (MOORA) method is one of the most effective multicriteria decision-making techniques in solving these problems. MOORA is used to optimize more than one goal or criterion simultaneously. This method relies on the analysis of the ratio between alternatives and criteria to produce optimal decisions. The MOORA method works by optimizing based on the ratio between the performance values of the alternatives to each criterion. In this process, each existing alternative will be assessed by comparing the ratio between the resulting values to the reference or standard values of each criterion used. The results of this analysis will provide a rating or score for each alternative that allows decision-makers to choose the best alternative (Arista, 2024).

Teacher performance is one of the key aspects that greatly affects the effectiveness of the learning process in the classroom and the achievement of student achievement. Teachers who have good performance can create a conducive learning atmosphere, motivate students, and improve academic achievement. Therefore, teacher performance assessment is an important activity that aims to ensure the quality of teaching staff in schools. The process of assessing teacher performance at SMK Negeri 7 Kupang City is still carried out conventionally. This assessment process is carried out by school operators by recording teacher performance based on aspects of teaching ability, mastery of materials, discipline, cooperation and teaching time. The performance data is then analyzed manually to determine the results of each teacher's performance assessment so that this process can be time-consuming and also requires high accuracy because each data must be calculated one by one based on the criteria that have been set. As a result, this process is susceptible to human error and has the potential to cause uncertainty and injustice. This can be detrimental to teachers who should be getting performance appraisals

that match their contributions. Therefore, a system that is able to assess teacher performance in an objective and structured manner is needed so that the results can be used as a reference in decision-making that supports the development of human resources in the school environment.

Research conducted by Enoch, et.al (2022) with the title "Decision Support System for Teacher Performance Assessment of Vocational Vocational School Using the MOORA Method" which has produced a decision support system using the Multi-Objective Method of Optimization by Ratio Analysis (MOORA) to facilitate the process of assessing teacher performance objectively at SMK Cakra Pratama to overcome problems in the decision-making process that cannot be done by the leadership agencies to determine the best teachers because there are many teachers who have almost the same criteria so that with the existence of a decision-making system, it is expected to help in making the best teacher decision-making. The research was conducted by Siregar, et.al (2022) with the title Decision Support System for Determining Archival Units Using the MOORA Method. The research has produced a decision support system program by applying the MOORA method in determining the best archival units that are feasible or unfeasible. The problem found by the researcher is that many people have difficulty finding the archival services they need. Therefore, with the resulting system, it is hoped that it can help in making decisions related to the best archive service unit. The research was also conducted by Faritsi, at.al (2022) with the title "Decision Support System to Determine Teaching Staff Using the MOORA Method" The problem found is that AITC still selects prospective teaching staff who apply manually, which requires more energy and time. The result obtained is a MOORA (Multi-Objective Optimization On The Basis Of Ratio Analysis) Method Implementation System program to determine the teaching staff at the Andalusia InFormation Technology Center.

Based on the description above, the researcher took a study entitled Teacher Performance Assessment Decision Support System Using the MOORA (Multi-Objective Optimization on the basis of Ratio Analysis) Method to assist school operators in managing and processing teacher performance data and also assisting school principals in making decisions based on teacher performance results.

2. Literature Review

Research conducted by Enoch, et.al (2022) entitled "Decision Support System for Teacher Performance Assessment at Cakra Pratama Vocational School Using the MOORA Method" which has produced a decision support system using the Multi-Objective Optimization by Ratio Analysis (MOORA) Method to facilitate the process of objectively assessing teacher performance at Cakra Pratama Vocational School to overcome problems related to the decision-making process that cannot be carried out by the head of the agency to determine the best teacher due to the large number of teachers who have almost the same criteria.
Siregar, et.al (2022) with the title Decision Support System for Determining Archival Units Using the MOORA Method. The study has produced a decision support system program by applying the MOORA method in determining the best archival unit that is feasible or not feasible. The problem found by the researcher is that many people have difficulty finding the archive services they need. The purpose of the study is to build a decision support system to assist decision making by using certain data and models to solve several unstructured problems.
Faritsi, et.al (2022) with the title "Decision Support System for Determining Teaching Staff Using the MOORA Method" The problem found is that AITC still selects prospective teaching staff who apply manually so that it requires more energy and time. The purpose of the study is to build a decision support system according to the established criteria to assist decision making in semi-structured and unstructured situations. The results obtained are a MOORA Method Implementation System program (Multi-Objective Optimization On The Basis Of Ratio Analysis) to Determine Teaching Staff at the Andalusia Information Technology Center.
Conclusions from these three studies show the success of implementing the MOORA (Multi-Objective Optimization by Ratio Analysis) method in decision support systems to solve complex decision-making problems in various fields. Enoch et al. (2022) developed a system that facilitates objective assessment of teacher performance at SMK Cakra Pratama, overcoming the difficulty of determining the best teacher from many candidates with similar criteria. Siregar et al. (2022) created a system to determine the best archive unit that is worthy or not worthy, helping the community find the archive services they need with a systematic approach. Meanwhile, Faritsi et al. (2022) produced a teacher selection system at the Andalusia Information Technology Center (AITC), accelerating the selection process that was previously manual and time-consuming. Although different in application domains—education, archive management, and human resource selection—these three studies confirm that the MOORA method is effective in increasing the efficiency, accuracy, and objectivity of decision-making, making it a versatile solution for various data-driven contexts.

