

The Decision Support System of Grade Promotion For The Students At Islamic Boarding School Foundation Tahfidzul Qur'an Mathlul Huda Using Analytic Hierarchy Process Method

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Abstract-Decision support system is the system which is very helpful for decision maker through data processing and decision model in solving a problem which is semi-structured or unstructured. In determining whether the student will graduate or stay in the class, it is necessary to pay attention to the thing which greatly affects the student activity. In this research, there are five assessment criteria used, namely Memorization, Semester Value, Morals, Imlak and Reading the Alkitab. There are ten alternatives used, and in this research the range of values used for graduating students is > 29.99 , so that the results obtained by the 9th student alternative and the 10th student alternative stay in the class because the value is < 29.99 . With this objective assessment, hopefully it can help the teachers, ustadz and kiyai in assessing students who have extraordinary potential, so that students can find out their abilities and potential both in the academic and non-academic fields.

Keywords: Decision Support System, AHP, Santri/student, Islamic Boarding School

I. INTRODUCTION

The education of islamic boarding school aims to develop the potential abilities of children (students) to become human beings that are faithful, godly, healthy, independent and always prioritize the akhlakul karimah and become obedient citizens that are able to practice the 1945 Constitution and Pancasila in everyday life. Students are expected to not only learn the knowledge in their field but also require to have soft skills in order to become successful and independent students and their abilities can be beneficial to society. This ability is

obtained not only from formal education but also from the education provided by the boarding school as extra-curricular. Development in the era of regional autonomy is a strategic step in an effort to realize a national development goal, especially the human resource sector in the field of education. Moreover, in the condition of the nation currently experiencing a moral crisis, islamic boarding school as educational institution shaping and developing the moral values is the pioneer and inspirer of the nation's moral generator. Development does not become empty but more valuable and meaningful. Along with the noble desire to educate and develop society, with its independence, boarding school continually makes the efforts to develop and strengthen "akhlakul karimah".[1]

However, not all students are willing and able to pursue all formal and non-formal learning. There are still a lot of students that have potential in academics but do not really take the advantage of their abilities to continue to be honed in the extra-curricular at the islamic boarding school. On the other hand, students that are active in the activity of honing skills sometimes have less value in academics. Therefore, Islamic boarding school needs further review or identification in finding ways how to enable students to achieve both in the academic and non-academic fields and every student getting both can get the appropriate award. In determining students that excel in graduating or staying in class, it is necessary to pay attention to the things greatly affecting the activities of these students. If this can be achieved, it is necessary to have an assessment with a model that can support all of them. The selection carried out is not only for the formality but in the future this selection will

provide positive values for students both in the academic and non-academic fields.

According to R Tamin, a very important decision-making in school is decision-making about graduating using the old method which will result in slow decision-making. This is due to a fundamental problem, namely inaccurate decision-making so there must be an effective decision-making system [2]. Meanwhile, according to Narti in decision making using the AHP method to determine students that are up the Ahp is a method that is able to break down something complex and unstructured into several components in an hierarchical arrangement by providing subjective values about the importance of all variables [3].

Based on the above problems, the researchers use a decision support system using the AHP method to determine which students are graduating or staying in class. A decision support system is an information system providing information, modeling and manipulation of system data that can be used to help make decisions in semistructural and structural situations where no one knows exactly how decisions are made. Analytical Hierarchy Process (AHP) is a multi-criteria decision-making method based on the concept of outranking by using paired comparisons of alternatives based on appropriate criteria. This method is used because it is able to solve problems in graduating the students of the Tahfidzul Qur'an Mathlul Huda of Islamic Boarding School Foundation.

It is hoped that this system can help the teachers, ustadz and kiyai in assessing and determining students to go to class or stay in class with an objective assessment so that they can quickly determine students having extraordinary potential and students can find out their abilities and potential both in academic and non-academic fields. Based on the above background, it can be concluded that the problem to be solved is how a decision support system using the AHP method can make it easier to assess whether a student is in the class or not based on predetermined criteria by using a program that can help solve the problem easier and more effective.

