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A Decision-Making Model for Kindergarten School Selection Using the AHP Method: A Case Study of West Bekasi

Novita Indriyani[1)], Ahmad Fauzi[2)], Andika Bayu Hasta Yanto[3)]
[1]Teknik dan Informatika, Universitas Bina Sarana Informatika Kampus Kota Bogor, Komplek Pesona Intiland Jl. Raya Cilebut Kel. Sukaresmi Tanah Sareal - Bogor
[2,3] Teknik dan Informatika, Universitas Bina Sarana Informatika, Jl.Kramat Raya No.98, Senen, Jakarta Pusat

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ABSTRACT

Choosing a Kindergarten (TK) is an important decision for parents because it involves many aspects such as the quality of educators, curriculum, facilities, costs, and environmental safety. However, the complexity of these criteria often creates uncertainty in making objective decisions. This study applies the Analytical Hierarchy Process (AHP) method to help provide recommendations for selecting the best kindergarten in the West Bekasi area. The hierarchical structure is built with six main criteria assessed by respondents through pairwise comparisons using Expert Choice. The synthesis results show that Kindergarten C received the highest weight of 0.433, followed by other alternatives, thus being determined as the best choice based on the criteria used. A Consistency Ratio (CR) value of 0.1 indicates that respondents' assessments are within the consistent limit (CR $\leq$ 0.1). Thus, the AHP model is proven to be able to measure priorities in a structured manner and help parents in making decisions about choosing a kindergarten more objectively and rationally.

Corresponding Author:

Novita Indriyani
Teknik dan Informatika,
Universitas Bina Sarana Informatika Kampus Kota Bogor,
Bogor, Indonesia
Email: novita.nvd@bsi.ac.id

1. Introduction

Early childhood education (PAUD), particularly kindergarten (TK) services, is a crucial foundation for children's cognitive, social, and emotional development. In cities surrounding the capital, such as West Bekasi, demographic dynamics, population mobility, and increasing parental awareness of the quality of early education have led to the emergence of numerous kindergarten institutions with diverse curriculum models, facilities, and cost policies. This situation creates a situation where parents—as the primary decision-makers—are faced with numerous alternatives and intersecting criteria when choosing the "right" kindergarten for their child. Practically, kindergarten selection is no longer based solely on a single factor such as cost or distance. Parents now consider a combination of criteria such as the quality of the teaching staff (teacher qualifications and competencies), the learning model (e.g., play-based learning vs. more academic), the teacher-child ratio and class size, physical facilities and cleanliness, safety aspects, reputation and accreditation, as well as affordability and ease of access/transportation. This complexity and multi-

criteria often lead to uncertainty and inconsistency in decision-making, especially when assessments are subjective and unstructured. In West Bekasi, several relevant phenomena include the development of residential areas and commercial centers, which influence the availability of kindergartens, differences in quality between institutions (public/private, paid/subsidized), and varying parental expectations. However, despite the wide range of choices available, there is limited systematic comparative information to help parents assess and prioritize alternatives based on criteria that align with their families' needs.
The rationale for this research is:
The need for a systematic and transparent decision-making tool for parents in selecting kindergartens;
The lack of applied research examining kindergarten selection in the West Bekasi context using a quantitative, multi-criteria approach;
The limited availability of local studies that incorporate parental preference weighting against key criteria, resulting in more objective and accountable recommendations.
The Analytic Hierarchy Process (AHP) method is suitable for this problem because it can break down complex decision problems into a hierarchical structure, handle subjective judgments through pairwise comparisons, and generate priority weights that facilitate the ranking of alternatives. By applying AHP, this research is expected to transform subjective judgments into a measurable and consistent basis for decisions.
This research aims to develop an AHP-based decision model that:

a. Identifying and categorizing relevant kindergarten selection criteria in West Bekasi,
b. Determining the priority weight of each criterion according to the views of parents/respondent groups,
c. Generating a ranking of alternative kindergartens to provide practical recommendations for parents.

The research results are expected to provide academic contributions (application of the AHP method in a local context) and practical benefits (a decision-making tool that can be used by the community and education policymakers in West Bekasi).

