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Decision Support for Selection of The Best Teachers Recommendations MCDM-AHP and ARAS Collaborative Methods

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Abstract: The role of the teacher is very important for the progress of the nation which can increase the dignity of the nation. The quality of education can increase thanks to the support of teachers who have good dedication in developing the learning process, especially in curriculum development. The teacher's biggest contribution is to make students ready to become the nation's credible successors. The purpose of this study is to provide an assessment in the selection process of teachers in an objective and selective manner. Method recommendations that can be raised in this study are collaborative methods that play a role in multi-criteria selection, namely MCDM-AHP and ARAS. Both of these methods can be said to be able to implement a selective and credible selection process for teachers which is carried out through the stages of data conversion and normalization which in turn can determine decision support in the multi-criteria selection process. The results of this study provide the best solution in selecting alternatives with a multi-criteria barometer for measurements with the ARAS method. The resulting decision support for the selection process of twenty teachers resulting in the best assessment can be seen from the optimization function which is based on the maximum value default divisor basis. The results obtained from obtaining the highest utility value of the twenty alternatives, the top three values that can be drawn as support for decision making are owned by A3 with a utility weight of 0.891, followed by the two highest ratings A17 and A14 with respective weights of 0.888 and 0.884.

Keywords: AHP, ARAS, Multi-criteria, Teachers rating, Utility.

INTRODUCTION

The progress of the world of education is of course the support of teachers who act as creators of the next generation of advanced nations, tirelessly these educational heroes continue to develop knowledge in various scientific fields as outlined in creating a varied curriculum (Muhammad Lukman, 2022) and developing various learning techniques to facilitate acceptance of student understanding students and to be able and easy to absorb knowledge (Retnawati et al., 2016). The process of improving teacher national education has an important role as a professional educator in improving the quality of national education.

The teacher selection process must be able to be applied properly and correctly to create quality human resources. Things like this must be done objectively and continuously and no longer use subjective treatment methods(Sulfasyah et al., 2015). Such treatment must be carried out selectively in order to produce teachers with the best predicate and achievements in improving the quality of education for their students.

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The development that will be carried out in this research is to make a different contribution in the selection process for teaching staff such as teachers who are included in the category of using collaborative methods between the Multi-criteria Decision Making-Analytic Hierarchy Process (MCDM-AHP) and the Additive Ratio Assessment (ARAS). The collaboration of these two methods will provide integrity that is in line with the division of tasks for solving problems from each of these methods in an integrated manner. The Analytic Hierarchy Process method is included in the MCDM grouping which is used for weighting of the ten criteria by obtaining the eigenvector value with a number of iterations (The et al., 1936). Meanwhile, the synergy of the ARAS method is built to determine the selection through the normalized matrices elements of all alternatives based on the default alternative as an optimization function (Goswami & Mitra, 2020).

The AHP method that will be applied in this study as a determinant of the weight of all criteria with different techniques, the determination of the weight value based on the eigenvector value that must be obtained to the optimal point through the iteration stages (Waas et al., 2022). The process of the occurrence of iterations carried out is measured based on the final value of the iteration process without any difference to the value of the eigenvector magnitude in the previous stage (Akmaludin et al., 2020). Many AHP users in conducting research do not pay attention to this important matter, so that the results tested cannot be verified on the eigenvector acquisition value. Proof of correctness can be tested by two methods, the first proving test using the mathematical algebra matrices method and the second proving test using expert choice apps (Akmaludin et al., 2020). Testing with the mathematic algebra matrices method can be proven by obtaining the results from the Consistency Ratio (CR) with the weight value of the eigenvector having to be less than 10 percent, while the second proof can be known through expert choice apps based on the amount of inconsistency produced which cannot exceed 10 percent with display results the magnitude of the eigenvector value for each criterion used and forming an image with a normal graph based on the synthesis process obtained from the expert choice apps.

Looking at previous research on selecting outstanding teachers using the AHP-SAW method with results that can reduce the error rate (Mirdania & Nawindah, 2021), there are other researchers who carry out the teacher selection process using the collaboration of the AHP method with TOPSIS with results of an accuracy rate of up to 78% (Sholehah & Maspiyanti, 2020), there are even other studies related to teacher selection uses the AHP-Promethee method with consistent assessment results (Pramana et al., 2022), while the use of the ARAS method for teacher assessment gives results that are able to solve problems in teacher rankings. Seeing the existing conditions, the researchers tried to rank the best teachers with the collaboration of the MCDM-AHP and ARAS methods, especially in terms of this assessment using the help of a questionnaire instrumentation both the criteria and input for the assessment of the teacher predicate.