The research objective that the researchers hope is to be able to help teachers, ustadz, kiyai and islamic boarding school in determining the students objectively graduating and staying in class by paying attention to the criteria set and can help the assessment more maximally.

The benefits of the research are to make it easier for all elements of the boarding school to provide results to students and provide more insight into how the assessments, results, criteria, and

achievements of students can be superior in their respective fields.

II. LITERATURE REVIEW

2.1 Decision Support System

Support system is interactive decision information system providing the information, data modelling and manipulation. Decision Support System is designed to solve the problems of decision makers in all fields but not to replace decisions and users' decision [2]. Decision support system is interactive computer-based system helping decision makers to use data and decision models to solve unstructured problems [3].

There are 4 stages that must be considered in decision making;

1. Search
This stage is explaining the problem and identifying the required information related to the problems faced regarding the decisions taken.
2. Design
This stage is the design in researching or formulating problem-solving alternatives.
3. Election
This stage determines which stage options can be adjusted.
4. Implementation
This stage is the implementation stage of the decision stage we take.

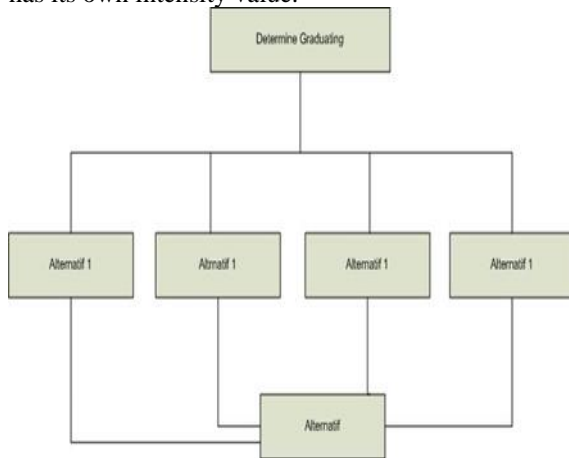
2.2 The Method of Analytic Hierarchy Process

AHP is a method of solving complex problems in an unstructured state into regular component parts or variables into a hierarchical form then assigns a numerical value to each variable to provide an objective value and an assessment for which variable is the top priority in determining the results in the assessment of the situation [4]. According to Dahriansah, AHP is a decision support method developed by Thomas L. Saaty where this decision support model will explain a complex multi-factor or multi-criteria problem into a hierarchical one. [5]

The method of analytic hierarchy process is a decision-making model that can overcome the human frame of mind. This method was first developed by Tomas L Saaty, a maetamita expert from Pittsbrug University in the early 1970s. The AHP method uses human perceptions considered by experts as the main input. Expert means that the person really understands the problem that you want to solve or has an interest in the problem. The steps for resolving using AHP are:

Creating a hierarchical structure, compiling a hierarchy of the problems faced, determining

criteria according to the problems faced then arranged into a hierarchical structure. Each criterion has its own intensity value.



Source : Dita Monita, 2013 [4]

Figure 1. Hierarchy of Alternative Decisions

The alternative criteria are put together with a pairwise comparison according to Saaty, to share problems. Scale 1 and 9 are the best scales for expressing opinions. Values and definitions of qualitative opinion from Saaty comparison scale can be measured using the analysis table as in the following table.

Table 1. Scale of comparison values

Level of Importance	Definition	Information
1	Just as important	Both criteria are of equal importance
3	Moderate is more important	The first criterion has a value slightly higher than the others
5	More important	The first criterion has a higher value than the second criterion
7	Very important	The first criterion has a very important value than the other criteria
9	More absolute	The first criterion is absolutely important than the other criteria
2,4,6,8,		What is given if there is an assessment between the two closest judgments
The opposite		If the first activity gets one number compared to 'j'

activity then j has the opposite value when compared to i

Source : Dita Monita, 2013 [4]