Research Method

A. Analytical Hierarchy Process

The AHP method helps solve complex problems by structuring a hierarchy of criteria, stakeholders, and outcomes, and by drawing on various considerations to develop weights or priorities. This method also combines the power of emotion and logic related to various issues, then synthesizes diverse considerations into results that match our intuitive expectations as presented in the considerations that have been made. As it develops, AHP can solve complex or unframed problems with quite a lot of aspects or criteria. This complexity is caused by unclear problem structures, uncertainty in decision-making perceptions, and the uncertainty in the availability or even complete absence of accurate statistical data. Sometimes, perceived and observed decision problems arise that require immediate action, but the variations are complex so that the data cannot be recorded numerically; only qualitative measurements can be made, namely based on perception, experience, and intuition. However, it does not rule out the possibility that other models are also considered during the decision-making process using the AHP approach, particularly in understanding individual decision-makers during the process of applying this approach. [1] The advantage of the AHP method is that at the final stage a consensus can be drawn which is a combination of opinions from all parties who are used as sources (experts). The stages in conducting AHP data analysis are stated as follows[2]:

1. System identification, which involves identifying problems and determining the desired solution. System identification is carried out by studying references and discussing with experts who understand the problem, resulting in a concept relevant to the problem at hand.
2. Developing a hierarchical structure, starting with the general objective, followed by criteria and sub-criteria. The bottom of the hierarchical structure contains possible strategic alternatives.
3. Criteria and Alternative Assessment, Criteria and alternatives are assessed through pairwise comparisons. According to Saaty (1988), for various problems, a scale of 1 to 9 is the best scale for expressing opinions. The values and definitions of qualitative opinions from Saaty's comparison scale can be seen in Table 1.

Table 1. Paired Comparison Rating Scale

Importance Intensity	Description
1	Both elements are equally important
3	One element is slightly more important than the other
5	One element is significantly more important than the other
7	One element is clearly more important than the other
9	One element is absolutely more important than the other
2,4,6,8	Values between two adjacent considerations

Source: (Saaty, 2001)

In AHP, alternative assessment can be performed using the direct method, which is a method used to input quantitative data. Typically, these values are derived from a previous analysis or from experience and a detailed understanding of the decision problem. If the decision maker has extensive experience or understanding of the decision problem at hand, they can directly input the weighting of each alternative.

1. Determining Priorities

For each criterion and alternative, pairwise comparisons need to be conducted. The relative comparison values are then processed to determine the ranking of all alternatives. Both qualitative and quantitative criteria can be compared according to predetermined assessments to generate weights and priorities. Weights or priorities are calculated by matrix manipulation or by solving mathematical equations. Considerations from the pairwise comparisons are synthesized to obtain overall priorities through the following steps:

a. Square the matrix resulting from the pairwise comparisons.
b. Calculate the sum of the values in each row, then normalize the matrix.

2. Logical Consistency

All elements are grouped logically and ranked consistently according to a logical criterion.
The weight matrix obtained from the pairwise comparisons must have a cardinal and ordinal relationship. This relationship can be shown as follows:
Cardinal relationship: aij.ajk=aik
Ordinal relationship: Ai > Aj, Aj>Ak, therefore Ai > Ak

3. The above relationship can be seen from two points:
   a. By looking at multiplicative preferences, for example, if grapes are four times tastier than mangoes and mangoes are twice tastier than bananas, then grapes are eight times tastier than bananas.
   b. By looking at transitive preferences, for example, if grapes are tastier than mangoes and mangoes are tastier than bananas, then grapes are tastier than bananas.
   c. In reality, there will be some deviations from this relationship, so the matrix is not perfectly consistent. This occurs due to inconsistencies in a person's preferences.

4. Calculating logical consistency is done by following these steps:
   a. Multiplying the matrix by the corresponding priorities.
   b. Summing the multiplication results per row
   c. che sum of each row is divided by its respective priority and the results are added together.
   d. The result of c divided by the number of elements gives λmax
   e. Consistency Index = CI / RI, where RI is the random consistency index. If the consistency ratio is ≤ 0.1, the data calculation results are valid.

The RI value is based on research conducted by Saaty (1993), as shown in the table 2.