LITERATURE REVIEW

Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) has become a reference for researchers to solve various problems related to multi-criteria decision support. AHP that can be used with the concept of Multi-criteria Decision Making (MCDM) can only be combined with expert choice apps (Ahmad et al., 2020), this is the difference between using AHP with the application of multi-criteria through obtaining optimal eigenvector values. Thus the optimization of the results of the eigenvector values obtained with the MCDM concept gives the same value as the proof through the mathematical algebra matrices method (Lin & Lu, 2019). The advantage of the MCDM-AHP method is that it can provide definite support for determining the value of the criteria for each selection process.

The working concept of the AHP method begins with the arrangement of data elements into matrices which can be shown in equation 1. The calculation process is carried out by multiplying matrices as usual which can be connected with the hands of matrices. This process will be carried out up to the synthesis stage through mathematical algebra matrices.

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$$X_{(m,n)} = \begin{bmatrix} a_{(1,1)} & a_{(1,2)} & a_{(1,3)} & \cdots & a_{(1,n)} \\ a_{(2,1)} & a_{(2,2)} & a_{(2,3)} & \cdots & a_{(2,n)} \\ a_{(3.1)} & a_{(3,2)} & a_{(2,4)} & \cdots & a_{(3,n)} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a_{(m,1)} & a_{(m,2)} & a_{(m,3)} & \cdots & a_{(m,n)} \end{bmatrix} \quad (1)$$

In this study using an assessment barometer with ten criteria, to find out that errors in comparison do not occur, we can use equation 2 as knowledge to determine the number of comparison numbers used. This must be applied because it is closely related to the entire process of calculating stages in AHP. To test the results obtained through the consistency test (de Castro-Pardo et al., 2019) which is useful for continuing the research process by looking for the Consistency Index (CI) acquisition which can be done using equation 3, while to find out the amount of Consistency Ratio (CR) using equation 4, with the acquisition value equal to or less than 10 percent based on the Saaty stipulation (Saaty, 2010).

$$CN = \frac{n*(n-1)}{2} \quad (2)$$

$$CI = \frac{(\lambda\,\max - \mathrm{n})}{(n-1)} \quad (3)$$

$$CR = \frac{CI}{RI} \quad (4)$$

CR calculations are indeed very influential on the Radom Index, Table 1 is the result of the determination from Saaty who found the calculations strictly, so that many researchers can only apply and use values that have become a reference in using the obtained CR values.

Table 1. Random Index (Bouayad et al., 2018)

Ordo	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0	0	0.6	0.9	1.12	1.24	1.32	1.41	1.45	1.48	1.51	1.48	1.56	1.57	1.58

Aditive Ratio Assesment (ARAS)

The Additive Ratio Assessment (ARAS) method is a method used for rating systems based on utility levels compared on the basis of the overall optimal index with the optimal index obtained from each alternative(Bošković et al., 2021). The ARAS method is applied based on simple multi-criteria to a number of alternatives and can be categorized as a Multi-attribute Decision Analysis. The first discoverers of the ARAS method were presented in 2010 by Zavadskas and Turksis (Zavadskas & Turskis, 2010). This method can solve complex problems with a simple comparison concept of utility value.

Several calculation stages can be carried out using the ARAS method. The first step taken is to determine the performance of the data to be processed with the ARAS method which is then converted into a Matrices Decision form and then determines the optimal alternative criteria as a comparison with other alternatives (Syahputra et al., 2019), while the matrix decision form which describes the layout of an element matrix can be seen in equation 5 which has a basis similar to equation 1, but has differences in the matrices elements that were created as alternative comparisons with optimal ratings (Rostamzadeh et al., 2017).

