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TeacherEval: An AHP-TOPSIS system for data-driven teacher evaluation in the Sultanate of Oman

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A B S T R A C T

The Sultanate of Oman places strong emphasis on improving education and teacher performance, where teacher appraisal is central to these efforts. This study proposes the TeacherEval system, which integrates the Analytic Hierarchy Process (AHP) and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to evaluate teachers in Omani schools. The system is designed around 16 main criteria, each with four sub-criteria, to provide a detailed and reliable appraisal. AHP determines the weights of the criteria through pairwise comparison, while TOPSIS ranks teachers according to their proximity to an ideal level of performance. The model was tested by educational supervisors in the North Batinah Governorate using the Technology Acceptance Model (TAM) and the System Usability Scale (SUS), and results showed high acceptance, with ratings between 4 and 5 on a five-point Likert scale. The findings confirm the effectiveness and usability of the system, and the study aligns with Oman Vision 2040 by promoting data-driven assessment that supports decision-making, enhances educational quality, and improves transparency and accuracy in teacher evaluations.

1. Introduction

Since the 1970s, the Sultanate of Oman has given high priority to the education sector, as nearly all children of basic education age are now attending school, and a substantial 86 percent of those in post-basic education are also enrolled. The Omani government is now focused not only on preserving these achievements but also on enhancing them to develop a high-quality, efficient, and relevant education system (WBG, 2025). The Education Council approved establishing the Oman Center for School Evaluation in 2015, to advance the level of the school performance development system. It reviews internal and external evaluation frameworks, sets comparative standards, develops a systematic strategy, promotes and monitors educational practices, and provides support for school performance improvement. The emphasis now lies in improving the quality of the learning process to cope with the needs of a knowledge-based society as envisioned in Oman Vision 2040 (MOE, 2025). An essential part of this improvement is the assessment of teachers, since their performance has a direct influence on student achievement, curriculum implementation, and educational development. Teacher evaluation is a natural process in the measurement of teaching effectiveness, professional development, and instruction quality. Teacher evaluation provides data-driven information that allows learning outcomes in schools to be improved, strengths and weaknesses to be identified, and a framework for professional development to be established (Al-Harthi et al., 2021).

The current teacher evaluation operation in Oman is manually paper-based, and the marks are subsequently translated into cumulative marks (1-5). It is founded on 16 broad criteria with different indicators, but a lack of standardization leads to subjective judgments and inconsistencies between appraisers. This inconsistency affects the Ministry of Education's decision-making, and it becomes challenging to identify best practices, plan teacher training, and overall education quality improvement. Moreover, the current evaluation system is felt as external accountability rather than a method of

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continuing teacher development. Omani educational supervisors clarify that it fails to give clear feedback to improve teaching practices and thus leads to inaccurate judgments and ineffective professional development. The decision-making process can be negatively affected by the absence of an integrated evaluation framework. This ensures the need for a more standardized, clear-cut evaluation model with the provision of substantive feedback and teachers' professional development (Al-Yahmadi, 2013).

To overcome the above difficulties, MCDM is utilized to prioritize or rank several alternatives based on a set of conflicting criteria. In college English blended teaching quality evaluation, Huang and Yu (2025) proposed an MCDM methodology that used an uncertainty framework under PS and the WASPAS method to rank alternatives. The study finds that learning outcomes achieve the highest importance, followed by Student Satisfaction. The model achieves a stable rank of alternatives.

MCDM approaches such as AHP (Analytic Hierarchy Process) and TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) have been widely used in educational quality assessments due to their ability to enhance objectivity and precision (Saaty, 2002; Madanchian and Taherdoost, 2023). AHP facilitates complex decision-making by performing pairwise comparisons and assigning priorities to criteria. For example, Do et al. (2024) proposed an evaluation framework for lecturers based on fuzzy-AHP to calculate the criteria weight. Also, fuzzy-TOPSIS was used to rank performance. Another contribution by Kukreja et al. (2023) identified and ranked key factors influencing early childhood education through touchscreen devices using a hybrid fuzzy AHP–TOPSIS method. Six moderators and ten critical factors were analyzed, with "children's age" being the most influential moderator, and "app features and content" ranked as the top critical factor. Moreover, in the context of the role of information technology in advancing music education. Fu et al. (2022) utilized AHP and TOPSIS methods to rank various IT-based learning tools. The results confirm their effectiveness in improving educational outcomes in music.

AHP is simple, with low computations and ease of integration with other MCDM methods, which enables more realistic and robust decisions (Brooke, 2013). Likewise, TOPSIS has simple logic, the ability to reflect human decision patterns, and insensitivity to the number of criteria involved (Madanchian and Taherdoost, 2023). The AHP-TOPSIS hybrid has proven especially effective in solving real-world problems due to its simplicity and adaptability, contributing to its growing popularity across research domains. As of 2024, over 6,897 research documents have adopted the AHP-TOPSIS framework, according to Scopus data (Fig.1).

The previously mentioned studies are mainly related to teacher evaluation objectives with the particular standards of individual universities or schools. The evaluation measures differ from one institution to another; these studies have been formulated to suit the particular educational contexts of their respective institutions. One key difference is that teacher evaluation standards differ significantly from one country to another, as highlighted by Schleicher (2012), Marzano and Toth (2013), Danielson (2016), Harris et al. (2014), and Dodson (2015). Their research indicates that different evaluation models are implemented globally, each emphasizing distinct domains and indicators for assessing teaching quality. For example, Danielson (2016) categorized teacher evaluation into four broad categories: Planning and Preparation, Classroom Environment, Professional Responsibilities, and Instruction, which are major areas of concern required in measuring good teaching. The differences in these models of evaluation between countries show how education systems prioritize different aspects of teacher performance based on national policies, organizational goals, and pedagogical needs. Also, Marzano and Toth (2013) categorized the teacher evaluation process into four domains such as Planning and preparing, learning environment, Reflecting on Teaching, and Personal and professional development.

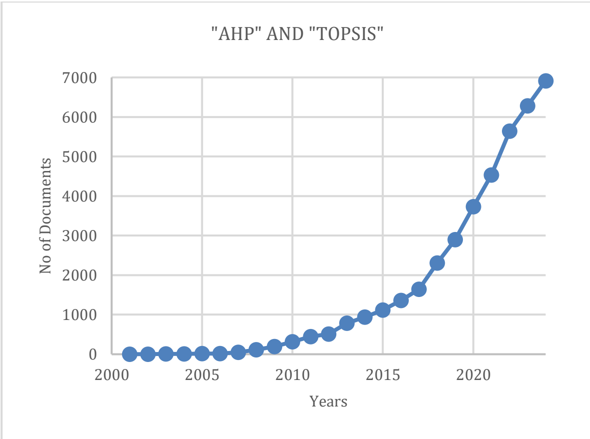


Fig. 1: Number of documents from 2000 to 2024

The Omani teacher evaluation model consists of four main domains: planning and preparation, personal and professional development, evaluation and follow-up of students' academic achievement, and teaching and learning. In most teacher evaluation models, the learning environment is considered a main domain; however, in the Omani model, it is treated as a criterion within the teaching and learning domain.

In addition, the planning and preparation domain in the Omani model includes only one criterion, while other models typically include more criteria, sometimes up to seven or more. In other evaluation models, the collegiality or personal and professional development domain plays an important role in improving teacher performance. Although the Omani model also includes this as a main domain, some of its criteria are repetitive.

Furthermore, the teaching and learning domain in the Omani model contains many criteria that are treated as separate domains in other models. As a result, the Omani model includes 16 main criteria and 64 sub-criteria. Table 1 presents the actual criteria and sub-criteria used for teacher evaluation in Oman.

This paper aims to propose an MCDM-based system that can align with the Ministry of Education's policies and Oman Vision 2040. However, the following obstacles should be addressed:

- Highly intensive computations to deal with the MCDM approach on a high number of criteria (16 main criteria and 64 sub-criteria)
- Translate the mathematical MCDM approaches to a web-based application.
- Gathering reliable, high-quality data for teacher evaluation can be difficult, especially in cases where evaluators have different interpretations of criteria.

