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# Decision Support System for Selecting Outstanding Students at SD Inpres Lanraki II Using the Weight Product Method

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**ABSTRACT**

Education stands as a pivotal driver of national progress, profoundly shaping societal advancement. Within basic education, like elementary schools (SD), the identification and support of exceptional students are paramount. SD Inpres Lanraki II, an educational institution dedicated to nurturing high achievers, underscores this commitment. This study employs the Weight Product method to pinpoint outstanding students. Findings reveal the method's efficacy in streamlining the selection process at SD Inpres Lanraki II, culminating in a top-ranking score of 0.1804, highlighting the selection of exceptional students. The impact is significant, enhancing the institution's ability to cultivate a cohort of high-performing individuals, thus positively influencing its educational landscape. This research not only identifies excellence but also bolsters the school's capacity to foster a generation of academic achievers, reinforcing its educational mission and societal contribution.



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## 1. INTRODUCTION

Education is a process or system designed to transfer knowledge, skills, values , and cultural norms from one generation to the next (Rohmah et al., 2023; Aryana, 2021). Education aims to maximize potential development (Khoiruzzadi and Prasetya 2021). Individuals become functioning members of society (Sada 2017). Education can take place at various levels, from early childhood education to higher education and lifelong education (Sutianah, 2022; Suryana, 2021; Wahab et al., 2021). The education system usually involves teachers or educators who provide instruction to students or students in a structured environment, such as a school or college (Pohan, 2020; Setiawan et al., 2021; Herlina et al., 2022). Apart from that, education also includes non-academic aspects such as the development of social, moral and ethical skills (Purnamasari et al., 2023). Education not only focuses on imparting knowledge and skills, but also on character formation and individual personality building. Education plays an important role in the development of individuals and society (Manaksia & Anggraeni, 2018). By improving education a person can have better access to employment opportunities, gain a better understanding of the world,

and become an active, contributing citizen in society (Saputra et al., 2023; Subroto et al., 2023; Santoso et al., 2023). Apart from that, education also functions as a tool to reduce social and economic disparities, improve the quality of life, and advance the development of a country (Rahman et al., 2023; Kusumawati et al., 2023). Therefore, education is considered an important foundation for achieving sustainable development and an inclusive society (Muslim, 2020; Nurnaningsih et al., 2023).

The significance of decision-making in selecting high-achieving students is multifaceted, encompassing the perspectives of teachers, parents, students, and educational practitioners. For teachers, these decisions not only influence a student's future but also reflect the standard of education they deliver (Makkonen, Lavonen, & Tirri, 2023; Mohamed, Abdelfattah, & Opoku, 2022). From the parents' perspective, such decisions can shape their expectations and support for their child's development. For students, the process may introduce both pressure and opportunities for growth. Practitioners, on the other hand, see decision-making as a key factor in guiding the educational system toward recognizing and nurturing the best talents (Gómez-Arizaga et al., 2023; Wu & Zhang, 2023). Understanding these diverse viewpoints provides valuable and nuanced insights into the critical role of selecting high-achieving students in education.

Elementary School (SD) Inpres Lanraki II, a private institution located in Makassar, South Sulawesi, aims to recognize students who meet predetermined achievement criteria. However, the current process for selecting outstanding students at the school is primarily focused on academic performance, which often involves subjective judgments, leading to inaccurate outcomes. This results in a lack of fairness and quality, as other students who meet the established standards may not be adequately recognized. In selecting high-achieving students, schools should take into account both academic and non-academic factors (Ahmad & Zainabon, 2023). To achieve this, schools must engage in continuous evaluation and improvement of their services, teaching methods, and quality assurance systems (Ahmed, 2023). The ultimate objective is to make the school competitive, high-quality, and achievement-oriented. The process of selecting outstanding students is complex and time-consuming (Wahyudi, 2022), often leading to errors due to subjectivity (Mardian et al., 2023; Witanto et al., 2020; Kholifah et al., 2023; Nurhadi et al., 2020; Pasaribu & Darussalam, 2022). Consequently, students who may not fully meet the desired standards could be selected, while those who better align with the criteria might go unrecognized (Franz & Karim, 2022; Pamungkas & Suryadi, 2022). Therefore, a more comprehensive and objective approach is necessary to ensure fair and accurate recognition of outstanding students.