3. Research Methodology

This section contains the methods used in writing the thesis.

3.1. System Analysis

At this stage, calculations are carried out using the MOORA method which is in the form of criteria and weights in order to make it easier to obtain ranking results.

3.2. Use case diagram

The use case diagram model in the research conducted includes 3 actors with three use case diagrams, namely the admin use case diagram, the principal use case diagram and the teacher use case diagram.
a. Admin use case diagram
In the admin use case diagram, it is explained that the admin is an actor who is tasked with managing admin data, managing principal data, managing teacher data, viewing teacher assessment data, managing alternative data, managing criteria data, managing calculation data and printing the final results.

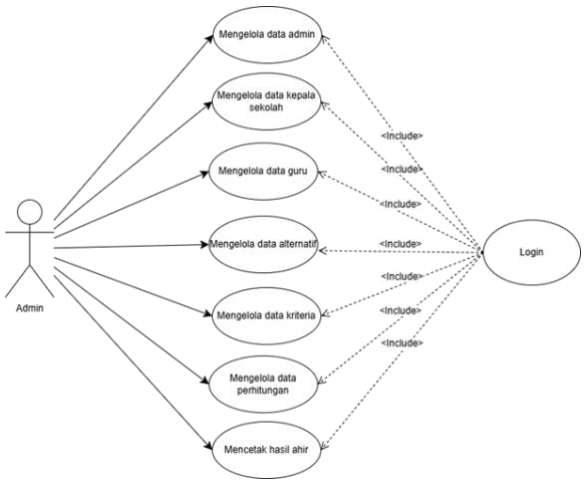

Fig. 1: Admin use case diagram

b. Principal use case diagram
In the principal use case diagram, it is explained that the principal is an actor who is responsible for managing principal data, managing teacher data and managing teacher assessment data.

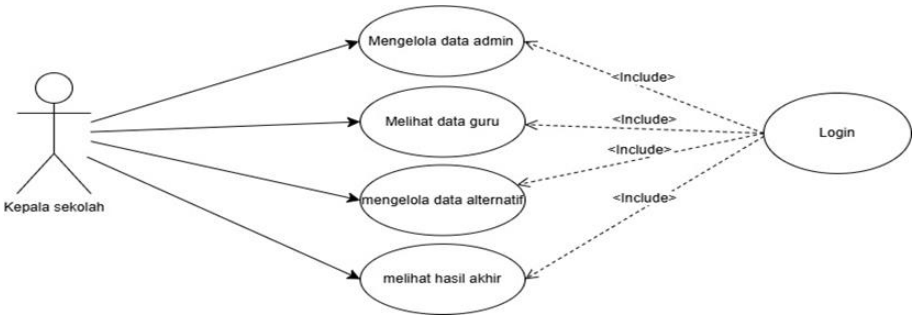

Fig. 2: Principal use case diagram

c. Teacher use case diagram
In the teacher use case diagram, it is explained that the teacher is the actor who is responsible for managing teacher data and viewing teacher assessment results.