These issues point to the essential need for a robust system for teacher evaluation based on AHP-TOPSIS approaches to rank teachers using 16 main criteria and 64 sub-criteria. Therefore, the major contributions of this paper are as follows:

- Propose a teacher evaluation web-application (TeacherEval) on real data on North Batinah Governorate, the Sultanate of Oman, that can be used by a wide range of users.
- Determine the criteria weight using the AHP approach from a pairwise comparison matrix, which can deal easily with high criteria and sub-criteria.
- Rank teachers using TOPSIS to find how close they are to an ideal standard performance.
- The system was tested by educational supervisors in the North Batinah Governorate using the TAM and SUS analysis.

The remainder of the paper is divided as follows. Section 2 provides the Methodology used in this study. Section 3 presents experimental results and discussion. Section 4 describes managerial implications. Section 5 illustrates the conclusion and future directions of this proposal.

2. Methodology

In this study, the proposed MCDM method aims to provide insight into teacher evaluation and ranking in Omani schools. Fig. 2 introduces an overview of the applied methodology, which comprises four main phases.

At the beginning, the selection problem is stated through the identification of teacher performance indicators, the selection of major assessment indicators, and the construction of the evaluation matrix. This stage ensures that all teaching competencies and assessment factors are addressed systematically.

In the second stage, weights are allocated to each sub-criterion and criterion through expert consultation and pairwise comparisons using the AHP. It is essential at this stage to verify that the pairwise comparison is consistent so that the process of evaluation becomes credible and precise.

The third stage involves ranking the evaluation factors in order of importance based on AHP outputs to determine the relative weights of the factors for use in teacher assessment. Next, rankings for the teachers are generated using TOPSIS to compare how closely each teacher measures against the ideal performance profile.

In the last stage, TAM analysis is employed to evaluate the usability and usefulness of the proposed teacher assessment system. It involves measuring educational supervisors' perceptions regarding how easy or hard it is to utilize the system and give the teachers clear ideas about their performance. Also, the System Usability Scale (SUS) offers a quick, reliable, and cost-effective way to assess the usability of a product through a simple 10-item questionnaire. Its flexibility across sectors, ease of explanation, and ability to support iterative design make it a widely adopted tool for user experience evaluation (Vlachogianni and Tselios, 2022; Davis, 1989).

Fig. 3 shows the structure of the selection problem under many criteria in this research. 16 main criteria and 64 sub-criteria are reviewed, and they are selected based on real-world case evaluations in Oman. Furthermore, the method ranks five teachers as alternatives. To select teachers depending on the chosen criteria, the weights of these criteria are achieved using AHP. Then, choose the closest teacher to the ideal solution using TOPSIS. These methods' preliminaries will be shown in the next sections.

2.1. Analytic hierarchy process (AHP)

The AHP is applied to resolve a variety of MCDM problems in large proportions. It can particularly be effective for group decisions and has proven very popular among various disciplines such as public policy, business, industry, medicine, shipbuilding, and education. The procedure facilitates decision makers to assign priority between alternatives, sub-criterion, and criteria with a thorough analysis process. Apart from this, AHP enhances the quality of decisions by integrating qualitative and quantitative elements, enabling more comprehensive and more informed decision-making procedures (Özcan et al., 2017). AHP relies on pairwise comparisons as a fundamental step to determine the relative importance of criteria based on expert judgment. It involves eliciting expert opinions to compare which criterion is more critical in relation to the decision objective. The comparison relies on a numerical scale of 1 to 9, formulated by Saaty (2008), as shown in Table 2.

Table 1: Oman teacher evaluation model

Main criteria	Definition	Sub-criteria	Definition
MC1	Effective teaching strategies	SC1	Uses modern teaching strategies appropriate to the situation of education.
		SC2	Type of teaching strategies based on the individual needs of their students and the characteristics of their development
		SC3	Employ teaching strategies that encourage students to be active learning.
		SC4	Diversify the teaching strategies based on the evaluation results.
MC2	Using suitable plans for both the outstanding student and the low achievement	SC5	The plan enrichment/therapeutic is based on the analysis of the results of student assessment.
		SC6	Performs activities/enrichment activities for students.
		SC7	Performs activities / therapeutic activities for students' low achievement.
		SC8	Low student achievements are encouraged to raise their level.
MC3	Being competent in the subject and the content delivered to the students during the lesson	SC9	Able to in-depth scientific article shows (specialized).
		SC10	Provide correct and sound scientific material.
		SC11	Enriches students' experiences to provide links to the curriculum and promotes learning examples.
		SC12	Supports Knowledge Applied life examples of student life.
MC4	Preparing an effective daily lesson plan/the annual plan	SC13	The integrated elements of an annual plan / daily.
		SC14	Temporal distribution determines to implementation of the plans.
		SC15	Determines the strategies and methods of evaluation and appropriate means to achieve educational goals.
		SC16	Remixes of his plans as new developments in education.
MC5	Being able to reflect on their teaching and performance during the lesson	SC17	Is he/she keen to assess constantly his/her own performance?
		SC18	Evaluates an objective assessment of his performance.
		SC19	Evaluation puts the performance measures (Exchange of visits, practical lessons, remedial training programs, individual reading, etc.).
		SC20	Benefit from others' experiences and observations (evaluation colleagues/evaluation first teacher/evaluation supervisor/principal of the school evaluation, etc.).
MC6	Letting their students acquire and apply the desired knowledge and skills	SC21	Gives students the opportunity to carry out educational activities (classroom and extracurricular).
		SC22	Supports cognitive examples and applications from the student's environment.
		SC23	Student interaction in the classroom and their answers reflect their understanding of the knowledge to be achieved.
		SC24	Urges students to employ their knowledge and skills in life situations
MC7	Developing the positive values with their students	SC25	Is he/she keen to draw appreciation and values, trends, and tendencies of the student's development?
		SC26	Performs descriptive and extracurricular educational activities concerned with the development of positive values and attitudes among students.
		SC27	Uses interesting educational methods to instill values and trends in the hearts of students.
		SC28	Encourages his students to form positive attitudes towards the subject matter.
MC8	Logical steps followed during the lesson	SC29	The educational situation performs sequential and orderly manner. (Initializes and then starts the boot and then implementation, and evaluation)
		SC30	The educational situation is carried out according to the sequence of goals and how to achieve them.
		SC31	It starts from easy to difficult, and from the simple to the complex.
		SC32	Combines both theoretical and practical in the classroom. (Depending on the nature lesson).
MC9	Applying the assessment tools' results to develop their students' level of achievement	SC33	Is he/she keen to determine the performance level of his students through the different evaluation tools? Is keen to analyze the results of the evaluation tools based on cognitive levels and abilities/skills required in teaching the material.
		SC34	Evaluation employs the results of the analysis in the development of students'
		SC35	performance on an ongoing basis.
		SC36	Provide periodic feedback on their discussions and actions provided (descriptive and extracurricular activities)
MC10	Activating the learning Resources Center (LRCs), Laboratory (Labs), and effective learning techniques	SC37	Laboratory employs in the implementation of explorations and experiments in order to achieve the objectives of the article.
		SC38	Employs modern technologies in teaching and learning. (Computers/software computerized/electronic sensors
		SC39	Determines the appropriate learning resources according to the needs of students and the requirements of the article.
		SC40	Choose learning resources that raise students' interest and yearning to learn.
MC11	Effective classroom management	SC41	Good time management and investing.
		SC42	Work is distributed equally, and discussion among students.
		SC43	Keen on mutual respect between him and his students and among the students themselves.
		SC44	Educational methods used to control and evaluate the behavior of students.
MC12	Boosting their students' motivation towards learning effectively	SC45	Raises the attention of the students for the lesson and motivates them to learn.
		SC46	Poses interesting questions to think about.
		SC47	Encourages students to interact and participate.
		SC48	Diversifies strengthening methods for students.
MC13	Variety in the questions given to their students	SC49	A variety of formats of questions linked to learning outcomes/goals article.
		SC50	Has the wording of questions skills at various levels (see - capabilities, graduate/inference/thinking skills)?
		SC51	Students are trained to question higher-order thinking skills.
		SC52	Diversifies to ask questions (oral, written) (descriptive and extracurricular) (objective and essay), and at different levels
MC14	Encouraging their students to learn independently	SC53	Directs students to go to the library or use scientific references or the World Wide Web to search for information related to a particular article.
		SC54	Cost the students to prepare reports/research/summaries, etc. Besides developing their self-learning.
		SC55	planning for self-learning
		SC56	clear instructions before and during the implementation of the activity for each student
MC15	Using prober language accurately	SC57	Uses the classical language (sound) in the presentation of the educational situation.
		SC58	Uses the classical language in writing.
		SC59	Urges students to speak in classical Arabic in their discussions and their answers.
		SC60	Using the English language concept accurately.
MC16	Using the suitable assessment tools during the lesson	SC61	Use the proper evaluation of the position of the educational tools.
		SC62	Type of evaluation tools commensurate with the educational situation (descriptive work and extracurricular).
		SC63	Employs a continuous assessment record in the evaluation of his students.
		SC64	Documentation and organization of students' assessment.