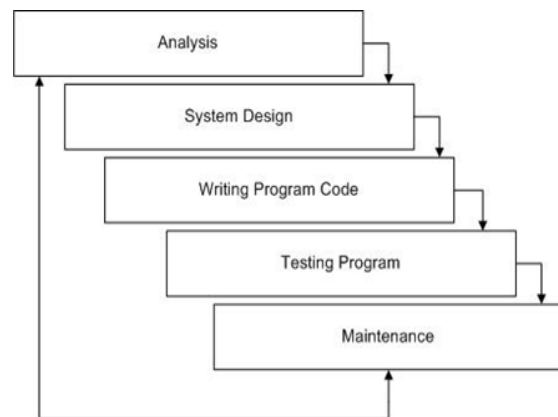
Table 2. Random Index

Matrix size	IR Value
1,2	0,00
3	0,58
4	0,90
5	1,12
6	1,24
7	1,32
8	1,41
9	1,45
10	1,49

Source : P.A Pratomo, 2018 [4]

2.3. The method of developing the waterfall system

The waterfall model is sometimes called the classic life cycle where it implies a systematic and sequential approach to software development which will begin with specifications on user needs and continue through the planning, modeling, construction and delivery stages of the software system to the customer or user ending with continuous support for software that can be seen in Figure 2. [6]



Source : Presman, 2012 [4]

Figure 2. Waterfall design model

1. Analysis
This defines and understands the needs of the software in order to be able to know the nature of the program to be made such as the required function performance (capability) and the required interface. This stage must be documented and informed to system users.
2. System design
In this stage, we design the management workflow and the program needed for

information system development and provide a very clear picture of how the system is formed.

3. Writing program code
In this process, the writers make program code using AHP and MySQL Database program.
4. Testing the program in this stage tests the system that is made both from the start to the results.

Table 3. Program Testing Results

No	Tes The System	Running	Error	Information
1	Sign in	✓		Success
2	Main Menu	✓		Success
3	Student data	✓		Success
4	Input The Value	✓		Success
5	Print The Result	✓		Success

5. Maintenance
In this stage, the system created requires routine maintenance within 1 month.

2.4. Definition of Islamic Boarding Schools

The term "pesantren" comes from the word pe - "santri" - an, where "santri" means pupil in Javanese. The term "pondok" comes from Arabic "funduq" ("فندق") which means dormitory. Particularly in Aceh, pesantren are also called "dayah". According to Van Bruinessen's report, the oldest islamic boarding school in Java is the Tegalsari pesantren founded in 1742, here young people from the north coast study Islam. But the results of the Dutch 1819 survey, in Van Bruinessen, found institutions similar to pesantren in Priangan, Pekalongan, Rembang, Kedu, Madiun, and Surabaya (Martin, 1995). In another report, Soebardi explained that the oldest pesantren was the Giri pesantren north of Surabaya, East Java founded by the Wali Sunan Giri in the 17th century directly led by the descendants of the Prophet-WaliIstilah. [7]

III. RESEARCH METHOD

3.1 Data Collection

The methods of data collection used are as follows;

- a. Interview
In collecting this data the researchers conducted direct interviews with those managing the YPPTQMH Islamic boarding

school that are in charge of both academics and non-academics.

- b. Observation
In this technique the researchers observe the object directly in the YPPTQMH Boarding School to be studied.

3.2 Design Model

This design model uses the AHP (Analytic Hieracy Process) method by requiring several criteria to determine a decision in class advancement such as: memorization, semester value, morals, imlak (writing) and reading kitab.

The following are descriptions of the values that will be used as criteria;

1. Memorization
 - a. SP class (beginner) for students who are in the beginner class they are required to memorize the book specified in the curriculum, namely 1 book for 1 semester.
 - b. Jurumiyah class for students who are at this level they are obliged to memorize the books determined, namely one book with jurumiyah books.
 - c. Imrithi class for students at this class level, they are required to memorize 254 verses for 1 semester.
 - d. Alfiyah for students at this level they are required to memorize 500 verses in 1 semester.
2. Semester Grades
This assessment is taken when the students have carried out the final semester determined by the semester committee.
3. Morals
Assessment using morals is taken in the daily life of students both ethically to teachers, friends and to kiyai.
4. Imlak (writing)
Assessment in terms of writing is determined by the students' ability to write Arabic in accordance with predetermined rules.
5. Reading the kitab
The assessment in this case is determined by the ability of the students to read predetermined Kitab such as Fiqh (Fasolatan, kasyafatussaja and fathul qorib).

