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Decision Support System for Poor Student Aid Recipients Using the Analytical Hierarchy Process (AHP) Method

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Abstract

The enforcement of mandatory education programs facilitates funding for primary and secondary schools, aligning with legal provisions designed to boost student engagement. Nevertheless, a stark reality persists, with numerous children unable to attend school, leading to dropouts and an inability to progress. A key factor contributing to this issue is the School Operational Assistance (BOS) not covering essential educational costs like uniforms, books, and shoes. The challenge lies in identifying suitable recipients for Poor Student Aid, hindered by insufficient categorized support data. Addressing this, a targeted solution involves designing a system, utilizing the Analysis Hierarchy Process (AHP) Method. Decisions regarding poor student aid approval would then be grounded in rational, objective considerations. Proactively implementing a structured decision support system is crucial in assigning significance to criteria values and weights, tailored to SD Negeri Baddoka Makassar's needs. Through AHP, the selection process becomes more transparent, measurable, and accountable. The resulting decisions have the potential to enhance the efficiency of providing assistance to those genuinely in need.

Keywords: Poor Student Aid; Decision Support System; Process Hierarchy Analysis (AHP).

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Introduction

The School Operational Assistance Fund or BOS fund for short is a program run by the government to help students who cannot afford to attend school(Nasution, 2023). The implementation of compulsory education programs allows the financing of primary and secondary schools and many other activities in accordance with the provisions of the law that are expected to increase student participation(Dafit & Ramadan, 2020). But the reality is that there are still many children who cannot go to school even to the point of dropping out of school and cannot even continue their studies to the next level of education. One of the causes is that the limited cost of education such as school uniforms, books, and shoes is not covered by BOS.

In this case, this is the background for the development of the Poor Student Assistance program. Assistance to the Poor makes it easier for underprivileged students to attend school by providing proper educational service facilities for students and minimizing dropouts, as well as encouraging underprivileged students to return to school and pay them, as well as reducing the cost of learning for students to meet the needs of educational activities(Inkiriwang, 2020).

The Assistance Program for Poor Students in need aims to keep children entering elementary school in underprivileged families able to stay in school (Yudhistira, 2022). Poor Student Assistance is intended for elementary school students or abbreviated as elementary, junior high school with the abbreviation SMP, High School or SMA, and Vocational High School or SMK are underprivileged students and meet the requirements below:

1. Recipients of assistance for underprivileged students whose parents are indigent and enter a government program, namely Keluarga Harapan or called (PKH) which is certified by the Ministry of Social Affairs.
2. Students who have a Smart Indonesia Card (KIP)(Saputri, 2020).
3. Students who are orphans, orphans or orphans.

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The determination of schools in determining recipients of Poor Student Assistance is done manually, which means that the determination of prospective beneficiaries is less efficient in time and process in processing the data(Purba et al., 2019). In this case, the selector will assign candidates based on predetermined criteria. The problem in determining student candidates to receive Poor Student Aid due to the lack of grouping supporting data from students and the need for suitable data, in this case, is a problem in identifying students who qualify to be recipients of Poor Student Aid, with the design of the system to be made this can be a solution to solve it on target (Aminah et al., 2020).

The students who will be recipients of Poor Student Aid will first be selected according to predetermined criteria so in the process of determining prospective recipients of aid some students will not get assistance, then this is a progress in determining prospective recipients of aid will utilize computer technology to manage data so that the data will be computerized and will make it easier to determine the quality of decisions of prospective students receiving Poor Student Aid on target(Fanda & Hardianto, 2021). With the advancement of technology, it is possible to use different areas of decision support to deliver accurate, fast, and efficient work(Manongga et al., 2022). Based on the above information, a decision support system is developed using methods that transform common, unstructured problems into models that are easily understood by all interested parties(Mahendra et al., 2023). Therefore, the author raised the title Decision Support System for Poor Student Aid Recipients Using the Analysis Hierarchy Process (AHP) Method to determine students who deserve BSM at SD Baddoka Makassar.