To address these challenges, research has been conducted to develop a system that offers solutions to the issues faced by SD Inpres Lanraki II. The system, titled "Decision Support System for Selection of Outstanding Students at SD Inpres Lanraki II Using the Weight Product Method," is designed to provide efficient and effective support to teachers, enabling them to identify high-achieving students more accurately. This system streamlines the collection, processing, and presentation of student data, ensuring that teachers have timely access to the necessary information. Additionally, the system includes a decision support feature that allows for the evaluation and selection of outstanding students based on predefined criteria (Riki & Yanti, 2020). By implementing this system, the process of selecting outstanding students is expected to become more objective, transparent, and accurate (Rahayu & Mukodimah, 2019). The system aims to enhance the quality of education by ensuring that deserving students receive proper recognition for their achievements (Rahayu & Idris, 2022). Furthermore, it will help reduce delays in data presentation and streamline the decision-making process for teachers, allowing the school to conduct the selection of outstanding students more effectively, efficiently, and fairly. Ultimately, this system will improve educational quality by enabling teachers and staff to recognize students based on clearly defined criteria, ensuring that excellence is properly acknowledged at SD Inpres Lanraki II.

## 2. METHODS

This research uses the Weighted Product method. Weighted Product (WP) is a method used to make multi-criteria decisions to calculate the value of each alternative based on the weights determined for each criterion (Fernandez, Prihantoro, and Hidayah 2021). This method involves several steps,

including identifying criteria, normalizing criteria, determining weights, multiplying weights, aggregating values, and ranking alternatives (Mahendra et al., 2023; Utomo et al., 2019; Subiyanto, nd; Wulansari et al., 2023; Vafaei et al., 2022). In the Weighted Product method, each criterion has a weight that determines its level of importance (Arief, Darmawan, and Prafianti 2022). This weight is used to multiply the values of each criterion, which are then added together to get the value of each alternative. The alternative with the highest collection value will be considered the best or most desired choice (Khairunnisa et al. 2023). This method was implemented in building a decision support system for selecting outstanding students at Inpres Lanraki II Elementary School.

The Weighted Product method was specifically selected due to its capacity to thoroughly assess and rank choices using various criteria (Alvarez, Ishizaka, and Martinez 2021). This technique empowers decision-makers to allocate importance-based weights to each criterion, fostering a methodical and organized decision-making process. An important benefit of the Weighted Product method is its adaptability in managing intricate decision scenarios where multiple factors must be simultaneously considered (Zakeri et al., 2022). Incorporating weights enables a more detailed evaluation aligned with the specific research goals, such as identifying exceptional students in an educational environment like SD Inpres Lanraki II. Additionally, the clarity provided by the Weighted Product method enhances decision-making by transparently illustrating the weighting of criteria and the evaluation of alternatives. This transparency enhances result reproducibility and cultivates confidence in decision outcomes. In essence, the suitability of the Weighted Product method stems from its capacity to offer a structured and methodical approach to decision-making, presenting a lucid and open framework for assessing and choosing exceptional students based on predetermined criteria.

In this research the author used data collection techniques as the method used to collect information or data in research (Assyakurrohim et al., 2023). The following are several data collection techniques used by the author:

**Table 1.** Data collection technique

| Data collection | Research Activities |
|---|---|
| Survey | Researchers conducted a survey to collect data from students, teachers, and school staff regarding factors that can influence student achievement. Surveys may include questions regarding student interests, motivation and perceptions of teaching quality |
| Interview | Researchers conducted interviews with high-achieving students to gain insight into the factors that contributed to the students' success. The author also conducted interviews with teachers and school staff to get their perspectives on the characteristics of high-achieving students |
| Observation | Researchers made direct observations of outstanding students in learning situations and extracurricular activities. Observations carried out can provide information about students' behavior, social interactions and abilities in real situations. |
| Study of literature | Researchers collect data by collecting information or data from various sources and taking references from books and web journals |

The use of the Weighted Product method in the practical implementation of decision support systems for selecting high-achieving students based on predefined criteria involves the following steps (Al-Saggaf et al. 2022; Rijati et al. 2020):