Table 2. Random index values

Orde Matriks	1	2	3	4	5	6	7	8	9	10
RI	0,00	0,00	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49

Source: (Saaty, 1993)

B. Previous Research

Based on research in the journal "Application of the AHP Method for a Decision Support System for Selecting Exemplary Students," it was concluded that: The results showed that exemplary students with the highest weighted scores achieved a score of 0.1920. The resulting DSS was able to select exemplary students more objectively and transparently based on existing criteria, namely discipline, attendance, achievement, and extracurricular activities. Implementing this system was able to increase objectivity and fairness in selecting exemplary students and motivate students to achieve better results. [3]

Based on research in the journal "Decision Support System for Selecting the Best Air Conditioning Technician Using the AHP Method," it was concluded that: The research method used an AHP-based system implementation to mathematically compare and weight criteria. The results showed that the developed system could produce fairer and more accurate assessments, reduce subjectivity, and provide recommendations for the best technicians on a regular basis. This system also facilitates the storage of technician performance history for future evaluation. [4]

Based on research in the journal entitled "Evaluation of Courier Service Provider Selection Based on the Analytical Hierarchy Process (AHP) Method," it was concluded that: To assist decision-making in selecting a logistics/courier service provider, the author conducted research on evaluating the selection of courier service providers using the AHP method. The AHP method was chosen because it can create an effective decision-making framework for complex problems by simplifying the decision-making process and breaking the problem down into criteria and then arranging these criteria in a hierarchical structure. Thus, the analysis results can synthesize various considerations to determine which variables have the highest priority and act to influence the outcome in a given situation [5].

Based on research in the journal entitled "Multi-Criteria Selection of Department Store Suppliers Using the Fuzzy AHP and TOPSIS Methods," it was concluded that: In this study, supplier selection was carried out using Multiple Criteria Decision Making (MCDM) using the Fuzzy AHP and TOPSIS methods. The Fuzzy AHP method can minimize uncertainty that can occur in decision-making. Meanwhile, TOPSIS compares the distance between negative and positive ideal solutions [6].

Based on research in the journal entitled "Decision Support System for Selecting Used Cars Using the AHP and SAW Methods at Nava Sukses Motor," it was concluded that: With the Decision Support System for selecting used cars using the Analytical Hierarchy Process (AHP) and Simple Additive Weighting (SAW) methods, the accuracy level reached 73% compared to using the Simple Additive Weighting (SAW) method alone, which had an accuracy level of only 60%. [7] Based on research in the journal entitled "Support System for Determining Priorities for Selecting Promotional Media Printing Using the AHP Method," it was concluded that: Decisions can be made based on the results of respondent stimuli, namely by administering a questionnaire containing comparisons between criteria and alternatives. And by using the Expert Choice tool in data processing with the AHP method. The results of the AHP test on frontlite-based materials were 0.9976. And printing company 1 was ranked first. [8] Based on research in the journal entitled "Decision Support System for Selecting Healthy Toddlers Using the AHP and TOPSIS Methods," it was concluded that: Based on the tests conducted in this study, the system has met its functional requirements according to the expected objectives. Testing of the decision support system for selecting healthy toddlers resulted in an accuracy of 50% [9].

Based on research in the journal entitled "Decision Support System for Selecting Outstanding Lecturers Using the Analytical Hierarchy Process (AHP) Method," it was concluded that: This decision support system for selecting outstanding lecturers uses the Analytical Hierarchy Process (AHP) method, which is carried out by creating a paired matrix value for each criterion. The values from the paired matrix must be consistent. Lecturer assessment data will be calculated using the paired matrix values, and the results of this calculation will appear in the form of a rating value. The lecturer with the highest rating value is entitled to become an outstanding lecturer at Balitar Islamic University [10].

Based on research in the journal entitled "Supplier Selection Analysis Using the Analytical Hierarchy Process (AHP) Method in the Shoe Retail Industry," it was concluded that: The results of the study indicate that the AHP method is effective in ranking suppliers based on aspects of quality, price, delivery timeliness,

and product quantity. The findings of this study indicate that the supplier with the highest score in the shoe category brand A received a score of 10 and was designated as the top supplier. Meanwhile, the best suppliers for brands B and C received scores of 8.5 and 8, respectively. By implementing the AHP method, the company can optimize the supplier selection process to improve supply chain efficiency and customer satisfaction [11].

Based on research in the journal entitled "Utilization of the Analytical Hierarchy (AHP) Method in a Decision Support System for Determining Year-End Bonuses," it was concluded that: By using AHP, PT. Dankos Farma can make more objective and measurable bonus decisions, increasing transparency and accountability in the process. In addition, AHP allows the company to quickly adjust bonus policies to changes in company strategy or market conditions. In conclusion, the use of AHP by PT. Dankos Farma's decision support system for determining year-end bonuses has helped improve the efficiency and effectiveness of decision-making related to employee incentives. [12]

Research in the journal "Decision Support System for Egg Supplier Selection in Grocery Stores Using the AHP Method" concluded that: The AHP method simplifies evaluation by separating each criterion based on its importance through pairwise comparisons, allowing the final ranking of each supplier to be objectively ranked. [13]

Research in the journal "Decision Support System for Egg Supplier Selection in Grocery Stores Using the AHP Method" concluded that: AHP enables more objective and accurate employee performance assessments based on various criteria, such as work speed and quality, communication, attendance, loyalty, and ethics and appearance. The results of this DSS implementation showed that Gita received the highest score of 8.0441, followed by Jenni with 7.9922, and Ranny with 7.8743. This system is expected to increase employee motivation through more transparent assessments. [14].