This subsection aims to provide an overview of the AHP methodology. A matrix A is created using pairwise comparisons as shown in Eq. 1.

$$A=\begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ a_{21} & 1 & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nm} \end{bmatrix} \quad (1)$$

a_{ij} represents the pairwise comparison value between criterion i and criterion j.

The matrix has reciprocal properties, as follows:

$$a_{ij} = \frac{1}{a_{ij}} \quad (2)$$

Saaty (2000) proposed a 1-9 relative relevance scale for subjective pairwise comparisons in AHP, which are shown in Table 2. After forming the pairwise comparison matrices, Saaty's (2000) eigenvector technique is used to compute the vector of weights, $w = [w_1, w_2, \dots, w_n]$. Weight computation comprises two phases. Eq. 3 normalizes the pairwise comparison matrix, $A = [a_{ij}]_{nxn}$, followed by Eq. 4, which computes the weights.

$$a_{ij}^{*} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}} \quad (3)$$

for all $j = 1, 2, \dots, n$.

$$w_i = \frac{\sum_{j=1}^{n} a_{ij}}{n} \quad (4)$$

for all $i = 1, 2, \dots, n$.

Saaty (2008) discovered a correlation between vector weights w, and the pairwise comparison matrix A, as indicated in Eq. 5.

$$Aw = \lambda_{max}\, w \quad (5)$$

The λ_{max} value is a crucial validation parameter in AHP. It serves as a reference index for screening information and determining the consistency ratio (CR) of the predicted vector. To compute the CR, use Eq. 6 to determine the consistency index (CI) for each matrix of order n.

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (6)$$

Then, CR can be calculated using Eq. 7:

$$CR = \frac{CI}{RI} \quad (7)$$

The random index (RI) is calculated using a pairwise comparison matrix that is produced at random. Table 3 displays the RI values for matrices of order 1-16, as recommended by Alonso and Lamata (2006). If CR is less than 0.1, the comparisons are admissible. If CR<0.1, it suggests inconsistent judgments. In such circumstances, modify the original values in the pairwise comparison matrix A.

Table 2: Linguistic sale

Intensity importance	Definition
1	Equal importance (EI)
3	Moderate importance (MI)
5	Strong importance (SI)
7	Demonstrated importance (DI)
9	Absolutely important (AI)
2,4,6,8	Intermediate values

Table 3: Random index (RI) (Alonso and Lamata, 2006)

n	3	4	5	6	7	8	9	10	11	12	13	14	15	16
R	0.524	0.881	1.108	1.247	1.341	1.405	1.449	1.485	1.514	1.536	1.555	1.571	1.583	1.59
I	5	5	6	9	7	6	9	4	1	5	1	3	8	8

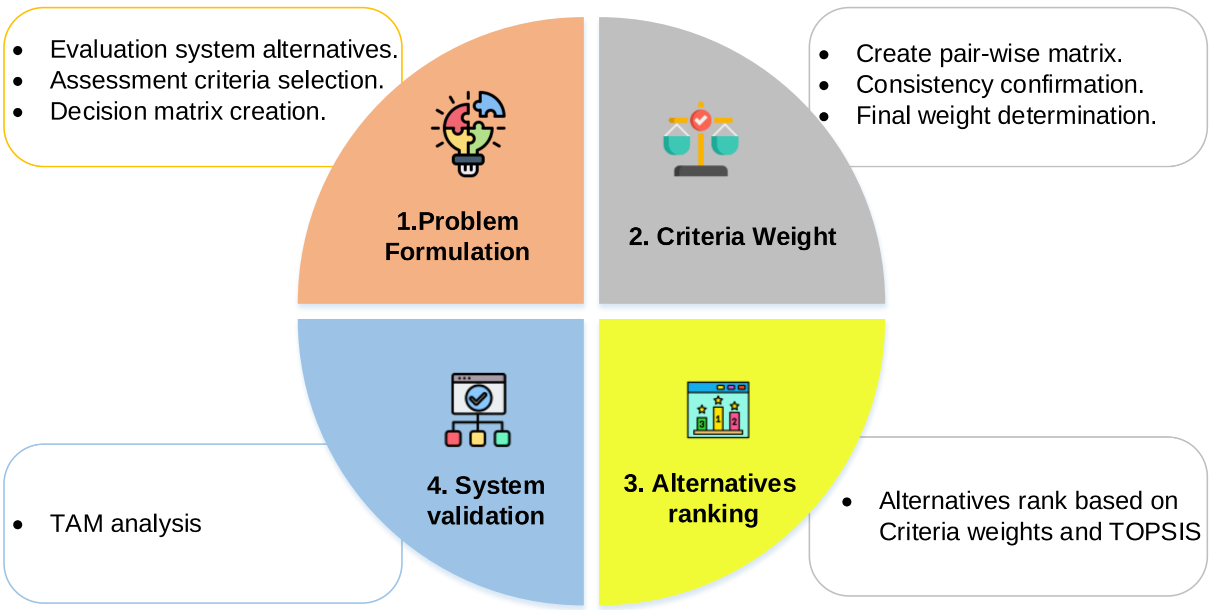


Fig. 2: Overview of the paper methodology

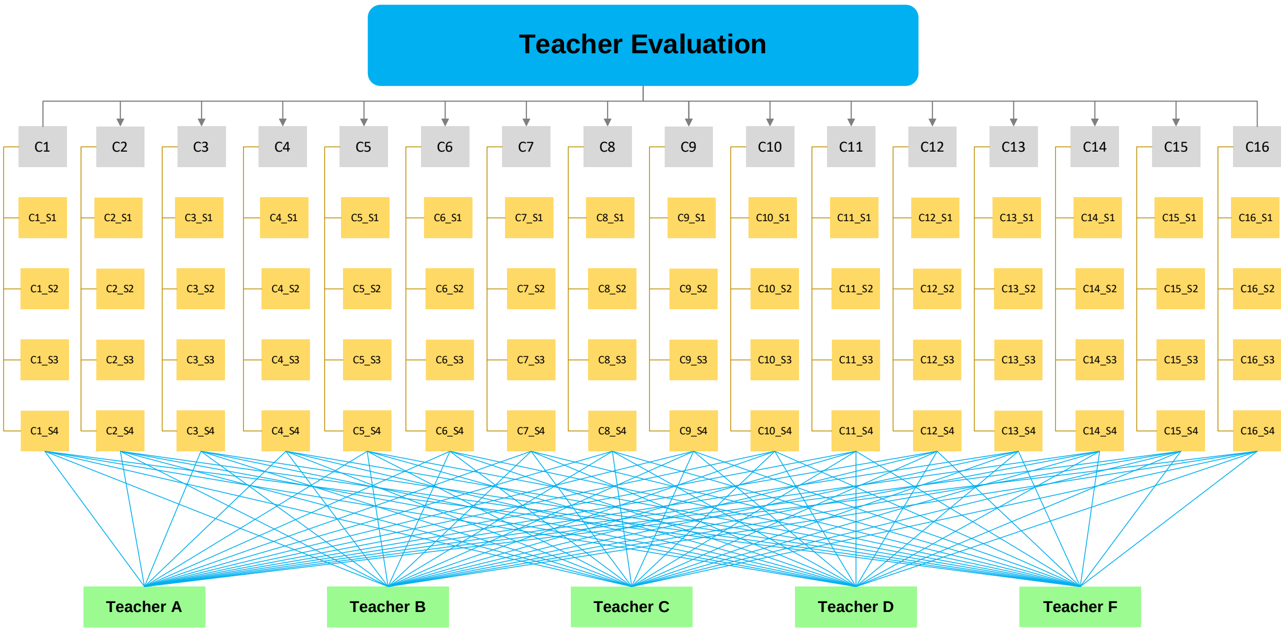


Fig. 3: TeacherEval hierarchy structure

2.2. Technique for order preference by similarity to ideal solution (TOPSIS)

In this research, the AHP is utilized to calculate the weights of alternatives and criteria through expert-based pairwise comparisons, as discussed in the foregoing section. As shown in Fig. 4 and Algorithm 1, the AHP weights and scores obtained are further analyzed using TOPSIS. Originally introduced by Hwang and Yoon (1981), TOPSIS is a widely used method for solving MCDM problems in real-world applications. This approach allows decision-makers to evaluate and rank alternatives by assessing their proximity to an ideal solution. According to Hwang and Yoon (1981), the ranking process is based on selecting the alternative closest to the positive ideal solution while maintaining the greatest possible distance from the negative ideal solution.

