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Assessment and Ranking Framework for the English Skills of Pre-Service Teachers Based on Fuzzy Delphi and TOPSIS Methods

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ABSTRACT In this study, pre-service teaching refers to teaching English as a second language (TESL) to Malaysian students whose first language is not English. TESL prepares English-language learners to become future teachers of English as a second language. To date, no multi-criteria framework has been developed to evaluate and select the skills of pre-service teachers. This study presents a new framework to assess and rank the English skills of pre-service teachers on the basis of fuzzy Delphi and multi-criteria analysis. Three experiments were conducted. Firstly, criteria were identified from the literature review and the opinions of representative experts via the Delphi method. Secondly, 31 pre-service teachers were evaluated to determine the skills of pre-service teachers on the basis of Delphi criteria outcomes. English proficiency was tested through the English Language Testing Service and four language skill examinations. Each examination was evaluated by experts with vast experience in English teaching. Thirdly, pre-service teachers were ranked on the basis of a set of evaluated Delphi criteria outcomes through the technique for the order of preference by similarity to ideal solution (TOPSIS) method. Thereafter, the mean and standard deviation were utilized to ensure the identical systematic ranking of pre-service teachers. Findings are as follows. Twenty-five criteria from previous studies are representative as evaluated by the opinions of experts, which were gathered through interviews and a structured questionnaire. The validity of content was verified using a five-point Likert scale. With Delphi method outcomes, 14 criteria were selected and included in the final framework. The results of the proposed evaluation framework were tested on Malaysian pre-service teachers. TOPSIS is effective for solving the selection problems of pre-service teachers. In the final experiment, significant differences were recognized between the scores of groups, indicating identical ranking results.

INDEX TERMS Pre-service teacher, TESL, multi-criteria decision making, MCDM, fuzzy Delphi method, TOPSIS.

I. INTRODUCTION

Teaching English as a second language (TESL) is a programme that teaches the language to non-English speaking students. In this study, TESL aims to prepare the learners to become English as a second language (ESL) teachers [1]. ESL teachers can play an important role in increasing student knowledge and teaching them how to apply correct learning strategies to different language activities. In addition, the teachers could expand strategies for new tasks

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in the language category and in other areas that require language skills [2]. The role of ESL teachers is to facilitate students to actively use their first language to learn a second language. ESL teachers are expected to provide the best possible language model, language skills and abilities, feedback, reinforcement, confidence, guidance, and second language data in terms of 'understandable inputs'. ESL teachers must constantly study to acquire new knowledge and skills during their careers. Teacher education does not involve the acquisition of individual skills but rather a different set of knowledge, skills and items that teachers must implement in the classroom [3], [4]. ESL teachers must be kind, patient and enthusiastic and have a sense of humour to encourage TESL students to become active and attentive. Good teaching practices are considered key to influencing student learning. ESL teachers play a critical role in learning of the language of students and therefore must possess positive attitudes to communicate with learners and effectively teach in classrooms [2], [5], [6].

ESL teachers must be proactive and take initiatives to increase their skills and develop educational competencies. These skills attract the attention of students and enable teachers to deliver information quickly and complete the required curriculum. Other tasks involving teachers and students are also important because these tasks improve the English skills of students, especially in terms of vocabulary, listening, speaking, reading and writing skills [3], [7], [8]. The Malaysian Education Ministry hired 600 retired teachers with adequate TESL experience to train teacher participants and provide sufficient knowledge and proper teaching methods. The participants are also taught how to manage students in the classroom [9]. The main traits of efficient and effective ESL teachers are basic pedagogical knowledge, awareness of meaningful classroom practices, language ability, positive attitude and understanding personality [10], [11].

TESL in different educational institutions in Malaysia offers several benefits. However, the surveyed works indicate that researchers are concerned about the challenges associated with TESL studies and skills in the country. The main challenges in adopting Malaysian TESL are listed below, along with citations for additional discussion.

The challenges are classified into concerns related to reading, grammar, writing, speaking, listening and ESL teachers. Concerns on reading include difficulty in understanding, lack of vocabulary and performance [12]–[16]. Concerns on grammar performance include grammatical errors, loss of text meaning, reading skills and lack of complex grammatical structures, [13], [14],[17]–[21]. Concerns on writing include loss of terminology, attitude, performance, wide knowledge and complex writing [22]–[30], [26], [31], [32]. Concerns on speaking include loss of confidence, wide knowledge, performance, difficulty of pronunciation and feeling of shame and apprehension [33]–[38]. Concerns on listening include lack of comprehension and memory [39]. Concerns on vocabulary include lack of vocabulary, limitations that cause failure in dialogue and use of inappropriate terms [15], [17]. Concerns regarding ESL teachers include weakness in teaching performance, interaction, teaching methods and lack of willingness to cooperate [7], [14], [29]. Other concerns include numerous students in the classroom [40], insufficient teaching time and weakness in the English language. Moreover, most ESL students dislike the complication of companies or the learning process. This dislike implies that students have difficulties adapting to the academic environment, feel insecure of their academic target and lack academic guidance [41]. The lack of oral participation amongst students causes numerous problems, including the lack of development of speech criteria, loss of mastery of dialogue, accent, correct pronunciation and loss of self-confidence [42]. The combination of these numerous concerns causes conflicts to occur amongst ESL students inside the classroom [14], [17], [43]. Therefore, several ESL students in Malaysia are required to improve their English skills. ESL students lack skills with respect to TESL in secondary and primary schools.

The current research aims to (i) design and develop a comprehensive English skill evaluation framework for pre-service teachers (future ESL teachers), (ii) test the proposed evaluation framework on Malaysian pre-service teachers and (iii) develop and validate a selection and ranking module for pre-service teachers by using multi-criteria decision-making (MCDM) techniques.

This paper is organised as follows: Section 2 reviews the literature; Section 3 presents the research methodology; Section 4 defines the findings and discussion; Section 5 offers suggestions for future research directions; and Section 6 provides the conclusion.

II. LITERATURE REVIEW

Few studies on ESL have applied the Delphi method and decision-making approaches. A study [44] regarded ESL as the most essential skill for college students. The study evaluated English institutions in Taiwan College, which attracts the enrolment of foreign students and also enhances the language competition of domestic students. The MCDM model was proposed to solve a variety of decision-making problems involving multiple criteria. The evaluation process was composed of two steps. Firstly, criteria were identified from previous studies and the opinions of representative experts via the fuzzy Delphi technique. Experts were asked to evaluate the criteria and dimensions and to verify the validity of their content by using the seven-point Likert scale. Secondly, the analytic hierarchy process (AHP), a decision-making technique, was used to organise and analyse complex decisions on the basis of mathematical models. This technique is utilised in the final criteria of the first step to solve a decision-making problem. Another study [45] designed and planned an ESL curriculum for elementary school students in a suburban county in Taiwan. The criteria were derived from literature and the opinions of representative experts via the Delphi technique. The opinions of experts were collected via interviews and structured questionnaires to evaluate the criteria and dimensions. The validity of their content was

verified using a five-point Likert scale. AHP methods were utilised to solve important MCDM issues in planning and evaluating the ESL curriculum. The study [46] utilised the fuzzy Delphi technique to obtain a consensus amongst several ESL experts on the possibility of using videos in TESL classrooms. An exploratory study of implementation was conducted with 15 first-year students in an English language proficiency course of a higher education institute in the Klang Valley in Malaysia. The works and responses of students were collected after an ESL lesson via video. The results noted that the participating students enjoyed lessons via videos and produced high-quality written tasks.

A study [47] presented the design and development of an online case-based problem-solving (OCBPS) module to evaluate the writing skills of pre-service teachers. The main purpose of this design is to increase the competency of TESL pre-service teachers. Several ESL experts evaluated the module by using fuzzy Delphi techniques on the OCBPS design, specifically on the case criteria. Another research [48] presented multiple-attribute decision process, fuzzy AHP (FAHP) and fuzzy Delphi method (FDM) to select and evaluate appropriate pre-reading strategies to facilitate reading skills and improve the interest and comprehension of students. A review committee with experts from the academia in Malaysia was likewise employed for evaluation [49]. This study examined how Wikipedia can be used as a means of enhancing skills in reading, writing and thinking amongst students. The consensus of Malaysian education experts was explored by using the fuzzy Delphi technique on Wikipedia to develop the competence of students and to encourage interest in learning English. A fuzzy Delphi survey was also designed [50] to investigate the potential of Twitter for developing reading skills amongst university students in Malaysia. The main focus was to gain an expert consensus on the future of Twitter and use it to learn future languages for university students. Other evaluations include multiple-attribute decision-making (MADM) techniques with hesitant fuzzy uncertain linguistic information (HFULPWA) [51] to evaluate the development of the professional competence of college English teachers in the Southeast Mountain Area in Jilin Province. The decision-making technique and the technique for the order of preference by similarity to ideal solution (TOPSIS) [52] were used to evaluate and prioritise the factors that affect in-service training courses for the English language teachers of the secondary schools in selected districts in Tehran. The familial Mediterranean fever (FMF) technique [53] was presented to evaluate the best speaking skills and communication practices for English teachers in an English institution at India. Six criteria were determined in the evaluation process: pronunciation, elaboration, accuracy, vocabulary, interaction and fluency. MCDM was presented for evaluation to support the final decision for teacher evaluation. Several new models to teach ESL, such as online, offline and using a mobile device, were also evaluated [54] because learning English has attracted increased attention for students in China. Then, MADM techniques, intuitionistic fuzzy multiple decision-making method and ordered weighted averaging (OWA) were used to select the most suitable, effective and optimal method. Hybrid methods, Grey fuzzy decision and AHP methods were also used to evaluate English teaching quality in educational institutions in China [55]. Evaluation was found to require joint effort of three aspects: teaching materials, students and teacher.

Academic literature likewise reveals the issues and challenges that have been determined in pre-service teachers in Malaysia. According to these studies [56], [57], the Malaysian government highlighted the improvement of pre-service teachers' quality in the education system for 2013–2025. Malaysia has lost the basic qualities of teachers and employability of graduates who possess high qualifications in the English language. Pre-service teachers on practical teaching in Malaysian schools have reported that they lack the skills needed to work effectively with their students and were somewhat unprepared to help students learn. English teacher quality in Malaysia is the most recognised measure that can influence student achievement and success in schools. Teacher actions, effective teaching, knowledge and creativity are knowledge bases of teaching that are widely accepted and will continually expand and change. However, when a disparity occurs between how teachers transform knowledge and effective instruction, then it may be time to re-analyse the reasons that create this gap. These previous studies [56], [58] suggest and recommend to develop a framework to support the pre-service teachers in educational institutions [59], [60] because of the lack of practical interaction between theory and practice and they are not able to move beyond superficial teaching towards using more sophisticated skills to promote effective learning. Thus, the Malaysian Education Ministry has been exerting concerted efforts to strengthen the country's education system [61].

The lack of skills are observed when the teachers are employed in schools, but none of the reviewed literature discussed a comprehensive evaluation framework for pre-service teachers prior to their appointments. Thus far, no study design and comprehensive framework has been developed to evaluate and employ English skills for pre-service teachers on the basis of multi-criteria evaluation. The present study therefore proposes a framework with four multi-criteria English evaluation (Listening test, Speaking test, Reading test and Writing test).

