

Research on Guided Performance Evaluation System Based on Dynamic Information Update and Iterative Feedback

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Abstract: In the field of higher education, traditional performance evaluation systems often neglect the consideration of individual student differences and the provision of dynamic feedback, resulting in evaluation results that do not fully reflect the development potential and actual performance of students. This paper proposes an innovative guided performance evaluation mechanism that incorporates two core algorithms: online information updating and secondary assessment feedback. The former ensures the timeliness and accuracy of the evaluation results through real-time monitoring and updating of students' learning status, while the latter realizes the expansion of the evaluation subject and the improvement of the feedback mechanism through the interaction between tutors and students. Then, this paper adopts the hierarchical analysis method and the fuzzy comprehensive evaluation method to conduct empirical research, and the results show that the proposed guided performance evaluation mechanism can effectively improve students' satisfaction with the performance evaluation system and promote the enhancement of their independent learning ability.

Keywords: Performance evaluation; Bootstrapping mechanisms; Dynamic updates; Iterative feedback.

1. Introduction

Performance evaluation is an important management tool in the field of higher education, aiming to improve the quality of education and motivate students to learn independently. Although studies have been conducted to enhance the scientific nature of the evaluation system through methods such as envelope analysis [1] and fuzzy comprehensive evaluation [2], these systems are still deficient in terms of comprehensiveness and effectiveness. Existing scholars have proposed a variety of improvement schemes, such as proposing a human resource management performance evaluation strategy [3]; constructing an open and shared service performance evaluation system for instruments and equipment [4]; carrying out a study on the efficiency of the use of discipline funding based on the DEA model [5]; proposing an evaluation system for the 'speciality, speciality, speciality, and newness' incentive policy [6]; and proposing a Speciality, Speciality, Speciality and New incentive policy evaluation system [7]. However, the existing evaluation system still exists problems such as lack of objectivity in quantitative evaluation, single evaluation subject and one-sided evaluation content, especially in the evaluation of student performance, which lacks an effective evaluation mechanism.

In order to solve the above problems, this paper proposes a guided performance evaluation mechanism based on online updating of information and secondary evaluation feedback. The mechanism ensures the timeliness and accuracy of the evaluation results by updating the students' learning status in real time; meanwhile, it provides personalised guidance through the secondary evaluation feedback of teacher-student interaction, thus overcoming the limitations of the traditional evaluation system. The mechanism proposed in this paper is innovative in enhancing the dynamic and personalised level

of evaluation, aiming to promote students' development more effectively.

2. Lead Performance Evaluation Mechanism

The common performance evaluation model can effectively summarize the user's current development status, but it still needs to solve the problems of its single evaluation subject, imperfect feedback mechanism, and underutilized assessment results. The guided performance evaluation proposed in this paper can use the feedback loop mechanism to enhance the utilization of evaluation results and improve the details of the content of the guidance program. Using the individual replacement strategy to expand the evaluation subject, mobilize students' self-study enthusiasm, and enhance the accuracy of the evaluation results through the online learning mechanism

2.1. Information is updated online

In common performance evaluation models, only the individual information is usually updated to obtain the individual's current assessment results. Individual assessment results are jointly determined by individual information and assessment programs, and unchanged assessment programs for a long period of time can lead to large biases in assessment results. Literature [12] suggests that online information updating is crucial for the assessment results of the system. Therefore, an information online updating strategy is proposed to enhance the accuracy of assessment results. The flowchart of the information online updating model is shown in Figure 1.

In Figure 1, the system provides students with more accurate assessment results by obtaining the indicator information and performance program information of student i in stage t . Second, when students continue to participate in

performance assessment, the system provides online assessment results for students by obtaining student information and performance program information at stage $t+1$. This method can improve the timeliness and accuracy of

the assessment results. In addition, by comparing the assessment results of different phases, it can help students understand their learning effectiveness and shortcomings within the phase.