Fig. 3: Teacher use case diagram

4. Results and Discussion

System implementation is the stage where the design of a decision support system for teacher performance assessment using the MOORA (Multi-Objective Optimization on the Basis of Ratio Analysis) method is realized in the form of an application that can be run and tested. At this stage, all previously designed system components, such as teacher data input, assessment criteria, calculation process using the MOORA method, and display of final results, are integrated into a functional system. The appearance of the implementation results aims to prove that the system has run according to the designed specifications and is able to provide objective and systematic teacher performance assessments.

1. Home page display
This page is the initial display of the system designed to assist the decision-making process in assessing teacher performance. This system was created to improve objectivity and efficiency in evaluating educators in SMK Negeri 7 Kota Kupang.

Fig. 4: Home page view

2. Admin login page display

The admin login page is used to access the system by the admin by entering a username and password. After the data is filled in, if the username and password addresses entered match the registered data, the system will provide access.

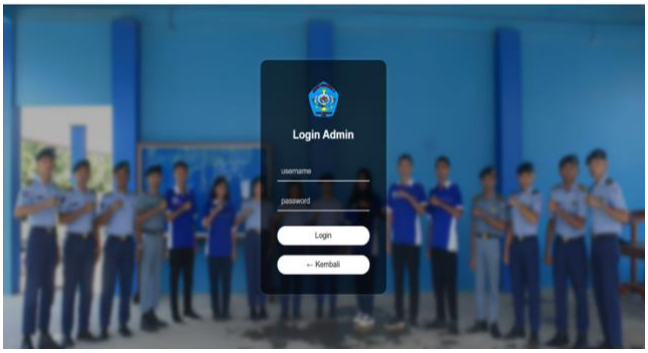

Fig. 5: Admin login page view

3. Admin dashboard page display

The admin dashboard page is the main display after the user successfully logs into the system. On this page, a welcome message is displayed to the user along with brief information that this is the admin dashboard page. On the left side there is a navigation menu that contains various system features, such as admin data, teachers, principals, criteria, alternatives, normalization, weighted, results, and a logout button.

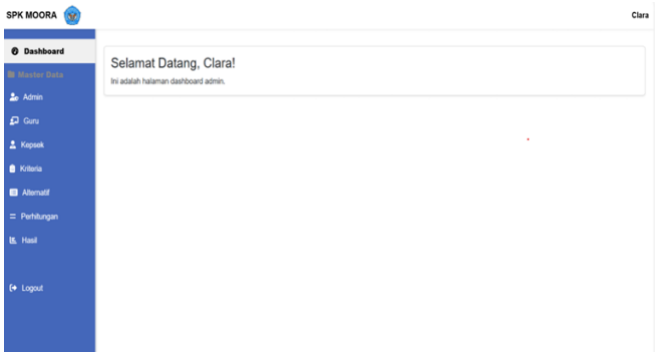

Fig. 6: Admin dashboard page view

4. Admin data management page display

The admin data management page displays a list of admins registered in the system, which includes information such as number, name, username and password. On the right side there is an action column that provides buttons to edit and delete admin data. In addition, there is an "Add Admin" button in the upper right corner to add new admin data.

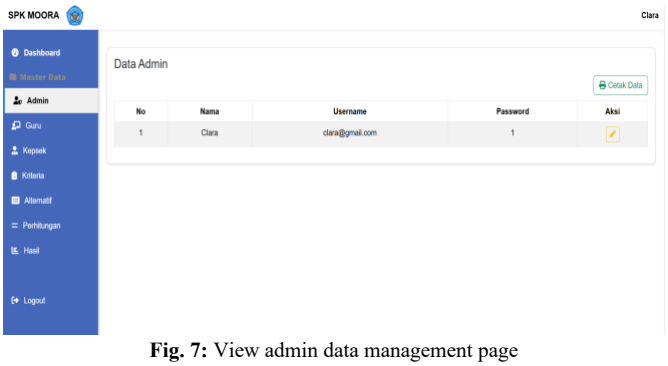

Fig. 7: View admin data management page

5. Admin data change form display

The admin data change form display is used to update registered admin information, such as name, username and password. This form is equipped with a "Save" button to save changes and a "Close" button to cancel or close the form without saving.