Method

The Decision Support System (SPK) that utilizes the Analytical Hierarchy Process (AHP) method is an important instrument in determining the receipt of aid for poor students(Kusumawardhany, 2020). AHP enables decision-makers to address the complexity of the aspects to be assessed in the context of determining the eligibility of such beneficiaries. First, DSS uses AHP to detail assessment criteria, such as the level of economic need, family social conditions, and academic performance of students(Riyansuni & Devitra, 2020).

Thereafter, through a pairwise comparison process, AHP generates relative weights that reflect the importance of each criterion, facilitating decision-makers to measure the relative contribution of each factor to the final decision(Lestari et al., 2020). By using AHP, DSS can create a more detailed hierarchy of subcriteria, such as family income level, number of dependents, and student academic achievement(Astuti et al., 2022). This allows the system to assess and compare those factors in a consistent and measurable way (Bunga & Sri, 2020). The result is an integration of the relative values of each element in the hierarchy, providing a comprehensive picture related to the need and potential impact of aid on the development of poor students(Septilia et al., 2020). Thus, SPK using AHP helps increase objectivity, transparency, and accuracy in the process of determining the acceptance of poor student aid, so as to ensure that aid is distributed to those who really need it effectively and efficiently(Katarina et al., 2021).

The test method used is the black box method. The black box method is used in application testing because of its focus on evaluating external functionality without regard to the internal structure of the application. In these tests, testers do not require knowledge of source code logic or internal implementation of the application being tested. The black box approach reflects the perspective of the end user, who is only interested in the input and output of the application without paying attention to internal details.

The main advantage of black box testing is its ability to find errors or mismatches between functional specifications and the actual behavior of the application. With no regard for internal details, black box testing ensures that applications behave according to user expectations and established specifications. Therefore, this method is effective in verifying whether the application can achieve its functional goals without requiring in-depth knowledge of the internal implementation. The black box approach also helps identify integration, performance, and security issues in the application's operational environment. By providing visibility into an application's response to various input situations and interactions with other system elements, black box testing is becoming a common choice to ensure application quality and performance before it is released to end users.

In this study, flowcharts and use cases were used to design a decision support system for poor student aid recipients using the Analysis Hierarchy Process (AHP) Method as follows in figure 1:

1. Flowchart

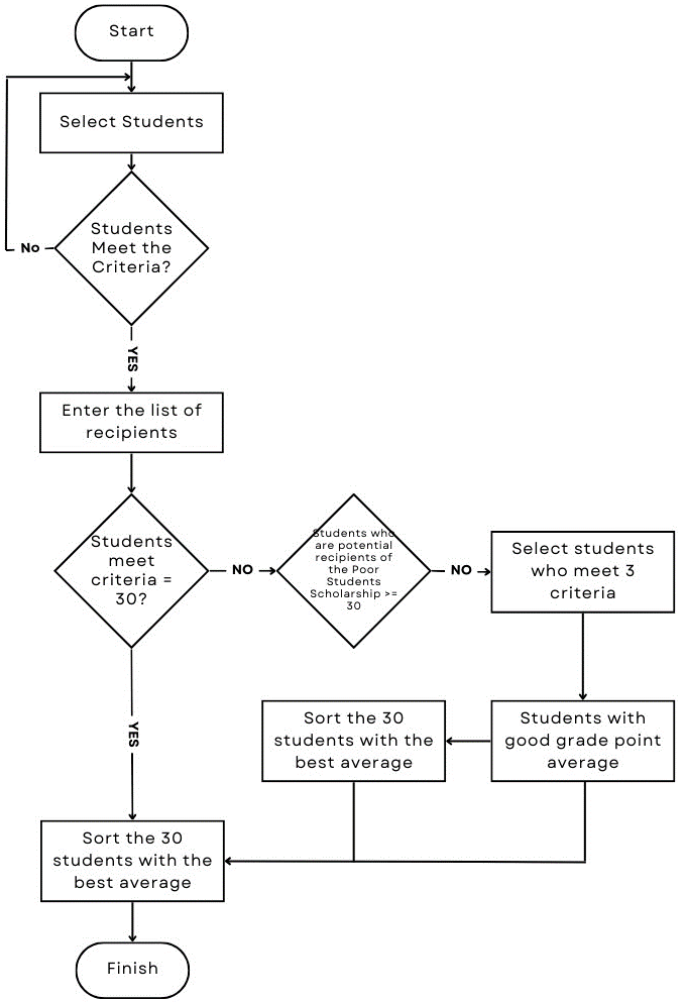

Figure 1. Flowchart

The flowchart of the system is a system that is currently working starting from selecting students one by one. From the selection, students will be selected by looking for students who are in the criteria who are families who have cards or are in the family hope program (PKH), have a certificate of disability, and children who no longer have parents or orphans(Wanti et al., 2020). After selecting 18 out of all students the system will recalculate for the students who will receive assistance. After calculating if there are still less than 30 students receiving Poor Student Aid, the system will look for other candidates to become recipients of Poor Student Aid, from student data that has only 3 criteria.

Students with these criteria will be re-selected based on the best average report card score to cover the shortage of students receiving Poor Student Aid and if students receiving Poor Student Aid who have more than 30 students meet the criteria, the students will be selected again according to the best average student report card, until the number of students who will be recipients of Poor Student Aid is met to 30 students(Tasrif et al., 2021). The existence of a system design can make it easier for teachers who will select students each year. The process of student selection also has limitations in terms of time, and often difficulties arise in selecting students who will receive Poor Student Assistance to study should need assistance or not get the assistance. These weaknesses are covered by adding criteria at the time of election(Mamat et al., 2019). But in fact, adding standards to the selection

of students receiving Poor Student Assistance will make student selection take quite a long time, therefore from this problem, a Decision Support system is needed to make it easier to select students who will be recipients of Poor Student Assistance(Nugraha & Gustian, 2022).

2. Use Case

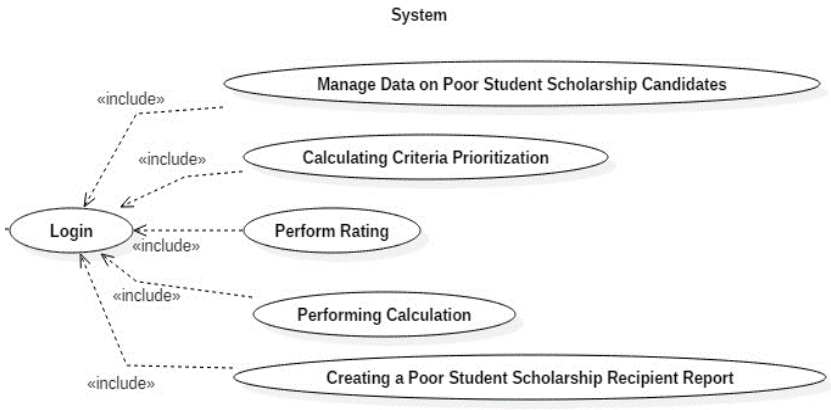

Figure 2. Use Case

The Use Case in the diagram above shows how to use this application where the application can only be used by admins, users must also first log into the application (Diana, 2019), and then can perform several activities namely:

a. Can input Misikin Student Aid data in the system.
b. Can see the criteria page that will help in determining the recipients of Poor Student Aid on the system.
c. View the calculation page on the system.
d. View reports on the results of Poor Student Aid recipients.

Results and Discussion

Result

The results of this study are in the form of a decision support system that can be used to select recipients of poor student assistance using the Analysis Hierarchy Process (AHP)(Alim, 2019) method as follows:

1. Display when logged into the system
   On this page, we are asked to enter a username and password in order to enter the menu page of the decision support system for recipients of Poor Student Assistance at Baddoka State Elementary School Makassar, as seen in Figure 3.