The initial phase of the TOPSIS method involves constructing a decision matrix, where m alternatives and n criteria intersect, with each element represented as x_{ij}, forming a matrix $(x_{ij})_{m\times n}$. Following this, the next step is to generate a normalized decision matrix. Normalization is performed to ensure comparability across different scales, facilitating a more consistent evaluation process. The vector normalization technique is applied to standardize values, as defined below.

$$Rij = aij/\sqrt{\sum_{k=1}^{m} aij^2} \; i = 1,2,\ldots,m \; vej = 1,2,\ldots,n \quad (8)$$

Once the normalized decision matrix is established, the next step is to compute the weighted normalized decision matrix V.

$$V_{ij} = w_j \times r_{ij} \forall_i, j, w_j \quad (9)$$

Eq. 9 is the weight of the criterion j.

The ideal and negative ideal solution are determined for every criterion (J_b for benefit criteria and J_c for cost criteria) using the following equations:

$$\begin{cases} A^+ = (\max_i vij \mid j \in J_b), (\min_i vij \mid j \in J_c) \\ A^- = (\min_i vij \mid j \in J_b), (\max_i vij \mid j \in J_c) \end{cases} \quad (10)$$

The ideal solution, maximizes the benefit criteria (or attributes) and minimizes the cost criteria, whereas the negative ideal solution (also called anti-ideal solution) maximizes the cost criteria/attributes and minimizes the benefit criteria/attributes. The negative ideal solution consists of the worst performance values, whereas the best alternative is the one that is nearest to the ideal solution (Roszkowska and Filipowicz-Chomko, 2024).

The separation distance of each competitive alternative from the ideal and negative ideal solution is computed using the following equations.

$$\begin{cases} S_i^+ = \sqrt{\sum_{j=1}^{n} (vij - vj^+)^2} \; i = 1,2,3,\ldots,m \\ S_i^- = \sqrt{\sum^{n} (vij - vj^-)^2} \; i = 1,2,3,\ldots,m \end{cases} \quad (11)$$

By comparing C^+ values, the ranking of alternatives is determined.

$$C_i^+ = S_i^- / (S_i^- + S_i^+) \; i = 1,2,3,\ldots,m \quad (12)$$

where, $0 \leq C_i^+ \leq 1$.

3. Results and discussion

Sixteen managers from the Sultanate of Oman's Ministry of Higher Education and North Al-Batinah government schoolteachers were involved in this study. The experts gave their opinions to derive the pairwise comparison matrix for ranking the five teacher alternatives. Values from 1 to 9 were given by the experts according to the Saaty (2008) scale in Table 2 for a detailed comparison of the alternatives.

The ensuing pairwise comparison matrix of the sixteen criteria is demonstrated in Table 4, while Table 5 illustrates the related normalized matrix.

Table 6 shows the weights calculated for all the criteria and sub-criteria in this study. For achieving consistency, the maximum eigenvalue (λ_{max}) is determined to be 16.69452803. As the number of criteria (n) is 16, the CI is determined to be 0.046301869, with a RI of 1.24 (as shown in Table 3) and a CR of 0.028978513. Since the CR value is still below the threshold value, the judgments are considered consistent.

The same AHP technique is applied to evaluate all the alternatives, and the final weights and scores of each alternative are based on the criteria listed in Table 7.

Table 4: Pairwise comparison matrix of criteria

	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	MC9	MC10	MC11	MC12	MC13	MC14	MC15	MC16
MC1	1	3	1	3	5	5	7	7	1	5	3	3	5	7	9	9
MC2	0	1	0	1	3	3	5	5	0	3	1	1	3	5	7	7
MC3	1	3	1	3	5	5	7	7	1	5	3	3	5	7	9	9
MC4	0	1	0	1	3	3	5	5	0	3	1	1	3	5	7	7
MC5	0	0	0	0	1	1	3	3	0	1	0	0	1	3	5	5
MC6	0	0	0	0	1	1	3	3	0	1	0	0	1	3	5	5
MC7	0	0	0	0	0	0	1	1	0	0	0	0	0	1	3	3
MC8	0	0	0	0	0	0	1	1	0	0	0	0	0	1	3	3
MC9	1	3	1	3	5	5	7	7	1	5	3	3	5	7	9	9
MC10	0	0	0	0	1	1	3	3	0	1	0	0	1	3	5	5
MC11	0	1	0	1	3	3	5	5	0	3	1	1	3	5	7	7
MC12	0	1	0	1	3	3	5	5	0	3	1	1	3	5	7	7
MC13	0	0	0	0	1	1	3	3	0	1	0	0	1	3	5	5
MC14	0	0	0	0	0	0	1	1	0	0	0	0	0	1	3	3
MC15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MC16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Table 5: Normalized pairwise comparison matrix of criteria

	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	MC9	MC10	MC11	MC12	MC13	MC14	MC15	MC16
MC1	0.17	0.20	0.17	0.20	0.15	0.15	0.12	0.12	0.17	0.15	0.20	0.20	0.15	0.12	0.10	0.10
MC2	0.06	0.07	0.06	0.07	0.09	0.09	0.09	0.09	0.06	0.09	0.07	0.07	0.09	0.09	0.08	0.08
MC3	0.17	0.20	0.17	0.20	0.15	0.15	0.12	0.12	0.17	0.15	0.20	0.20	0.15	0.12	0.10	0.10
MC4	0.06	0.07	0.06	0.07	0.09	0.09	0.09	0.09	0.06	0.09	0.07	0.07	0.09	0.09	0.08	0.08
MC5	0.03	0.02	0.03	0.02	0.03	0.03	0.05	0.05	0.03	0.03	0.02	0.02	0.03	0.05	0.06	0.06
MC6	0.03	0.02	0.03	0.02	0.03	0.03	0.05	0.05	0.03	0.03	0.02	0.02	0.03	0.05	0.06	0.06
MC7	0.02	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.03	0.03
MC8	0.02	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.03	0.03
MC9	0.17	0.20	0.17	0.20	0.15	0.15	0.12	0.12	0.17	0.15	0.20	0.20	0.15	0.12	0.10	0.10
MC10	0.03	0.02	0.03	0.02	0.03	0.03	0.05	0.05	0.03	0.03	0.02	0.02	0.03	0.05	0.06	0.06
MC11	0.06	0.07	0.06	0.07	0.09	0.09	0.09	0.09	0.06	0.09	0.07	0.07	0.09	0.09	0.08	0.08
MC12	0.06	0.07	0.06	0.07	0.09	0.09	0.09	0.09	0.06	0.09	0.07	0.07	0.09	0.09	0.08	0.08
MC13	0.03	0.02	0.03	0.02	0.03	0.03	0.05	0.05	0.03	0.03	0.02	0.02	0.03	0.05	0.06	0.06
MC14	0.02	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.03	0.03
MC15	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
MC16	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Algorithm 1: TeacherEval_AHP_TOPSIS

Input:

- Main criteria MC = {MC1, MC2, ..., MC16}
- Sub-criteria SC = {SC1, SC2, ..., SC64}, grouped under MC
- Alternatives: T = {T1, T2, ..., Tn}