However, evaluation and ranking of pre-service teachers require individual consideration of multiple attributes (i.e. speaking, listening, reading and writing) [62]. Focusing on the first issue, MADM is needed. In addition, a similar ranking process requires simultaneous consideration of the grade from multiple attributes [56], [63]. Data variant is generated to address the second issue. Consequently, this process leads to the fact that the ranking of pre-service teachers is a complex multi-criteria problem. In this scenario, every teacher is regarded as an alternative for the decision maker. As these processes question how teachers can be ranked,

a decision-based method can be used to address this complicated problem.

Decision-making algorithms should be adopted to improve decision-making on complicated problems [64]–[66]. Using structured and explicit approaches in decisions that involve multiple attributes can improve the quality of decision-making [67]–[70]. For this purpose, a set of techniques that is classified under the collective heading multiple criteria decision analysis (MCDA) is useful. MCDA is a sub-discipline of operational research and explicitly considers multiple criteria in decision-making conditions, which occur in various actual situations in educational environments [71]–[74]. Several useful techniques can be used to deal with MADM/MCDM problems in the real world. These methods help organise the problems to be solved and perform analysis, ranking and scoring of alternatives [75], [76]. The scoring of suitable alternative(s) are then performed accordingly [77], [78]. In any MADM/MCDM ranking, fundamental terms are defined, which include decision or evaluation matrix (DM/EM) alternatives and criteria [79]–[81]. A DM/EM that comprises m alternatives and n criteria is necessary [82], [83]. Considering the intersection of each alternative and criteria as xij, we obtain the following matrix $(xij\ mn)^*$:

$$DM\ l\ EM = \begin{array}{c} \\ A_1 \\ A_2 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccc} c_2 & c_2 & \ldots & c_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & \ldots & x_{1n} \\ x_{21} & x_{22} & \ldots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \ldots & x_{mn} \end{bmatrix} \end{array},$$

where A_1, A_2, A_3, …, A_m are possible alternatives (i.e. English skills of pre-service teacher) that decision makers must select. C_1, C_2, C_3, …, C_n are the criteria (i.e. speaking, listening, reading and writing) against which each performance of alternatives is measured. Finally, x_{ij} is the rating of an alternative A_i with respect to criterion C_j and W_j is the weight of the criterion C_j. Certain processes, such as normalisation, maximisation of indicators, addition of weights and others that depend on the method, are completed to rank the alternatives [84], [85]. Several MCDM theories or methods have been investigated. The most popular MADM methods that use different concepts include multiplicative exponential weighting (MEW), weighted product method (WPM), weighted sum model (WSM), simple additive weighting (SAW), hierarchical adaptive weighting (HAW), AHP, analytic network process (ANP) and TOPSIS [86], [87]. To the best of our knowledge, none of these methods have been used to develop a framework to assess and rank pre-service teacher English skills.

According to literature [88]–[93], the drawbacks, benefits and recommendations for popular MCDM techniques can be summarised as follows. HAW and WSM techniques are easy to use and understand, but the weights of the attributes are arbitrarily assigned. Using both techniques can be difficult when the number of criteria increases. Another problem that arises from these methods is the use of common numerical scales to obtain the final score. SAW considers all the criteria, intuitively makes decisions and offers simple calculation. However, all the criteria values should be maximum and positive. Moreover, SAW does not always reflect the actual situation. The strengths of MEW and WPM include their capability to remove any unit of measure and use relative rather than actual values. However, no solution with an equal weight of decision matrices is offered. By contrast, the ANP model provides a complete understanding of the level of importance that a criterion can have by its interrelationship with the other elements of the model. A benefit of the model is that ANP allows assessment of the consistency of judgments, and evaluating such assessment is impossible with the method of assigning weights by compromise. Another positive aspect of the ANP is its capability to facilitate the assignment of weights because it divides the problem into small parts. A group of academics can then have a manageable discussion, and only two criteria can be compared to assign the judgements. However, ANP has two disadvantages. Firstly, providing an accurate network structure for the criteria is difficult even for experts, and different structures lead to varying results. Secondly, all criteria have to be compared pairwise with regard to all other criteria to form a super matrix, and such a comparison is difficult and unnatural [94], [95]. Meanwhile, AHP enables DMs to arrange a decision-making problem into a hierarchy, which helps in understanding and simplifying the problem. However, this technique is time-consuming due to the mathematical calculations and number of pairwise comparisons, which increase as the number of alternatives and criteria increases or changes. The ranking of the alternatives in AHP depends on the alternatives considered for evaluation. Adding or deleting alternatives can change the final ranking (rank reversal problem). TOPSIS is functionally associated with the problems of discrete alternatives. This technique is one of the most practical methods for solving real-world problems. A relative advantage of TOPSIS is its capability to rapidly identify the best alternative. Therefore, TOPSIS is suitable for cases with a large number of alternatives and attributes [96]. However, the major weakness of TOPSIS is the lack of provision for weight elicitation and consistency of checking for judgements. TOPSIS requires an efficient technique to obtain the relative importance of different criteria with respect to the objective, and AHP provides such a procedure. The value of 7 ± 2 is the ceiling for comparison given that AHP is used to set weights for objectives on the basis of stakeholder preferences [97] and has been significantly restrained by the human capacity for information processing [98]. From this viewpoint, TOPSIS alleviates the requirement of paired comparisons, and the capacity limitation may not significantly influence this process [87]. Therefore, TOPSIS has been recommended in ranking English skills of pre-service teachers.

The current research aims to develop a new framework to assess and rank English skills of pre-service teachers using FDM and TOPSIS. FDM was utilised to select and determine the final set of criteria used in the proposed framework on

the basis of the opinions of experts. TOPSIS was utilised to rank the pre-service teachers on the basis of a set of evaluated Delphi criteria outcomes. This framework identifies the skills critical to learning ESL to enable future teachers to interact with students within the classroom.

III. METHODOLOGY

This section presents the design of a new framework to assess and rank the English skills of pre-service teachers in Malaysia. The experimental design is divided into four prominent experiments (see Fig. 1).

Fig. 1 presents an overview of the steps of research methodology and the four experiments. Experiment One defines the framework design by using the fuzzy Delphi techniques. Experiment Two tests the framework in the English language departments in a single university. Experiment Three ranks and selects the ideal pre-service teachers by using TOPSIS. The last experiment shows the analysis of the framework data results by using descriptive analysis and comparative results.

A. EXPERIMENT ONE: DESIGNING FRAMEWORK

This section designs and develops the comprehensive evaluation framework by using FDM. This method relies on the collective thinking of qualified experts who confirm the validity of the collected information. As described in Fig. 1, FDM is categorised into nine steps: identification of the multi-criteria based on literature review, determination of expert selection, expert questionnaire, data analysis (triangular fuzzy number and threshold value d), Likert scale conversion to fuzzy scale, determination of data collection, data analysis (triangular fuzzy number) expert consensus percentage, data analysis (triangular fuzzy number, defuzzification and fuzzy score value A) and data interpretation.

B. EXPERIMENT TWO: TESTING FRAMEWORK

This experiment presents four steps to test the new framework.

Step 1: Validation of revised instruments to evaluate pre-service teachers

English language institutions (ELITS) validate the ESL instruments for official acceptance or approval, especially before examination.

Step 2: ELITS

ELITS is designed and required to know the English language level based on four skills: reading, writing, listening and speaking. These skills provide a reliable indicator of language ability, reducing the risk that the English skills of students do not match expectations. These examinations check the level of the English language for each pre-service teacher (TESL students) because several students suffer weaknesses in using the English language. In this study, numerous Malaysian students were revealed to have weaknesses in English during evaluation. Through deep research, we found that only one study uses the four essential skills in the English language as criteria to evaluate students in a Malaysian institution. According to this study, the student must have the possibility and ability to read, write, speak and listen. Therefore, when the new framework is designed, the first part of evaluation has been developed to examine the language level for each student based on the four English language skills. The education of pre-service teachers is important in Malaysian education institutions. The current study attempts to measure the quality of English skills in four main and sub-criteria amongst pre-service teachers at the English Language and Literature Department, Faculty of Languages and Communication. English Language Teaching (ELT) originally utilised examinations for evaluation. The current study obtained permission from the Graduate Research Institute in 23 May 2018, University Pendidikan Sultan Idris (UPSI) for data collection purpose and from ELITS, Kuala Lumpur in 7 May 2018 to use the ESL instruments for evaluation.

Step 3: Evaluation tools and instruments

We present the ESL instruments applied in this study. This part includes four sections that consist of 40 questions and estimated response time of 40 minutes, including transfer time. Through this instrument, we test the comprehension abilities of students and how they relate by listening.

- *Speaking test:* This test has three parts, each of which is designed to allow students the opportunity to talk about abstract issues and ideas. The time given is between 10 and 15 minutes for each part, which consists of 15 questions.
- *Listening test:* This part includes four sections that consist of 40 questions and a response time 40 minutes, including transfer time. Through this test, we test the comprehension abilities of students and how they relate by listening.
- *Reading test:* This part includes three sections that consist of 40 questions. The allotted time is one hour. Through this test, we determine the reading skills of students by asking them to read texts that can answer related questions.
- *Writing test:* This part includes two tasks with a duration of approximately one hour. Students were asked to write at least 150 words for Task One and at least 250 words for Task Two.

Step 4: Data collection

The current study evaluates 31 pre-service teachers (symbol C31) from the Faculty of English Language and Literature Department of the UPSI, Tanjong Malim. The students are currently enrolled in Semester Six (6) of the TESL programme. Before the examinations for evaluation, the researchers obtained permission from the Graduate Research Institute, UPSI for data collection purpose and the ELITS, Kuala Lumpur. This letter of consent was submitted, along with the evaluation (four English examinations: Listening, Speaking, Reading and Writing) to the faculty, and was approved. These examinations only lasted approximately three hours, from 10 am to 1 pm and arranged at a time convenient to the public holiday of students on Tuesday, 29 May 2018 at Hall Number 16, inside the e-learning