Based on research in the journal entitled "Analysis of Transportation Mode Selection Using the Analytical Hierarchy Process (AHP) Method, Case Study: Banyuwangi - Surabaya," it was concluded that: regional. The AHP method is used to understand the preferences and weights given by transportation users to various criteria in choosing a transportation mode. This study identified several key criteria that influence the choice of transportation mode, such as travel time, cost, comfort, safety, and environmental sustainability. Respondents involved in this study were travelers between Banyuwangi and Surabaya. The analysis results show that comfort is the most important factor considered by respondents in choosing a transportation mode. Travel time and cost also have a significant influence on their decisions. Based on a comparison between different transportation modes, the results show that trains are considered the most preferred choice, followed by buses and private cars. This study provides valuable insights for decision-makers in the transportation sector to improve transportation services between Banyuwangi and Surabaya, as well as encourage the use of more sustainable and efficient transportation modes [15].

Based on research in the journal entitled "Decision Support System for Selecting the Best Graduates Using the Analytical Hierarchy Process (AHP) Method," it was concluded that: The analytical hierarchy method (AHP) used in this decision support system can help provide relevant recommendations quickly, thus enabling universities to select their best graduates appropriately [16].

Based on research in the journal entitled "Implementation of the AHP and TOPSIS Methods in Selecting the Best Social Commerce for MSMEs," it was concluded that: AHP is a priority weighting method between criteria with a multi-level analysis process. Meanwhile, TOPSIS is a decision support method where the best selected alternative not only has the closest distance from the positive ideal solution, but also has the furthest distance from the negative ideal solution. A combination of these two methods is used by applying AHP in weighting and TOPSIS in ranking based on input from AHP. This research aims to provide information in determining effective social commerce media for MSMEs so they can maximize the media for transaction and marketing activities. This certainly supports MSMEs in maximizing promotional and sales media to achieve profits [17].

Based on research in the journal entitled "Decision Support System for Determining the Status of Contract Employees to Permanent Employees Using the AHP Method," it was concluded that: Based on research findings, a decision support system offers the best alternative for determining the status of contract and permanent employees through the application of the Analytical Hierarchy Process (AHP) method. The

analysis results show that the values generated by both system calculations and manual calculations are the same. However, the final result rests with the decision maker, namely the HRD of PT. RBN [18].

Based on research in the journal entitled "Implementation of a Decision Support System for Selecting the Best Laptop Using the Analytical Hierarchy Process (AHP) Method (Case Study: Center IT Computer)," it was concluded that: The Analytical Hierarchy Process (AHP) method is used as the basis for decision-making in laptop selection. AHP is a decision support model that prioritizes functional hierarchy with the main input being human perception. The calculation results show that MSI received the highest weighting with a value of 0.325, followed by Zyrex (0.229), Lenovo (0.203), Asus (0.138), and HP with the lowest priority of 0.105[19].

Based on research in the journal entitled "Application of the Analytical Hierarchy Process (AHP) Method in the Vendor Selection Process (Case Study: PT. XYZ)," it was concluded that: This study used a mixed methods approach supported by data collection through interviews and questionnaires. The data processing in this study used the AHP method as a decision support system that helped researchers identify criteria and alternatives for the company. The results showed that the primary criterion in vendor selection was fleet availability, which had the highest weighting with a value of 0.553. Meanwhile, the selected vendor was Vendor B with a value of 0.358 out of a total of four other alternative vendors[20].

Based on research in the journal entitled "Decision Support System for Selecting Fertilizers in Cassava Plants Using the AHP Method" concluded that: This study aims to select the most suitable fertilizer for cassava plants using the Analytical Hierarchy Process method. The results of the study show that Inorganic Fertilizer (A2) has the highest priority of 0.509 or 50.90%, followed by Organic Fertilizer (A1) with a value of 0.262 or 26.20%, and finally Biological Fertilizer (A3) with the lowest value of 0.230 or 22.99%. So these results can provide useful recommendations for farmers to choose optimal fertilizers to increase agricultural productivity and sustainability. This study shows that the Analytical Hierarchy Process method is effective in supporting complex decision-making systematically in considering various criteria [21].

