DECISION SUPPORT SYSTEM WITH MABAC METHOD TO DETERMINE THE BEST STUDENTS

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Abstract

This research aims to apply the Multi Attributive Border Approximation Area Comparison (MABAC) method in the process of selecting the best students in the educational environment. MABAC, as a multi-criteria decision making method, provides a systematic and objective approach to evaluating and comparing various attributes possessed by students. In this study, the criteria considered include academic, extracurricular, personality and social skills aspects. Data was collected from academic records, teacher assessments, and observations of student involvement in school activities. The MABAC method is used to calculate the relative weight of each criterion and determine a comprehensive score for each student. The research results show that the MABAC method is effective in providing a holistic and multifaceted assessment of student performance. In addition, this method also helps in identifying strengths and areas of development for each student, thereby providing valuable insight for teachers and educators in the coaching process. This research concludes that the application of MABAC can be a useful tool in the educational evaluation process, especially in determining the best students with a more objective and structured approach.

Keywords: DSS, Mabac, Students.

Introduction

In the world of education, the process of assessing and recognizing student achievements is an important aspect that contributes to their motivation and potential development. Determining the best students is often a challenge because it involves various criteria that must be assessed objectively and fairly. Traditionally, this assessment is often based on quantitative approaches such as academic grades. However, this approach does not always reflect students' overall abilities and potential, especially in non-academic aspects such as social skills, extracurricular activities, and personality. The Multi Attributive Border Approximation Area Comparison (MABAC) method emerged as a solution to overcome these limitations. MABAC is a multi-criteria decision making method that is able to integrate various assessment aspects into one comprehensive assessment system. This research aims to implement the MABAC method in an educational context, specifically to determine the best students by considering various broader aspects of assessment. This study begins with an in-depth

literature review regarding various methods of decision making and assessment in education, as well as the advantages and limitations of each method. [1] according to Abdullah, M. A., & Aldisa, R. T. (2023) provides results using SPK with the MABAC method which can help in finding a ranking of each alternative so as to obtain the best coffee shop and determine recommendations for the best coffee shop. [2] according to Sihombing, D. O., & Cahyadi, A. (2023). The results of this research provide significant results as recommendations for determining the best students at the Sabda Setia Institute of Technology and Business and other institutions that have similar criteria.[3] according to Ahyuna, A., Rahman, B., Nugroho, F., Nirawana, I. W., & Karim, A. (2023). that the Multi-Attributive Border Approximation area Comparison (MABAC) and ENTROPY methods can find accurate and logical results and produce the highest ranking. Next, this research explains the MABAC methodology, the adaptation process and its application in an educational context. By using data from schools that have implemented a similar assessment system, this research aims to evaluate the effectiveness of MABAC in determining the best students. [4] According to Anisyah, L., & Dewi, R. (2023). By using the Mabac method, calculations can be carried out automatically when the user inputs alternative values and criteria values, thereby reducing problems in decision making in student selection. [5] according to Hondro, R. K. (2018). This method was chosen because, this method provides a stable (consistent) and reliable solution for rational decision making, compared to other methods of multi-criteria decision making. Through this research, it is hoped that insight can be generated regarding the application of multi-criteria decision making methods in education, as well as providing contribute to the development of a more holistic and objective student assessment system.

Research Methods
Decision Support Systems

A Decision Support System (DSS) is an information system used to support the decision-making process in an organization or business. SPK is a system used to help people who need help in determining or making a decision regarding choosing something. SPK is one of the methods that relate to and work on computers[6]–[7]
Students

Student are individuals who are involved in the learning process to acquire knowledge, skills, values, and habits through teaching, training, or research. In general, "student" can refer to anyone studying at an educational institution, such as a school, college, university, or in a non-formal or informal educational context. Students are expected to achieve learning objectives, students are the center of the teaching and learning process, so the standard of success of the teaching and learning process depends on the level of achievement of students' knowledge and skills.[8]
MABAC Method

The MABAC Multi Attributive Border Approximation Area Comparison method is a method developed in 2015 by an expert named Pamucar and Cirovic. This method is a well-known method whose main function is to find the best ideal solution. This method is used when there is a situation that requires someone to find a decision. The solution provided by this method is a solution that produces a ranking [9]. Since the Mabac technique is a multicriteria decision support system method and is considered a reliable way for rational decision making, its application can solve the problem [10]

The Multi Attributive Border Approximation Area Comparison (MABAC) method is a multi-criteria decision making method. This method can help in implementing SPK. The MABAC (Multi-Attributive Border Approximation area Comparison) method is a multi-criteria decision making technique used to evaluate a number of alternatives based on a number of criteria.