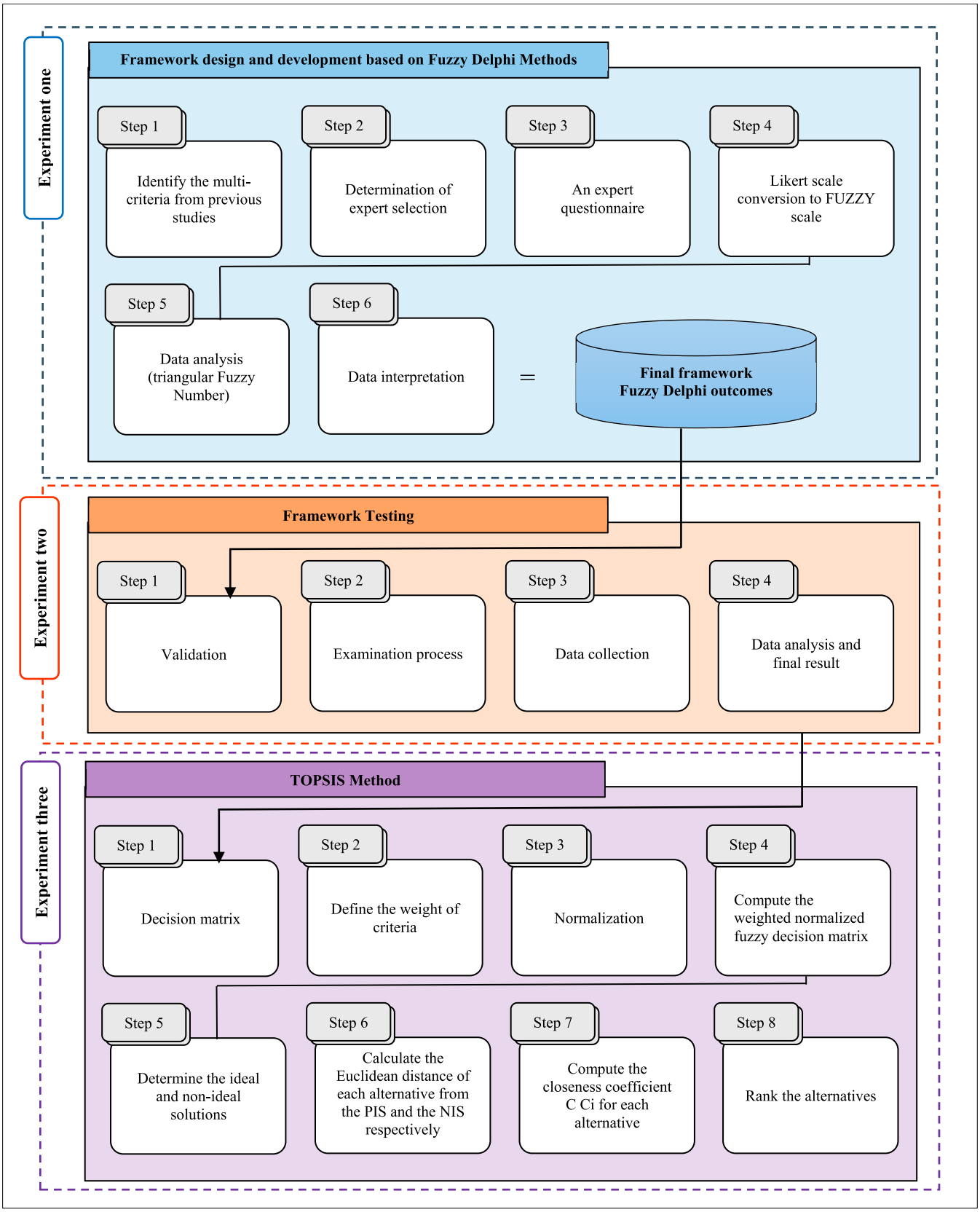

FIGURE 1. Methodology.

building. Participation in the examinations is entirely voluntary and kept in utmost confidentiality.

C. EXPERIMENT THREE: DEVELOPING PROCESSES BASED ON MCDM

MCDM is one of the most important topics in expert system and operations research, which contains several decision alternatives and criteria. The objective of MCDM is to locate the most eligible amongst a set of alternatives with the chosen criteria (see Fig. 1). MCDM techniques can solve selection problems in various domains, including engineering; economics; management and social problems [61], [99], [100] and other fields, such as medicine, sports science, networking and communication. [101]–[106].

In MCDM, various techniques are used to solve problems, and one of the most popular is TOPSIS. The core idea of TOPSIS is to choose the best solution by simultaneously measuring the distances of each alternative to the positive ideal solution (PIS) and the negative ideal solution (NIS). As an alternative, PIS is the most preferred solution by decision makers in maximising benefit criteria and minimising cost criteria, whereas NIS is the least preferred solution in maximising the cost criteria and minimising the benefit criteria. The preference order is then built according to which alternative is closest to PIS and farthest from NIS, resulting in a scalar criterion that combines the two distance measures and the best alternative [107].

In this study, we propose a new MCDM method on the basis of TOPSIS.

TOPSIS Steps:

Step 1: DM is created. The columns of the matrix represent criteria (Cj), and the rows represent alternatives.

$$D = \begin{array}{c} \\ A_1 \\ A_2 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & \ldots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & \ldots & x_{1n} \\ x_{21} & x_{22} & \ldots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \ldots & x_{mn} \end{bmatrix} \end{array}$$

Step 2: The weight of the criteria is computed by different ways from the human approach or entropy depending on mathematical operations, such as AHP and BWM.

Step 3: Normalised DM is computed.

In this step, the benefit of the normalisation is to make the values have the same scale and remove the units.

$$\mathrm{r_{ij}} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{a} x_{ij}^2}}$$

Step 4: The weighted normalised fuzzy DM is computed.

In this study, the weight is equally divided amongst the criteria because the importance of the criteria is equal amongst the experts.

Step 5: Ideal and non-ideal solutions are determined.

PIS $= A^+$ and NIS $= A^-$ are determined for each criterion.

$$A^+ = \left\{ \left(\max_i r_{ij} \,|\, j \in J \right), \left(\min_i r_{ij} \,|\, j \in J \right) \,|\, i = 1, 2, \ldots, m \right\}$$

Max when the criterion is the benefit, and min when the criterion is the cost.

$$A^- = \left\{ \left(\min_i r_{ij} \,|\, j \in J^- \right), \left(\max_i r_{ij} \,|\, j \in J^- \right) \,|\, i = 1, 2, \ldots, m \right\}$$

Min when the criterion is the benefit, and max when the criterion is the cost.

Step 6: The Euclidean distance of each alternative from the PIS and the NIS is calculated.

The separation measure in this step is completed by calculating the distance between each alternative in R and the ideal vector A^+ by using the Euclidean distance, which is given by the following

$$D^+ = \sqrt{\sum_{j=1}^{n} \left(r_{ij} - r_j^* \right)^2}, \quad i = (1, 2, \cdots m),$$

$$D^- = \sqrt{\sum_{j=1}^{n} \left(r_{ij} - r_j^- \right)^2}, \quad i = (1, 2, \cdots m).$$

At the end of Step 6, two values are presented, namely, D^+ and $D-$, for each alternative that has been counted. These two values represent the distance between each alternative and the ideal and non-ideal alternatives.

Step 7: Closeness coefficient (Ci) for each alternative is computed.

$$C_{i^*} = D_i^- / \left(D_i^- + D_i^* \right), \quad i = (1, 2, \cdots m)$$

Step 8: The alternatives are ranked, and the alternative with the highest closeness coefficient represents the best solution.

IV. FINDINGS AND DISCUSSION

Three phases were determined in this discussion. A framework design was developed using FDM in the first phase. The results of the proposed evaluation framework for Malaysian pre-service teachers were tested in the second phase. TOPSIS was used to solve the selection problems of pre-service teachers, and the validation ranking results were presented in the third phase.

A. EXPERIMENT ONE RESULTS: FRAMEWORK DESIGN STEPS

Step1: Identification of evaluation criteria from the literature review

Fig. 2 shows how to define and select the important English evaluation criteria from previous studies.

Listening involves identifying and manipulating speech in words and sentences. The students receive an oral message from an audio recording. Students use their ears to receive individual sounds when listening (stress, letters, pause and rhythm), which their brains turn into texts. Listening is a skill that requires good focus and attention [39]. According to the literature review, two criteria are used to evaluate the listening comprehension of students: understanding the words and sentences and attempting to picture what the speaker is saying. The wide range of knowledge refers to that exhibited whilst listening from the audio record. Speaking is considered very important and is one of the four main criteria

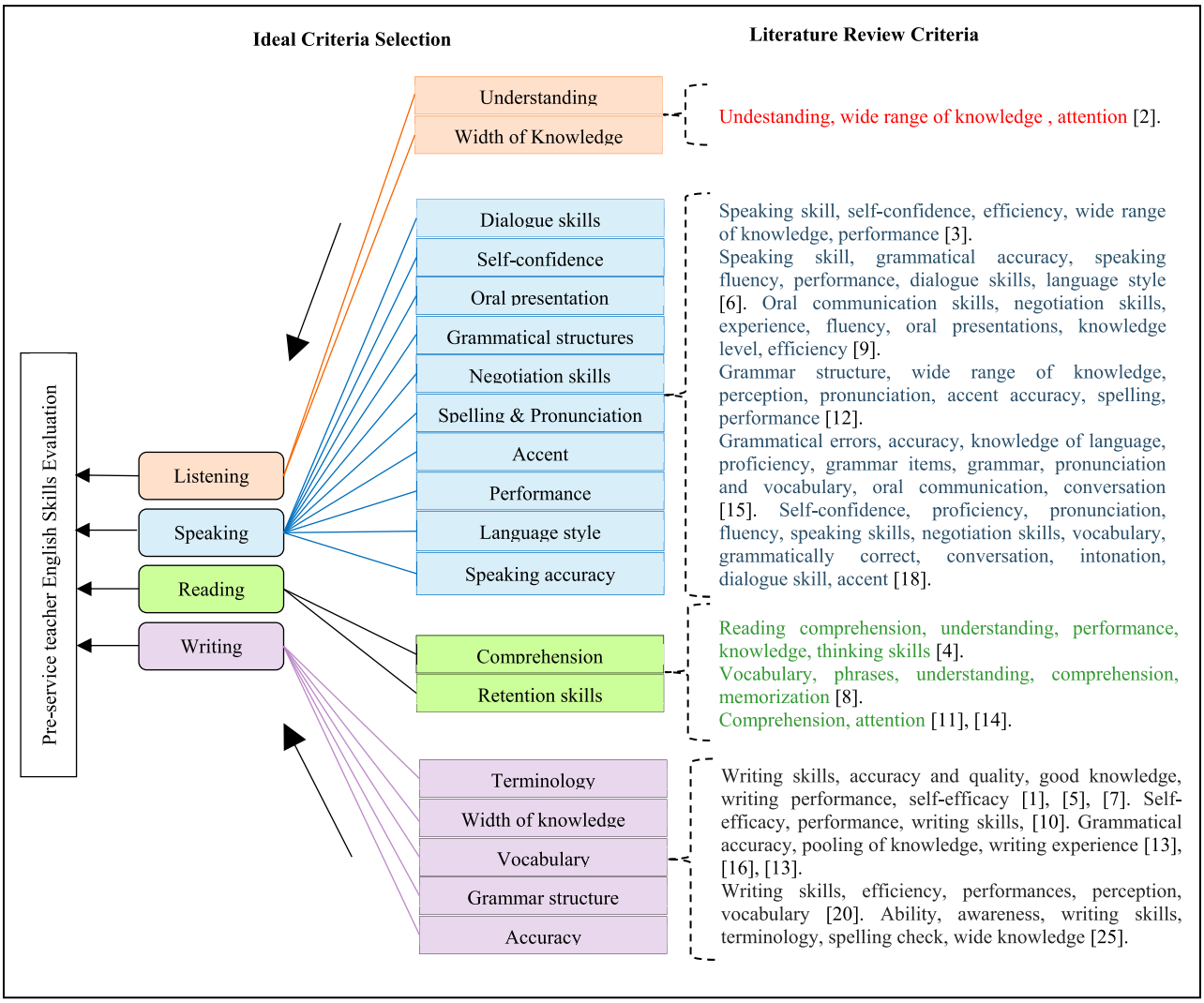

FIGURE 2. Proposed initial theoretical framework to evaluate English skills for pre-service teachers in Malaysia.

to assess the level of English skills for students. Speaking is also expressing the thoughts and feelings of an individual in spoken language. Students create sounds by using various parts of the body, including lungs, vocal chords, teeth, tongue and lips. Experts evaluate the English dialogue during the conversation.