3.3 Data Analysis

The method of data analysis used in this research is descriptive analysis method. This analysis is that the data obtained in the form of words or schemes and described so that it can provide realistic clarity.

3.3.1. Determination of criteria

There are 5 criteria used in this grade promotion as in the table below:

Table 4. Criteria Data

Code	Name
C01	Memorization
C02	Semester Grades
C03	Morals
C04	Imlak (Writing)
C05	Reading the Kitab

Each predefined criterion will be weighted based on a fuzzy number. There are five numbers used in weighting, namely VP = Very Poor, L = Less, E = Enough, G = Good and VG = Very Good.

After the data is entered (criteria data and data on graduating students), a representation is carried out into a hierarchical structure. The problem that will be formulated in building a hierarchical structure is the goal as the final decision. Goal becomes a very important decision in a case. The goal that must be achieved in this final project is the students to move up the grade. As for the identification of the criteria for selecting the graduating students, the initials can be made into the C symbol (criteria). The alternative identification stage is to identify the graduating students that are the object of assessment and the goal of achieving students. In this study, the researchers take 10 alternative samples.

3.3.2. Criteria Data

1. Memorization

Table 5. Memorization Data

No	Memorization	Score
1	Very good	9
2	Good	7

Table 5 describes the weighting of the criteria C01 (Memorization), which has a maximum value weight of 9 (nine) and a minimum value weight of 7 (seven).

2. Semester Grades

Table 6. Semester Result Data

No	Semester Grades	Score
1	Very good	8
2	Good	5

Table 6 describes the weighting of the C02 criteria (semester scores), which has a maximum value weight of 8 (eight) and a minimum value weight of 5 (five).

3. Morals

Table 7. Data of Moral Appraisers

No	Morals	Score
1	Very good	7
2	Good	6

Table 7 describes the weighting of the C03 criteria (morals), which has a maximum value weight of 7 (seven) and a minimum value weight of 6 (six).

IV. Imlak (write)

Table 8. Imlak assessment data

No	Imlak	Score
1	Very good	5
2	Good	4

Table 8 describes the weighting of the criteria C04 (imlak), which has a maximum value weight of 5 (five) and a minimum value weight of 4 (four).

V. Reading the Kitab

Table 9. Assessment Data of Reading the Kitab

No	Reading the Kitab	Score
1	Very good	8
2	Good	7

Table 9 describes the weight of the C05 criterion (reading the kitab), which has a maximum value weight of 8 (eight) and a minimum value weight of 7 (seven).

3.3.3. Alternative Data

Table 10. Alternative Data

Code	Name
A1	Ani Lutfiani
A2	Latifatun Nuri
A3	Nina Anita
A4	Handayani
A5	Nabila Fitri
A6	Mawar
A7	Nur Putri
A8	Yuni
A9	Kris Ardiska
A10	Bela Ning Tias

There are 10 alternative data taken on YPPTQMH students

- A1 = Ani Lutfiani
- A2 = Latifatun Nuri
- A3 = Nina Anita

- A4 = Handayani
- A5 = Nabila Fitri
- A6 = Mawar
- A7 = Nur Putri
- A8 = Yuni
- A9 = Kris Ardiska
- A10 = Bela Ning Tias

The data from the selection results can be seen in the table below:

Table 11. made the normalization of Ci

No	Name	C01	C02	C03	C04	C05
1	A1	6	5	6	9	7
2	A2	7	9	5	6	5
3	A3	9	6	5	6	4
4	A4	8	7	6	5	7
5	A5	9	7	7	4	6
6	A6	7	6	7	5	8
7	A7	9	7	5	7	5
8	A8	7	7	7	4	6
9	A9	8	5	4	5	6
10	A10	9	5	4	3	6