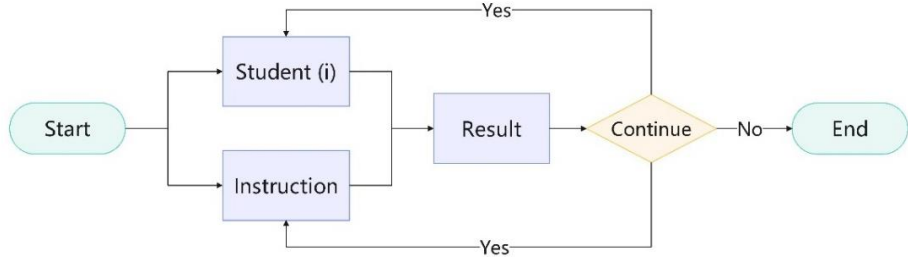


Figure 1. Flowchart for online updating of information

2.2. Feedback from secondary assessment

The utility of the current performance evaluation system for the student body is low, and there are problems that the evaluation form tends to be quantitative, the evaluation

subject is single, and the assessment results are not fully utilized. In order to solve the above problems, a secondary evaluation feedback mechanism is proposed, and its realization process is shown in Figure 2.

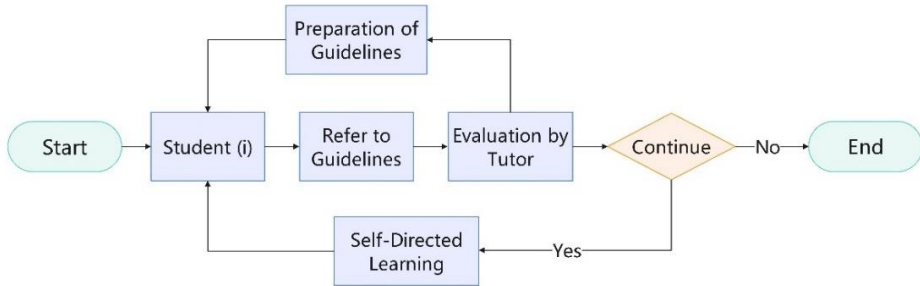


Figure 2. Flow chart of secondary assessment feedback

Students initially understand their own information through the reference guidance program in order to clarify their learning direction and their own problems. Secondly, the tutor carries out secondary evaluation and guidance in combination with students' individual differences to help students understand their own problems more comprehensively. The tutor's secondary evaluation mechanism can avoid the problems of ignoring individual differences and quantitative evaluation. Finally, the mentor and the student work together to revise the guidance program according to the evaluation results to enhance the practicality and guidance value of the guidance program. The joint participation of tutors and students can expand the subject of evaluation, improve the feedback mechanism, make full use of the evaluation results, and mobilize the students' enthusiasm for self-learning.

In addition, the target of evaluation is expanded to students

and the guidance program, which can effectively realize the closed-loop effect of top-level design and grass-roots innovation. By participating in the revision of the guidance program and mobilizing students' self-study, students can exercise their ability of independent learning and exploration, and cultivate their independent and healthy personalities.

2.3. Lead Performance Evaluation Realization Process

The use of online information updating strategy and secondary assessment feedback mechanism can effectively improve the information feedback mechanism, make full use of the evaluation results, and at the same time provide students with guidance value guidance program and personalized evaluation results. The realization process of the guided performance evaluation program is shown in Figure 3.

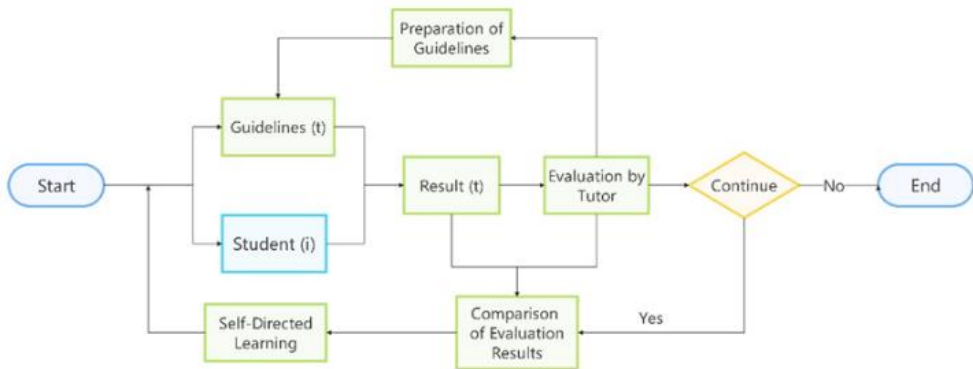


Figure 3. Flowchart of lead performance evaluation

Students combine information about their status with information about the current mentoring program to obtain