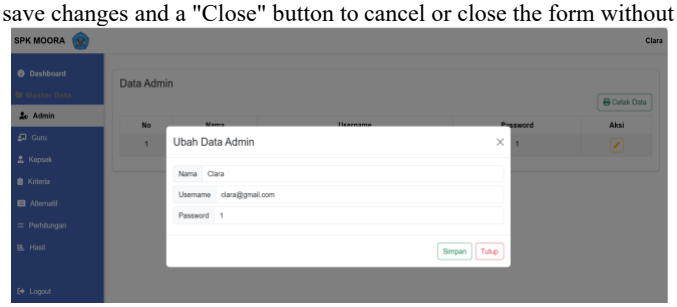

Fig. 8: View admin data change form

6. Teacher data management page display

The teacher data management page display presents a list of teacher information including number, name, rank/group, username and password. On this page there is also a button to add new teacher data as well as action buttons in the form of edit and delete for each data displayed.

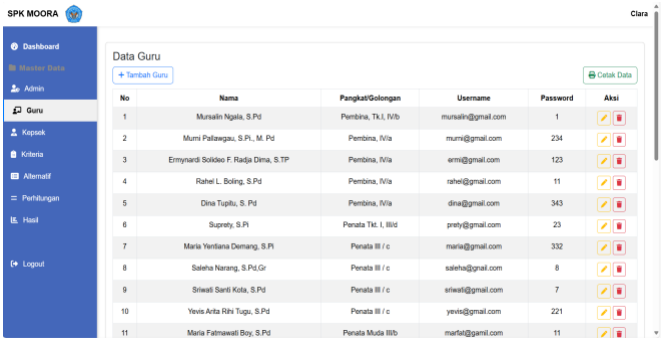

Fig. 9: View the teacher data management page

7. Teacher data change form display

The teacher data change form display on the admin page displays fields for editing the teacher's name, rank/group, username, and password. This form is equipped with a "Save" button to save changes and a "Close" button to cancel or close the form without saving.

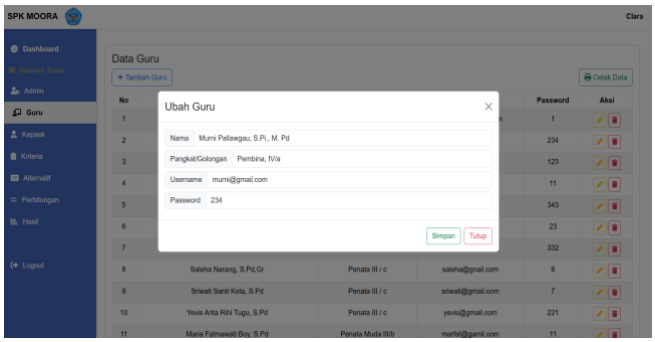

Fig. 10: View teacher data change form

8. Principal data management page display

The principal data management page accessed by the admin displays a list of principals in the form of a table containing columns for number, name, username, password and actions to edit data.

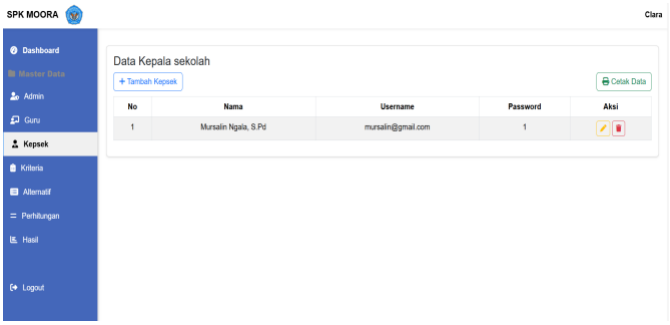

Fig. 11: View the principal data management page

9. Display of the form for changing principal data

This form display contains input columns for changing the name, username and password and is equipped with a “Save” button to save the changes and “Close” to cancel the process.

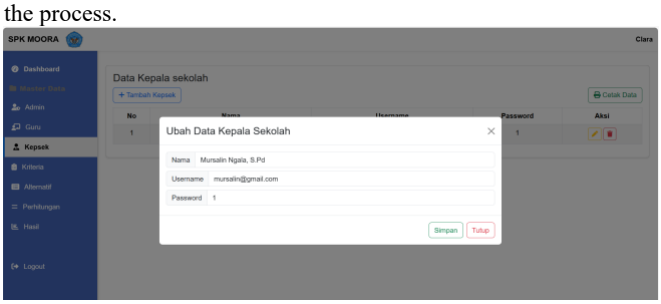

Fig. 12: View the form for changing principal data

10. Criteria data management page display

The criteria data management display in the SPK MOORA application displays a list of criteria used in the assessment process. Each criterion is displayed in the form of a table containing information such as criteria code, criteria name, type and weight. There are also action buttons to edit and delete criteria data. In addition, there is an “Add Criteria” button to add new criteria.