**Setting Criteria:** Relevant criteria for assessing high-achieving students need to be established initially. These criteria may include academic achievements, participation in extracurricular activities, leadership, and attitude.
**Weight Assignment:** Each criterion is assigned a weight based on its importance level. These weights reflect how significant each criterion is in evaluating student success.
**Data Collection:** Data related to the established criteria is collected through various methods such as surveys, interviews, observations, and literature review.
**Data Processing:** The collected data is then processed using the Weighted Product method to provide assessments of each student based on the predefined criteria.
**Student Ranking:** By applying the Weighted Product, students are evaluated and ranked based on the assigned weights to each criterion. This process aids in identifying high-achieving students according to the prioritized criteria.
**Selection of High-Achieving Students:** The results of student ranking can be used to select high-achieving students who meet the established standards, enabling more informed and objective decision-making in an educational context.

By implementing the Weighted Product method in decision support systems for selecting high-achieving students, the evaluation process becomes more structured, measurable, and provides a clear foundation for accurate and effective decision-making. This research system design method uses Use Case Diagrams to illustrate the interactions between various actors (users) and the system (Zulfa et al. 2020), showing how use cases (scenarios) interact with actors and how the system behaves in various situations. The use case for this research can be seen in Figure 1:

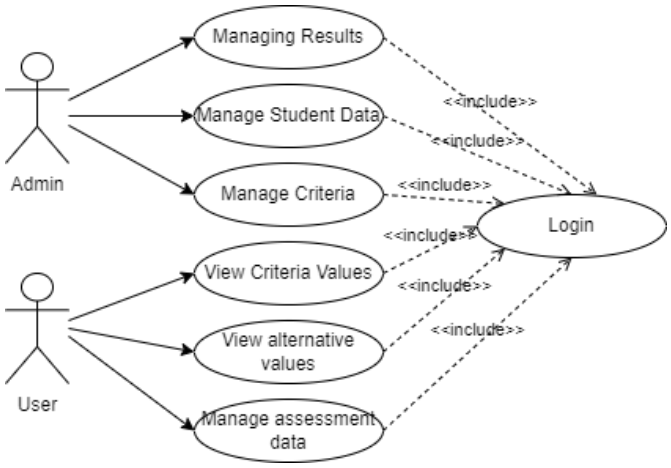


**Figure 1.** Use Case Diagram

## 3. FINDINGS AND DISCUSSION

### *3.1 Weighted Product Method Testing*

In testing the Weigted Product Method, calculations are carried out using alternative data and criteria data that have been input by the user.

**Table 1.** Alternative Data

| Code | Alternative |
|---|---|
| A01 | fany |
| A02 | Toby |
| A03 | Elizabeth |
| A04 | Luke |
| A05 | Everlin |
| A06 | Michael |

Table 2 Alternative Data displays a list of alternatives that will be evaluated using the Weighted Product Method. Each alternative has a unique code used for identification, such as A01 for Fany, A02 for Tobi, A03 for Elisabet, A04 for Lukas, A05 for Everlin, and A06 for Michael. In the context of Weighted Product Method testing, these alternatives represent choices or options that will be evaluated based on certain criteria. Each alternative has characteristics or values that need to be measured or assessed, and the results of the calculations will later help determine the most optimal alternative.

**Table 2.** Criterion Data

| Criterion ID | Criterion Name | Preference Weights |
|---|---|---|
| C01 | Average report card value | 35% |
| C02 | Behavior | 25% |
| C03 | Presence | 25% |
| C04 | Skills | 15% |

Table 3 presents the criteria data used in testing the Weighted Product (WP) Method. There are four criteria that will be evaluated, namely the average report card score (C01), behavior (C02), attendance (C03), and skills (C04). Each criterion is given an ID to facilitate identification and data processing. The average report card score (C01) reflects student academic achievement, behavior (C02) assesses aspects of student behavior, attendance (C03) records student absences, and skills (C04) evaluates relevant special skills. This criteria data will be used as a basis for calculating the Weighted Product Method, where the weight or importance of each criterion will be determined by the user according to needs.