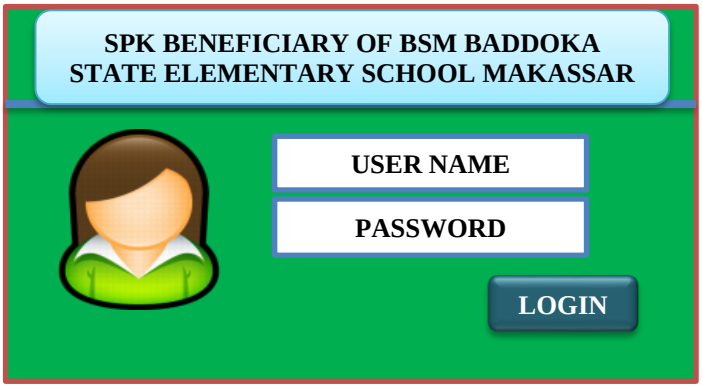

Figure 3. Login Page

2. Dashboard View

After logging in, this is the main page on the decision support system for recipients of Poor Student Assistance at Baddoka Makassar State Elementary School Makassar, which displays a student form, criteria form, BSM calculation form, and report form, as seen in Figure 4.

Figure 4. Dashboard Page

3. Form Display Inputting Data

On this page the admin will input all data from students receiving Poor Student Assistance at Baddoka Makassar State Elementary School, by inputting the student's name, student grades, parents' income, children's dependents and then the distance from home to school then click the input button, as seen in Figure 5.

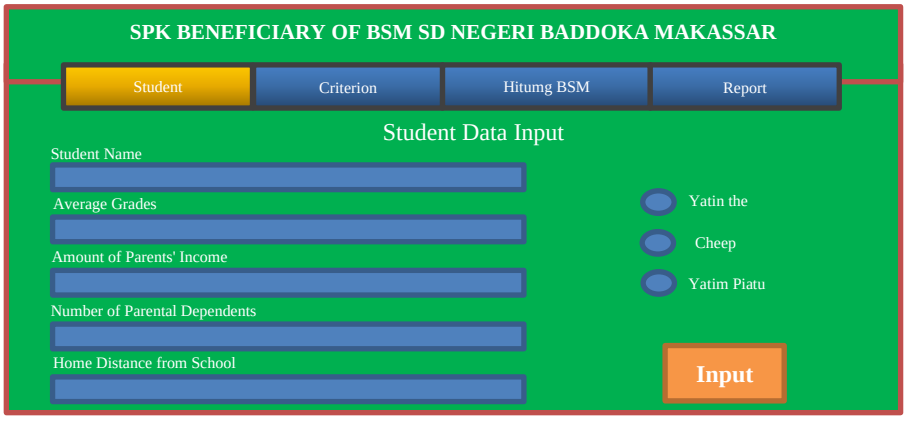

Figure 5. Input Data Page

4. Page View on Criteria Form

On this page displays the form of displaying criteria for prospective students receiving Poor Student Assistance at Sd Negeri Baddoka Makassar Makassar which has been inputted by the admin(Sujatmika, 2022), this page form displays the results of input that has been input by the previous admin which displays the name of the prospective student beneficiary(Baydar, 2022), average student grade, amount of income of parents, dependents of parents, and away from school, as seen in Figure 6.