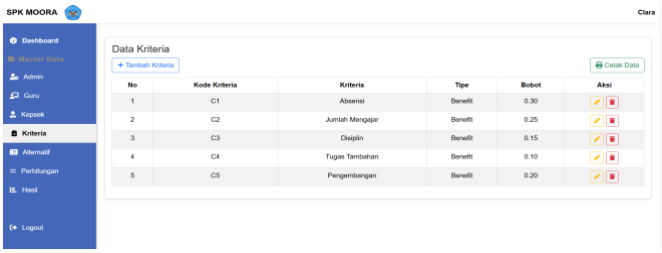

Fig. 13: View the manage criteria data page

11. Change criteria data form display

The change criteria data form display is used to edit criteria data in the system. This form contains criteria code, criteria, type, and weight. The criteria code is fixed, while other fields can be changed. There is a “Save” button to save changes and a “Close” button to cancel.

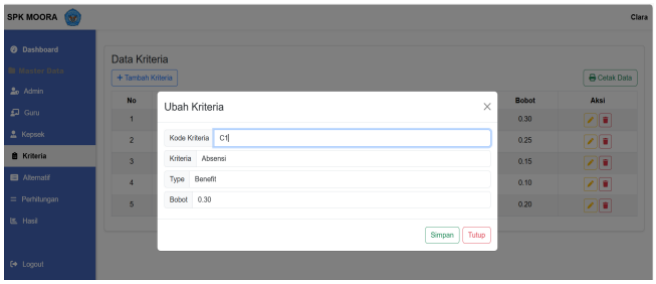

Fig. 14: View the change criteria data form

12. View the alternative data management page

The alternative data management page displays a list of alternatives used in the decision-making process. Each alternative is displayed in a table containing the code, name and value of the relevant criteria. Users can add, edit or delete alternative data through the available action buttons. This display facilitates data management systematically and efficiently.

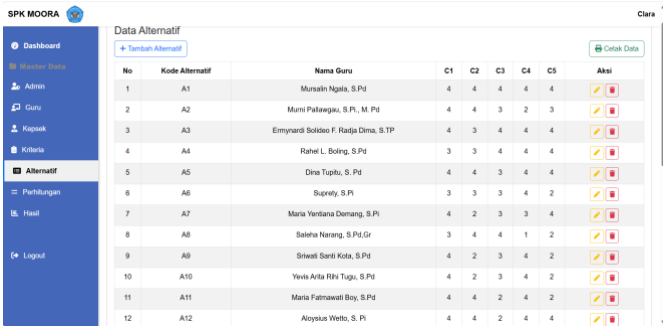

Fig. 15: View alternative data management page

13. Alternative data change form display

The alternative data change form display is used to edit registered alternative information. This form contains fields such as alternative code, alternative name and value for each criterion. Users can update the data, then save it via the "Save" button or cancel with the "Close" button.

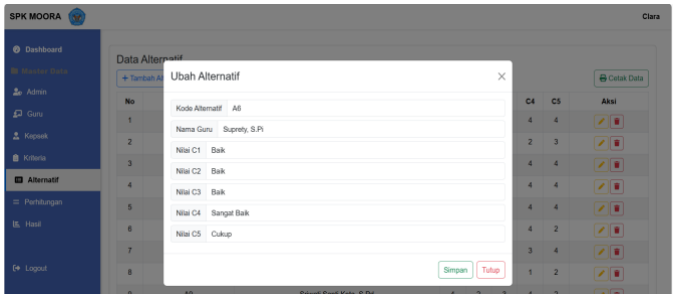

Fig. 16: View alternative data change form

14. Normalization data page display

This display displays the results of the normalization of the value of each alternative based on each criterion before being multiplied by the weight. This table contains alternative codes, teacher names and value columns for each criterion. Each value in the table is the result of a calculation from the normalization process which aims to equalize the scale between criteria so that they can be compared fairly. This display is one of the important initial stages in the MOORA method before continuing to weighting and ranking.