**Table 4.** Weights of Criteria C1-C4

| Mark | Weight | Information | Criteria Weight |
|---|---|---|---|
| <50 | 1 | Very less | Lowest |
| 51-65 | 2 | Not enough | |
| 66-75 | 3 | Enough | |
| 76-85 | 4 | Good | |
| 86-100 | 5 | Very good | Highest |

Table 4 Weight of Criteria C1-C4 provides an explanation of the weight given to each criterion C1 to C4 in the Weighted Product Method. This weight is given based on a predetermined range of values, starting from a value of less than 50 which has a weight of 1, indicating the criteria level is "Very Poor" and is considered the lowest value. The score range 51-65 has a weight of 2, indicating the criterion level is "Poor." Furthermore, the range 66-75 is given a weight of 3 to indicate the criterion level of "Fair." Likewise, the 76-85 and 86-100 ranges have weights of 4 and 5, respectively, representing the criteria levels of “Good” and “Excellent.” This table helps determine the weight according to the level of criteria desired by the user, which will later be used to calculate the Weighted Product Method.

**Table 5.** General Criteria Weights

| Weight | Information | Criteria Weight |
|---|---|---|
| 0% | Very less | Lowest |
| 10% | Not enough | |
| 15% | Enough | |
| 25% | Good | |
| 35% | Very good | Highest |

Table 5 shows the General Criteria Weights used in testing the Weighted Product Method. The weight is given to each criterion with information about its importance level. The weight scale starts from 0% for criteria considered very poor (lowest) to 35% for criteria considered very good (highest).

For example, criteria with a weight of 0% are considered to have the lowest level of importance, while criteria with a weight of 35% are considered to have the highest level of importance. Users can adjust these weights according to their needs and preferences when assessing alternatives based on predetermined criteria.

**Table 6.** Alternative Values for Each Criteria

| Alternative | Criteria | | | |
|---|---|---|---|---|
| | C1 | C2 | C3 | C4 |
| Fany | 80 | 85 | 90 | 80 |
| Toby | 90 | 80 | 85 | 90 |
| Elizabeth | 80 | 70 | 90 | 70 |
| Luke | 90 | 80 | 70 | 75 |
| Everlin | 80 | 80 | 70 | 80 |
| Michael | 80 | 80 | 60 | 70 |

Table 6 shows the alternative values in each criterion for the six alternatives evaluated in the Weighted Product Method. Each row represents one alternative, while the columns represent the four criteria being assessed, namely C1, C2, C3, and C4. For example, for the Fany alternative, the values given for criteria C1, C2, C3, and C4 are 80, 85, 90, and 80 respectively. Likewise, the alternative values for Tobi, Elisabet, Lukas, Everlin, and Michael for each The criteria can be seen in the table. These values reflect the assessment or weight given by the user to each alternative for each criterion being measured. The Weighted Product calculation will involve these values to produce a total score and assist in selecting the best alternative based on the preferences and priorities set by the user.

**Table 7.** Alternative Results in Each Criteria

| Alternative | Criteria | | | |
|---|---|---|---|---|
| | C1 | C2 | C3 | C4 |
| Fany | 4 | 4 | 5 | 4 |
| Toby | 5 | 4 | 4 | 5 |
| Elizabeth | 4 | 3 | 5 | 3 |
| Luke | 5 | 4 | 3 | 3 |
| Everlin | 4 | 4 | 3 | 4 |
| Michael | 4 | 4 | 2 | 3 |

Next, normalize the weights

$w^1 = = = 0.3333 \frac{5}{5+4+3+3} \frac{5}{15}$

$w^2 = = = 0.2666 \frac{4}{5+4+3+3} \frac{4}{15}$

$w^3 = = = 0.2 \frac{3}{5+4+3+3} \frac{3}{15}$

$w^4 = = = 0.2 \frac{3}{5+4+3+3} \frac{3}{15}$

So the value of w1+w2+W3+w4 = 0.3333 + 0.2666 + 0.2 + 0.2 = 0.9999

Next, determine the vector value s

S1 = (800.3333)(850.2666)(900.2)(800.2) = 83.2050
S2 = (900.3333)(800.2666)(850.2)(900.2) =86.1876
S3 = (800.3333)(700.2666)(900.2)(700.2) =76.9256
S4 = (900.3333)(800.2666)(700.2)(750.2) =79.9364
S5 = (800.3333)(800.2666)(700.2)(800.2) =77.8576
S6 = (800.3333)(800.2666)(600.2)(700.2) =73.5044