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$$X = \begin{bmatrix} X_{(0,1)} & X_{(0,n)} & \cdots & X_{(0,n)} \\ X_{(i,1)} & X_{(i,n)} & \cdots & X_{(i,n)} \\ \vdots & \vdots & \ddots & \vdots \\ X_{(n,1)} & X_{(m,n)} & \cdots & X_{(m,n)} \end{bmatrix}$$

(5)

Where $X_{(m,n)} = the\ performance\ value\ of\ an\ alternative\ m\ to\ n$ m against n
$X_{(0,n)} = optimum\ value\ of\ performance\ j$

Basically the use of the ARAS method to determine the value of $X_{(0,n)}$ is not visible but must be formed by determining the difference between the maximum and minimum values of each type that each criterion has using equation 6.

$$X_{(0,n)} = \frac{max}{m}.X_{(m,n)}, if\ \frac{max}{m}.X_{(m,n)}\ is\ freferable$$

(6)

$$X_{(0,n)} = \frac{min}{m}.X_{(m,n)}, if\ \frac{min}{m}.X_{(m,n)}\ is\ freferable$$

(7)

The normalization process in the ARAS method provides an overview so that data can be processed for the stage of forming a ranking of utility values (Triajeng Pungkasanti & Indriyawati, 2019). The normalization process can be obtained using equation 8. Because in this study the collaboration of the ARAS method and the AHP method was used, the determination of the weights must be adjusted first with optimal eigenvalues to find optimal results.

$$X^{*}{}_{(m,n)} = \frac{X_{(m,n)}}{\sum_{m=0}^{a} X_{(m,n)}}$$

(8)

The criteria have two types of use, there are criteria that are different types of benefits, meaning that the criteria have a positive value, there are criteria that have an unbenefit value, meaning that the criteria have a negative value. For criteria that have a negative value, there are two stages of completion to obtain results that have a positive value (Satria, 2020). These two stages can use equation 9 and equation 10.

$$X^{*}{}_{(m,n)} = \frac{1}{X_{(m,n)}}$$

(9)

$$R = \frac{X^{*}{}_{(i,j)}}{\sum_{i=0}^{m} X^{*}{}_{(i,j)}}$$

(10)

Based on the process of normalization results, it has provided an overview for solving utility values which needs to be weighted for each criterion, the weighting technique will be taken from the optimal eigenvector value obtained using the AHP method (Lipovetsky, 2011). To enter the eigenvector quantity using equation 11 and equation 12 is used to determine the optimal function. As a final process, it compares the ranking based on the optimal function to the highest level utility using equation 13.

$$D = [d_{(i,j)}]mxn = r_{(i,j)}.w_j$$

where w_j= criteria weight of j

(11)

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$$S_i = \sum_{j=1}^{n} d_{(i,j)} \quad (12)$$

$$K_i = \frac{S_i}{S_0} \quad (13)$$

The process stages that explain the collaboration of the two AHP and ARAS methods can be realized as a method in the form of an algorithm which can be seen in Fig. 1 which is the stage of completing the teacher selection solution with a combination of the two AHP and ARAS methods.