Speaking is a conversation with a student where several questions are raised and answered from 10 different important criteria derived from previous studies. Dialogue skills include conversational skills, present real-life speech and presentation of culture in different social situations. Students love to play roles, which is used to present new vocabulary and sentence structure and develop conversation ability [37], [108]. Self-confidence is the feeling of assurance during a conversation [37], [108]. Oral presentation refers to the creation of a good oral presentation, which is an English art that involves attention to the needs of the audience, careful planning, brief discussion of a defined topic and attention to delivery [38]. Grammatical structures, also called syntax, refer to the arrangement of words, phrases and clauses in the sentence for the correct transfer of information during speech [20], [36]. Negotiation skills refer to reducing misunderstandings as a key part of effective negotiation and dealing with difficult situations, decision making, problem solving and rapport building [38]. Spelling pronunciation refers to spelling as a record of the world of phonemes in the English language. Spelling only refers to the sound as it is spoken and is important because it provides the true meaning of the word. For instance, when students incorrectly spell a word, another meaning may be derived [20], [37]. Accent refers to the modes of pronunciation and tone whilst speaking [37]. Performance refers to the accomplishment of a given task measured against pre-set and known standards of accuracy, completeness, technical language, use of English language in concrete situations, speed during speaking and comprehension. When students are assessed and determined to be an

English language learner, they are assigned a high level of English language proficiency. Performance is also regarded as the fulfilment of an obligation [36]. Language style refers to the power of expressing or communicating thoughts by speaking [108]. Speaking accuracy refers to speaking with a high level of accuracy and very few mistakes [35], [37], [108].

Reading skills refer to the ability of students to understand text. Two important criteria were found in the literature review: reading comprehension and retention skills. The difference between these two criteria is that reading comprehension refers to what students understand when reading several texts in that present moment [34], whereas retention skills refers to what students remember later. Retention means the ability to keep or hold, and having extraordinary powers of retention means remembering everything the students have read [109], [110].

Writing skills refer to a key criterion used in the language environment. Writing skills enable students to express their feelings and ideas on paper on the basis of a wide range of knowledge, terminology, vocabulary, spelling, correct grammar and punctuation. This skill is one of the most important criteria through which participants organise their knowledge and beliefs into convincing arguments and convey meaning via good text construction. These criteria involve sentences and the improvement of writing performance by developing writing skills [22], [25], [43]. Terminology refers to the correctness of terms used in a particular writing. A wide range of knowledge refers to the necessity to possess broad knowledge in different fields [111]. Vocabulary refers to the words used in the writing work [32]. Grammar structure refers to the need of applying the correct rules during writing [112], [113]. Writing accuracy refers to the proper coverage of topics in appropriate detail, which is the careful conformity to truth or fact [27]. Stylistic accuracy concerns the careful use of language to express meaning [22], [43].

Step 2: Determination of expert selection

Experts are individuals with a high level of linguistic knowledge and skills in the field of the English language. In this study, the fuzzy Delphi method is used to obtain a consensus amongst several ESL experts on the possibility of using the questionnaire and interview. Ten experts are determined according to Table 1. Most of these experts have long years of ESL teaching experiences in educational institutions in Malaysia. These experts are from the English language departments of two universities: University of Malaya (UM) and International Islamic University Malaysia (UIA).

Step 3: Expert questionnaire

The questionnaire in this study is a research instrument consisting of a series of questions to evaluate the framework criteria of pre-service teachers for the purpose of gathering information from ESL experts. This study uses questionnaire surveys to allow several experts the opportunity to provide opinions on their experiences in English language criteria.

Step 4: Determination of data collection

This study collected the data from the opinion of experts by using interviews and a structured questionnaire. The survey requested experts to evaluate the criteria and dimensions and verify the validity of content by using the five-point Likert scale Table 2).

TABLE 1. ESL experts' background.

No.	Job place	Job title	Years of experience
Expert 1	University of Malaya	Senior lecturer	15 to 25 years
Expert 2	University of Malaya	Language teacher	15 to 25 years
Expert 3	University of Malaya	Language teacher	3 to 5 years
Expert 4	University of Malaya	Language teacher	More than 30 years
Expert 5	University of Malaya	Language teacher	15 to 25 years
Expert 6	University of Malaya	Language teacher	15 to 25 years
Expert 7	University of UIA	Language teacher	5 to 10 years
Expert 8	University of UIA	Lecturer	15 to 25 years
Expert 9	University of UIA	Lecturer	15 to 25 years
Expert 10	University of UIA	Professor	15 to 25 years

Step 5: Likert scale conversion to the fuzzy scale

The interview protocol was prepared beforehand. The questionnaire survey uses a five-point Likert scale, with answers such as 'very important', 'important', 'neutral', 'unimportant' and 'not important at all'. *Very important* means the criteria have sustained a level grade of excellence. *Important* denotes that the criteria have sustained a high level grade but not excellent. *Neutral* shows that the criteria have a half grade. *Unimportant* implies that the criteria are minimally acceptable to meet grade-level expectations. *Not important* signifies that the criteria are not acceptable for grade-level expectations. Linguistic variables are determined and converted to triangular fuzzy numbers. Table 3 describes linguistic variables for weighting the agreement of the experts.

Step 6: Data analysis (triangular fuzzy number and threshold value d)

The vertex method was utilised to calculate the distance between two fuzzy numbers.

$$d\,(\tilde{m}, \tilde{n}) = \sqrt{\tfrac{1}{3}\left[\left(m_1 - n_1\right)^2 \left(m_2 - n_1\right)^2 \left(m_3 - n_3\right)^2\right]}$$

Each element was measured. If the threshold value (d) is less than or equal to 0.2 ($\mathrm{d} \geq 0.2$), then the elements are rendered as accepted by the consensus of experts. If the average percentage of the consensus of experts is more than or equal to 75%, then the elements are considered to attain consensus.

Step 7: Data analysis (triangular fuzzy number, defuzzification and fuzzy score value A)

The average fuzzy score was determined on the basis of the value of α-threshold, which is 0.5. If the average fuzzy score (A) is more than or equal to 0.5, then the elements are measured achieving the consensus of experts. The formula used for defuzzification is as follows:

$$\mathrm{a} = \frac{1}{3} * (m_1 + m_2 + m_3).$$

Step 8: Data analysis and interpretation

FDM was adopted to solve the problem of the traditional Delphi method. This method relies on the collective thinking of qualified experts, who confirm the validity of the collected information. The data collected by the experts were analysed by the FDM programme to extract the best criteria chosen by the ten experts (Table 4).

TABLE 2. Questionnaire data collection.

	Listening		Speaking										Reading		Writing				
Experts No.	Understanding	Wide of Knowledge	Dialogue skills	Self-confidence	Oral presentation	Grammatical structure	Negotiation skills	Spelling pronunciation	Accent	Performance	Language style	Speaking accuracy	Comprehension	Retention skills	Terminology	Wide of knowledge	Vocabulary	Grammar structure	Accuracy
Expert 1	2	2	1	1	1	1	1	1	3	2	3	2	1	1	1	1	1	1	1
Expert 2	2	3	1	1	1	1	1	1	4	2	3	2	1	1	2	2	2	1	1
Expert 3	1	1	1	1	2	1	2	1	4	2	2	2	1	1	1	2	1	1	2
Expert 4	2	2	1	2	2	1	1	2	3	2	3	1	1	2	2	2	1	1	1
Expert 5	2	4	2	2	2	2	2	2	3	3	3	2	2	2	3	2	2	2	2
Expert 6	1	2	1	2	2	2	2	2	2	2	2	1	2	2	2	2	1	2	2
Expert 7	1	2	1	1	1	2	1	2	4	1	2	2	2	1	2	2	1	2	2
Expert 8	1	2	1	1	2	1	1	2	3	2	2	1	1	2	2	2	2	2	1
Expert 9	1	2	2	1	2	1	2	2	4	2	4	2	2	2	2	4	1	1	1
Expert 10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

TABLE 3. Five-point linguistic variable scale.

Likert Scale	Linguistic Change Enable	Fuzzy Scale		
1	Very important	0	0	0.2
2	Important	0	0.2	0.4
3	Neutral	0.2	0.4	0.6
4	Not important	0.4	0.6	0.8
5	Not important at all	0.6	0.8	1

The results for listening test are as follows: 'Understanding' equals 80% and is accepted, but 'Wide range of knowledge' equals 60% and is rejected. The speaking test has eight criteria that are determined in previous studies. The accepted criteria attained 100% for 'Dialogue skills', 'Self-confidence', 'Oral presentation', 'Grammatical structures', 'Negotiation skills', 'Spelling pronunciation', 'Language style' and 'Speaking accuracy'. However, two criteria are rejected: 'Accent' equals 40%, and 'Performance' equals 70%. In the reading test, two criteria are accepted with 100%, 'Comprehension' and 'Retention skills'. Writing test has five criteria, of which three are accepted with 100%, 'Vocabulary', 'Grammar structure' and 'Accuracy'. Two criteria are rejected: 'Terminology' with 70% and 'Wide range of knowledge' with 60%.

Finally, FDM yielded 14 criteria for evaluation and selection in the final framework based on the opinions of experts.

The task of this framework is to evaluate pre-service teachers in Malaysia. The framework allows increased focus on the linguistic problems faced by students before they are employed in educational institutions. This framework examines the aspects of the language of each pre-service teacher after completing university education. This framework is very useful because it will help educational institutions predict the English language problems that teachers may experience in the future (Fig. 3).

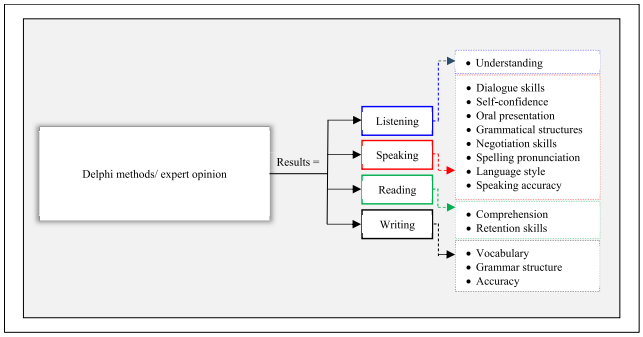

FIGURE 3. Final Delphi method framework outcomes.

B. EXPERIMENT TWO RESULTS: FRAMEWORK TEST RESULTS

Fig. 3 lists the final framework evaluation results for 31 participants from the Faculty of English and Communication in UPSI. Data were selected as paradigms to test the framework. Change in the language proficiency of students was measured by the framework on the basis of the calculation of each student's grades obtained during evaluation and a replica test conducted four years later (Table 5).

The table shows the framework evaluation data results for each examination in detail and the evaluation process assessed by English experts in UIA University.

C. EXPERIMENT THREE RESULTS: DECISION-MAKING TECHNIQUES (TOPSIS) AND STATISTICAL ANALYSIS RESULTS

This experiment is divided into two parts. Part One presents decision-making techniques (TOPSIS), and Part Two presents statistical analysis (Fig. 4).