$$\text{Rumus } R_{ij} = \frac{x_{ij}}{\max ij}$$

NORMALIZATION

1. Memorization

$$R_{11} = \frac{9}{\max(9)} = 1$$

$$R_{12} = \frac{7}{\max(9)} = 0,8$$

2. Semester Grades

$$R_{21} = \frac{8}{\max(8)} = 1$$

$$R_{22} = \frac{5}{\max(8)} = 0,7$$

3. Morals

$$R_{31} = \frac{7}{\max(7)} = 1$$

$$R_{32} = \frac{6}{\max(7)} = 0,9$$

4. Imlak (Writing)

$$R_{41} = \frac{5}{\max(5)} = 1$$

$$R_{42} = \frac{4}{\max(5)} = 0,8$$

5. Reading the kitab

$$R_{51} = \frac{8}{\max(8)} = 1$$

$$R_{52} = \frac{7}{\max(8)} = 0,9$$

The result of the normalized performance branch value R_{ij} forms a normalized matrix R

$$R = \begin{matrix} 1 & 1 & 1 & 1 & 1 & 1 \\ 0,8 & 1 & 0,7 & 0,8 & 1 & 0,9 \end{matrix}$$

$$V_i = \sum_{j=1}^n N_j R_{ij}$$

Information:

V_i = The final value of the alternatives

N_j = Weight specified

r_{ij} = Normalization

$$A1 = (6) \times (1) + (5) \times (1) + (6) \times (1) + (9) \times (1) + (7) \times (1) = 33$$

$$A2 = (7) \times (1) + (9) \times (1) + (5) \times (1) + (6) \times (1) + (5) \times (1) = 32$$

$$A3 = (9) \times (1) + (6) \times (1) + (5) \times (1) + (6) \times (1) + (4) \times (1) = 30$$

$$A4 = (8) \times (1) + (7) \times (1) + (6) \times (1) + (5) \times (1) + (7) \times (1) = 33$$

$$A5 = (9) \times (1) + (7) \times (1) + (7) \times (1) + (4) \times (1) + (4) \times (1) = 33$$

$$A6 = (7) \times (1) + (6) \times (1) + (7) \times (1) + (5) \times (1) + (8) \times (1) = 42$$

$$A7 = (9) \times (1) + (7) \times (1) + (5) \times (1) + (7) \times (1) + (5) \times (1) = 33$$

$$A8 = (7) \times (1) + (7) \times (1) + (7) \times (1) + (4) \times (1) + (5) \times (1) = 31$$

$$A9 = (8) \times (1) + (5) \times (1) + (4) \times (1) + (5) \times (1) + (6) \times (1) = 28$$

$$A10 = (9) \times (1) + (5) \times (1) + (4) \times (1) + (3) \times (1) + (6) \times (1) = 27$$

In this study, the range of values used in determining the graduating students is $> 29,99$ so that the 9th and 10th alternative student stays in class because the value is $< 29,99$.

VI. DISCUSSION

4.1 Design

Based on direct field research, the authors can see that the system used in YPPTQMH in making class promotion decisions still uses the system manually. This can be seen from the value management system carried out by Ustadz (Mustahiq) using simple programs such as Microsoft Word and Excel. In fact, there are also some Ustadz (Mustahiq) in the class managing

grades by hand. The application of a system like this that will hamper the determination of students to graduate or not is caused by the management of value data and this provides an overview of the data management system that is very unorganized or structured and directed. From the results of field research, system analysis can be seen in the form of a system flowchart that is currently running in Figure 3.

