

Research Article

Performance Appraisal Model for Optimizing Teacher Incentive and Constraint Mechanisms by Random Matrix

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At present, colleges and universities attach great importance to the assessment of teachers, strengthen the assessment of college teachers, and create a team of teachers with high quality, professionalism, and vitality, which can not only fully develop and allocate human resources in colleges and universities, but also promote colleges and universities. The reform of the personnel system will continuously optimize the proportion and structural allocation of teachers' resources in colleges and universities, improve the quality and efficiency of running schools, enhance the competitiveness and attractiveness of schools, and better achieve the school's school-running goals. In order to obtain higher signal reconstruction accuracy and satisfy random matrix with a relatively small compression ratio, this paper combines QR decomposition, which is used to increase the column independence of random matrix, and gradient descent method, which can reduce the cross-correlation between random matrix and sparse matrix. Based on the actual situation of a certain university, this paper studies and designs a set of perfect and reasonable teacher performance appraisal system that meets the requirements of the college, analyzes and researches the current situation of teacher performance appraisal in the college, and finds out the problem. Combining the advanced concept of being good at performance appraisal with the actual situation of the college, it analyzes the problems in the teacher performance appraisal system, summarizes the reasons for the formation of the problem, further redesigns the teacher performance appraisal index system, and gives the relevant implementation of the system. The basic characteristics presented in the organization of colleges and universities will not change. With the continuous adjustment of the organization of colleges and universities, the goals of colleges and universities are also being adjusted. Colleges and universities should continuously improve the performance appraisal system of teachers to make the goals of teachers consistent with the development goals of colleges and universities, so as to continuously improve the basic quality and realization of college teachers.

1. Introduction

Teachers are the core factor in the development of colleges and universities, and the key force to promote the development of colleges and universities, and their role has received more attention as the importance of colleges and universities increases [1]. However, whether its role and work results are significant should not be limited to theoretical predictions, but must be assessed through specific measures. At present, colleges and universities attach great importance to the assessment of teachers [2]. The quantity, quality, team building, staff allocation, and structure of teachers all have an important impact on the development vitality and overall level of colleges and universities, and are

the key factors for the smooth and healthy development of colleges and universities. Strengthening the assessment of college teachers and building a high-quality, professional, and energetic teaching team can not only fully develop and allocate the human resources of colleges and universities, but also use this as a key to promote the reform of the personnel system in colleges and universities, continuously optimize the proportion of college teachers' resources, improve the quality and efficiency of running schools, enhance the competitiveness and attractiveness of the school, and better achieve the school's school-running goals [3, 4].

The software generates fast, has good incoherence with the fixed sparse base dictionary matrix, and has a certain robustness against sparse signals. For the original data signal

of length N and sparsity K , only M measurement values are required to restore the original data with high probability. However, the Gaussian random measurement matrix only satisfies the RIP and weak coherence with a high probability in statistical significance, and cannot guarantee that the random Gaussian matrix generated every time meets the conditions, so the original signal can only be accurately restored with a high probability. Based on the above shortcomings of the random measurement matrix, the optimization of the random measurement matrix is particularly important.

In the reform of the personnel system in colleges and universities, the emphasis should be placed on the assessment of teachers, because this not only affects the enthusiasm of teachers' work, but also affects the quality of teaching results [5]. At present, the management of teachers in colleges and universities generally includes appointment, assessment, training, use, and other links, the most important of which is assessment. Therefore, it is necessary to develop a scientific and objective teacher assessment system to facilitate the objective and fair assessment of teachers. The quality of the teacher performance appraisal system is related to whether it can stimulate the enthusiasm and creativity of teachers, and whether it can better manage the human resources of colleges and universities, and these are the fundamental factors of the development of colleges and universities [6, 7]. Teacher performance appraisal is an important method for colleges and universities to evaluate teachers' work achievements and motivate teachers' work enthusiasm. Therefore, it is of great significance to study the performance appraisal of college teachers.

This paper introduces the gradient descent method and the QR decomposition principle, and proposes a new random matrix optimization. And it is simulated and compared with several existing matrix optimization methods. This optimization method has a good effect in improving the peak signal-to-noise ratio and reconstruction stability. For a long time, teacher performance appraisal work has been the key and difficult task of personnel system reform in universities and colleges. Performance appraisal has a certain connection with salary management, job promotion, training development, etc., in human resource management work. It is an important part of human resource management. This paper analyzes and researches the fundamental tasks of teachers in a university, gives various indicators related to performance appraisal, and tries to use the analytic hierarchy process to determine the weight coefficient of each indicator, so as to increase the feasibility and objectivity of the indicators. Aiming at the current situation of the performance appraisal system for college teachers, this paper puts forward some problems and analyzes the causes of the problems, and then makes a path choice for improving the construction of the performance appraisal system for college teachers in our country, which has certain implications for the construction of the performance appraisal system for college teachers in the future. Under the construction of this performance appraisal system, it can further reflect the scientific concept of "people-oriented" in colleges and universities, improve the teaching level and scientific research level of college

teachers with a more scientific and reasonable appraisal system, realize the development goals of colleges and universities, and improve the construction of the appraisal system. The management model of colleges and universities promotes the process of national education reform.