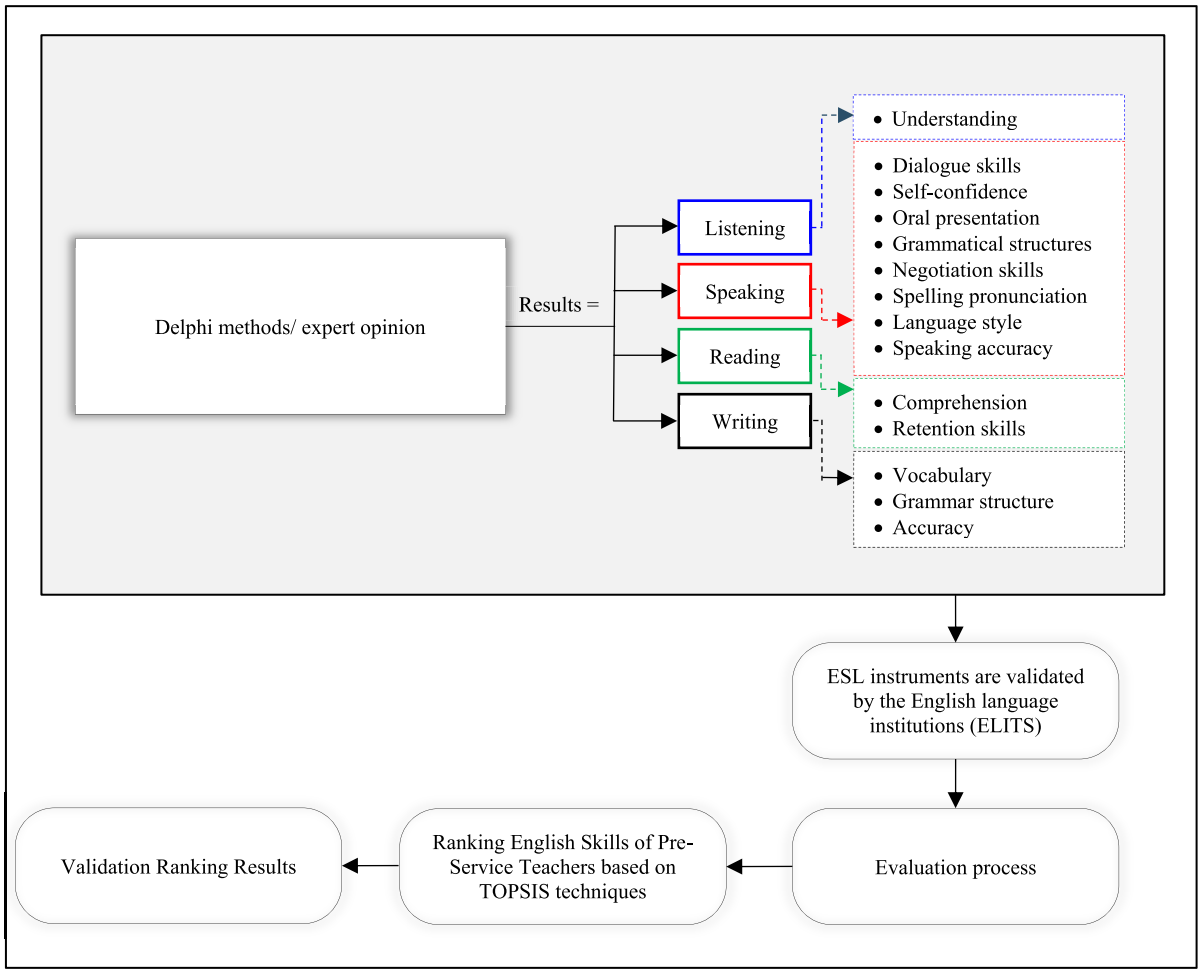

FIGURE 4. Decision-making technique application in the evaluation process.

1) DISCUSSION OF TOPSIS RESULTS

A framework is proposed to select the providers of pre-service teachers by using FDM to shortlist the most important criteria (Fig. 3). After testing the framework, TOPSIS was used to obtain the final ranking of the alternative closest to the ideal (best) solution (Table 5).

The overall success of a student depends on his/her English language skills and abilities. Accordingly, the discussion results and evaluation are based on the following steps.

a: DM RESULTS

This section presents the results of the evaluation of the performances of Malaysian pre-service teachers. However, this section focuses on the data and the use of these data, from their raw form to the final results of DM.

b: RAW DATA FOR DECISION MATRIX RESULT

A sample of 31 pre-service teachers from the Faculty of English Language and Literature Department, UPSI was evaluated. Table 6 presents their results.

Table 7 must fulfil the DM that crosses between the identified criteria and the alternatives that refer to the pre-service teachers.

The dataset for the four criteria of pre-service teachers includes listening, speaking, reading and writing for each applicant. Table 7 presents the data as a DM.

2) RESULTS FOR THE FRAMEWORK DEVELOPMENT FOR PRE-SERVICE TEACHER APPLICANTS

The results of the development of a selection framework are presented in two subsections. The first section discusses the weight result, and the second presents the result of TOPSIS. Ideal pre-service teachers are chosen amongst the sample in this study on the basis of their English skills and performances. The overall success of any pre-service teachers relies on English capabilities and performances. Consequently, this section discusses the results and evaluation via two main steps, the **weighted criteria** and **ranking results**.

3) WEIGHTED CRITERIA

The weight of criteria is computed by using the human approach or entropy depending on mathematical operations.

Table 8 shows the calculated weight for each criterion.

TABLE 4. Questionnaire data analysis.

		Triangular Fuzzy Numbers		Defuzzification Value	
Main criteria	Sub-criteria	Average Threshold (d) Value	Average of Expert (%) Consensus	Average Fuzzy Score (A)	Criteria Results
Listening	Understanding	0.1	80 %	0.093	Accepted
	Wide Range of Knowledge	0.2	60 %	0.180	Rejected
Speaking	Dialogue skills	0.1	100 %	0.093	Accepted
	Self-confidence	0.1	100 %	0.107	Accepted
	Oral presentation	0.1	100 %	0.147	Accepted
	Grammatical structure	0.1	100 %	0.107	Accepted
	Negotiation skills	0.1	100 %	0.120	Accepted
	Spelling pronunciation	0.1	100 %	0.147	Accepted
	Accent	0.2	40 %	0.427	Rejected
	Performance	0.2	70 %	0.193	Rejected
	Language style	0.1	100 %	0.287	Accepted
	Speaking accuracy	0.1	100 %	0.133	Accepted
Reading	Comprehension	0.1	100 %	0.107	Accepted
	Retention skills	0.1	100 %	0.147	Accepted
Writing	Terminology	0.2	70 %	0.180	Rejected
	Wide Range of knowledge	0.2	60 %	0.213	Rejected
	Vocabulary	0.1	100 %	0.107	Accepted
	Grammar structure	0.1	100 %	0.120	Accepted
	Accuracy	0.1	100 %	0.120	Accepted

4) RESULTS OF TOPSIS DECISION-MAKING CONTEXTS

TOPSIS is used to rank the alternatives on the basis of the DM results presented in Tables 8 and 9, which show the criteria weight and importance of the evaluation criteria, respectively. TOPSIS identifies the highest and lowest scoring results for alternatives and compares each alternative with the PIS (highest criteria value) and NIS (lowest criteria value). S− represents the closeness of an alternative to the lowest value, whereas S∗ represents the closeness of an alternative to the highest value (score). Table 9 shows the ranking results, S− and S∗.

Table 9 presents the closeness of each pre-service teacher to the best and the worst performances. S− and S+ represent the separation measurements determined by computing the distance between each alternative. The separation measure in Step 6 in Section 3.3 is completed by calculating the distance between each alternative in R and ideal vector A^+ by using the Euclidean distance.

Table 9 and Fig. 5 shows that the ranking of TOPSIS results for pre-service teachers reveals that two students obtaining the highest results, C22 with score 0.821583 and C17 with score 0.803493. Five other students obtain a high score: C14 = 0.77836, $C26$ = 0.739695, C7 = 0.737412, C29 = 0.712909 and C31 = 0.701959. Moderate results are determined for 13 students. The result values for each are C12 = 0.695644, C23 = 0.695378, C6 = 0.687089, C19 = 0.678963, C24 = 0.674314, C21 = 0.669687, C2 = 0.668091, C9 = 0.648246, C4 = 0.64194, C30 = 0.63313, C25 = 0.626272, C15 = 0.622554 and C18 = 0.61619. Seven other students obtain a moderate score but less than the student results above. The result values for each are C8 = 0.598427, C10 = 0.58239, C11 = 0.577511, C27 = 0.571783, C1 = 0.562083, C16 = 0.54358 and C3 = 0.523119. Three students obtain a moderate score but less than the moderate results above. The result values for each are C20 = 0.490746, C13 = 0.476309 and C5 = 0.45798. The lowest result is obtained by one student, C28 = 0.066107.

5) VALIDATION OF TOPSIS RESULTS

The participants are divided into four groups according to the selection results using TOPSIS to validate our results. Each group consists of six students selected on the basis of scoring values from the results shown in Table 10. Validation is achieved using two methods derived from a statistical platform, which should prove that the first group should reach the highest scoring value by measuring the mean (m) and standard deviation (SD). This method thus shows which group is the best. According to the systematic ranking results, the first group is statistically proven to be the best group amongst the four groups. The results of the statistical analysis in Table 11 are summarised as follows.

a: RESULTS OF THE FIRST GROUP

Table 10 shows the comparative results of the first group amongst four language skill criteria. In the listening criteria, 'Understanding' is considered the highest achievement, with mean (m) value results = 7.625±1.236. The range is between

TABLE 5. Framework testing results.

Samples	Listening		Speaking									Reading			Writing			
	Understanding	Final score	Dialogue skills	Self-confidence	Oral presentation	Grammar	Negotiation skills	Spelling	Language style	Meaning accuracy	Final Score	Comprehension	Retention skills	Final Score	Grammar	Vocabulary	Accuracy	Final Score
C1	5	5	4	5	4	4	4	5	4.5	5	5	6	7	6.5	6	6	6	6
C2	7.5	7.5	5.5	6	6	4.5	5	5	5	5	5.5	7	4	5.5	7.5	7	7.5	7.5
C3	7	7	6	5	5.5	5	4.5	5	4.5	4	5	4	3	3.5	5	4	6	5.5
C4	7	7	4.5	3	3.5	5.5	5	4	4	5	4.5	5	6	5.5	5	6	6	5.5
C5	5.5	5.5	4	3.5	3	4	4	3	3.5	4	4	6	4	5	4	3	5	4.5
C6	6	6	7	7	6.5	7	7	6.5	6	6.5	7	7	7	7	7.5	7.5	7	7.5
C7	7.5	7.5	4	4	4.5	5.5	4.5	5	4	5.5	4.5	6	7	6.5	6	6.5	6	6.5
C8	6.5	6.5	3	3	4	4.5	4	5.5	4.5	4	4	6	5	5.5	6	6	6	6
C9	6.5	6.5	3	3.5	4	5.5	4	4	5	4.5	4	6	7	6.5	5	5	6	5.5
C10	7	7	4.5	5	5.5	6	5	4.5	6	5.5	5	6	4	5	5	5	4	5
C11	6	6	3	3.5	4	4.5	4	3.5	4	3.5	3.5	6	6	6	5	4.5	6	5
C12	7.5	7.5	4.5	5	4	5.5	4	4.5	4	5	4.5	7	5	6	7	7	7	7
C13	6	6	4.5	5.5	5	5.5	5	5.5	5	4.5	5.5	5	2	4	7	7	6	6.5
C14	7.5	7.5	3.5	5.5	4	3.5	4.5	3.5	4	3.5	4.5	7	9	8	6	6	6	6
C15	8	8	6	6.5	6	6	6.5	6.5	6	6	6.5	5	4	4.5	6	5	3	5
C16	8	8	7	7	7	7	7	6.5	6.5	6.5	7	3	1	2	6.5	7	7	7
C17	7.5	7.5	4.5	5	5	4.5	5	5.5	5	4.5	5	7	8	7.5	7	7	7	7
C18	6.5	6.5	4	5	4.5	4	3.5	4.5	4	4	4.5	6	5	5.5	7	7	7	7
C19	7.5	7.5	5	6	5	6	6.5	4.5	6	6	6	4	6	5	6.5	7	6.5	6.5
C20	6.5	6.5	5	5.5	5	5.5	5.5	4.5	4.5	5	5.5	5	2	3.5	5.5	5.5	6	6
C21	7	7	4.5	5	4	4.5	3.5	4	4.5	4	4.5	6	7	6.5	5	5	4.5	5
C22	9	9	6	6.5	6	6	5	4.5	5.5	6	5.5	8	7	7.5	5.5	6	5	5.5
C23	7.5	7.5	4	5	4.5	5	4.5	4.5	4.5	4.5	4.5	8	5	6.5	6	7	6	6
C24	7	7	4.5	5	4.5	4.5	4.5	5	4.5	3.5	5	7	6	6.5	4.5	6	6	5.5
C25	8	8	4.5	5.5	4	4	4	4.5	4.5	4.5	4.5	4	5	4.5	4	5.5	5	5
C26	8	8	5.5	6	5.5	5.5	5	5	5.5	5.5	5.5	6	6	6	6	6	6	6
C27	6.5	6.5	3.5	3	4	4	3.5	3.5	3	3.5	3.5	5	5	5	6	6	5.5	6
C28	2	2	2	3	2	2	2	2	2	2	2.5	3	0	1.5	4	4	4.5	4
C29	7	7	5.5	6	6	6	5	6.5	6	5.5	5.5	6	7	6.5	5	6	6.5	6
C30	6	6	5	5	5.5	5.5	4	5	5	5.5	5	7	7	7	5	5	5	5
C31	7	7	5.5	5.5	5.5	5.5	4.5	5.5	4.5	5	5.5	8	6	7	6	5.5	6	6