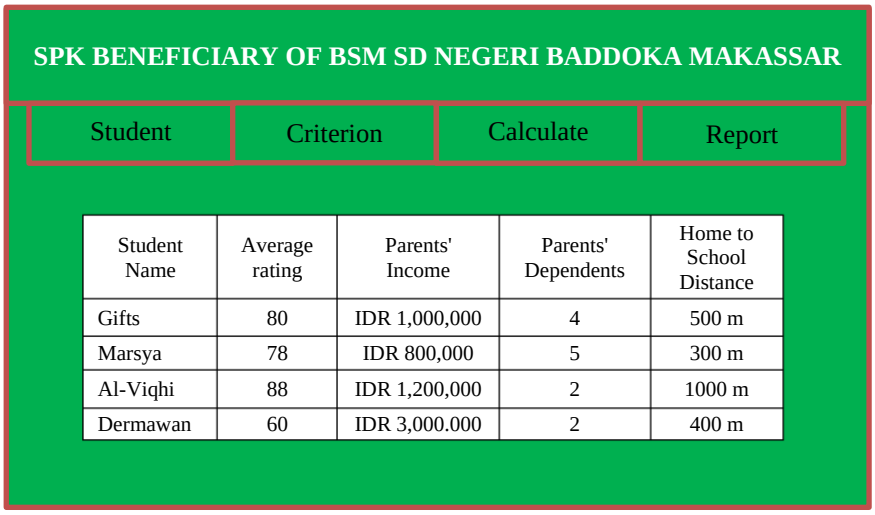

Figure 6. Criteria Page

5. Poor Student Aid Count View
   This page displays the system calculation for prospective recipients of Poor Student Assistance at Sd Negeri Baddoka Makassar Makassar, after the data has been entered on the criteria form, it will be calculated by the BSM Calculate form by clicking the Calculate button, as seen in Figure 7.

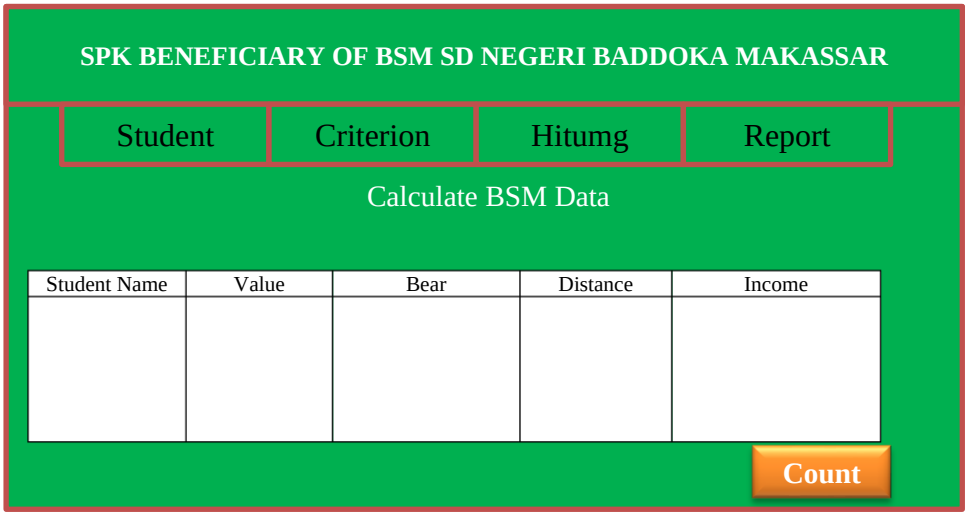

Figure 7. BSM Calculation Page

6. Report Form Page
   This page will be used as an output as a result of which students will receive Poor Student Assistance at Baddoka Makassar State Elementary School. This output can then be printed or printed by pressing the print button on the report form, as seen in Figure 8.

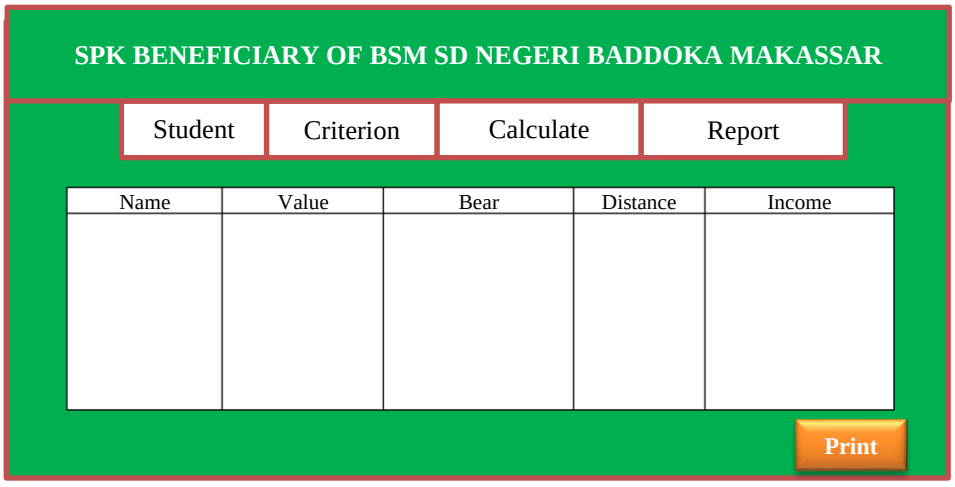

Figure 8. Report Form Page

Discussion

The Analytical Hierarchy Process (AHP) method to determine the beneficiaries of poor student aid based on the criteria mentioned(Ali et al., 2021). First, we must define the relevant criteria and then create a pairwise comparison matrix for those criteria.