2. Related Work

Relevant scholars have proved that as long as the random matrix conforms to the uniform distribution, the RIP principle can be satisfied [8]. Therefore, in the previous compressed sensing, random matrices such as Gaussian random matrix, random matrix, and Bernoulli random matrix are more commonly used. The researchers applied polynomials to finite fields and proposed polynomial deterministic random matrices that satisfy the RIP principle.

In order to better apply deterministic matrices, related scholars have begun to explore new deterministic random matrices in Devore's theory [9]. Random matrices are built on smaller-dimensional block elements, which solves the problem of the original deterministic matrix elements. On this basis, in order to increase the dimension of the measurement matrix, related scholars have studied the bipolar matrix, binary matrix, and ternary sampling matrix built on the basis of BCH code, and applied the tensor product to the existing deterministic random matrix including low correlation coefficient [10]. Scholars have constructed binary matrices through algebraic geometric coding, and the results show that they perform better than Devore's theoretical matrices, provided that algebraic curves are used and appropriate choices are made [11].

Based on the research of the Toeplitz matrix, related scholars proposed a "generalized rotating random matrix" construction algorithm, setting a fixed coefficient a ($a > 1$), and multiplying it with the circular move to the front element, its operation method is to use the energy distribution [12]. The nonuniform sampling characteristics of the random matrix increase the independence between the column vectors of the random matrix. The researchers redesigned the Toeplitz matrix and introduced zero elements into the random matrix to form a random sparse Toeplitz moment random matrix.

Related scholars proposed a new random matrix design method [13]. The main idea of the method is to decompose the singular values of the random matrix and then change its eigenvalues through the mean algorithm. On the basis of previous research, scholars proposed pseudo-random generalized binary rotation matrix and generalized binary rotation matrix [14]. These two types of matrices have different structures and proved to have good RIP properties. Compared with the deterministic matrix, this matrix has more randomness and is suitable for more practical applications.

In order to improve the number of observations of polynomial deterministic matrices and make use of finite initial values, related scholars proposed sub-Gaussian matrices, which not only satisfy the RIP principle, but also effectively solve the above problems [15]. In addition, the researchers propose a random matrix optimization algorithm based on matrix transformation [16].

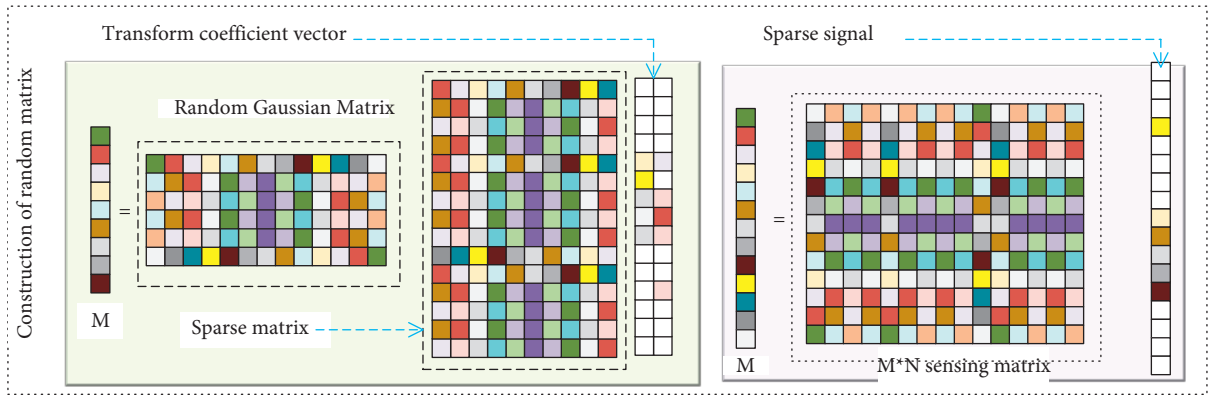


FIGURE 1: Process diagram of random matrix measurement signal.

The British government put forward eight assessment indicators including “teacher’s knowledge and understanding, teachers’ teaching evaluation, teachers’ professional characteristics, and students’ progress.” It was not until the 1990s that the research on teacher performance assessment was paid attention to and developed rapidly. The results of teacher performance assessment are often used as the basis for teacher qualifications, employment, rewards and punishments, career ladder plans, and continuing education certificate updates. There is a lack of research on performance appraisal in primary and secondary schools. Many researchers in the USA initially divided the evaluation subject into two parts: internal evaluation and external evaluation, and only adhered to the principles of equality and democracy in specific evaluations [17].