minimum (min) values = 7 and maximum (max) values = 9. However, the lowest achievement is for speaking criteria, with a mean value = 5.025 ± 0.769. The range is between min = 3.8 and *max* = 6. Eight sub-criteria are found in the speaking criteria. The mean value of 'Dialogue skills' is 4.875 ± 0.876, with a min = 3.5 and a max = 6. The mean value of 'Self-confidence' is 5.438 ± 0.776, with min = 4 and max = 6.5. 'Oral presentation' is 5.063 ± 0.821, with min = 4 and max = 6. 'Speaking grammar' has a mean = 5.250 ± 0.845, with min = 3.5 and max = 6. 'Negotiation skills' result is $M = 4.688 \pm 0.372$ with a min = 4 and max = 5. 'Spelling and pronunciation' is $M = 5.000 \pm 0.886$, between a min = 3.5 and a max = 6.5. 'Language style' is $M = 4.813 \pm 0.799$, between a min = 4 and a max = 6. 'Meaning accuracy' is $M = 5.063 \pm 0.776$, with a range between min = 3.5 and max = 6. The moderate achievement is for reading criteria, with an average mean value = 6.875 ± 1.041. The range is between a min = 5.5 and a max = 8.5. Reading criteria contains two sub-criteria. The mean value of 'Comprehension' is = 6.875 ± 0.835, between min = 6 and a max = 8. 'Retention skills' has $M = 6.875 \pm 1.246$, with min = 5 and max = 9. Another moderate achievement is writing criteria, with an average mean value of 6.167 ± 0.621. The range is between min = 5.2 and max = 7. Under writing, three sub-criteria are included. The value results of 'Grammar structure' has $M = 6.063 \pm 0.678$, ranging between min = 5 and max = 7. 'Vocabulary' has $M = 6.250 \pm 0.535$, with a

TABLE 6. Raw data.

Samples	Listening	Speaking								Reading		Writing		
	Understanding	Dialogue skills	Self-confidence	Oral presentation	Grammar	Negotiation skills	Spelling	Language style	Meaning accuracy	Comprehension	Retention skills	Grammar	Vocabulary	Accuracy
C1	5	4	5	4	4	4	5	4.5	5	6	7	6	6	6
C2	7.5	5.5	6	6	4.5	5	5	5	5	7	4	7.5	7	7.5
C3	7	6	5	5.5	5	4.5	5	4.5	4	4	3	5	4	6
C4	7	4.5	3	3.5	5.5	5	4	4	5	5	6	5	6	6
C5	5.5	4	3.5	3	4	4	3	3.5	4	6	4	4	3	5
C6	6	7	7	6.5	7	7	6.5	6	6.5	7	7	7.5	7.5	7
C7	7.5	4	4	4.5	5.5	4.5	5	4	5.5	6	7	6	6.5	6
C8	6.5	3	3	4	4.5	4	5.5	4.5	4	6	5	6	6	6
C9	6.5	3	3.5	4	5.5	4	4	5	4.5	6	7	5	5	6
C10	7	4.5	5	5.5	6	5	4.5	6	5.5	6	4	5	5	4
C11	6	3	3.5	4	4.5	4	3.5	4	3.5	6	6	5	4.5	6
C12	7.5	4.5	5	4	5.5	4	4.5	4	5	7	5	7	7	7
C13	6	4.5	5.5	5	5.5	5	5.5	5	4.5	5	2	7	7	6
C14	7.5	3.5	5.5	4	3.5	4.5	3.5	4	3.5	7	9	6	6	6
C15	8	6	6.5	6	6	6.5	6.5	6	6	5	4	6	5	3
C16	8	7	7	7	7	7	6.5	6.5	6.5	3	1	6.5	7	7
C17	7.5	4.5	5	5	4.5	5	5.5	5	4.5	7	8	7	7	7
C18	6.5	4	5	4.5	4	3.5	4.5	4	4	6	5	7	7	7
C19	7.5	5	6	5	6	6.5	4.5	6	6	4	6	6.5	7	6.5
C20	6.5	5	5.5	5	5.5	5.5	4.5	4.5	5	5	2	5.5	5.5	6
C21	7	4.5	5	4	4.5	3.5	4	4.5	4	6	7	5	5	4.5
C22	9	6	6.5	6	6	5	4.5	5.5	6	8	7	5.5	6	5
C23	7.5	4	5	4.5	5	4.5	4.5	4.5	4.5	8	5	6	7	6
C24	7	4.5	5	4.5	4.5	4.5	5	4.5	3.5	7	6	4.5	6	6
C25	8	4.5	5.5	4	4	4	4.5	4.5	4.5	4	5	4	5.5	5
C26	8	5.5	6	5.5	5.5	5	5	5.5	5.5	6	6	6	6	6
C27	6.5	3.5	3	4	4	3.5	3.5	3	3.5	5	5	6	6	5.5
C28	2	2	3	2	2	2	2	2	2	3	0	4	4	4.5
C29	7	5.5	6	6	6	5	6.5	6	5.5	6	7	5	6	6.5
C30	6	5	5	5.5	5.5	4	5	5	5.5	7	7	5	5	5
C31	7	5.5	5.5	5.5	5.5	4.5	5.5	4.5	5	8	6	6	5.5	6

min = 5.5 and a max = 7. The last criteria is 'Writing accuracy', with a mean = 6.188 ± 0.651, min = 5 and max = 7.

b: RESULTS OF THE SECOND GROUP

Table 10 presents the comparative results of the second group amongst four language skill criteria. In the listening criteria, 'Understanding' is considered the highest achievement, with the mean = 7 ± 0.535, ranging between min = 7.5 and max = 6. However, the lowest achievement is for the speaking criteria, with an average mean value = 5.025±1.02, ranging between min = 3.6 and max = 6.7. Eight sub-criteria are found under speaking. The mean value of 'Dialogue skills' is = 4.750±1.165, with a min = 3 and a max = 7. The mean value of 'Self-confidence' is = 5.063±1.321, with a min = 3 and a max = 7. However, 'Oral presentation' has a mean = 4.750 ± 1.035, ranging between min = 3.5 and max = 6.5. The mean value of 'Grammar' is M = 5.313 ± 0.884, with min = 4.5 and max = 7. However, 'Negotiation skills' has the mean = 5.000 ± 1.195, with a min = 3.5 and max = 7. The mean value of 'Spelling and pronunciation' is = 4.688±0.843, with min = 4 and max = 6.5. 'Language style' has mean = 4.938 ± 0.729, with min = 4 and max = 6.5. 'Meaning accuracy' has mean = 4.875 ± 0.991, with a min = 3.5 and max = 6.5. The moderate achievement is for reading criteria, with an average mean value = 6.125 ± 1.02. The range is between a min = 7.5 and max = 4. Two sub-criteria are found in the reading criteria. The mean value of 'Comprehension' is = 6.250 ± 1.282, with a min = 4 and a max = 8. However, the mean value of 'Retention skills' is = 6.000 ± 1.069, with a min = 4 and a max = 7. Another moderate achievement is for writing criteria, which contain an average mean = 6.125 ± 1.011. The range is between min = 4.7 and max = 7.5. Three sub-criteria are found under writing. The mean value of 'Grammar structure' is 5.875±1.188, with a min = 4.5 and a max = 8. The mean

TABLE 7. Raw DM of pre-service teachers.