Based on research in the journal entitled "Alternatives for Controlling Surface Runoff in Urban Areas Using the Analytical Hierarchy Process (AHP) Method," it was concluded that: The results of the analysis using the AHP method provide relative priority values for each alternative, allowing for the selection of optimal solutions for surface runoff problems. The resulting green open space alternative is the optimal solution for surface runoff control systems in urban areas [22].

Based on research in the journal entitled "Decision Support System for Selecting the Best Village Using the AHP (Analytical Hierarchy Process) Method in Sidikalang District," it was concluded that: The main benefit of the Analytical Hierarchy Process (AHP) method is problem-solving and multi-criteria decision-making. This method weights priorities for alternatives by establishing objectives, criteria, and sub-criteria in a hierarchical structure. In this study, there are five criteria: Government Services, Environmental Cleanliness, Environmental Beauty, Layout, and Facilities. The alternatives include several villages: Bintang Village, Pancuran Village, Hutabaru Village, Repelita Village, and Panji Village. By carrying out the stages using the AHP method, the best alternative village was obtained, namely Bintang Village, with the highest score of 0.51, which was also proven from all criteria. Therefore, using this method will not find the same value in the final result [23].

Based on research in the journal entitled "Application of the AHP (Analytical Hierarchy Process) Method in Recommendations for Student Boarding Houses (Case Study: North Kalimantan University)" concluded that: The results of the AHP method calculation resulted in a boarding house recommendation with the highest score, namely the Pagar Hijau boarding house located in Gang Mandala in front of the North Kalimantan University campus. This recommendation resulted in criteria with relatively low costs with complete facilities, but located far from the campus with an estimated distance of 400-700 meters [24].

Based on research in the journal entitled "Drug Selection Decision Support System Based on Disease Symptoms Using the AHP Method" it was concluded that: Based on the results of the research that has been carried out, it can be concluded that: the application of the Analytical Hierarchy Process (AHP) method in the drug selection decision support system provides objective and measurable results in helping medical

personnel determine the most appropriate drug based on the symptoms experienced by the patient, especially symptoms of fever, cough, and sore throat [25].

2. Result and Discussion

In the initial stage of weighting with expert choice, namely by entering the criteria and alternatives as follows:

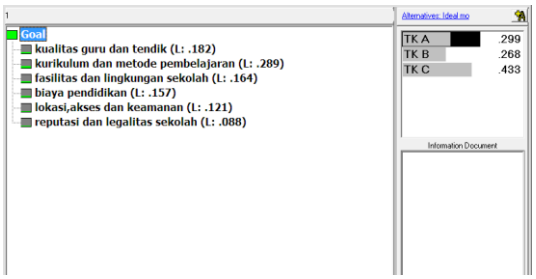

Figure 1. Criteria and Alternatives

The analysis of the combined opinions of the respondents that has been processed produces the following criteria basis:

Figure 2. Criteria Value Basis Weight

The criteria base produces selection alternatives with the following division:
1. Quality of Teachers and Education Personnel

Figure 3. Alternative Foundation Value Weighting Based on Teacher and Education Personnel Quality Criteria

2. Curriculum and Learning Methods

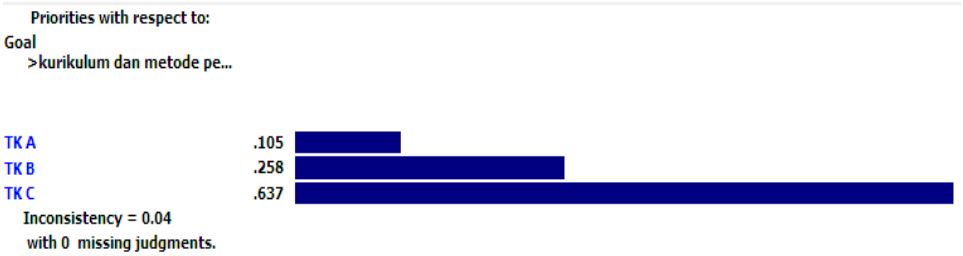

Figure 4. Alternative Foundation Value Weighting Based on Curriculum Criteria and Learning Methods