1. Identification of Criteria and Alternatives
   a. Criteria: Average Value (NR), Parents' Income (PO), Parents' Dependents (TO), Distance from Home to School (JR).
   b. Alternatives: Doni, Marsya, Al-Viqhi, Benefactor
2. Paired Comparison Matrix for Criteria
   Create paired comparison matrices for NR, PO, TO, and JR criteria. Like the following table 1:

Table 1. Comparison Matrix

	NO	PO	TO	JR
NO	1	3	1	5
PO	1/3	1	1/2	1/4
TO	1	2	1	3
JR	1/5	4	1/3	1

3. Calculate Criteria Weight Vector
   Normalization of paired comparison matrix to obtain the weight vector of the criterion table 2:

Table 2. Criteria Weight Vector

	NO	PO	TO	JR	NO
NO	1	3	1	5	0.45
PO	0.333	1	0.5	0.25	0.175
TO	1	2	1	3	0.425
JR	0.2	4	0.333	1	0.175

4. Comparison Matrix of Alternatives to Criteria
   Suppose we have an alternative comparison matrix against the following criteria Table 3:

Table 3. Alternative Benchmarking Matrix Against Criteria

	NO	PO	TO	JR
Gifts	5	2	4	3
Marsya	4	3	5	2
Al-Viqhi	7	5	3	4
Dermawan	2	4	2	1

5. Calculate the Total Score for Each Alternative
   Calculate the total score for each alternative by multiplying the comparison matrix of alternatives against the criteria by the criterion weight vector:
   a. Total score for Doni = (5 × 0.45) + (2 × 0.175) + (4 × 0.425) + (3 × 0.175) = 4.125
   b. Total score for Marsya = (4 × 0.45) + (3 × 0.175) + (5 × 0.425) + (2 × 0.175) = 3.975
   c. Total score for Al-Viqhi = (7 × 0.45) + (5 × 0.175) + (3 × 0.425) + (4 × 0.175) = 5.275
   d. Total score for Benefactor = (2 × 0.45) + (4 × 0.175) + (2 × 0.425) + (1 × 0.175) = 2.775
6. Alternative Rankings
   With the total score calculated, we can rank alternatives. In this example, Al-Viqhi has the highest total score, so Al-Viqhi is considered a deserving recipient of poor student aid(Pranoto et al., 2022). Using the AHP method, the decision to accept poor student aid can be taken based on a comparison of predetermined criteria.

Conclusions and Suggestions

Conclusions

The AHP method provides a systematic and structured framework for evaluating criteria and alternatives for decision-making (Setiawan & Karyadiputra, 2022). Thus, the decision on the admission of aid to poor students is based on rational and objective considerations(Riyadi et al., 2021). The application of a structured decision support system is proactive in determining the importance of the value of criteria and the weight of the criteria so that it can be adjusted to what is needed or needed by the SD Negeri Baddoka Makassar school.

With a decision support system using AHP, the selection process for poor student aid recipients can be more transparent, measurable, and accountable(Rahmawati et al., 2019). The resulting decisions can help increase effectiveness in providing assistance to those in need.

Suggestions

From the system built using an Analytical Hierarchy Process method in the decision support system for receiving Poor Student Assistance at SD Negeri Baddoka Makassar School, suggestions can be given for the future to be developed again:

1. When using this system only one user, namely the admin, can operate it, and it is expected that in the next system development, more users will be added with certain access rights.
2. It is expected that the provision of facilities to back up data gradually is necessary to prevent unexpected events such as damage to the server so that data is not immediately deleted permanently.
3. In the process of entering data and value, accuracy is needed to maximize the results of a decision.
4. In the future, it is expected that the development will take place in the form of adding the necessary application features to the system along with anti-virus that is useful for protecting data in the database.

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