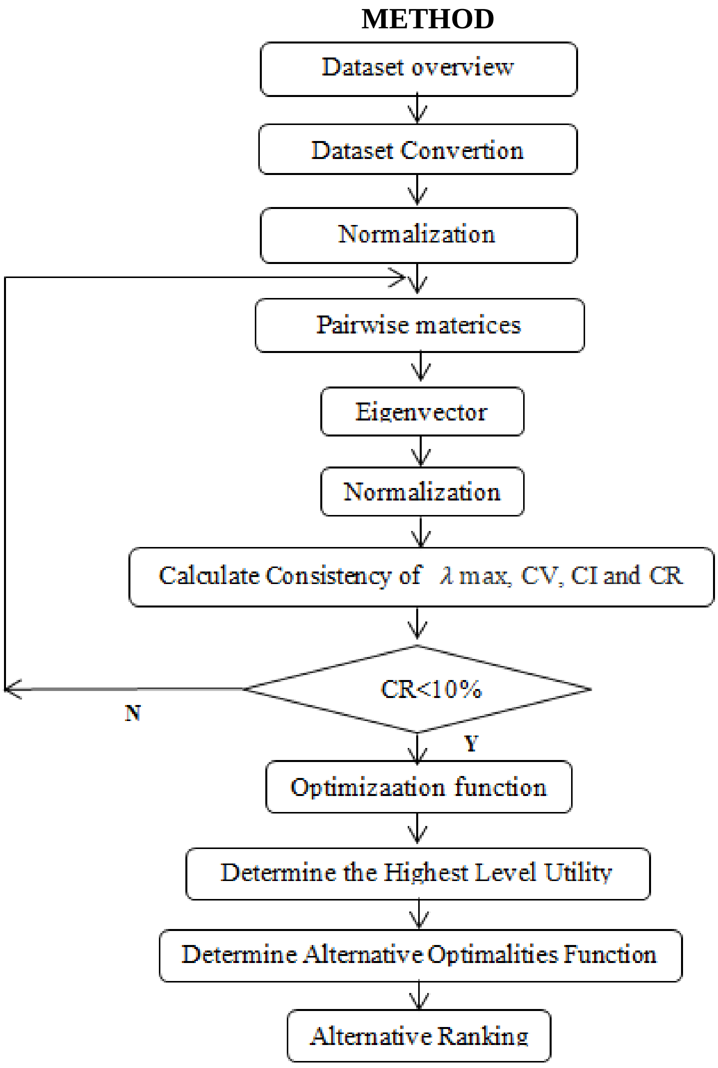

Fig. 1. AHP-ARAS Algoritm

The collaborative process of the two AHP and ARAS methods shown in Fig. 1 can be done. ARAS method, which is well-known in decision-making, have been chosen to design the algorithm for priority setting (Kutut et al., 2013). Seen from another point of view, because it has many characteristics in common, both of them have similarities in data processing with the concept of multi-criteria for decision datasets, have goals that are in line in the selection and evaluation process and the goals can be collaborated especially in the process of assigning weights that are not owned by ARAS which is usually done manually and looks less objective, so the AHP method is needed to determine these weights and the treatment in AHP is to determine the weights through the acquisition of

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eigenvector values as a step for determining objective weights based on the respondents who act as the role of experts in determining the quality of the results to the value eigenvector through the process of reducing iteration matrices to obtain optimal eigenvector values, as evidenced by the absence of difference between the last eigenvector and the previous eigenvector. Another supporting reason is the AHP method for determining the feasibility of weights using the Mathematical Algebra Matrices method which is supported by the application of expert choice for the consistency quantity.

RESULT

Teacher selection decision support is one of the solutions that can provide an assessment of teachers in an objective way, the usual selection of teachers based on subjectivity assessments does not provide the best view of the assessor and also the teacher who has been selected as a result of the assessment, because the method used is inappropriate conducted. Thus it is necessary to carry out an assessment that is carried out in a transparent, open and objective manner. In research trying to provide an overview of a teacher assessment system that is selective and objective, this method can be used as a prototype for selecting teachers with credibility, because the assessment is carried out based on research results in determining the assessment criteria and the calculation process is carried out using collaborative methods that can be recommended.

Determination of criteria must be determined by distributing questionnaires and filtering indexed descending to the criteria of the most selected candidates and approved by a number of respondents. Then the selected criteria will be arranged in matrices according to equation 1, then disseminated and distributed with the help of instrumentation in the form of a questionnaire to compare the assessment of each selected criterion using equation 2 according to the number of criteria used and calculated for each criterion using equation 3 and equation 4 to see the consistency rating. The determination of the criteria used for teacher assessment has been selected from the ten criteria shown in Table 1.

Table 1. Criteria

Kriteria	Keterangan	Type (B/C)
C1	Experience (EXP)	Benefit
C2	Presence (PRE)	Benefit
C3	Teaching (TEC)	Benefit
C4	Discipline (DSP)	Benefit
C5	Attitude (ATT)	Benefit
C6	Performance (PFM)	Benefit
C7	Communication (COM)	Benefit
C8	Accuracy (ACR)	Benefit
C9	Motivation (MTV)	Benefit
C10	Obligation (OBL)	Cost

While the assessment barometer is determined by using fuzzy numbers that are the same for all assessment criteria. The fuzzy numbers used as barometers of judgment can be seen in Table 2, using range 1 as the smallest value and range 5 as the largest value.

Table 2. Fuzzy Number

Evaluation	Fuzzy value
Very good	5
Good	4
Enough	3
Less	2
Very less	1

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Based on the input data from a number of respondents, a finalized dataset was obtained as shown in Table 3, which consists of 20 hospitals as alternative research objects with ten criteria and each type of criteria, pay attention to Table 3 below.

