Implementation of the Simple Multi Attribute Ranking Technique Method as a Model for Decision Making in Determining the Talents and Interests of Children in Continuing Education

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Abstract. Talent and interest are very influential on students in the process of their development and learning. This is because every child needs an education program that matches their talents and interests. Many problems occur due to mistakes of parents or teachers in determining talent and asking students so mistakes in determining education still tend to be incorrect. So students find it difficult to adapt to the education they face because it is not in accordance with their abilities and potential. Therefore, we need a modeling of decision making based on the criteria of talent and interests of children using the Simple Multi Attribute Ranking Technique modeling. The implementation of the SMART method in this study is able to provide solutions to the problem of decision making talents and interests of children. This study uses a sample of 15 student data which is then entered into the computation of the SMART calculation method. The result is that 3 students who were sampled were able to have grades above the standard or scores above 70 points that have been set based on predetermined rules. While the other 12 students have the final result below the standard that has been set which is below the value of 70 points.

1. Introduction
At this time the talents and interests of students is very influential on students in the process of its development. This is because every child needs an education program that suits their respective talents so that they can develop and use their talents to the full.

Many problems occur due to mistakes of parents or teachers in determining talent and asking students so mistakes in determining education still tend to be incorrect. So students find it difficult to adapt to the education they face because it is not in accordance with their abilities and potential. Children's talents and interests are innate abilities that are potentials that still need to be developed or trained to achieve specific skills, knowledge and skills, for example language skills, playing music, painting, and others. To be able to realize talent must be supported by interests, training, knowledge, experience so that talent can be actualized properly. Based on this, it is important to determine the children's talents and interests early on. In determining talent and interest, proper modeling is needed.
to achieve maximum results. Therefore, a modeling of decision making is carried out based on the
criteria of talent and interests of children using the Simple Multiple Attribute Rating Technique
(SMART) modeling.
SMART modeling is used to find the weight of each alternative used as a decision model. The
weight is used as a standard in determining children's talents and interests. Data of children taken are
elementary school students in third, fourth and fifth grade. The interests and talents that are generated
include the areas of verbal, numerical, spatial, reasoning, and the ability of memory and creativity to
think.

2. Related Work
The SMART method used in making the decision support system for extracurricular activities has
been able to answer the existing problems with the response of respondents by 83.415% strongly agree
that this system is able to help students in choosing extracurricular activities [1]. This multi-criteria
decision making technique is based on the theory that each alternative consists of a number of criteria
that have values and each criterion has a weight that illustrates how important it is compared to other
criteria [2].
Simple Multi Attribute Rating Technique which is a quantitative method in decision making, where
in each criterion is given a weight then calculated using the SMART formula [3]. The SMART
method is able to solve problems with various criteria with the result that the percentage of system
accuracy is in the range of 83.57% [4].

3. Research Methodology
SMART is a multi-attribute decision making method. This method was developed by Edward in 1997
[5] [6]. This multi-attribute decision making technique is used to help stakeholders choose between
several alternatives. Each alternative consists of a set of attributes and each attribute has values, these
values are averaged on a certain scale [7]. Each attribute has a weight that illustrates how important it
is compared to other attributes. With SMART attribute weighting is done in two steps, namely:
1. Sorts the importance of an attribute from the worst level to the best level.
2. Make a comparison of the importance ratio of each attribute with other attributes underneath.

The SMART method equation:

\[
u(a_i) = \sum_{j=1}^{m} w_j u_j(a_i), \rightarrow i = 1, 2, \ldots, m
\]

Where :

- \( w_j \) = weighting value of the \( j \)th and \( k \) criteria
- \( u(a_i) \) = utility value of the \( i \)-th criterion for the \( i \)-th criterion

Decision selection is to identify which of the \( n \) alternatives has the greatest functional value.
4. Result and Discussion

4.1. Data Analysis
Before doing the calculations using the SMART method below, we present a sample of 15 students who will be used in this study. Data on a sample of children's talent and interest values are shown in Table 1.

| Student Data | Criteria value data | Verbal Criteria | Numeric Criteria | Spatial Criteria | Memory Criteria | Thinking Criteria |
|--------------|---------------------|----------------|------------------|-----------------|----------------|------------------|
| Student A    |                     | 80             | 100              | 100             | 60             | 80               |
| Student B    |                     | 100            | 60               | 80              | 80             | 80               |
| Student C    |                     | 80             | 80               | 80              | 60             | 60               |
| Student D    |                     | 40             | 60               | 100             | 100            | 80               |
| Student E    |                     | 80             | 100              | 40              | 80             | 40               |
| Student F    |                     | 80             | 80               | 40              | 40             | 100              |
| Student G    |                     | 100            | 40               | 100             | 80             | 40               |
| Student H    |                     | 60             | 100              | 40              | 100            | 80               |
| Student I    |                     | 40             | 100              | 100             | 60             | 60               |
| Student J    |                     | 80             | 60               | 100             | 80             | 100              |
| Student K    |                     | 60             | 80               | 40              | 60             | 40               |
| Student L    |                     | 40             | 80               | 80              | 100            | 40               |
| Student M    |                     | 80             | 40               | 40              | 80             | 80               |
| Student N    |                     | 40             | 100              | 100             | 40             | 100              |
| Student O    |                     | 60             | 100              | 80              | 60             | 60               |