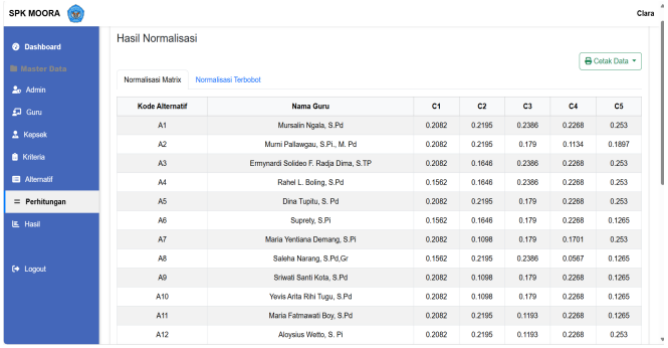

Fig. 17: View the normalization data management page

15. Weighted data page display

This page displays the results of the normalization calculation that has been multiplied by the weight of each criterion. These values reflect the contribution of each criterion to the alternative after the normalization and weighting process. This display is an important stage in the MOORA method to produce an objective final ranking based on the specified criteria.

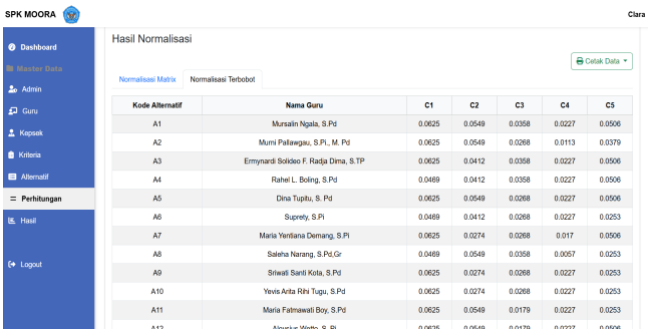

Fig. 18: View the weighted data management page

16. Display of the results data page

The results data page displays the final teacher ranking based on the results of the MOORA method calculation. The results table contains columns of alternative codes, teacher names, grades, and rankings. The data is displayed in order from highest to lowest values, indicating the position of each teacher in the assessment.

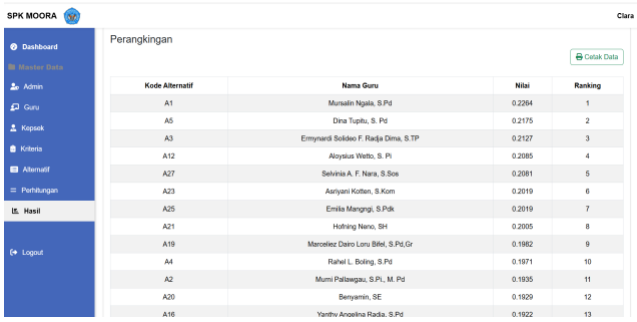

Fig. 19: View the manage results data page

17. Principal login page display

The principal login page is used to access the system carried out by the principal by entering a username and password. After the data is filled in, if the username and password addresses entered match the registered data, the system will provide access.

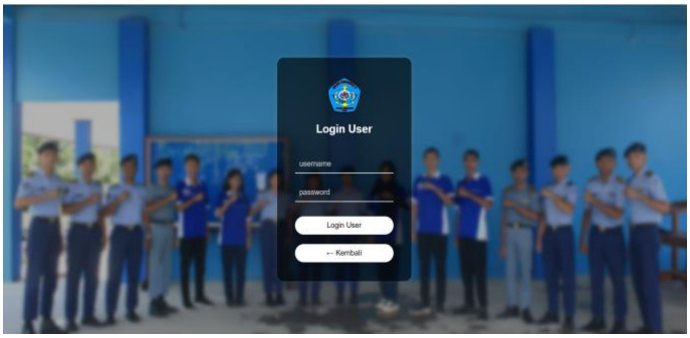

Fig. 20: Principal login page view

18. Principal dashboard page display

The principal dashboard page is the main display after the user successfully logs into the system. On this page, a welcome message is displayed to the user along with brief information that this is the principal dashboard page. On the left side there is a navigation menu that contains various system features, such as teacher data, principals, criteria, alternatives, normalization, weighted, results and a logout button.