the t-stage evaluation results, followed by a second, personalized assessment by the mentor. Students can understand their own problems and the focus of the mentoring program more comprehensively through the results of the two evaluations, and at the same time can understand the effectiveness of their own efforts by comparing the results of the evaluations at different stages. Secondly, the mentor and the student revise and update the mentoring program through the second evaluation, which can ensure the practical value and guidance of the mentoring program. In addition, students can make use of the guidance program to clarify the direction of study and carry out independent study, which can help them exercise their independent learning and exploration ability and realize comprehensive development.

3. Research and Analysis

It is necessary to conduct a new investigation of the research problem [13]. In order to practically understand the actual effect of the current performance evaluation in colleges and universities and the necessity of model innovation, the study chose to conduct the research in school A. The main body of the research is master's degree students, and the form of the research is online research. Secondly, the research data were screened according to the logic of the questionnaire to ensure the quality of the research data. The relevant analysis of the research data is shown later.

3.1. Research Methods`

Hierarchical analysis is used for weighting to obtain the optimal weight share. The evaluation indexes of the degree of understanding include six index elements, namely, performance measurement, assessment content, weight

percentage, competition standard, credit accumulation, and selection requirements, and the weights are assigned to the importance of each index according to the popularity of each index and the actual situation. Second, the consistency test is performed on the judgment matrix. The formula for calculating the indicators CI , CR , and w_i are shown in equations (1), (2), and (3).

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

$$CR = \frac{CI}{RI} \quad (2)$$

$$w_i = \frac{t_i}{\sum_{i=1}^n t_i} \quad (3)$$

Where, λ_{max} is the maximum eigenvalue of the matrix, n represents the order of the judgment matrix, CI is the consistency index, which represents the consistency level of the judgment matrix, CR is the consistency ratio, which is used to assess the acceptance level of consistency of the judgment matrix, RI is the stochastic consistency index, which is dependent on the order n , and w_i is the relative weight of the decision element i . The maximum eigenvalue approximation is found to be 6, the CI is 3.5527×10^{-16} , and the RI is 1.24. According to the consistency ratio formula, the value of CR is calculated to be 2.865×10^{-12} . when CR is less than 0.1, the weight consistency is accepted, and thus the weight assignment is accepted for consistency test.

Secondly, the corresponding weight w_i of each index is calculated to provide weight conditions for fuzzy comprehensive evaluation. Normalization of feature vectors is realized to obtain the weight vector, and the final calculation results show that the weights of each index are 0.44, 0.15, 0.09, 0.15, 0.11, and 0.06, and their weights are assigned as shown in Figure 4.