Output:

- Ranked list of teachers based on final TOPSIS scores

Begin

1. AHP Phase – Weight Derivation

1.1 Construct pairwise comparison matrix A using Eqs. 1-2
1.2 Normalize matrix A column-wise using Eq. 3
1.3 Compute priority vector (criteria weights using Eq. 4
1.4 Compute λ_max using Eq. 5
1.5 Calculate Consistency Index (CI) using Eq. 6
1.6 Calculate Consistency Ratio (CR) using Eq. 7
1.7 Calculate the global weights

2. TOPSIS Phase – Alternative Ranking

2.1 Construct a normalized decision matrix using Eq. 8
2.2 Calculate weighted normalized decision matrix using Eq. 9
2.3 Classify ideal and negative-ideal solutions using Eq. 10
2.4 Calculate separation measures for each teacher using Eq. 11
2.5 Compute closeness coefficient using Eq. 12
2.6 Rank all teachers based on the closeness coefficient

Return the final ranked list of teachers

End

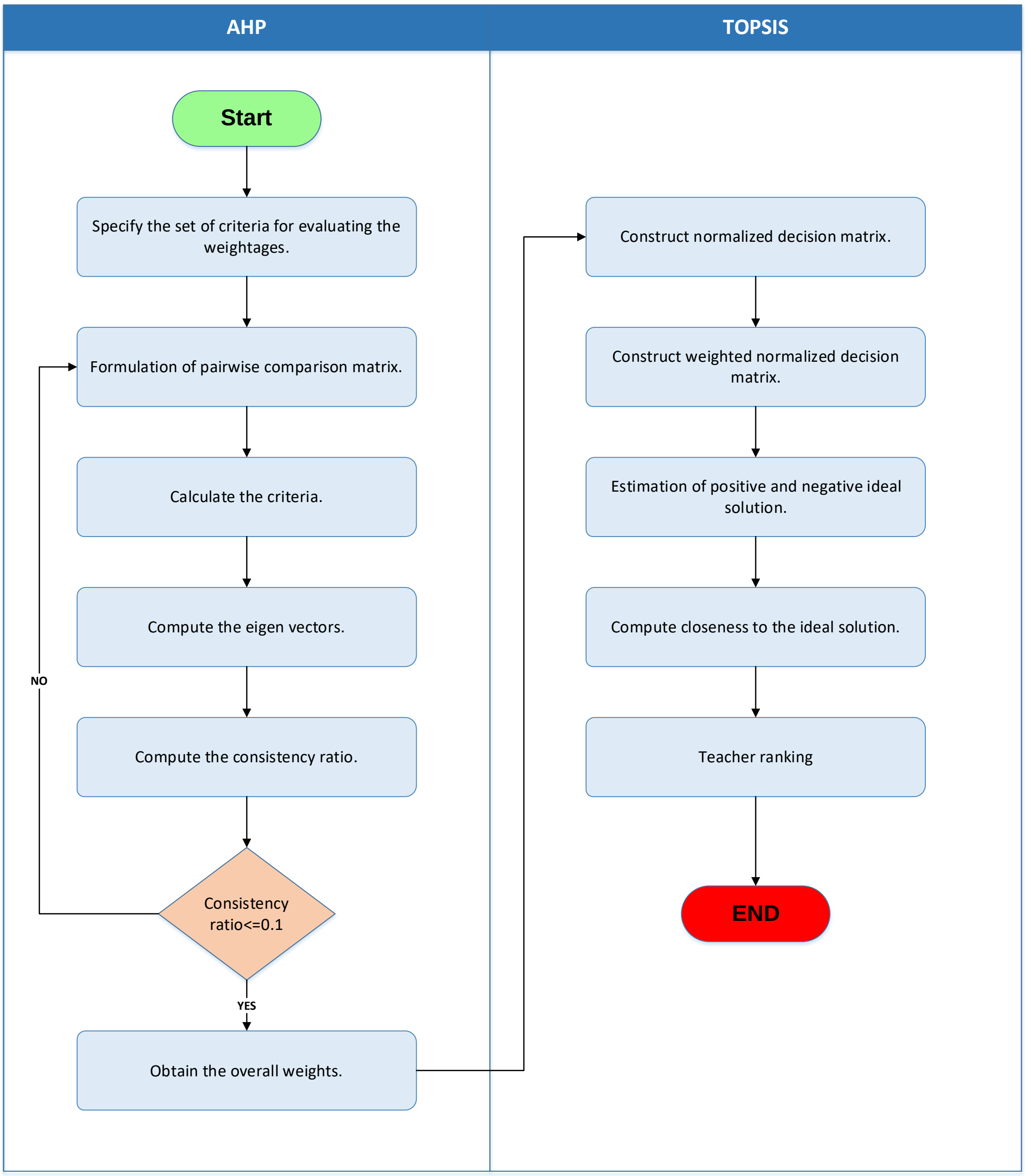


Fig. 4: The AHP-TOPSIS flow in the proposed system

3.1. Criteria prioritizing

AHP-TOPSIS methodology was employed in this study as an integrated decision-making system to break down the evaluation process in a hierarchical way. This methodology permitted us to determine the relative importance of various criteria and to assign relative weights for selecting teachers in Omani schools. By carrying out a systematic pairwise comparison between the chosen criteria and alternatives, the research ensured a complete review of their relative importance to each other, ultimately leading to the computation of criterion weights.

Fig. 5a presents the weights and relative level of importance assigned to each criterion in the evaluation. As is evident, the weights on the criteria range from 1% to 16%. Among these, MC1, MC3, and MC9 were the most important criteria, each with a relative weight of 16%. It can be understood that decision-makers place high value on effective teaching approaches, subject-matter knowledge, and the use of assessment tool results to enhance students' academic achievement.

Following these are MC2, MC4, MC11, and MC12 in positions four to seven with a relative weight of 8% each. These criteria emphasize the importance of developing tailored instructional plans for both high-achievement and low-achievement students, developing effective daily and annual lesson plans, implementing good classroom management, and improving student motivation for effective learning.

Relative weights from 2% to 4% are placed upon MC5, MC6, MC10, MC13, MC7, MC8, and MC14 at the middle to lower ranks. The relative weights for these criteria address whether or not a teacher is good at reflecting upon teaching performance, at assisting learners in the process of knowledge acquisition and skill implementation, at managing LRCs and lab materials, at applying a diversity of questioning approaches, at reinforcing desired values in pupils, and at upholding sequence logic in pedagogical action.