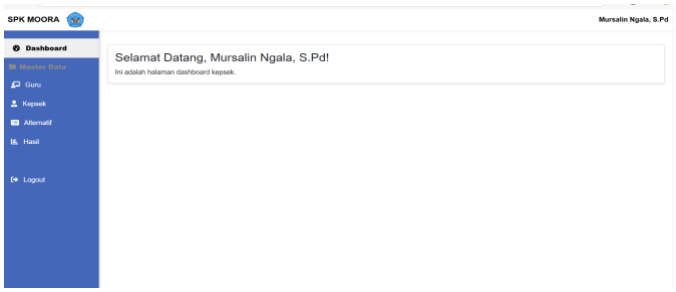

Fig. 21: Principal dashboard page view

19. Principal data management page display

The principal data management page displays the principal data registered in the system, which includes information such as number, name, username and password. On the right side there is an action column that provides buttons for editing the principal data.

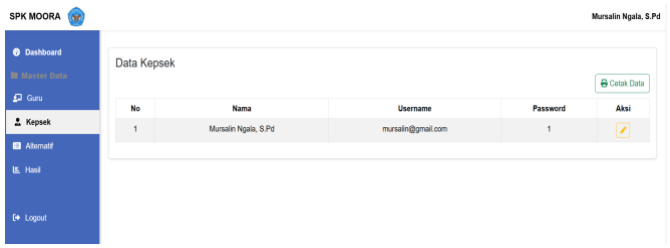

Fig. 22: View the principal data management page

20. Principal data change form display

The principal data change form display on the principal page displays fields for editing name, username, and password. This form is equipped with a “Save” button to save changes and a “Close” button to cancel or close the form without saving.

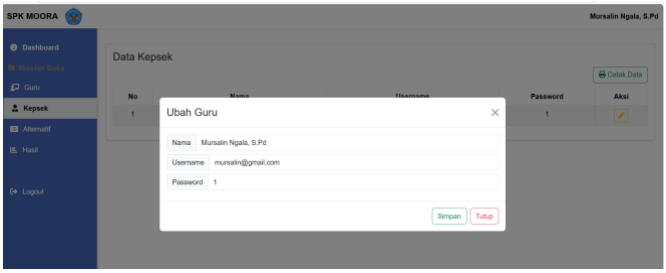

Fig. 23: View the form for changing principal data

21. Teacher login page display

The teacher login page is used to access the system carried out by the teacher by entering a username and password. After the data is filled in, if the username and password addresses entered match the registered data, the system will provide access.

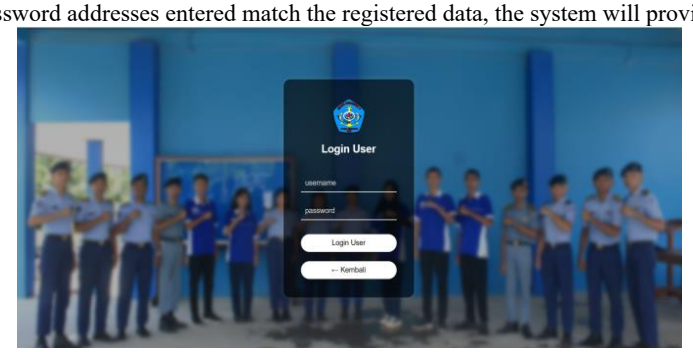

Fig. 24: Teacher login page view

22. Teacher dashboard page display

The teacher dashboard page is the main display after the user has successfully logged in to the system. On this page, a welcome message is displayed to the user along with brief information that this is the teacher dashboard page. On the left side there is a navigation menu that contains various system features, such as teacher data, results and a logout button.

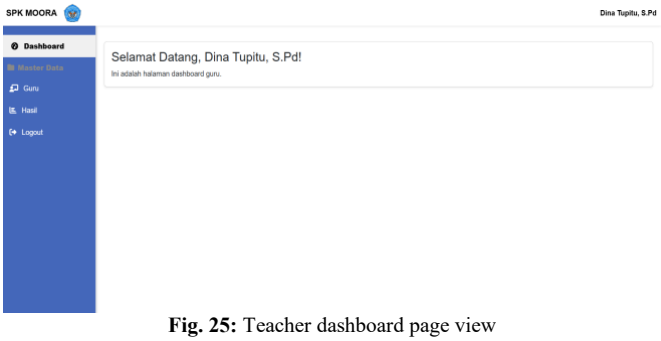

Fig. 25: Teacher dashboard page view

23. View the teacher data management page

The teacher data management page displays teacher data registered in the system, which includes information such as number, name, rank/group, username and password. On the right side there is an action column that provides buttons for editing teacher data.