Research Stages

To conduct research aimed at recommending the best students using the MABAC method or decision-making technique, you will go through several important research stages. The following is a general overview of these stages along with a brief explanation for each stage
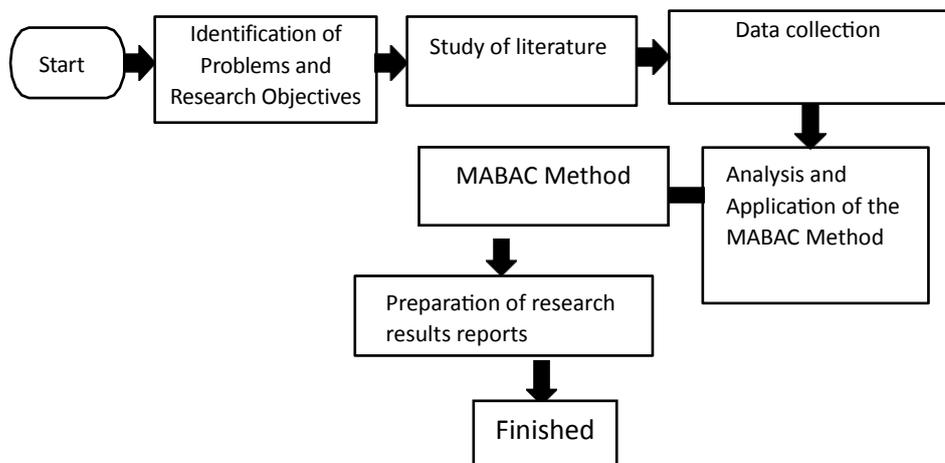

Figure 1. Research stages

Identification of Research Problems and Objectives:
▪ First, determine the problem you want to solve. In this context, the problem is how to select the best students from a group of students based on certain criteria.
▪ The aim of the research is to develop an objective and efficient model for evaluating and recommending the best students.
   Literature Review and Determination of Criteria:
▪ Related literature to understand methods that have been used in similar contexts.

Determine the criteria that will be used to evaluate students. These criteria could be academic achievement, extracurricular involvement, leadership skills,

- Data collection:
  Collect relevant data for each student based on predetermined criteria. This data can be in the form of test scores, track record of extracurricular activities, awards.
- Application of the MABAC Method:
  Use the MABAC method to evaluate students with the steps of normalizing the decision matrix, weighting criteria, calculating the weighted matrix, calculating scores for each alternative, and ranking.
- Results Analysis:
  Analysis of the results obtained from applying the method.
  Evaluate the effectiveness of the method in identifying the best students and check whether there are any shortcomings in the method.

Usecase Diagram
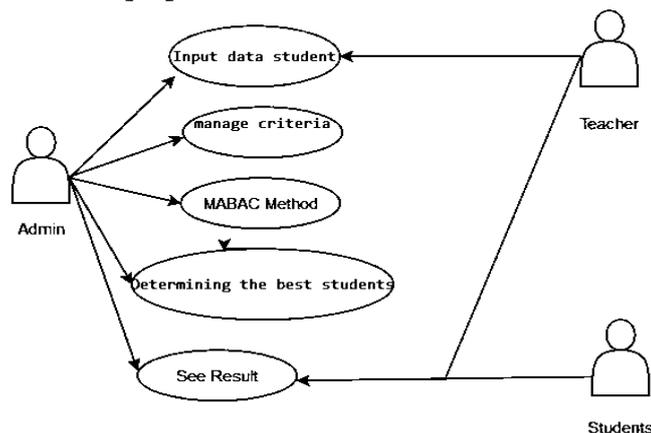Use case can describe the type of interaction between system users interactions between system and actors [10]

Figure 2 Use case diagram

Actor

- Teacher: Input student data, including grades and relevant criteria.
- System Admin: Manages the system, including setting assessment criteria and configuring MABAC methods.
- Students: May have access to view rankings or final results regarding themselves, depending on school policy.