Table 6: Obtained weights of the criteria and sub-criteria

Main criteria	Criteria weights	Rank	Sub criteria	Local weight	Global weight	Rank
MC1	2.69	1	SC1	0.564456343	0.088468503	1
			SC2	0.12407013	0.019445788	21
			SC3	0.241392855	0.037834041	5
			SC4	0.070080671	0.0109839	26
MC2	1.32	4	SC5	0.399713522	0.030804056	10
			SC6	0.328074866	0.025283199	12
			SC7	0.154010695	0.011868886	24
			SC8	0.118200917	0.009109193	29
MC3	2.69	2	SC9	0.336422258	0.052728211	4
			SC10	0.364109848	0.057067749	3
			SC11	0.151357323	0.023722571	14
			SC12	0.14811057	0.0232137	15
MC4	1.32	5	SC13	0.4568303	0.03520578	7
			SC14	0.282376974	0.021761476	19
			SC15	0.196136669	0.015115338	23
			SC16	0.064656056	0.004982741	40
MC5	0.61	8	SC17	0.525758129	0.019375007	22
			SC18	0.298806479	0.011011485	25
			SC19	0.096516868	0.003556797	47
			SC20	0.078918524	0.002908271	52
MC6	0.61	9	SC21	0.579551747	0.021357386	20
			SC22	0.243945989	0.00898979	31
			SC23	0.121558954	0.004479637	43
			SC24	0.05494331	0.002024747	57
MC7	0.29	12	SC25	0.493284493	0.008910457	33
			SC26	0.292124542	0.005276799	39
			SC27	0.142551893	0.00257499	55
			SC28	0.072039072	0.00130128	60
MC8	0.29	13	SC29	0.455812109	0.008233574	35
			SC30	0.326187454	0.005892095	38
			SC31	0.178216614	0.00321922	49
			SC32	0.039783823	0.000718636	64
MC9	2.69	3	SC33	0.597389427	0.093630178	2
			SC34	0.201977885	0.031656445	9
			SC35	0.151977885	0.023819833	13
			SC36	0.048654803	0.007625776	36
MC10	0.61	10	SC37	0.594617538	0.021912584	10
			SC38	0.252256841	0.009296058	28
			SC39	0.072902173	0.002686559	53
			SC40	0.080223448	0.002956359	51
MC11	1.32	6	SC41	0.487040222	0.037533917	6
			SC42	0.285559335	0.022006725	17
			SC43	0.117313747	0.009040823	30
			SC44	0.110086695	0.008483868	34
MC12	1.32	7	SC45	0.437631016	0.03372618	8
			SC46	0.399656333	0.030799649	11
			SC47	0.121458141	0.009360212	27
			SC48	0.04125451	0.003179293	50
MC13	0.61	11	SC49	0.616608119	0.022722971	16
			SC50	0.126424668	0.004658946	41
			SC51	0.185558158	0.006838108	37
			SC52	0.071409055	0.002631535	54
MC14	0.29	14	SC53	0.496355306	0.008965927	32
			SC54	0.239418177	0.004324736	44
			SC55	0.193783256	0.003500409	48
			SC56	0.07044326	0.001272454	61
MC15	0.16	15	SC57	0.424089843	0.004229268	45
			SC58	0.391584324	0.003905104	46
			SC59	0.087646023	0.000874057	63
			SC60	0.09667981	0.000964147	62
MC16	0.16	16	SC61	0.456723981	0.004554714	42
			SC62	0.245726603	0.002450527	56
			SC63	0.140139673	0.001397553	59
			SC64	0.157409742	0.001569781	58

Conversely, "Proper language accuracy" and "Using appropriate assessment tools in the lesson" received the lowest weights, both of which were 1% relative value. This shows that decision-makers accord relatively lower importance to linguistic accuracy and the use of structured assessment tools. This could be because Arabic, being the mother tongue, is the predominant medium of instruction in Omani schools, reducing language accuracy-related issues. Also, prevalent conventional assessment practices are used extensively, so the transition to alternative assessment tools is not of the highest priority in the decision-making process. These ratios are correlated with sub-criteria ranks as the highest-ranked sub-criteria prioritize assessment-driven teaching, innovative instructional strategies, and subject-matter expertise (SC33, SC1, SC10, SC9), indicating a strong focus on student evaluation and teaching effectiveness. Mid-ranked sub-criteria emphasize classroom management, diverse teaching strategies, and adaptive lesson planning (SC41, SC4, SC5), reflecting their importance but positioning them as secondary to assessment and subject knowledge. Lower-ranked sub-criteria (SC32, SC28, SC24) show minimal emphasis on real-world application, student motivation, and independent learning, suggesting a preference for structured instruction over broader pedagogical strategies. Least valued sub-criteria (SC57, SC61) highlight a low priority on language accuracy and structured assessment tools, likely due to Arabic as the native language and reliance on traditional evaluation methods.

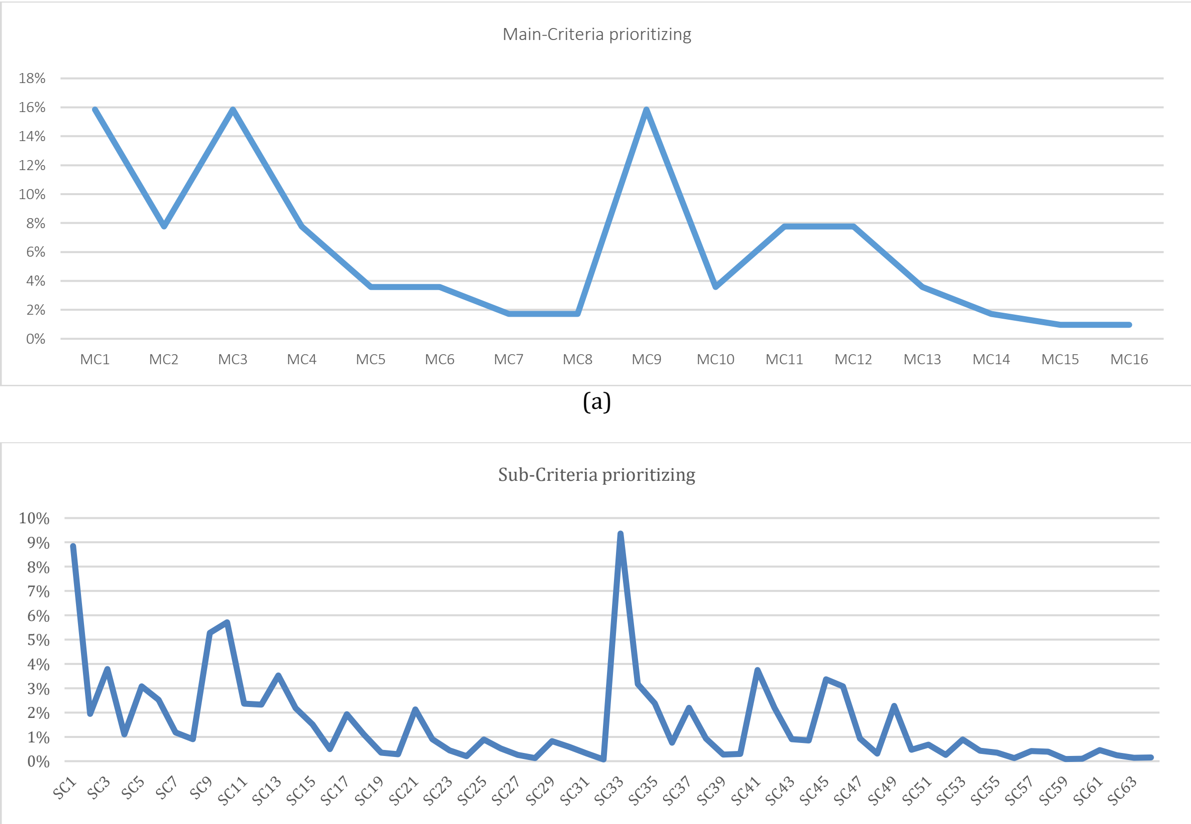
Table 7: Each alternative weight according to each criterion