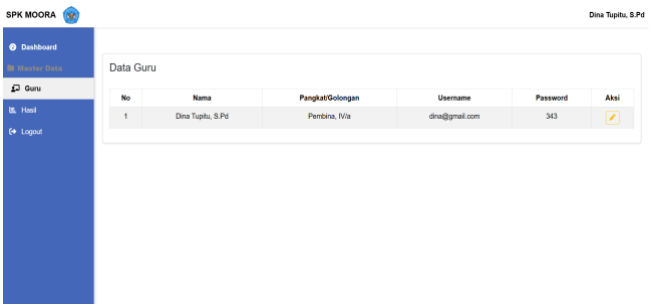

Fig. 26: View the teacher data management page

24. Teacher data change form display

The teacher data change form display on the teacher page displays fields for editing the teacher's name, rank/group, username, and password. This form is equipped with a "Save" button to save changes and a "Close" button to cancel or close the form without saving.

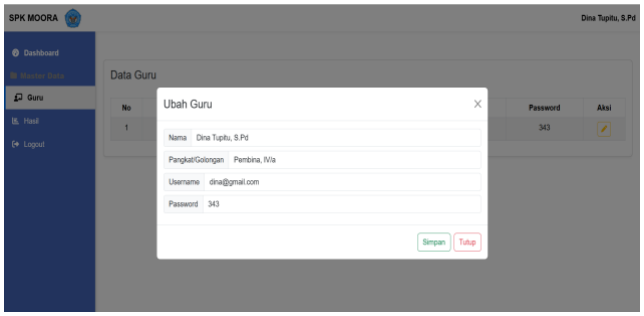

Fig. 27: View teacher data change form

25. Display of the results data page

The results data page displays the final teacher ranking based on the results of the MOORA method calculation. The results table contains a ranking column, alternative code, teacher name and value. The data is displayed in order from the highest to the lowest value which shows the position of each teacher in the assessment.

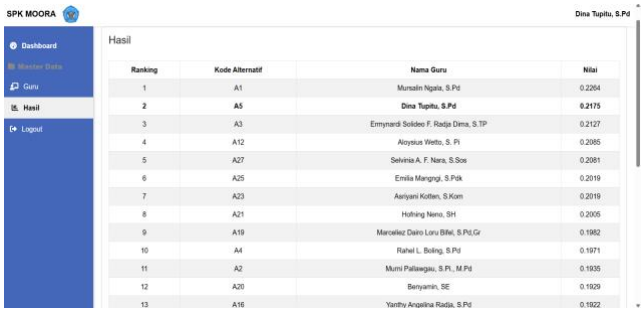

Fig. 28: View result data page

26. Output of MOORA result report

The output of the MOORA calculation result report is displayed in a table format containing alternative codes, teacher names, grades and rankings. This report is arranged sequentially from highest to lowest, reflecting the final results of the evaluation process. The report display is prepared to be printed or saved in PDF format as official documentation of the assessment results that can be used in decision making.

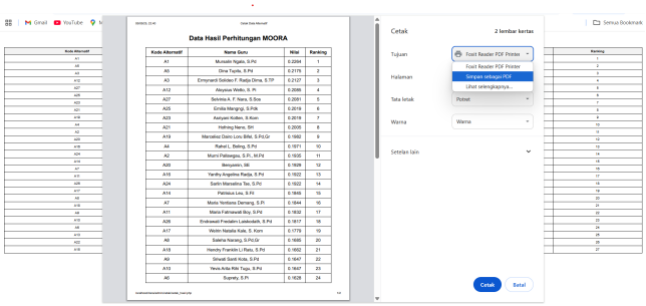

Fig. 29: MOORA result report output

5. Conclusion

Decision Support System (DSS) using the MOORA method on SIPEKSTU is able to provide objective, systematic and accurate assessment results in determining teacher performance assessments based on predetermined criteria. The assessment is carried out objectively through a normalization and weighting process, resulting in precise and accurate results. The MOORA method presents the final results in the form of a ranking that facilitates decision making and each teacher data is processed systematically to ensure the accuracy of the results. With this, this DSS is able to become a tool in evaluating teacher performance. The entire efficient process makes the MOORA DSS the right solution in supporting precise decision making.

Acknowledgement

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