Use Case

- Manage Criteria: System admins can add, change, or delete criteria used to grade students.
- Entering Student Data: Teachers/Instructors enter student data, including grades based on predetermined criteria.

- Calculating MABAC Score: The system automatically calculates the student's score using the MABAC method based on the data entered.
- Determining the Best Student: Based on the score calculation, the system determines the student with the best score.
- Viewing Results: Teachers, system admins, and possibly students can view ranking results and top students.

Result and Discussion

The assessment criteria are as follows:

1. Academic Achievement (K1)

2. Extracurricular Involvement (K2)

3. Leadership (K3)

4. Social Skills (K4)

Each student will be rated on a scale of 1-10 for each alternative. Here is hypothetical data for 5 students:

Student	K1	K2	K3	K4
Student 1 :	8	6	7	9
Student 2 :	7	8	8	6
Student 3 :	9	7	6	8
Student 4 :	6	9	5	7
Student 5 :	8	7	9	8

Next, we will normalize this matrix, assign weights to each criterion, calculate the weighted matrix, and then calculate the MABAC score for each student. Suppose the weight for each criterion is the same (for example, all criteria have a weight of 1). Based on calculations using the MABAC method, this is the score obtained for each student:

- Student 1: -0.38
- Student 2: -0.79
- Student 3: -0.29
- Student 4: -1.21
- Student 5: 0.12

In the context of this score, students with the highest scores (those closest to zero or positive) are considered the best students. So, based on this score, Student 5 has the best performance, followed by Student 3, Student 1, Student 2, and Student 4. These results show the relative ranking of students based on predetermined criteria From the results of calculations that have been carried out using 5 student alternatives and 4 assessment criteria, the best alternative is shown, namely student criteria 5 as the best student.
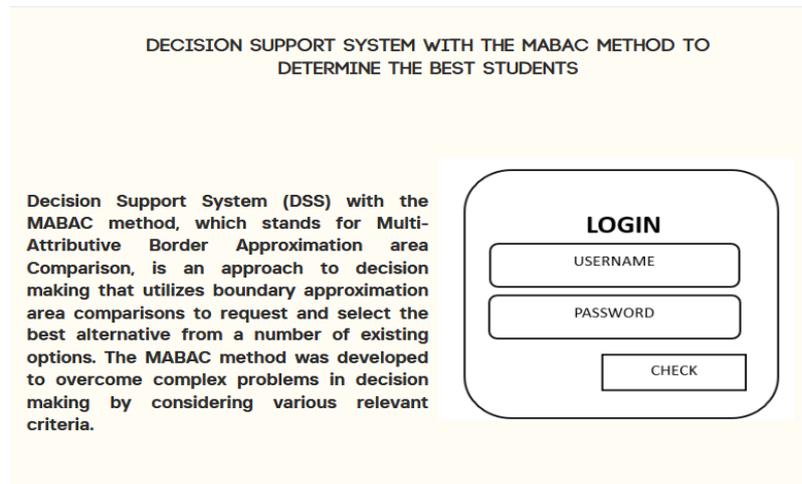
Application Results

Figure 3 System front page

In Figure 3 there is a display of the system's front page where a brief explanation regarding understanding the Decision Support System and the MABAC Method. Display the front page of this system by filling in the username and password then entering the system to the main page

Conclusion

The application of the Multi Attributive Border Approximation Area Comparison (MABAC) method to determine the best students offers an objective and comprehensive approach in evaluating student performance. By considering multiple criteria, this method successfully integrates important aspects of student performance into a unique score that facilitates direct and objective comparisons between students. This helps in identifying students who perform best overall, not just in one particular aspect but across multiple assessment dimensions.

Suggestion

It is recommended to continually develop and review the assessment criteria used. This includes considering new criteria that may be relevant to current or future educational need. Suggests further studies to explore the potential application of the MABAC method in different contexts or with varying assessment criteria. This may include adapting methodology to accommodate special educational needs or to assess student performance in extracurricular activities.

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