	Listening	Speaking								Reading		Writing		
Samples	Understanding	Dialogue skills	Self-confidence	Oral presentation	Grammar	Negotiation skills	Spelling	Language style	Meaning accuracy	Comprehension	Retention skills	Grammar	Vocabulary	Accuracy
C1	0.0324	0.0047	0.0055	0.0046	0.0044	0.0047	0.0058	0.0053	0.0058	0.0224	0.0279	0.0155	0.0151	0.0152
C2	0.0486	0.0065	0.0066	0.0069	0.0049	0.0059	0.0058	0.0059	0.0058	0.0261	0.0159	0.0193	0.0177	0.0190
C3	0.0454	0.0071	0.0055	0.0063	0.0055	0.0053	0.0058	0.0053	0.0046	0.0149	0.0119	0.0129	0.0101	0.0152
C4	0.0454	0.0053	0.0033	0.0040	0.0060	0.0059	0.0046	0.0047	0.0058	0.0187	0.0239	0.0129	0.0151	0.0152
C5	0.0356	0.0047	0.0038	0.0035	0.0044	0.0047	0.0035	0.0041	0.0046	0.0224	0.0159	0.0103	0.0076	0.0126
C6	0.0389	0.0083	0.0077	0.0075	0.0076	0.0083	0.0075	0.0070	0.0075	0.0261	0.0279	0.0193	0.0189	0.0177
C7	0.0486	0.0047	0.0044	0.0052	0.0060	0.0053	0.0058	0.0047	0.0064	0.0224	0.0279	0.0155	0.0164	0.0152
C8	0.0421	0.0035	0.0033	0.0046	0.0049	0.0047	0.0064	0.0053	0.0046	0.0224	0.0199	0.0155	0.0151	0.0152
C9	0.0421	0.0035	0.0038	0.0046	0.0060	0.0047	0.0046	0.0059	0.0052	0.0224	0.0279	0.0129	0.0126	0.0152
C10	0.0454	0.0053	0.0055	0.0063	0.0066	0.0059	0.0052	0.0070	0.0064	0.0224	0.0159	0.0129	0.0126	0.0101
C11	0.0389	0.0035	0.0038	0.0046	0.0049	0.0047	0.0041	0.0047	0.0041	0.0224	0.0239	0.0129	0.0113	0.0152
C12	0.0486	0.0053	0.0055	0.0046	0.0060	0.0047	0.0052	0.0047	0.0058	0.0261	0.0199	0.0180	0.0177	0.0177
C13	0.0389	0.0053	0.0060	0.0058	0.0060	0.0059	0.0064	0.0059	0.0052	0.0187	0.0080	0.0180	0.0177	0.0152
C14	0.0486	0.0041	0.0060	0.0046	0.0038	0.0053	0.0041	0.0047	0.0041	0.0261	0.0358	0.0155	0.0151	0.0152
C15	0.0518	0.0071	0.0071	0.0069	0.0066	0.0077	0.0075	0.0070	0.0069	0.0187	0.0159	0.0155	0.0126	0.0076
C16	0.0518	0.0083	0.0077	0.0081	0.0076	0.0083	0.0075	0.0076	0.0075	0.0112	0.0040	0.0167	0.0177	0.0177
C17	0.0486	0.0053	0.0055	0.0058	0.0049	0.0059	0.0064	0.0059	0.0052	0.0261	0.0319	0.0180	0.0177	0.0177
C18	0.0421	0.0047	0.0055	0.0052	0.0044	0.0041	0.0052	0.0047	0.0046	0.0224	0.0199	0.0180	0.0177	0.0177
C19	0.0486	0.0059	0.0066	0.0058	0.0066	0.0077	0.0052	0.0070	0.0069	0.0149	0.0239	0.0167	0.0177	0.0164
C20	0.0421	0.0059	0.0060	0.0058	0.0060	0.0065	0.0052	0.0053	0.0058	0.0187	0.0080	0.0142	0.0139	0.0152
C21	0.0454	0.0053	0.0055	0.0046	0.0049	0.0041	0.0046	0.0053	0.0046	0.0224	0.0279	0.0129	0.0126	0.0114
C22	0.0583	0.0071	0.0071	0.0069	0.0066	0.0059	0.0052	0.0064	0.0069	0.0299	0.0279	0.0142	0.0151	0.0126
C23	0.0486	0.0047	0.0055	0.0052	0.0055	0.0053	0.0052	0.0053	0.0052	0.0299	0.0199	0.0155	0.0177	0.0152
C24	0.0454	0.0053	0.0055	0.0052	0.0049	0.0053	0.0058	0.0053	0.0041	0.0261	0.0239	0.0116	0.0151	0.0152
C25	0.0518	0.0053	0.0060	0.0046	0.0044	0.0047	0.0052	0.0053	0.0052	0.0149	0.0199	0.0103	0.0139	0.0126
C26	0.0518	0.0065	0.0066	0.0063	0.0060	0.0059	0.0058	0.0064	0.0064	0.0224	0.0239	0.0155	0.0151	0.0152
C27	0.0421	0.0041	0.0033	0.0046	0.0044	0.0041	0.0041	0.0035	0.0041	0.0187	0.0199	0.0155	0.0151	0.0139
C28	0.0130	0.0024	0.0033	0.0023	0.0022	0.0024	0.0023	0.0023	0.0023	0.0112	0.0000	0.0103	0.0101	0.0114
C29	0.0454	0.0065	0.0066	0.0069	0.0066	0.0059	0.0075	0.0070	0.0064	0.0224	0.0279	0.0129	0.0151	0.0164
C30	0.0389	0.0059	0.0055	0.0063	0.0060	0.0047	0.0058	0.0059	0.0064	0.0261	0.0279	0.0129	0.0126	0.0126
C31	0.0454	0.0065	0.0060	0.0063	0.0060	0.0053	0.0064	0.0053	0.0058	0.0299	0.0239	0.0155	0.0139	0.0152

TABLE 8. Weighted criteria (W).

	Listening	Speaking								Reading		Writing		
W	0.25	0.25								0.25		0.25		
	Understanding	Dialogue skills	Self-confidence	Oral presentation	Grammar	Negotiation skills	Spelling	Language style	Meaning accuracy	Comprehension	Retention skills	Grammar	Vocabulary	Accuracy
W	1	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.5	0.5	0.3333	0.3333	0.3333

value of 'Vocabulary' is 6.313 ± 0.961, with a min $= 5$ and a max $= 7.5$. Finally, the mean value of 'Writing accuracy' is $= 6.188 \pm 0.884$, with a min $= 4.5$ and a max $= 7.5$.

c: RESULTS OF THE THIRD GROUP

Table 10 presents the comparative results of the third group of language skill criteria. 'Understanding' is found under listening, which is considered the highest achievement, with mean values of 6.813 ± 0.799. The range is between a min $= 6$ and a max $= 8$. However, the lowest achievement is found in the speaking criteria, also with an average value $= (5.025)$ and SD $= (1.004)$. The range is between min $= 3.4$ and max $= 6.2$. The speaking criteria contain eight sub-criteria. The mean value of 'Dialogue skills'

TABLE 9. Closeness of pre-service teachers to the best and worst performances.

Pre-service teachers' number	S+	S−	Final Score	Rank
C1	0.0385	0.0300	0.562083	25
C2	0.0465	0.0231	0.668091	14
C3	0.0370	0.0337	0.523119	27
C4	0.0431	0.0241	0.64194	16
C5	0.0308	0.0364	0.45798	30
C6	0.0470	0.0214	0.687089	10
C7	0.0491	0.0175	0.737412	5
C8	0.0395	0.0265	0.598427	21
C9	0.0435	0.0236	0.648246	15
C10	0.0397	0.0285	0.58239	22
C11	0.0385	0.0281	0.577511	23
C12	0.0471	0.0206	0.695644	8
C13	0.0332	0.0365	0.476309	29
C14	0.0544	0.0155	0.77836	3
C15	0.0453	0.0274	0.622554	19
C16	0.0448	0.0376	0.54358	26
C17	0.0534	0.0131	0.803493	2
C18	0.0410	0.0255	0.61619	20
C19	0.0470	0.0222	0.678963	11
C20	0.0343	0.0356	0.490746	28
C21	0.0453	0.0223	0.669687	13
C22	0.0585	0.0127	0.821583	1
C23	0.0476	0.0208	0.695378	9
C24	0.0450	0.0217	0.674314	12
C25	0.0452	0.0270	0.626272	18
C26	0.0497	0.0175	0.739695	4
C27	0.0381	0.0285	0.571783	24
C28	0.0046	0.0644	0.066107	31
C29	0.0473	0.0191	0.712909	6
C30	0.0427	0.0248	0.63313	17
C31	0.0468	0.0199	0.701959	7

is = 4.188 ± 1.033, with a min = 3 and a max = 6.The mean value of 'Self-confidence' is 4.563 ± 1.266, with min = 3 and max = 6.5. However, 'Oral presentation' has the mean = 4.688 ± 0.843 and ranges between a min = 4 and a max = 6. The mean value of 'Speaking grammar' is 4.813 ± 0.884, with a min = 4 to max = 6. The mean value of 'Negotiation skills' is = 4.313 ± 0.998, with a min = 3.5 and a max = 6.5. Another criterion, 'Spelling pronunciation' has the mean value of 4.688 ± 0.998. The range is between a min = 3.5 and a max = 6.5. The mean value of 'Language style' is M = 4.625 ± 1.026, with a min = 3 and a max = 6. Finally, the mean value of 'Meaning accuracy' is M = 4.563 ± 0.980, with a min = 3.5 and a max = 6. The moderate achievement is for reading criteria, with an average mean value = 5.375 and SD = 0.954, ranging between a min = 4 and a max = 7. Two sub-criteria are found in the reading criteria, and the mean value results of 'Comprehension' is = 5.625 ± 0.916, with a min = 4 to a max = 7. Writing criteria have the same average results, with the mean value = 5.396 and SD = 0.993, ranging between a min = 3.8 and a max = 7. Three sub-criteria are found in the writing criteria, and the mean value of 'Grammar structure' is = 5.500 ± 0.926, with a min = 4 and a max = 7. The mean value of 'Vocabulary' is = 5.500 ± 0.802, with a min = 4.5 and a max = 7. The mean value of 'Writing accuracy' is = 5.188 ± 1.252, with a min = 3 and a max = 7.

d: RESULTS OF THE FOURTH GROUP

Table 10 presents the comparative results of the fourth group of criteria. Listening contains one criterion, which is 'Understanding'. The highest achievements are evaluated in the listening criteria, with 'Understanding' criterion the mean value result = 5.714 ± 1.912, with a min = 2 and a max = 8. However, the lowest achievements are found in the speaking criteria. The mean value is equal 5.025, and SD = 1.498, with the range between min = 2.1 and max = 6.8. This group contains eight sub-criteria. The mean value of 'Dialogue skills' is 4.643 ± 1.600, with a min = 2 and a max = 7. 'Self-confidence' has the mean value of 4.929 ± 1.336, which ranged between a min = 3 and a max = 7. The mean value of 'Oral presentation' is 4.500 ± 1.658, with a min = 2 and a max = 7. The mean value of 'Grammar' is 4.714 ± 1.577, with a min = 2 and a max = 7. The mean value of 'Negotiation skills' is = 4.571 ± 1.539, ranging between a min = 2 and a max = 7. The mean value of 'Spelling' is M = 4.500 ± 1.528, with a min = 2 and a max = 6.5. The mean value of 'Language style' is = 4.357 ± 1.376, with a min = 2 and a max = 6.5. The mean value of 'Meaning accuracy' is = 4.429 ± 1.367, with a min = 2 and a max = 6.5. The moderate achievement is for the reading criteria, with an average mean value = 3.643 and SD = 1.781, ranging between min value = 1.5 and max value = 6.5. Two sub-criteria exist. The mean value of 'Comprehension'

TABLE 10. Results of pre-service teachers per group.