Table 3. Dataset Overview

Type Alt\ Criteria	(B) C1	(B) C2	(B) C3	(B) C4	(B) C5	(B) C6	(B) C7	(B) C8	(B) C9	(C) C10
A1	4	4	3	4	4	4	4	4	5	4
A2	4	5	4	4	3	4	4	3	4	4
A3	5	5	4	4	4	4	4	5	4	4
A4	4	3	4	3	5	5	4	4	5	4
A5	4	4	3	4	4	4	4	4	3	4
A6	5	4	4	5	4	4	4	4	4	4
A7	3	4	5	4	4	3	4	4	5	3
A8	4	3	4	4	4	4	3	3	4	4
A9	4	4	4	4	4	5	4	4	4	4
A10	4	5	4	4	3	4	4	4	5	4
A11	3	4	4	4	4	4	3	4	4	4
A12	4	4	3	3	5	4	4	4	4	5
A13	5	4	3	4	4	4	4	4	4	4
A14	5	4	4	5	4	4	4	5	5	5
A15	4	3	5	4	5	3	4	4	4	5
A16	4	3	5	4	4	4	4	4	4	4
A17	4	4	5	5	4	5	4	5	4	4
A18	4	5	4	4	4	4	4	4	4	4
A19	4	5	4	4	4	4	4	4	4	4
A20	4	5	4	4	5	5	4	5	4	5

From the dataset acquisition, it will be processed into decision making matrices by determining the optimal value of criterion $X_{(0,j)}$ which can be obtained using equation 5. This optimal value is obtained from the maximum value and minimum value of all the alternatives that become For reference to the layout of data elements in a matrix, consider Table 4 below.

Table 4. Decision Making Matrices

Type Alt\ Criteria	(B) C1	(B) C2	(B) C3	(B) C4	(B) C5	(B) C6	(B) C7	(B) C8	(B) C9	(C) C10
A0	0.057	0.057	0.059	0.058	0.057	0.057	0.049	0.057	0.056	0.333
A1	0.046	0.046	0.035	0.047	0.046	0.046	0.049	0.046	0.056	0.250
A2	0.046	0.057	0.047	0.047	0.034	0.046	0.049	0.034	0.045	0.250
A3	0.057	0.057	0.047	0.047	0.046	0.046	0.049	0.057	0.045	0.250
A4	0.046	0.034	0.047	0.035	0.057	0.057	0.049	0.046	0.056	0.250
A5	0.046	0.046	0.035	0.047	0.046	0.046	0.049	0.046	0.034	0.250
A6	0.057	0.046	0.047	0.058	0.046	0.046	0.049	0.046	0.045	0.250
A7	0.034	0.046	0.059	0.047	0.046	0.034	0.049	0.046	0.056	0.333
A8	0.046	0.034	0.047	0.047	0.046	0.046	0.037	0.034	0.045	0.250
A9	0.046	0.046	0.047	0.047	0.046	0.057	0.049	0.046	0.045	0.250
A10	0.046	0.057	0.047	0.047	0.034	0.046	0.049	0.046	0.056	0.250
A11	0.034	0.046	0.047	0.047	0.046	0.046	0.037	0.046	0.045	0.250
A12	0.046	0.046	0.035	0.035	0.057	0.046	0.049	0.046	0.045	0.200
A13	0.057	0.046	0.035	0.047	0.046	0.046	0.049	0.046	0.045	0.250
A14	0.057	0.046	0.047	0.058	0.046	0.046	0.049	0.057	0.056	0.200
A15	0.046	0.034	0.059	0.047	0.057	0.034	0.049	0.046	0.045	0.200

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A16	0.046	0.034	0.059	0.047	0.046	0.046	0.049	0.046	0.045	0.250
A17	0.046	0.046	0.059	0.058	0.046	0.057	0.049	0.057	0.045	0.250
A18	0.046	0.057	0.047	0.047	0.046	0.046	0.049	0.046	0.045	0.250
A19	0.046	0.057	0.047	0.047	0.046	0.046	0.049	0.046	0.045	0.250
A20	0.046	0.057	0.047	0.047	0.057	0.057	0.049	0.057	0.045	0.200

Paying attention to Table 4 gives an illustration that the location of a data element is already in the position that has been posted according to the magnitude value of each data element based on the specified scale range. This calculation of the ARAS method can already be started through the normalization results listed in Table 4 as normalized data based on equation 6 and equation 7. With the existence of these data, it can be obtained the amount of weight sourced from the eigenvector through the AHP method, this can be done using equation 8.

Obtaining eigenvector values with AHP can be done in two ways, namely the first step can be done using the Mathematical Algebra Matrices concept and the second concept using the Expert Choice application. By using the concept of Matrices Matrices Matrices that have been done with matrices multiplication mathematically which is done repeatedly for up to five iterations, this iteration is used to get the optimal eigenvector value. The optimal eigenvector value can be obtained by subtracting the rowcount normalization results for each criterion, so that in the end you will find the expected eigenvector value, then multiply the resulting matrices repeatedly by yourself to find the second stage eigenvector value. This is done to find a point of subtracting the last eigenvector value from the previous eigenvector value. From the results of reducing the eigenvector value, it is hoped that there will be no difference in value. If you still find the value of the difference with the eigenvector then, you must multiply the result matrices, as in the previous method. This is done until as expected, that is, there is no visible difference in the reduction of the last eigenvector value with the previous eigenvector value. Look at the following Table 5a.