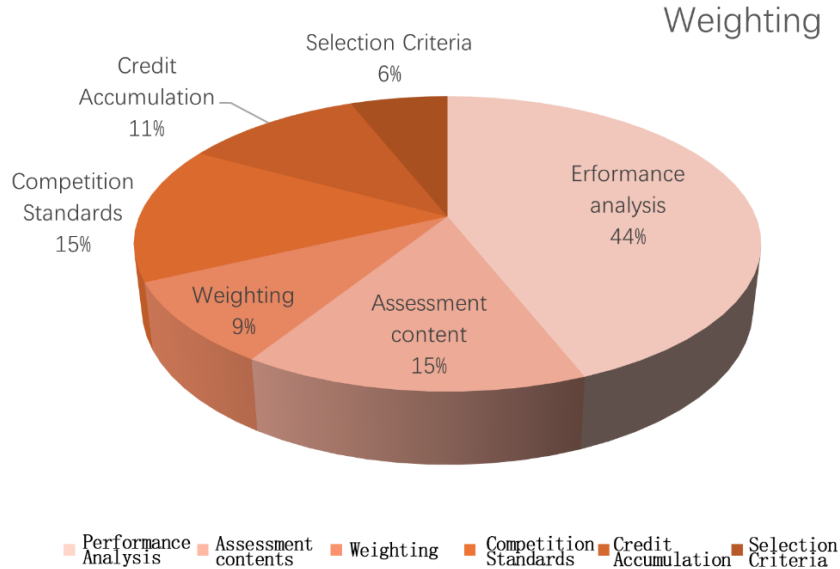


Figure 4. Indicator weight allocation

Finally, the sample data are utilized to obtain the percentage of the number of options and transformed into data vectors in order to obtain the fuzzy evaluation matrix of indicator weight assignment. The weighting operation and normalization of the fuzzy evaluation matrix are carried out using the weight vector w_i to assess the degree of understanding of the student body about the performance of school A. The results of the evaluation of the degree of understanding are shown in Figure 5, from which it is learned that the results of the combined evaluation scores of the five

degrees of understanding are 0.12, 0.36, 0.36, 0.05, 0.11. Among them, The two indicators of better and average understanding have the highest and equal percentage ratings, both showing 0.36. Therefore, it is considered that the students of School A have a good level of understanding of the performance analysis model of the school.

In addition, the results of the research show that the number of people with a better rating is 34%, the number of people with an average rating is 35%, and there are still more students who do not understand performance analysis, with a

population of 21%. However, the overall level of awareness has a beneficial impact on the actual feasibility of the program. It is hypothesized that the guided performance analysis model

proposed in this paper has a higher probability of being accepted and implemented by students, with a higher possibility of practical application.

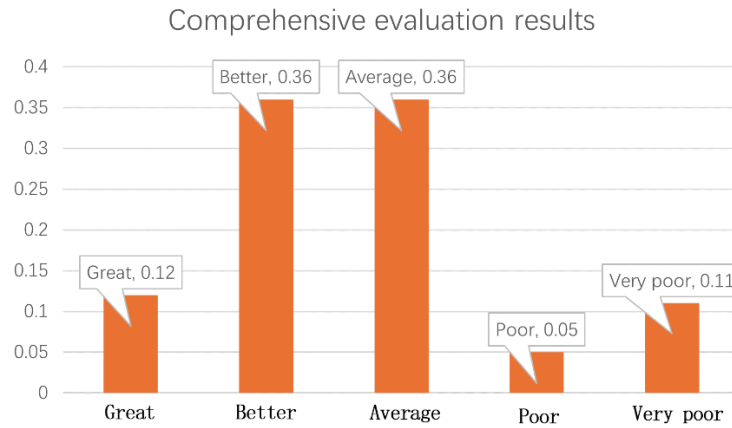


Figure 5. Results of the evaluation of the level of understanding

3.2. Application Value Analysis

The practical feasibility of the introductory performance evaluation is decisive for the research value of the project, so the practical feasibility of the project was assessed through research and analysis. Hierarchical analysis was utilized to assign weights to the evaluation levels of the indicators, and the feasibility of the project was comprehensively evaluated through the TOPSIS method.

Firstly, the hierarchical analysis method was used to assign weights according to the degree of influence of each level of indicators on the implementation of the project, and the evaluation levels were very good, good, fair, poor, and very poor, with the corresponding judgment matrix values of 1, 3, 5, 2, and 1. Secondly, the numerical value of CI was computed to check the consistency of the indicators. The formula for the value of CI is shown in (4).

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (4)$$

Where CI is the consistency indicator, which represents the consistency level of the judgment matrix, and CR is the consistency ratio. The results show that the maximum

eigenvalue λ_{max} is 5 and the CI value is 0. The table of consistency indicator RI values is shown in Table 1.