3. School Facilities and Environment

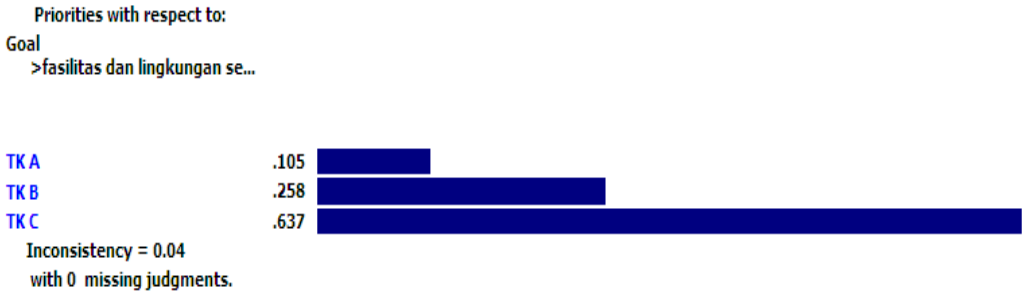

Figure 5. Weighting of Alternative Foundation Values Based on School Facilities and Environment Criteria

4. Education Costs

Figure 6. Alternative Basis Value Weighting Based on Education Cost Criteria

5. Location, Access and Security

Figure 7. Weighting of Alternative Foundation Values Based on Location, Access and Security Criteria

6. School Reputation and Legality

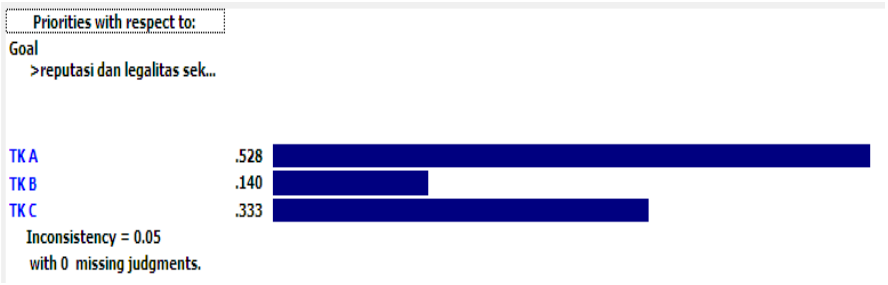

Figure 8. Weighting of Alternative Foundation Values Based on School Reputation and Legality Criteria

Based on the paired comparison data of criteria and alternatives, the following results were obtained.

Figure 9. Expert Choice Results Synthesis Weight

The image above shows that Kindergarten C has the highest weighting, at 0.433, making it the best kindergarten choice. The overall consistency score is 0.1, so the study on kindergarten selection can be considered consistent because CR <0.1.

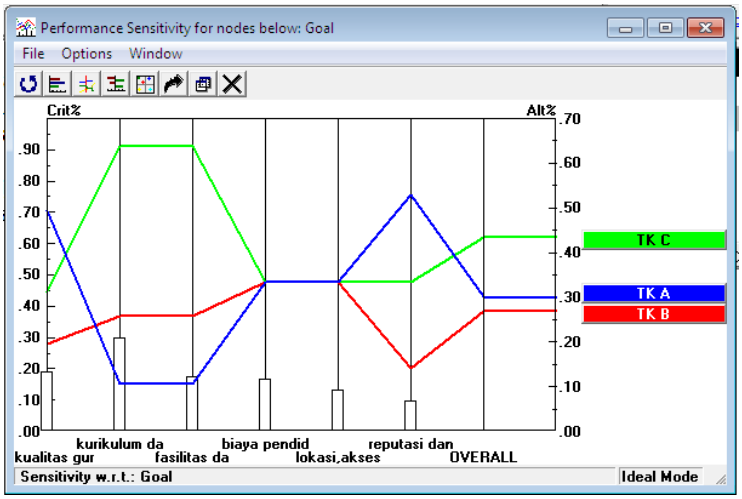

Figure 10. Performance Sensitivity Expert Choice Results

3. Conclusion

This study successfully applied the AHP method to determine the priority of selecting the best kindergarten in the West Bekasi area. Based on the weighting results of six main criteria including teacher quality, curriculum, facilities, tuition fees, location and security, and school reputation, it was found that Kindergarten C was the best alternative with the highest weighting of 0.433. The assessment process also showed a valid level of consistency with a CR value of 0.1, so the results can be accounted for. The developed AHP decision model can help parents in determining the school that suits their child's needs in a more objective and structured manner. In the future, the research can be developed by increasing the number of respondents, alternative schools, and integrating a web-based system or application as a more practical decision-making tool for the community.

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