Foreign research on teacher assessment focuses on how to give full play to teachers’ initiative and enthusiasm, enhance teachers’ subject participation, and make assessment a process of teachers’ self-development, self-motivation, and self-realization. In terms of research on performance appraisal methods, the appraisal methods are flexible and diverse, and the commonly used methods abroad are the 360-degree performance appraisal method, the balanced scoring method, the key performance indicator method, and the management by objectives method [18]. Most of these methods originate from the practice area of business management. The administrator establishes an assessment manual for teachers, records the daily performance of teachers in detail, and conducts assessments once every six months.

Relevant scholars pointed out that the basic performance salary is related to the regional economic development level, price level, job responsibilities, and other factors [19]. On the basis of performance evaluation, teachers who perform job responsibilities and complete school teaching tasks can be paid in full. Incentive performance pay mainly reflects factors such as workload and actual contribution. On the basis of assessment, the school determines the distribution method. It can be seen that both basic performance pay and reward performance pay are closely related to performance appraisal [20].

3. Methods

3.1. Construction of Random Matrix. Compared with the Nyquist sampling theorem, the compression sensing theory is broken in that the sampling and compression of the signal are carried out at the same time, and the breaking method is to linearly measure the signal according to the dimension-reduced random matrix and finally obtain the dimension-reduced measurement vector.

The sparse vector coefficient β is obtained from the original signal after sparse transformation, an $M * N$ -dimensional measurement matrix Φ needs to be constructed and processed, and at the same time $M < N$ is satisfied. Finally, the M -dimensional vector y can be obtained. Figure 1 shows the sparse representation of the signal and the inter-matrix measurement process.

$$y = \beta \bullet D = x \bullet \Phi = \psi \bullet \beta \bullet \Phi. \quad (1)$$

It is difficult to verify whether the sensing matrix has the RIP characteristic or not. For this reason, an equivalent description of the RIP characteristic is given; that is, when the random matrix Φ is uncorrelated with the sparse matrix Ψ , the sensing matrix D will be consistent with a high probability. RIP characteristics have a lot to do with how accurately the signal can be reconstructed. Therefore, how to reduce the correlation between random matrices and sparse transform basis has become the focus of research on compressed sensing theory. When the sparse transformation basis is fixed, the construction of random matrix can be used to make the sensing matrix D conform to the RIP characteristic. The theoretical basis for a sensing matrix that can accurately reconstruct the original signal is the RIP characteristic and irrelevance, but it cannot be a detailed step in constructing the matrix.

To this end, three characteristics that random matrices need to conform to are given:

- (1) The minimum singular value of a submatrix composed of random matrix column vectors must be greater than a certain constant; that is to say, a specific linear independence needs to be satisfied by the random matrix column vector elements.

- (2) Some independent randomness similar to noise needs to be reflected by the elements between the columns and vectors of the random matrix.
- (3) The solution of sparsity is the solution that conforms to the minimum l_1 norm.

These three features are the main idea to guide the construction of random matrix and also the main theoretical basis for the construction of random matrix in this paper.

If the elements in $M\Phi$ meet the requirements of independent and identical distribution, and its elements obey the standard normal distribution, then

$$M\xi^2 > CK \log(N \bullet K). \quad (2)$$

If the submatrix consisting of m rows randomly and uniformly selected from the $N * N$ -dimensional unitized discrete Fourier transform matrix is denoted as $M\Phi$, then

$$M\xi^2 > CK(\log\xi^{-1} \bullet \log^2 N). \quad (3)$$

3.2. Optimize the Construction of Random Matrix. In order to obtain a random matrix with more stable reconstruction performance, this paper proposes an optimization method combining the QR decomposition based on the gradient descent method, considering the independence of the column vector of the random matrix and the correlation between the random matrix and the sparse matrix.

The purpose of reducing the cross-correlation between the random matrix and the sparse matrix can be achieved, and at the same time, the column independence of the random matrix can be increased.