	A1	A2	A3	A4	A5
SC1	0.047754	0.021224	0.042448	0.031836	0.047754
SC2	0.001466	0.013192	0.01026	0.004397	0.008795
SC3	0.026428	0.008809	0.005873	0.017619	0.017619
SC4	0.005103	0.005103	0.005832	0.005832	0.000729
SC5	0.0236	0.015733	0.002622	0.005244	0.010489
SC6	0.012309	0.012309	0.013848	0.007693	0.009232
SC7	0.000839	0.007553	0.007553	0.000839	0.005036
SC8	0.00668	0.004175	0.00167	0.000835	0.004175
SC9	0.035651	0.004456	0.031194	0.022282	0.004456
SC10	0.01712	0.01712	0.01712	0.01712	0.045654
SC11	0.001905	0.015244	0.013338	0.007622	0.009527
SC12	0.012665	0.009499	0.014248	0.004749	0.007916
SC13	0.008958	0.023889	0.011944	0.002986	0.020903
SC14	0.006282	0.018846	0.002094	0.002094	0.008376
SC15	0.001669	0.006677	0.003338	0.008346	0.010015
SC16	0.002803	0.000561	0.000561	0.003364	0.002242
SC17	0.014064	0.002009	0.010045	0.006027	0.006027
SC18	0.006243	0.002775	0.003468	0.006243	0.004856
SC19	0.001621	0.001621	0.001621	0.001158	0.001852
SC20	0.001669	0.000371	0.001669	0.001483	0.000742
SC21	0.01355	0.005081	0.015244	0.001694	0.003388
SC22	0.002595	0.001298	0.003893	0.006488	0.003893
SC23	0.000668	0.003339	0.002003	0.002003	0.000668
SC24	0.001273	0.000182	0.000545	0.000182	0.001455
SC25	0.005026	0.005744	0.002872	0.002872	0.002154
SC26	0.002963	0.00037	0.002963	0.001852	0.002593
SC27	0.001104	0.000221	0.001325	0.001546	0.001104
SC28	0.000385	0.000256	0.001026	0.000128	0.000641
SC29	0.005845	0.001461	0.000731	0.002192	0.005114
SC30	0.002378	0.002378	0.003171	0.000793	0.003567
SC31	0.00072	0.00168	0.00096	0.00216	0.0012
SC32	8.98E-05	0.000449	8.98E-05	0.000539	8.98E-05
SC33	0.030648	0.010216	0.081727	0.030648	0.010216
SC34	0.015092	0.003018	0.012073	0.024147	0.006037
SC35	0.005758	0.005758	0.011517	0.015356	0.011517
SC36	0.000615	0.001229	0.004916	0.001229	0.005531
SC37	0.008504	0.008504	0.006803	0.010204	0.013606
SC38	0.00502	0.004303	0.002152	0.00502	0.003586
SC39	0.001386	0.001386	0.001783	0.000396	0.000198
SC40	0.00211	0.000938	0.000703	0.000469	0.001641
SC41	0.008766	0.020454	0.026298	0.002922	0.01461
SC42	0.010457	0.011951	0.002988	0.011951	0.008963
SC43	0.001208	0.001208	0.002416	0.001208	0.008457
SC44	0.002809	0.004213	0.001404	0.006319	0.002106
SC45	0.010632	0.021264	0.015948	0.015948	0.007974
SC46	0.013353	0.013353	0.008012	0.018695	0.013353
SC47	0.004311	0.002463	0.005543	0.004311	0.003695
SC48	0.001765	0.000504	0.001009	0.000756	0.002269
SC49	0.010037	0.015056	0.002509	0.005019	0.012547
SC50	0.002411	0.002066	0.001378	0.0031	0.000344
SC51	0.00215	0.000717	0.000717	0.005735	0.002867
SC52	0.001074	0.001611	0.000895	0.001253	0.000895
SC53	0.001409	0.004227	0.002818	0.00634	0.003522
SC54	0.00263	0.000877	0.002338	0.001169	0.002046
SC55	0.001495	0.001196	0.002392	0.001196	0.001196
SC56	0.000752	0.000502	0.000878	0.000125	0.000125
SC57	0.001525	0.001144	0.001144	0.003051	0.001907
SC58	0.002527	0.001083	0.000361	0.001083	0.002527
SC59	0.000593	0.000198	6.59E-05	0.000461	0.000395
SC60	0.000665	0.00038	0.000285	0.00019	0.000475
SC61	0.000442	0.003097	0.002654	0.000885	0.00177
SC62	0.000225	0.000899	0.001572	0.001572	0.000449
SC63	0.000796	0.000796	0.00053	0.00053	0.000354
SC64	0.001211	0.000135	0.000808	0.000404	0.000404

Fig. 5b shows the importance level of all criteria for each teacher's alternative. The alternative analysis A1–A5 indicates evident areas of strength and weakness in teacher judgment. A1 and A5 emphasize current instructional practices, content knowledge, and quality teaching with high performance in SC1 (5%), SC9 (4%), and SC10 (5%). A3 is strong on assessment-based instruction, particularly SC33 (8%), whereas A2 and A4 are evenly balanced, performing moderately well in classroom management (SC41) and interpreting assessments (SC34). Yet, all the alternatives have poor focus on application in real life (SC24), value-based education (SC27), and combining theoretical and practical learning (SC32), with uniformly low or zero scores. SC57 (Use of Proper Language) and SC61 (Use of Structured Assessment Tools) also had little weight, reflecting a low priority on linguistic correctness and formal assessment tools. Overall, the model overestimates instructional techniques and assessment methods and neglects other overall pedagogical issues, such as student motivation, interest, and learning experiences.

3.2. Alternatives prioritizing

Using the criteria and alternative weights derived from the AHP analysis in the section above, the priority rankings of each teacher are presented in Table 8 as calculated using TOPSIS. The TOPSIS method ranks teachers based on their proximity to the ideal solution (C_i). Fig. 6 also shows graphically the priority levels assigned to each teacher based on the AHP analysis.



(b)

Fig. 5: Prioritization of the main criteria (a) and sub-criteria (b)

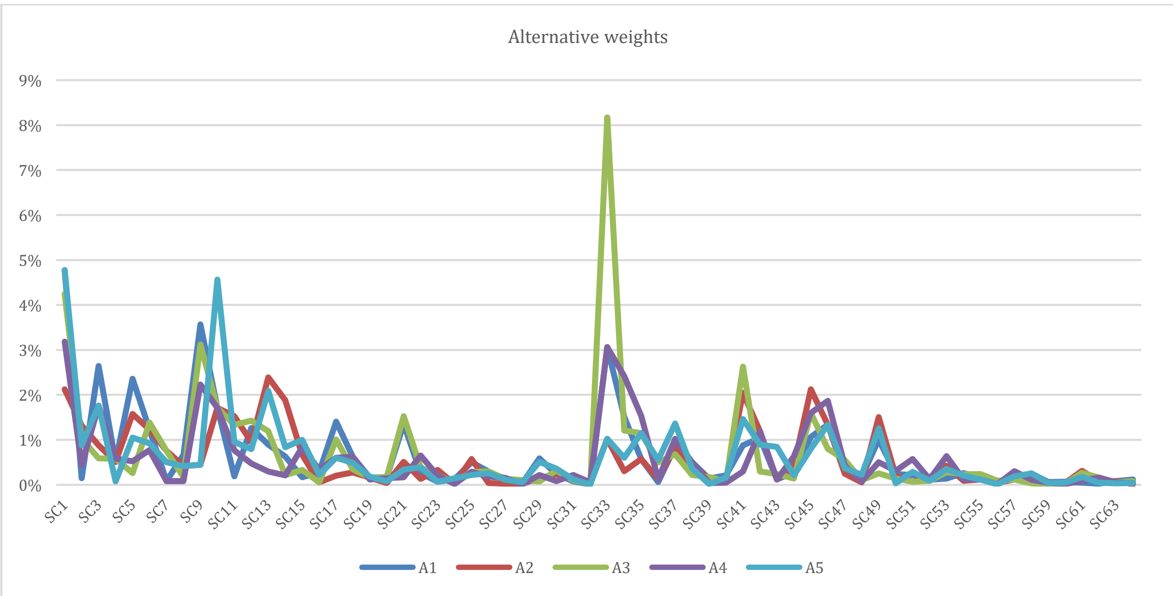


Fig. 6: Importance levels of the criteria considered for each teacher

According to Table 8 and Fig. 7, the AHP-TOPSIS ranking results provide priority assignment levels of each of the teachers based on their performance values. The ranking positions A3 as the highest performing teacher, followed by A1 and A5, while positioning A4 and A2 at the lower ends of the rankings. Ranking teachers according to the TOPSIS approach relies on the closeness to the best solution (values of C_i), where the closest is for A3, corresponding to the best performance. These rankings are based on performance and suitability of the evaluation method. The marriage of AHP and TOPSIS offers a balanced and systematic appraisal since AHP determines the weight of each criterion, while TOPSIS enhances ranking by obtaining the relative closeness to ideal and anti-ideal solutions. The proposed approach allows for enhanced transparency and fairness in teacher appraisal, allowing decision-makers to contrast performance results impartially. This rigorous approach further refines decision-making based on data, as education administrators are better able to ascertain best practices and areas to target for development. While AHP-TOPSIS is strong when applied to multi-criteria decisions, effectiveness hinges as much as anything on reliable input data, judgmental logic, and the criteria selected. It would be further enriched in future refinements through incorporating fuzzy logic for handling subjective ratings uncertainty and ensuring a comprehensive, flexible appraisal model.

3.3. Technology acceptance model (TAM)

The technology acceptance model was developed by Davis (1989), where the model implies that if an application is expected to be easy to use, the more likely it is that it will be considered useful for the user and the more likely it is that this will stimulate the acceptance of the technology. A survey of 49 Ministry of Education supervisors revealed high acceptance of a proposed teacher evaluation system. The system was found to be easy to use, useful, and user-friendly. Supervisors rated the system as useful, providing feedback, enhancing testing procedures, and aiding decision-making. They were also highly prepared to adopt the system, with mean scores of 4.53 and 4.63, indicating a high willingness to integrate it into their working processes. The study confirms the system's long-term use and high acceptance among educational supervisors. The results are summarized in Table 9.