Table 1. Table of values for indicators of consistency

n	1	2	3	4	5
RI	0	0	0.58	0.90	1.12

At this time, the order n is 5, and the corresponding indicator value RI is 1.12. Based on the CI , the RI value is tested for consistency of the results of the weight assignment. the formula for the CR value is shown in Equation 5.

$$CR = \frac{CI}{RI} \quad (5)$$

The consistency test is accepted when CR is less than 0.10, and the result shows that CR is 0, indicating that the weight allocation method is more reasonable. Finally, the weight corresponding to each evaluation level is calculated, and the weight calculation formula is shown in Equation 6, and the result of weight allocation is shown in Figure 6.

$$w_i = \frac{t_i}{\sum_{i=1}^n t_i} \quad (6)$$

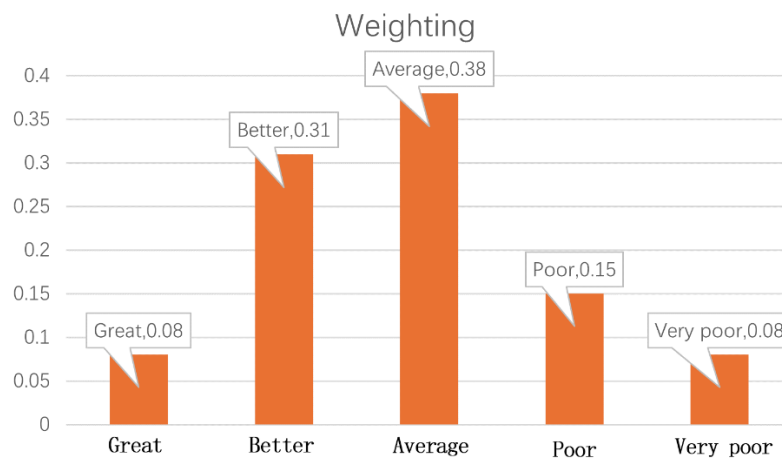


Figure 6. Results of weight distribution

The results show that the corresponding weights of the evaluation levels are 0.08, 0.31, 0.38, 0.15, 0.08, respectively, and that the current performance model of School A is more beneficial to the project implementation at the general level, so the corresponding weights are also larger. Secondly, this

paper uses the Zscore method to standardize the research data, and the Zscore formula is shown in Equation 7. Based on the results of weight allocation to achieve weighted processing, weighted data r_{ij} calculation formula is shown in Equation 8.

And the final data are used for TOPSIS analysis and evaluation.

$$x'_{ij} = \frac{x_{ij} - \text{mean}(x_j)}{\text{std}(x_j)} \quad (7)$$

$$r_{ij} = w_j * x'_{ij} \quad (8)$$

The use of Zscore method can eliminate the influence of the scale and ensure the uniformity of the data scale. Then, the distance between the evaluation object i and the maximum value is calculated, and the maximum value distance d_i^+ is calculated as shown in Equation 9, and the minimum value distance d_i^- is calculated as shown in Equation 10.

$$d_i^+ = \sqrt{\sum_{j=1}^n (r_i^+ - r_{ij})^2} \quad (9)$$

$$d_i^- = \sqrt{\sum_{j=1}^n (r_i^- - r_{ij})^2} \quad (10)$$

Where, $r_{ij} \in (r_{ij})_{m \times n}$ is the element in the weighted data matrix, r_j^+ is the maximum value of each column of data, r_j^- is the minimum value of each column of data. d_i^+ denotes the distance between the i th evaluating object and the maximum value, and d_i^- denotes the distance between the i th evaluating object and the minimum value. Finally, the project application environment is objectively analyzed by calculating the results of each index score $Score_i$. The formula for calculating $Score_i$ is shown in (11).