4.2. Determine of number criteria
This method requires several criteria that are used as standard parameters in implementing the SMART method in the decision making of children's talents and interests. The criteria used in the study amounted to five, namely, verbal ability, numerical ability, spatial ability, memory ability and thinking ability. Table 2 shows the parameters that are standard in determining Verbal capabilities.

| No Criteria | Value | Weight |
|-------------|-------|--------|
| 1           | Very Good | 100    |
| 2           | Good    | 80     | 15%    |
| 3           | Enough  | 60     |
| 4           | Less    | 40     |

Table 3 shows the parameters that are standard in determining Numeric Ability.

| No Criteria | Value | Weight |
|-------------|-------|--------|
| 1           | Very Good | 100    |
| 2           | Good    | 80     | 30%    |
| 3           | Enough  | 60     |
| 4           | Less    | 40     |
Table 4 shows the parameters that are standard in determining Spatial Ability.

| No | Criteria   | Value | Weight |
|----|------------|-------|--------|
| 1  | Very Good  | 100   |        |
| 2  | Good       | 80    | 20%    |
| 3  | Enough     | 60    |        |
| 4  | Less       | 40    |        |

| No | Criteria   | Value | Weight |
|----|------------|-------|--------|
| 1  | Very Good  | 100   |        |
| 2  | Good       | 80    | 10%    |
| 3  | Enough     | 60    |        |
| 4  | Less       | 40    |        |

| No | Criteria   | Value | Weight |
|----|------------|-------|--------|
| 1  | Very Good  | 100   |        |
| 2  | Good       | 80    | 25%    |
| 3  | Enough     | 60    |        |
| 4  | Less       | 40    |        |

4.3. Normalization Criteria
The next step is to normalize the criteria parameter values. How to get the normalization value is as follows:

Normalization of verbal ability criteria = \[
\frac{15}{100} = 0,15
\]
Note: 15 is the weighting value of verbal ability criteria. 100 is the overall weight value.

Normalization of numerical ability criteria = \[
\frac{30}{100} = 0,3
\]

Normalization of verbal ability criteria = \[
\frac{20}{100} = 0,2
\]

Normalization of verbal ability criteria = \[
\frac{10}{100} = 0,1
\]

Normalization of verbal ability criteria = \[
\frac{25}{100} = 0,25
\]
4.4. Find the utility value
After calculating the normalization of the criterion value, the next step is to calculate the utility value for each criterion. How to get the utility value is as follows:

Verbal Criteria

\[ u_i(a_i) = 100 \frac{(80 - 40)}{(100 - 40)} % \]

\[ u_i(a_i) = 66,6 \]

Numeric Criteria

\[ u_i(a_i) = 100 \frac{(100 - 40)}{(100 - 40)} % \]

\[ u_i(a_i) = 100 \]

Spatial Criteria

\[ u_i(a_i) = 100 \frac{(100 - 40)}{(100 - 40)} % \]

\[ u_i(a_i) = 100 \]

Memory Criteria

\[ u_i(a_i) = 100 \frac{(60 - 40)}{(100 - 40)} % \]

\[ u_i(a_i) = 33,3 \]

Thinking Criteria

\[ u_i(a_i) = 100 \frac{(80 - 40)}{(100 - 40)} % \]

\[ u_i(a_i) = 66,6 \]

4.5. Finding the result

Verbal Criteria

Result = 66,6 x 0,15
\[ = 9,99 \]

Numeric Criteria
Result  = 100 x 0,3
        = 30
Spatial Criteria
Hasil  = 100 x 0,2
        = 20

Memory Criteria
Hasil  = 33,3 x 0,1
        = 3,33

Thinking Criteria
Hasil  = 66,6 x 0,25
        = 16,65

The final step is to find the value of the final result. How to calculate the value of the final result is as follows:

Result  = 9,99 + 30 + 20 + 3,33 + 16,65
        = 79,97

5. Conclusion
The SMART method implementation in this study is able to provide solutions regarding the problem of decision making and children's interests and interests. The SMART method focuses on weighting each criterion that influences the final decision. Students who tend to have a small value on the criteria given a large weight affect the final results of this method. The SMART method provides a ranking of all student data that has been completed. This study uses a sample of 15 student data which is then entered into the SMART computational method. The result is that 3 students who were sampled were able to have a value above the standard or a value above 70 points that have been set, while 12 other students have the final result below the standard that has been set that is below the value of 70 points.

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