			Listening		Speaking									Reading			Writing		
			Understanding		Dialogue skills	Self confidence	Oral presentation	Grammar	Negotiation skills	Spelling	Language style	Meaning accuracy		Comprehension	Retention skills		Vocabulary	Grammar	Accuracy
Results of the first group	C22		9		6	6.5	6	6	5	4.5	5.5	6		8	7		5.5	6	5
	C17		7.5		4.5	5	5	4.5	5	5.5	5	4.5		7	8		7	7	7
	C14		7.5		3.5	5.5	4	3.5	4.5	3.5	4	3.5		7	9		6	6	6
	C26		8		5.5	6	5.5	5.5	5	5	5.5	5.5		6	6		6	6	6
	C7		7.5		4	4	4.5	5.5	4.5	5	4	5.5		6	7		6	6.5	6
	C29		7		5.5	6	6	6	5	6.5	6	5.5		6	7		5	6	6.5
	C31		7		5.5	5.5	5.5	5.5	4.5	5.5	4.5	5		8	6		6	5.5	6
	C12	Total	7.5	Total	4.5	5	4	5.5	4	4.5	4	5	Total	7	5	Total	7	7	7
	M	7.625	7.625	5.024	4.875	5.438	5.063	5.250	4.688	5.000	4.813	5.063	6.875	6.875	6.875	6.167	6.063	6.250	6.188
	SD	0.641	0.641	0.769	0.876	0.776	0.821	0.845	0.372	0.886	0.799	0.776	1.041	0.835	1.246	0.621	0.678	0.535	0.651
	max	9.0	9	6.0	6	6.5	6	6	5	6.5	6	6	8.5	8	9	7.0	7	7	7
	min	7.0	7	3.8	3.5	4	4	3.5	4	3.5	4	3.5	5.5	6	5	5.2	5	5.5	5
Results of the second group	C23		7.5		4	5	4.5	5	4.5	4.5	4.5	4.5		8	5		6	7	6
	C6		6		7	7	6.5	7	7	6.5	6	6.5		7	7		7.5	7.5	7
	C19		7.5		5	6	5	6	6.5	4.5	6	6		4	6		6.5	7	6.5
	C24		7		4.5	5	4.5	4.5	4.5	5	4.5	3.5		7	6		4.5	6	6
	C21		7		4.5	5	4	4.5	3.5	4	4.5	4		6	7		5	5	4.5
	C2		7.5		5.5	6	6	4.5	5	5	5	5		7	4		7.5	7	7.5
	C9		6.5		3	3.5	4	5.5	4	4	5	4.5		6	7		5	5	6
	C4	Total	7	Total	4.5	3	3.5	5.5	5	4	4	5	Total	5	6	Total	5	6	6
	M	7.000	7.000	4.922	4.750	5.063	4.750	5.313	5.000	4.688	4.938	4.875	6.125	6.250	6.000	6.125	5.875	6.313	6.188
	SD	0.535	0.535	1.020	1.165	1.321	1.035	0.884	1.195	0.843	0.729	0.991	1.176	1.282	1.069	1.011	1.188	0.961	0.884
	max	7.5	7.5	6.7	7	7	6.5	7	7	6.5	6	6.5	7.5	8	7	7.5	7.5	7.5	7.5
	min	6.0	6	3.6	3	3	3.5	4.5	3.5	4	4	3.5	4.0	4	4	4.7	4.5	5	4.5
Results of the third group	C30		6		5	5	5.5	5.5	4	5	5	5.5		7	7		5	5	5
	C25		8		4.5	5.5	4	4	4	4.5	4.5	4.5		4	5		5.5	5	5.5
	C15		8		6	6.5	6	6	6.5	6.5	6	6		5	4		5	3	5
	C18		6.5		4	5	4.5	4	3.5	4.5	4	4		6	5		7	7	7
	C8		6.5		3	3	4	4.5	4	5.5	4.5	4		6	5		6	6	6
	C10		7		4.5	5	5.5	6	5	4.5	6	5.5		6	4		5	4	5
	C11		6		3	3.5	4	4.5	4	3.5	4	3.5		6	6		4.5	6	4.5
	C27	Total	6.5	Total	3.5	3	4	4	3.5	3.5	3	3.5	Total	5	5	Total	6	5.5	6
	M	6.813	6.813	4.555	4.188	4.563	4.688	4.813	4.313	4.688	4.625	4.563	5.375	5.625	5.125	5.396	5.500	5.188	5.500
	SD	0.799	0.799	1.004	1.033	1.266	0.843	0.884	0.998	0.998	1.026	0.980	0.954	0.916	0.991	0.993	0.802	1.252	0.802
	max	8.0	8	6.2	6	6.5	6	6	6.5	6.5	6	6	7.0	7	7	7.0	7	7	7
	min	6.0	6	3.4	3	3	4	4	3.5	3.5	3	3.5	4.0	4	4	3.8	4.5	3	4.5
Results of the fourth group	C1		5		4	5	4	4	4	5	4.5	5		6	7		6	6	6
	C16		8		7	7	7	7	7	6.5	6.5	6.5		3	1		6.5	7	7
	C3		7		6	5	5.5	5	4.5	5	4.5	4		4	3		5	4	6
	C20		6.5		5	5.5	5	5.5	5.5	4.5	4.5	5		5	2		5.5	5.5	6
	C13		6		4.5	5.5	5	5.5	5	5.5	5	4.5		5	2		7	7	6
	C5		5.5		4	3.5	3	4	4	3	3.5	4		6	4		4	3	5
	C28	Total	2	Total	2	3	2	2	2	2	2	2	Total	3	0	Total	4	4	4.5
	M	5.714	5.714	4.580	4.643	4.929	4.500	4.714	4.571	4.500	4.357	4.429	3.643	4.571	2.714	5.476	5.429	5.214	5.786
	SD	1.912	1.912	1.498	1.600	1.336	1.658	1.577	1.539	1.528	1.376	1.367	1.781	1.272	2.289	1.185	1.170	1.577	0.809
	max	8.0	8	6.8	7	7	7	7	7	6.5	6.5	6.5	6.5	6	7	7.0	7	7	7

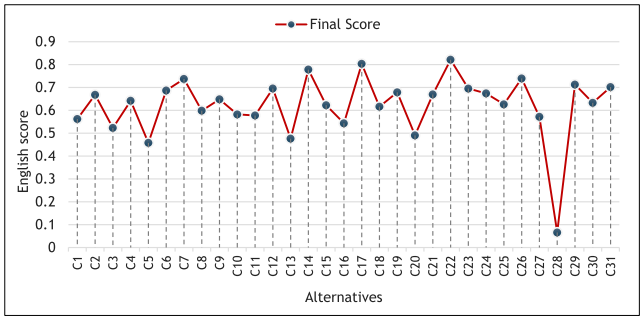

FIGURE 5. Final rank for alternatives.

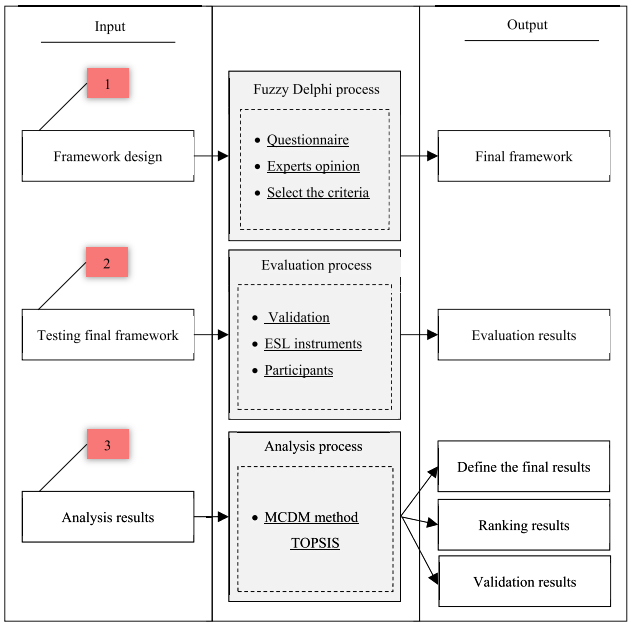

FIGURE 6. Research flow and output contribution.

is $= 4.571 \pm 1.272$, with a min $= 3$ and a max $= 6$. The mean value of 'Retention skills' is $= 2.714 \pm 2.289$, with a min $= 0$ and a max $= 7$. Writing criteria have the same average results, with the mean value $= 5.476$ and SD $= 1.185$, ranging between a min $= 3.8$ and a max $= 7$. Three sub-criteria exist in the writing criteria. The mean value of 'Grammar structure' is $= 5.429 \pm 1.170$, with a min $= 4$ and a max $= 7$. The mean value of 'Vocabulary' is 5.214 ± 1.577, with a min $= 3$ and a max $= 7$. The mean value of 'Writing accuracy' is $= 5.786 \pm 0.809$, with a min $= 4.5$ and a max $= 7$.

The means and SDs of the scores of the groups per test were compared (Table 11). The comparison indicates that the first group scored the best with the following criteria: 'Understanding' in the listening criteria; 'Dialogue skills', 'Self-confidence', 'Oral presentation', 'Spelling and

TABLE 11. Comparative results amongst average results for each group.

Criteria	Sub-criteria	First Group	Second Group	Third Group	Fourth Group
Listening	Understanding	7.625	7.000	6.813	5.714
Speaking	Dialogue skills	4.875	4.750	4.188	4.643
	Self-confidence	5.438	5.063	4.563	4.929
	Oral presentation	5.063	4.750	4.688	4.500
	Grammar	5.250	5.313	4.813	4.714
	Negotiation skills	4.688	5.000	4.313	4.571
	Spelling and pronunciation	5.000	4.688	4.688	4.500
	Language style	4.813	4.938	4.625	4.357
	Meaning accuracy	5.063	4.875	4.563	4.429
Reading	Comprehension	6.875	6.250	5.625	4.571
	Retention skills	6.875	6.000	5.125	2.714
Writing	Grammar structure	6.063	5.875	5.500	5.429
	Vocabulary	6.250	6.313	5.500	5.214
	Accuracy	6.188	6.188	5.188	5.786

pronunciation' and 'Meaning accuracy' in the speaking criteria and 'Comprehension' and 'Retention skills' in the reading criteria. The first group scored second best in 'Grammar' and 'Negotiation skills' in the speaking criteria and only in 'Vocabulary' in the writing criteria. The scores of the first and second groups were nearly identical as the second highest in 'Accuracy' under the writing criteria. The second group scored the best in 'Understanding' in the listening criteria and 'Dialogue skills', 'Self-confidence', 'Oral presentation', 'Speaking grammar', 'Negotiation skills', 'Language style' and 'Meaning accuracy' in the speaking criteria, and 'Comprehension' and 'Retention skills' in the reading criteria. However, 'Grammar structure', 'Vocabulary' and 'Accuracy' in the writing criteria are better than the third group, with only 'Spelling and pronunciation' having the same test value. The third group scored the second worst, only faring better than the fourth group. The third group scored the best in 'Understanding' in the listening criteria and 'Oral presentation', 'Speaking grammar', 'Spelling and pronunciation', 'Language style' and 'Meaning accuracy' in the speaking criteria, and 'Comprehension' and 'Retention skills' in the reading criteria. However, the third group scored the worst amongst the four groups in 'Dialogue skills', 'Self-confidence' and 'Negotiation skills' in the listening criteria and in 'Accuracy' in the writing criteria.

Finally, the second group scored the second best, and the third group scored the worst. The fourth group scored the worst amongst the other groups. In conclusion, the first group is the best.

V. SUGGESTIONS FOR FUTURE RESEARCH DIRECTIONS

This study examines, evaluates and selects pre-service teachers from a university in Malaysia. The literature review reveals several other variables that are crucial in the evaluation of pre-service teachers, such as curricula and teaching methods. This replication enables the dissemination of results to all educational institutions in Malaysia. In addition, the results of such a repetition can enhance the validity of instruments used in this research. Future research on the selection of pre-service teachers can be extended in several directions. This replication can help educational institutions improve quality and provide several insights into the statistics regarding pre-service teachers in Malaysian educational institutions. Numerous questions that need additional investigation are likewise generated. Other factors that may affect pre-service assessment and selection criteria should be identified. In the future, the additional replication of the current work is needed to determine whether similar results can be found if a large sample size is used from different educational institutions or universities in Malaysia.

VI. CONCLUSION

Malaysian schools have reported that they lack the skills needed to work effectively with their students and were unprepared to help students learn. The significance of this study is in helping educational institutions improve quality and providing several insights for pre-service teachers in Malaysian educational institutions. This research contribution presented a new framework to evaluate and rank pre-service teachers in Malaysia by using MCDM approaches (Fig. 6). The methodology in this study is based on three main experimental stages that can be considered in the assessment and ranking framework for the English skills of pre-service teachers in Malaysia. The first stage identifies listening, speaking, reading and writing from the literature review. Each criterion has sub-criteria and representative of the opinions of the ten experts via the Delphi technique. These experts were requested to evaluate the criteria and dimensions and verify the validity of the content by using the five-point Likert scale. In the second stage, 31 pre-service teachers were evaluated to test the proposed framework. The third stage utilises TOPSIS, an MCDM technique, which was adopted to rank and select the pre-service teachers and select ideal solutions. In this stage, statistical analyses are performed to validate the ranking result. In addition, the students are ranked on the basis of their number of available services from the highest to the lowest levels. The validation of results was then achieved objectively in this research.

Compliance with ethical standards

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Compliance with ethical standards

Conflict of interest: The authors declare no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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