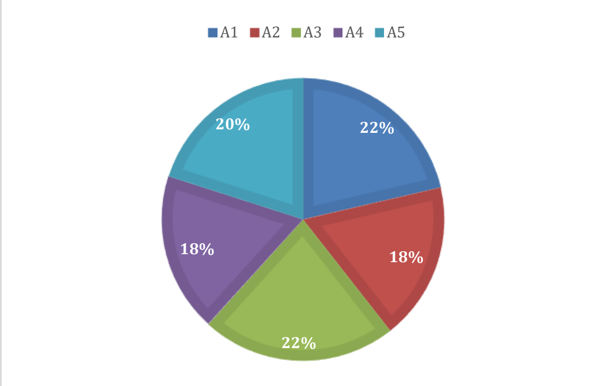


Fig. 7: Alternative's rank

3.4. System usability scale (SUS)

John Brooke developed SUS analysis in 1986 (Brooke, 2013), and it is a standardized way of measuring perceived usability across digital systems. SUS consists of ten questions that are answered with five points on the Likert scale, which allows quantitative analysis of user experience. It is easy, effective, and versatile, making it ideal for iterative, user-centered design. The SUS score, ranging from 0 to 100, is arrived at by recoding answers—positive for odd-numbered items and negative for even-numbered ones—and then multiplying the total by 2.5. A score above 70 indicates satisfactory usability, and over 85, excellent performance. Its popularity is since it is reliable, can be used across industries, and enables evidence-based design decisions.

A SUS survey involves 19 participants to evaluate the usability of the proposed teacher evaluation system. The results show a high level of user satisfaction with the system. The average SUS score was 75.58, with a standard deviation of 5.63, suggesting that users generally found the system to be highly usable. The detailed results are presented in Table 10.

Table 8: AHP-TOPSIS ranking results

	AHP weights	S^+	S^-	C_i	Rank
A1	21.35964	0.071325866	0.062180734	0.465750264	2
A2	18.06184	0.095441872	0.046702953	0.32855894	5
A3	22.28714	0.054931016	0.088409712	0.616780125	1
A4	18.2402	0.079970026	0.045758649	0.363947595	4
A5	20.05118	0.087193274	0.053501929	0.380268323	3

4. Managerial implications

The study aligns with the Education, Learning, Scientific Research, and National Capabilities priority of Oman Vision 2040 to build a knowledge-based society with competitive national capabilities. The proposed MCDM-based teacher evaluation system substantively supports this vision by improving the education quality, building teaching mechanisms, and designing a data-driven approach towards decision-making. By employing modern means of educational evaluation, the system furnishes Omani instructors with ongoing feedback, which enhances professional growth and higher teaching standards.

This, in turn, produces graduates with skills and competencies that align with local and international labor market demands, bolstering Oman's vision to establish a knowledge-based economy. Additionally, the study keeps the education of lifelong learning alive through the incorporation of scientific evidence and education into the study plan. It also improves digitization in the assessment approach and accounts for teachers' evaluation according to international accreditation criteria. This methodological shift not only integrates the education system but also aligns with Oman Vision 2040 in establishing institutions and cadres that can compete globally without loss of Omani identity and values.

Table 9: TAM analysis for teacher evaluation system

	N	Minimum	Maximum	Mean	Standard deviation
Easy to use					
wording1	49	3.00	5.00	4.6327	.52812
wording2	49	3.00	5.00	4.4082	.57440
wording3	49	3.00	5.00	4.5918	.53690
wording4	49	3.00	5.00	4.4898	.54476
wording5	49	3.00	5.00	4.4286	.57735
wording6	49	3.00	5.00	4.4898	.61652
Usefulness					
wording7	49	2.00	5.00	4.5306	.64878
wording8	49	3.00	5.00	4.5306	.54398
wording9	49	3.00	5.00	4.4082	.60959
wording10	49	3.00	5.00	4.4286	.64550
wording11	49	3.00	5.00	4.4694	.54398
wording12	49	3.00	5.00	4.4694	.61583
Intend to use					
wordin13	49	3.00	5.00	4.5306	.54398
wording14	49	3.00	5.00	4.6327	.52812
Valid N (listwise)	49				

Table 10: SUS analysis results

Max	92.5
Min	62.5
Standard deviation	7.129749879
Mean	75.66666667

Secondly, the integration of technology into teacher assessment facilitates an innovative culture in education, preparing learners and teachers for the challenges of an ever-evolving digital era. Through efficient collaboration between educational institutions and private business entities, the initiative ensures scientific research and development work towards Oman's overall socio-economic goals.

In general, the research is an enabler strategy for Oman's future via a modernization of education, a strengthening of national capabilities, and the consolidation of the knowledge economy, all of which are most critical to the vision of Oman Vision 2040 for inclusive, innovative, and globally competitive education.

5. Conclusion

In this study, the Analytic Hierarchy Process (AHP) and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) were used as multi-criteria decision-making (MCDM) tools to rank and assess teachers based on a predetermined set of performance criteria. The study aimed to apply a science-based and unbiased teacher evaluation model to the Oman Ministry of Education to end the flaws of the prevailing manual and subjective evaluations. The evaluation model applied 16 key criteria and 64 sub-criteria to provide an all-encompassing and fair evaluation process. The decision-making process was also validated using the TAM and SUS analysis to test the usability and acceptance of the system by educational supervisors.

The results of this study can be summarized as follows:

- Among the 16 most important criteria, "Effective Teaching Strategies" (MC1), "Competence in Subject Matter" (MC3), and "Applying Assessment Results to Improve Student Achievement" (MC9) were most critical, all three receiving the top priority weighting. This attests to the importance of teaching methods, competence in subject matter, and assessment based on evidence towards increasing education quality.
- Sub-criteria ranking revealed that the implementation of modern pedagogy methodologies (SC1), the enactment of assessment outcomes effectively (SC33), and the supply of scientifically accurate content (SC10) were the most prominent criteria influencing the performance of teachers. They are concurrent with the need for student-centered learning, evidence-based assessment, and sound subject matter knowledge in pedagogy.
- AHP-TOPSIS results confirmed a systematic ordering of teachers based on how close they are to ideal performance. This ensures that teacher assessment is clear, evidence-driven, and fair.
- TAM analysis showed that the system was rated as very usable and useful by educational supervisors with a mean rating of over 4.5 on a five-point Likert scale. Supervisors stated that the system facilitates it to be easy conduct of the evaluation, enhances fairness, and provides constructive feedback to inform teacher development.
- Findings of this research provide valuable suggestions for policymakers and educational administrators to improve the system of teacher assessment in Oman. The model developed yields a standardized, technology-driven approach to

assessment, reducing subjectivity and inconsistency in teacher assessment.

Overall, the use of AHP-TOPSIS in teacher evaluation allows for a more efficient and systematic decision-making process that results in enhanced teacher performance and student learning outcomes. The system enhances Oman Vision 2040 by means of data-driven decision-making and continuous professional development of teachers. Future research may apply the model to other education levels and combine machine learning techniques for better optimization.

List of abbreviations

A1–A5	Teacher alternatives 1 to 5
AHP	Analytic hierarchy process
AI	Absolutely important
CI	Consistency index
CR	Consistency ratio
DI	Demonstrated importance
EI	Equal importance
IT	Information technology
Labs	Laboratories
LRCs	Learning resources centers
MC	Main criteria
MCDM	Multi-criteria decision making
MI	Moderate importance
PS	Plithogenic set
RI	Random index
SC	Sub-criteria
SI	Strong importance
SUS	System usability scale
TAM	Technology acceptance model
TOPSIS	Technique for order preference by similarity to the ideal solution
WASPAS	Weighted aggregated sum product assessment
λmax	Maximum eigenvalue

Compliance with ethical standards

Ethical considerations

All participants were informed about the purpose of the study, and their consent was obtained prior to participation. No personally identifiable information was collected, and all responses were anonymized and used solely for research purposes.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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