Calculate the relative preference value of each alternative

$$v^1 = = 0.1742 \frac{83,2050}{83,2050+86,1876+76,9256+79,9364+77,8576+73,5044}$$
$$v^2 = = 0.1804 \frac{86,1876}{83,2050+86,1876+76,9256+79,9364+77,8576+73,5044}$$
$$v^3 = = \frac{76,9256}{83,2050+86,1876+76,9256+79,9364+77,8576+73,5044} 0.1610$$
$$v^4 = = \frac{79,9364}{83,2050+86,1876+76,9256+79,9364+77,8576+73,5044} 0.1673$$
$$v^5 = = 0.1630 \frac{77,8576}{83,2050+86,1876+76,9256+79,9364+77,8576+73,5044}$$
$$v^6 = = \frac{73,5044}{83,2050+86,1876+76,9256+79,9364+77,8576+73,5044} 0.1538$$

Ranking by sorting the values (vector V values) from largest to smallest.
Rank 1 = v2 = 0.1804
Rank 2 = v1 = 0.1742
Rank 3 = v4 = 0.1673
Rank 4 = v5 = 0.1630
Rank 5 = v3 = 0.1610
Rank 6 = v6 = 0.1538
So it can be concluded that of the 6 student choices, the one who deserves to be selected as an outstanding student is Tobi.

### *3.2 Blackbox Texting Testing*

Testing is carried out with the aim of observing software input and output without requiring knowledge of the structural code used (Dhaifullah et al., 2022; Arbeit et al., 2023; Ismail & Efendi, 2021). Testing is carried out after the software has been developed, with the aim of ensuring that the software has good benefits and meets expectations.

**Table 8.** Blackbox Texting Testing

| Inputs | Outputs | Results |
|---|---|---|
| Login Menu | Displays the login menu display with the requirement to enter a username and password. | Success |
| Admin main menu | Displays the dashboard display, criteria data, student data, calculation results, and logs out. | Success |
| Admin criteria data menu | Displays name, report card average, attendance, behavior, and skills. | Success |
| Admin student data menu | Displays full name, Nis, Address, place, date of birth, and class. | Success |
| Menu Manage admin calculation results | Displays name, nis, average report card value, attendance, behavior and skills. | Success |
| Admin calculation results menu | Displays the name, nis, class and calculated value. | Success |
| Main user menu | Displays dashboard, criteria, alternatives, calculation results and log out | Success |
| User criteria data menu | Displays name, report card average, attendance, behavior and skills. | Success |
| Alternative user data menu | Displays a list of students who are recognized as prospective outstanding students. | Success |
| Menu User assessment data | Displays a table containing the names and classes of outstanding students | Success |

### *3.3 Responded Assessment*

Respondents' assessments regarding the decision support system for selecting outstanding students at SD Inpres Lanraki II used the WP method with 4 available criteria. Each criterion is given weight according to its superiority.

**Table 9.** Discussion of Responses

| Question | Mark | | | | |
|---|---|---|---|---|---|
| | **SS (5)** | **S (4)** | **RR(3)** | **T.S. (2)** | **STS (1)** |
| Is the application easy to use? | 20 | 6 | 4 | 0 | 0 |
| Is the design flow in the application appropriate? | 21 | 5 | 4 | 0 | 0 |
| Does the application help the school in determining outstanding students? | 22 | 2 | 6 | 0 | 0 |
| The decision support system for selecting outstanding students is designed according to existing needs. | 25 | 3 | 2 | 0 | 0 |
| Can this application make things easier for schools? | 28 | 2 | 0 | 0 | 0 |
| **Total** | **116** | **18** | **16** | **0** | **0** |

Note
SS : Strongly agree
S: Agreed
RR: Doubtful
TS : Disagree
STS: Strongly Disagree

The percentage can be done using a Likert scale calculation as follows:
Number of respondents strongly agree: 116(5)
Number of respondents who agreed: 18(4)
Number of undecided responses: 16(3)
Number of responses disagree 0(2)
Number of responses strongly disagree: 0(1)