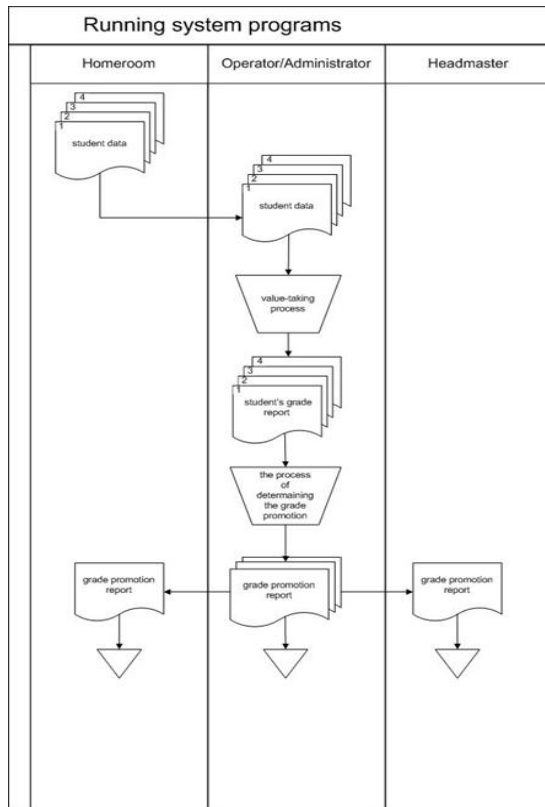


Figure 3. The previous flowchart

4.1.2 Analysis of the proposed system diagram

Based on analyzing the diagram that is still running, the proposed system analysis can be seen in the chart form Figure 4.

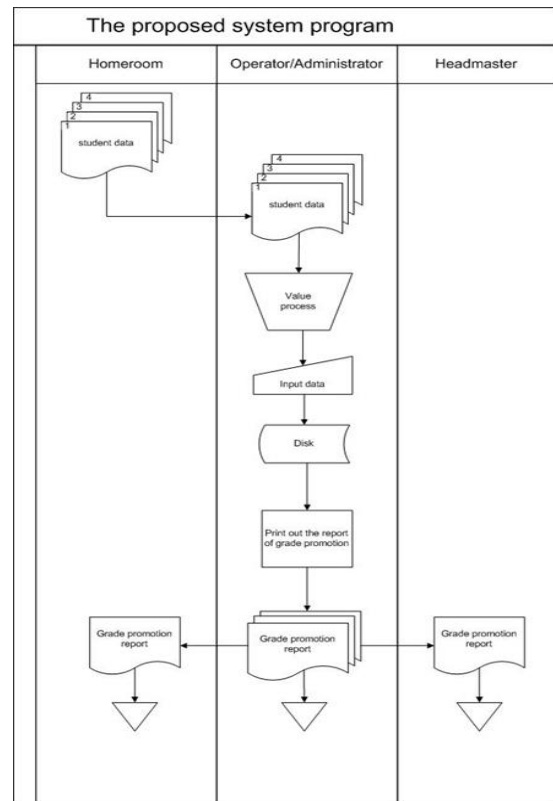


Figure 4. The proposed flow chart

4.1.3 Context Diagram Design of Decision Support System

Context diagram is a diagram showing the system as a process. The goal is to outline the system in general. Context diagram shows a process interacting with its environment. Context diagram also shows data flowing from outside parties providing input to a system and outsiders receiving the system's output in general. The context diagram is as follows:

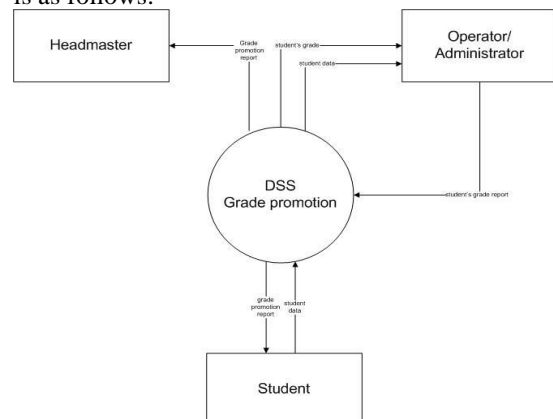


Figure 6. Context Diagram

4.1.4 Database Design of Decision Support System of Graduation

Database design is a very important stage in making an information system, including a 4.1.4 decision support system. The purpose of the

database itself is to explain the data in a file. The file itself contains data flowing both into and out of a system. The following is a list of the tables contained in the database in Figure 7.