Table 5a. Eigenvector using Mathematic Algebra Matrices

Criteria	EXP	PRE	TEC	DSP	ATT	PFM	COM	ACR	MTV	OBL	Eigenvector
Experience (EXP)	1.000	2.019	2.131	2.172	2.280	2.361	2.283	3.249	2.432	2.371	0.187
Presence (PRE)	0.495	1.000	2.121	2.211	2.094	2.547	3.032	2.442	3.428	2.226	0.167
Teaching (TEC)	0.469	0.471	1.000	2.142	2.342	2.497	2.664	2.763	2.945	3.232	0.146
Discipline (DSP)	0.460	0.452	0.467	1.000	2.134	2.183	2.266	2.415	2.035	3.423	0.114
Attitude (ATT)	0.439	0.478	0.427	0.469	1.000	2.542	2.126	2.113	3.144	2.826	0.101
Performance (PFM)	0.424	0.393	0.400	0.458	0.393	1.000	2.245	2.338	2.347	2.162	0.078
Communication (COM)	0.438	0.330	0.375	0.441	0.470	0.445	1.000	3.033	2.226	2.134	0.068
Accuracy (ACR)	0.308	0.410	0.362	0.414	0.473	0.428	0.330	1.000	2.102	2.022	0.052
Motivation (MTV)	0.411	0.292	0.340	0.491	0.318	0.426	0.449	0.476	1.000	3.463	0.049
Obligation (OBL)	0.422	0.449	0.309	0.292	0.354	0.463	0.469	0.495	0.289	1.000	0.038
The Result of □ Max=	10.852	*CI=*	0.095	*CR=*	0.064						

The second way to find eigenvector values is with the help of the expert choice application, where the application is similar to using the concept of mathematical algebra matrices, the difference lies in the input matrix data elements which only use the upper triangle of an input matrix. Pay attention to the results obtained for the eigenvector values using the Expert choice apps shown in Figure 2 (Saaty, 2003).

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	Experience	Presence	Teaching	Discipline	Attitude	Performance	Communication	Accuracy	Motivation	Obligation
Experience		2.019	2.131	2.172	2.28	2.361	2.283	3.249	2.432	2.371
Presence			2.121	2.211	2.094	2.547	3.032	2.442	3.428	2.226
Teaching				2.142	2.342	2.497	2.664	2.763	2.945	3.232
Discipline					2.134	2.183	2.266	2.415	2.035	3.423
Attitude						2.542	2.126	2.113	3.144	2.826
Performance							2.245	2.338	2.347	2.162
Communication								3.033	2.226	2.134
Accuracy									2.102	2.022
Motivation										3.463
Obligation	Incon: 0.06									

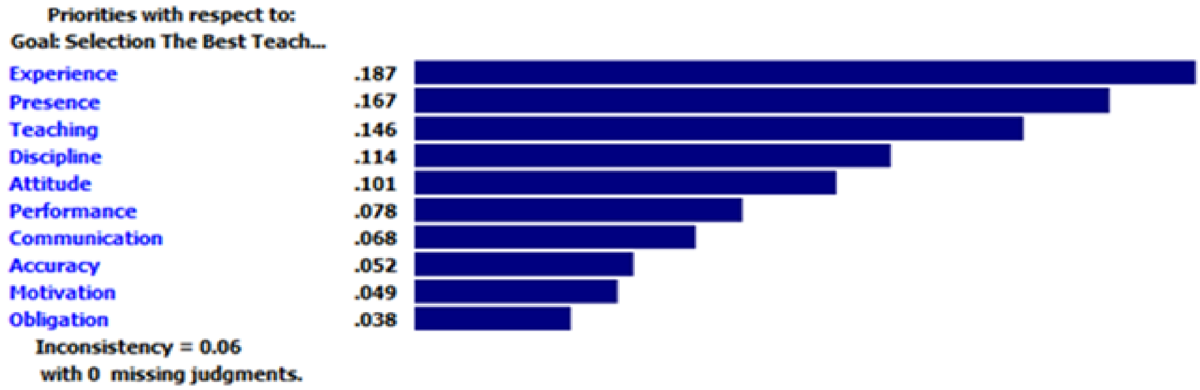

Fig. 2. Eigenvector using Expert choice Apps (Hamidah et al., 2022)

Based on the two AHP processes regarding the acquisition of eigenvector values both with the concept of Mathematical Algebra Matrices and through Expert choice Apps, giving values that are identical in both ways. The results of the acquisition of the eigenvector values will be applied in the calculation of the ARAS method which will be listed in Table 5b.