Likert scale formula:

T x Pn

With information:
T = total number of respondents
Pn = choice of Likert score numbers

Calculating the Likert scale = (116×5)+(18×4)+(16×3)+(0×2)+(0×1)
= 580+72+48+0+0
= 700

Percentage calculation:

$$\frac{total\ skala\ likert}{total\ skor\ max}$$

$= \times 100\frac{700}{750}$
=0.93333×100
=9.33%

So, the percentage of the Likert scale in this data is around 93.33%

***Discussion***

This research employs the Weight Product (WP) method, which involves several systematic steps: identifying criteria, normalizing the criteria, determining their respective weights, multiplying the weighted values, aggregating these values, and finally ranking the alternatives (Abdulla, Baryannis, & Badi, 2023; Umar, 2023). In the WP method, each criterion is assigned a specific weight that reflects its relative importance in the decision-making process (Krishnan et al., 2021). These weights are then used to multiply the criterion values, and the resulting scores are summed to derive the total value for each alternative. The alternative with the highest aggregate score is deemed the most suitable or optimal choice (Yusupa et al., 2023). This method ensures that the evaluation process is both quantitative and structured, making it well-suited for complex decision-making scenarios.

The data collection process in this research involved multiple stages, including surveys, interviews, observations, and a comprehensive review of literature. This mixed-method approach enabled the gathering of a diverse set of data points, which were then processed using the WP method to evaluate and rank students at SD Inpres Lanraki II. By incorporating multiple data sources, the research ensured a more holistic evaluation of student performance, taking into account both academic and non-academic factors.

This study builds upon previous works, such as Riki and Yanti's (2020) research on selecting outstanding students using the WP method. It is also aligned with Yulianto's (2021) study on the application of decision support systems in student selection, and Ameliana's (2019) research on implementing the WP method in higher education decision support systems. These earlier studies validate the effectiveness of the WP method in various educational settings, providing a strong foundation for its application in the context of elementary education.

The WP method is particularly advantageous for selecting outstanding students at SD Inpres Lanraki II for several reasons. First, it allows for the consideration of multiple criteria, ensuring a more comprehensive evaluation of student performance. Second, the method enables customizable weight assignment, allowing schools to prioritize certain criteria based on their specific goals or values. Third, it promotes objective decision-making by minimizing subjectivity and bias, as the final rankings are determined by a mathematical formula rather than individual preferences.

Despite its numerous benefits, the WP method does come with certain limitations. It requires clearly defined criteria, as ambiguity in the criteria can lead to misinterpretation of results. Additionally, managing the complexity of interpreting weighted scores can be challenging, especially for users unfamiliar with the technical aspects of the method. Nonetheless, the findings of this research demonstrate that the WP method is highly effective in identifying the most suitable candidates for recognition as outstanding students at SD Inpres Lanraki II, thereby contributing to fairer and more accurate selection processes. The use of this method has the potential to significantly improve educational outcomes by ensuring that students are recognized for their achievements in a more objective and comprehensive manner.

## 4. CONCLUSION

The research findings align closely with the initial research objectives of developing a decision support system for selecting outstanding students at SD Inpres Lanraki II. The results demonstrate that through the implementation of the designed program with various features, the selection process at the school can be efficiently conducted. The utilization of the Weighted Product method in the decision support system has proven effective in simplifying the decision-making process for identifying outstanding students. The outcome of implementing this method resulted in a top ranking of 0.1804, indicating successful identification of outstanding students, with a high percentage score of 93.33% on the Likert scale. Despite the positive outcomes, it is crucial to acknowledge the limitations of the research. These limitations may include the need for further validation of the Weighted Product method

in diverse educational settings, potential biases in data collection, and the necessity for ongoing system updates and maintenance to ensure long-term effectiveness.

Moving forward, future research endeavors in this area could focus on enhancing the decision support system's features, expanding the criteria used for student selection, conducting comparative studies with other decision-making methods, and exploring the integration of advanced technologies to further improve the efficiency and accuracy of the student selection process at SD Inpres Lanraki II. These recommendations can guide future studies to build upon the current research findings and enhance the overall functionality and impact of the decision support system in educational settings.

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