$$score_i = \frac{d_i^-}{d_i^+ + d_i^-} \quad (11)$$

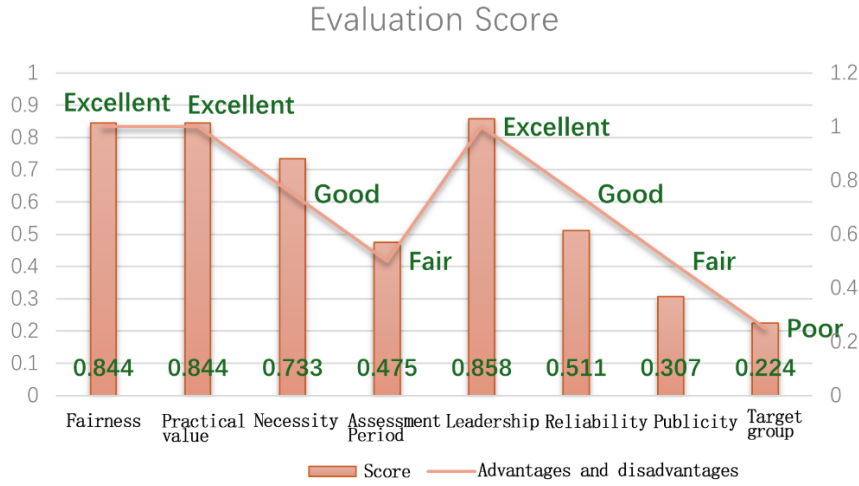


Figure 7. Evaluation score results

where d_i^+ indicates the maximum value spacing and d_i^- indicates the minimum value spacing. In order to facilitate the analysis of the strengths and weaknesses of the indicators, the evaluation scores were divided into four grades: excellent (0.75~1), good (0.5~0.75), moderate (0.25~0.5), and poor (0~0.25), and the results are shown in Figure 7. The results show that fairness, practical value and guidance are the three most recognized indicators by students in School A, reflecting a good learning atmosphere and the importance of practical results. Among them, the highest score of the directionality indicator is 0.858, indicating that students in School A have strong independent learning ability and have a greater need for directional guidance content. In addition, the development concept of School A's performance evaluation program pays more attention to the guidance and practical value of the guidance program. On the other hand, School A scored lower in terms of publicity and target population, showing that its performance model has problems of imperfect feedback mechanism and neglect of individual differences. The proposed guided orientation program can effectively address these issues by providing secondary assessment based on students' individual situations. School A's performance measurement cycle score is 0.475, with a grade of average, indicating that it is difficult to utilize the feedback content and assessment results in a timely manner. The proposed secondary assessment feedback mechanism can improve the quality of the guidance program, make full use of student assessment results, and improve the feedback mechanism.

In terms of the effect of performance application in School A, the weights of the three indicators of fairness, practicability and necessity were assigned as 0.23, 0.69 and 0.08 by the hierarchical analysis method and were subjected

to the consistency test. The calculation results of the fuzzy comprehensive evaluation method showed a score of 0.39, indicating that the performance application effect of School A is better, but there is still much room for improvement, and the students' expectations of performance implementation are higher.

In terms of the satisfaction of the evaluation results, five indicators of rationality, guidance, reliability, publicity and target population were established based on the evaluation rules of School A. The weights were assigned as 0.18, 0.53, 0.06, 0.18 and 0.06, and the assigned results were tested for consistency. The final score of the fuzzy comprehensive evaluation method is 0.38, indicating that students' satisfaction with the results of the on-campus assessment is average, and the assessment rules still need to be adjusted according to students' feedback. The proposed secondary feedback mechanism can provide targeted advice based on students' individualized differences and encourage students to actively participate in the revision of the guidance program. Therefore, School A's guided performance program has a greater likelihood of being applied in practice.

In terms of measuring the degree of understanding of the rules, five elements were determined based on the existing content: assessment content, weight share, competition standards, credit accumulation and selection requirements, with weights assigned as 0.15, 0.31, 0.15, 0.08 and 0.31, and the results were tested for consistency. The score calculated by the fuzzy comprehensive evaluation method was 0.39, showing that there are still more students who do not actively participate in the performance assessment. The proposed guided performance assessment method can stimulate students' motivation and interest in self-learning, and

motivate them to explore and learn independently according to the directional guidance.

In summary, students in School A have high expectations of the performance program, but the actual application is poor. The proposed guided performance assessment program can make up for the shortcomings of the existing program to a certain extent, provide personalized analysis services, improve the information feedback mechanism, and fully mobilize students' interest in self-study. Therefore, the implementation of the guided performance assessment program is an important necessity.

4. Conclusion

The guided performance evaluation mechanism proposed in this study effectively enhances the dynamic and personalized level of performance evaluation in colleges and universities through online updating of information and secondary assessment feedback. Empirical research shows that the mechanism can significantly enhance students' satisfaction and independent learning ability. Compared with the existing system, the mechanism has obvious advantages in real-time feedback and individualized assessment, providing a new optimization direction for higher education performance evaluation. Future research can further explore its applicability and scalability in different educational settings.

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