Table 5b. ARAS method calculation through eigenvector

Criteria Alt\ Weight	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	S_i	K_i
	0.187	0.167	0.146	0.114	0.101	0.078	0.068	0.052	0.049	0.038		
A0	0.011	0.010	0.009	0.007	0.006	0.004	0.003	0.003	0.003	0.002	0.0573	1.000
A1	0.009	0.008	0.005	0.005	0.005	0.004	0.003	0.002	0.003	0.002	0.0452	0.789
A2	0.009	0.010	0.007	0.005	0.003	0.004	0.003	0.002	0.002	0.002	0.0466	0.812
A3	0.011	0.010	0.007	0.005	0.005	0.004	0.003	0.003	0.002	0.002	0.0511	0.891
A4	0.009	0.006	0.007	0.004	0.006	0.004	0.003	0.002	0.003	0.002	0.0458	0.798
A5	0.009	0.008	0.005	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.0441	0.770
A6	0.011	0.008	0.007	0.007	0.005	0.004	0.003	0.002	0.002	0.002	0.0499	0.870
A7	0.006	0.008	0.009	0.005	0.005	0.003	0.003	0.002	0.003	0.002	0.0462	0.806
A8	0.009	0.006	0.007	0.005	0.005	0.004	0.002	0.002	0.002	0.002	0.0431	0.751
A9	0.009	0.008	0.007	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.0473	0.825
A10	0.009	0.010	0.007	0.005	0.003	0.004	0.003	0.002	0.003	0.002	0.0477	0.832
A11	0.006	0.008	0.007	0.005	0.005	0.004	0.002	0.002	0.002	0.002	0.0434	0.757
A12	0.009	0.008	0.005	0.004	0.006	0.004	0.003	0.002	0.002	0.001	0.0442	0.770
A13	0.011	0.008	0.005	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.0468	0.817
A14	0.011	0.008	0.007	0.007	0.005	0.004	0.003	0.003	0.003	0.001	0.0507	0.884
A15	0.009	0.006	0.009	0.005	0.006	0.003	0.003	0.002	0.002	0.001	0.0461	0.804
A16	0.009	0.006	0.009	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.0462	0.806
A17	0.009	0.008	0.009	0.007	0.005	0.004	0.003	0.003	0.002	0.002	0.0509	0.888
A18	0.009	0.010	0.007	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.0483	0.843
A19	0.009	0.010	0.007	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.0483	0.843
A20	0.009	0.010	0.007	0.005	0.006	0.004	0.003	0.003	0.002	0.001	0.0506	0.883

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By paying attention to Table 5b, it becomes the center for completing the ARAS method in collaboration with the AHP method, which can be seen in Table 5b, each alternative has been given a weight for each criterion obtained from the AHP eigenvector value as shown in Table 6 which includes the value of Si and Ki . The eigenvalues generated through six stages of iteration to find the optimum eigenvector values to support decision making with optimal results. The results of calculating the eigenvector values are obtained by using equations 2, 3, and 4 which are simulated using Table 1 Random Index as a support for obtaining Consistency in AHP. Look at Table 6 below.