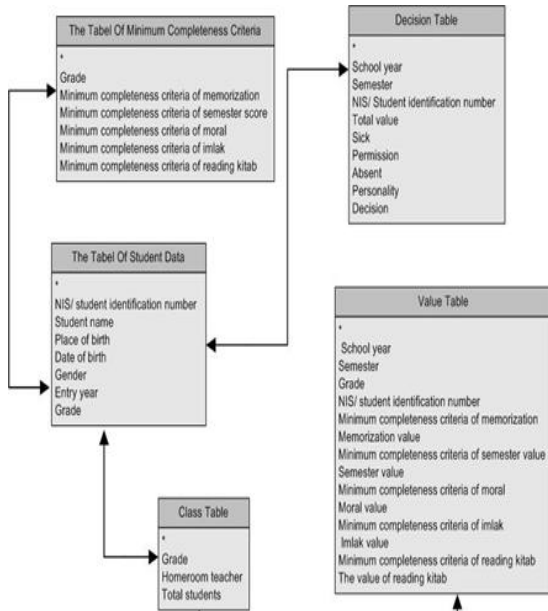


Figure 7. Database Relations

4.2 Implementation

4.2.1 Login page

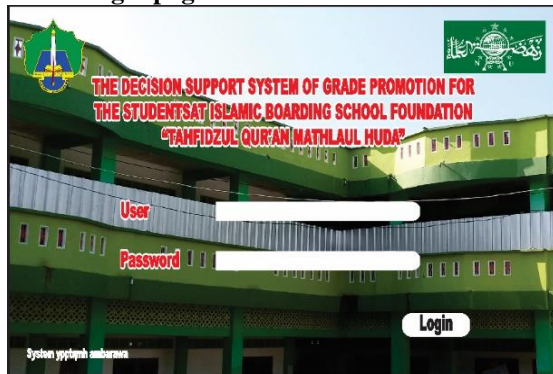


Figure 8: The design of the login page

4.2.2 Page of Input Data



Figure 9. Design of Input data

4.2.3 Halaman cetak

This page contains a report on the calculation of the value on the predefined grade promotion criteria. To get the report, we can access it via the print menu, then click the name to be printed.

THE DECISION SUPPORT SYSTEM OF GRADE PROMOTION FOR THE STUDENTS
AT ISLAMIC BOARDING SCHOOL FOUNDATION "TAHFIDZUL QUR'AN MATHLAUL HUDA"
2020/2021

NO	CODE	NAME	VALUE				THE NUMBER OF VALUE	INFORMATION	
			MEMORIZATION	SEMESTER VALUE	MORAL	IMLAK			READING NOTAS
1	A1	ANI LUFHANI	6	5	6	5	7	33	PROMOTED TO NEXT GRADE
2	A2	LATIFATUN NURI	7	9	5	6	5	32	PROMOTED TO NEXT GRADE
3	A3	NINA ANITA	9	6	5	6	4	30	PROMOTED TO NEXT GRADE
4	A4	HANAGYANI	8	7	6	7	7	35	PROMOTED TO NEXT GRADE
5	A5	INABILA FITRI	9	7	7	4	6	33	PROMOTED TO NEXT GRADE
6	A6	MUHAMMAD	7	6	7	5	8	33	PROMOTED TO NEXT GRADE
7	A7	NUR PUTRI	9	7	5	7	5	33	PROMOTED TO NEXT GRADE
8	A8	YUNI	7	7	7	4	6	31	PROMOTED TO NEXT GRADE
9	A9	KRIS AROSKA	8	5	4	5	6	28	STAY CLASS
10	A10	BEJANINGTAS	9	5	4	3	6	27	STAY CLASS

Ambarawa, 20 Juni 2021
Headmaster,

Ust. Khair Abdullah, S.Pd

Figure 10. Print page

4.3 Discussion

Based on the analysis that has been running, the system created can affect the performance and assessment of islamic boarding schools. The system created is an effective system in terms of workmanship, time and makes it easier in the academic field of islamic boarding schools. This system has adapted to the existing conditions in the boarding schools so that the effectiveness of this system can actually run.

V. CONCLUSION

The conclusions of this study are the use of a new system in the form of a decision support system for class promotion can be a priority means of making decisions for class promotion. This system can produce decisions that can measure the ability of students both academically and nonacademically. Data processing is carried out in a system manner so that it can be done quickly and minimizes the errors occurring in assessing the class advancement of the students.

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