Table 6. Optimal Function and Ultimate Utility

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	**Si**	**Ki**
Alt\ Weight	0.187	0.167	0.146	0.114	0.101	0.078	0.068	0.052	0.049	0.038		
A0	0.011	0.010	0.009	0.007	0.006	0.004	0.003	0.003	0.003	0.002	0.057	1.000
A1	0.009	0.008	0.005	0.005	0.005	0.004	0.003	0.002	0.003	0.002	0.045	0.789
A2	0.009	0.010	0.007	0.005	0.003	0.004	0.003	0.002	0.002	0.002	0.047	0.812
A3	0.011	0.010	0.007	0.005	0.005	0.004	0.003	0.003	0.002	0.002	0.051	0.891
A4	0.009	0.006	0.007	0.004	0.006	0.004	0.003	0.002	0.003	0.002	0.046	0.798
A5	0.009	0.008	0.005	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.044	0.770
A6	0.011	0.008	0.007	0.007	0.005	0.004	0.003	0.002	0.002	0.002	0.050	0.870
A7	0.006	0.008	0.009	0.005	0.005	0.003	0.003	0.002	0.003	0.002	0.046	0.806
A8	0.009	0.006	0.007	0.005	0.005	0.004	0.002	0.002	0.002	0.002	0.043	0.751
A9	0.009	0.008	0.007	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.047	0.825
A10	0.009	0.010	0.007	0.005	0.003	0.004	0.003	0.002	0.003	0.002	0.048	0.832
A11	0.006	0.008	0.007	0.005	0.005	0.004	0.002	0.002	0.002	0.002	0.043	0.757
A12	0.009	0.008	0.005	0.004	0.006	0.004	0.003	0.002	0.002	0.001	0.044	0.770
A13	0.011	0.008	0.005	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.047	0.817
A14	0.011	0.008	0.007	0.007	0.005	0.004	0.003	0.003	0.003	0.001	0.051	0.884
A15	0.009	0.006	0.009	0.005	0.006	0.003	0.003	0.002	0.002	0.001	0.046	0.804
A16	0.009	0.006	0.009	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.046	0.806
A17	0.009	0.008	0.009	0.007	0.005	0.004	0.003	0.003	0.002	0.002	0.051	0.888
A18	0.009	0.010	0.007	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.048	0.8430
A19	0.009	0.010	0.007	0.005	0.005	0.004	0.003	0.002	0.002	0.002	0.048	0.8430
A20	0.009	0.010	0.007	0.005	0.006	0.004	0.003	0.003	0.002	0.001	0.051	0.883

According to Table 6, it can be seen that the value of the optimization function and the highest ranking utility of all alternatives has provided a comparison of the results of the two, so that the comparison of the highest values is used as a measure for determining the ranking of all alternatives in determining the index of each alternative. To make it easier to read the measurable ranking in the ranking column, it can be simplified as shown in Table 7. The results of the comparison are assessed based on the highest utility measure for the results obtained from the optimal function, so that to determine the largest ranking seen from the size of the comparison value that has the greatest weight that will be occupy the highest rank.

Table 7. Alternative Ranking

Alt	**Si**	**Ki**	**Ranking**
A3	0.051	0.891	1
A17	0.051	0.888	2
A14	0.051	0.884	3
A20	0.051	0.883	4
A6	0.050	0.870	5
A18	0.048	0.843	6
A19	0.048	0.843	7
A10	0.048	0.832	8
A9	0.047	0.825	9

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A13	0.047	0.817	10
A2	0.047	0.812	11
A7	0.046	0.806	12
A16	0.046	0.806	13
A15	0.046	0.804	14
A4	0.046	0.798	15
A1	0.045	0.789	16
A5	0.044	0.770	17
A12	0.044	0.770	18
A11	0.043	0.757	19
A8	0.043	0.751	20

DISCUSSIONS

The best teacher rating rating system can be carried out by collaborating the MCDM-AHP method with the ARAS method, because the two methods have the same completion characteristics in handling ranking and evaluation techniques where the comparison method using AHP is more perfect in obtaining weight calculations through eigenvector values. This method applies the weighting technique with the help of instrumentation in the form of a questionnaire sourced from experts, so that the determination of the weight of the criteria is not based on manual provisions, but rather through the stages of research in comparing objective criteria based on their importance. The dataset used to provide a basic assessment of a number of teachers must be carried out based on minimal research results based on the same instrumentation as was carried out using instrumentation in the form of a questionnaire, this is intended so that the results obtained are more objective and the process tools used are also objective. The results to be obtained will provide support for objective decision-making as well, because they are not influenced by any party and are of course obtained from pure research results. For further research, testing can be carried out using different methods to prove the logical correctness of the results obtained, as was done with the collaboration of the AHP and ARAS methods.

CONCLUSION

The best teacher rating system provides optimal results as a support for decision making through the collaboration of MCDM-AHP and ARAS method. Both of these methods have the advantage that they both have normalization stages in determining the process of ranking results from selecting the best alternative teachers, so that mutually reinforcing decision-making support through the collaboration of the two methods. The result of the highest ranking process is positioned for alternative A3 with a Ki weight of 0.891 as the first rank. The Ki dimension can be used as a reference to determine the next rank position continuously.

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