Assuming a sparse matrix Ψ and a random matrix Φ , the cross-correlation coefficient is a measure of the correlation between the random matrix and the sparse matrix. The smaller the coefficient, the weaker the cross-correlation. Column unitization of D is performed to obtain a new matrix, which is represented by D' . From the meaning of u introduced above, we can see

$$u(D) = \text{Max} \left[\frac{d_j^T d_j}{\|d_i\| \|d_j\|} \right]. \quad (4)$$

Since the gradient descent method can get better results when dealing with matrices, we continue to use this method to process the Gram matrix, so as to reduce the size of the off-diagonal elements of the Gram matrix and make it gradually approach the unit matrix. Ideally, the coherence coefficient is 0 when all but the diagonal elements of the matrix are zero. Take the following approach to optimize the Gram matrix so that it is a close approximation to the identity matrix.

$$G' = \text{argMin}(I - G)^3. \quad (5)$$

The optimization model is equivalent to

$$D' = \text{argMin}(D^{-1}D^T - 0.5I)^3. \quad (6)$$

Define the error function:

$$J = (D^T - ID^{-1})_F^3. \quad (7)$$

It is known that

$$\nabla J = \frac{\partial (I - 0.5D'D^{-1})_F^3}{\partial d_{ij}}. \quad (8)$$

According to CS theory, the number of measurements required for signal reconstruction is strongly related to the column independence of the reconstruction matrix—the greater its column independence, the fewer measurements are required.

At the same time, the column independence of random matrix has a strong correlation with its smallest singular value. The specific relationship is as follows:

The larger the minimum singular value of the matrix, the stronger the column independence of the matrix, but at the same time, the minimum singular value must meet the condition that it is greater than a certain non-negative constant.

Therefore, whether to increase the minimum singular value of the measurement matrix without changing other properties of the measurement matrix becomes the key to improve the performance of the reconstruction matrix.

In order to obtain a random matrix with less correlation with the sparse matrix and greater column independence, this paper takes the Gaussian matrix as the original matrix and optimizes it. The specific processing process is as follows: we construct the Gram matrix by using the Gaussian matrix, reduce the off-diagonal elements of the Gram matrix by gradient descent, so that it can approximate the unit matrix; at this time, the matrix after iterative optimization is obtained in reverse, and then uses the QR decomposition method to process the matrix to obtain a matrix with better performance; repeat the above process with the matrix obtained in the above steps as the initial matrix; when the number of iterations reaches a threshold, the final random matrix is obtained, and the result is output at the same time.

3.3. The Theoretical Relationship between Incentives and Constraints. Motivation is a certain state or power that can exert its own initiative and guide relevant personnel to work hard for the immediate goal. From its goal, it aims to effectively stimulate and mobilize the enthusiasm and initiative of employees, and encourage them to exert their enthusiasm and creativity, so as to effectively improve efficiency.

Constraint has the meaning of entanglement, bondage, restriction, and restraint. This management model has the characteristics of strong management of the combination of rigidity and softness. Constraint management is mainly based on the system, and other forms of restraint are used in a set of management modes shared by the segment, which not only blocks the management loopholes, but also mobilizes the enthusiasm of employees. It includes the implementation of corresponding rigid management methods by means of system and disciplinary supervision

and restraint, and the implementation of corresponding rigid management methods by means of punishment and coercion. It also includes flexible management measures implemented by means of induction, inspiration, and incentives.

The two are different forms of effective management activities. The direct incentive goal is to better stimulate the initiative and creativity of the majority of people and improve labor productivity; from the perspective of constraints, it is mainly to protect the direction and goals of people's actions, so that it does not work. Motivation is mainly used to deal with the problems of insufficient enthusiasm and low work enthusiasm of the managers; constraints are mostly used to formulate disciplines, penalties, and other means. Incentives cannot replace constraints, and constraints cannot replace incentives. Incentives and constraints are inseparable organic wholes, with strong complementary characteristics, they are inseparable from each other in the process of practice, and they can be transformed into each other under certain conditions. The ultimate purpose of incentives and constraints is to pursue the efficiency and institutionalization of management activities, and to stimulate the enthusiasm, initiative, and originality of the managed objects as much as possible, so that the relevant personnel can work hard to make certain behaviors, so as to greatly improve the efficiency of management activities. Efficiency serves the goals set by the organization. In addition, it is necessary to scientifically combine constraints and incentives in order to maximize the initiative and enthusiasm of relevant personnel with half the effort. Otherwise, the role of the two cannot be maximized, and the goals and effects of constraints and incentives cannot be achieved. Therefore, it is necessary to reasonably match the constraints and incentive mechanisms, and use them scientifically.

3.4. Design Ideas of Teacher Performance Appraisal System.

Whether the quality of education and teaching can be improved depends on the existing teacher performance appraisal system. Teacher performance appraisal is the most effective tool to enhance the competitiveness of the college and improve the personal performance of teachers. It can provide detailed and real data information, so that the management of the college can fully and completely understand the work and work effects of teachers. Therefore, the design and implementation of the teacher performance appraisal system can effectively improve the quality of education and teaching, continuously improve the competitiveness of the college, and improve team work performance and teacher individual performance. The design idea of the teacher performance appraisal system in this paper is shown in Figure 2.

3.5. *Determine the Assessment Method and Assessment Subject.* The determination of appraisal methods requires the analysis and understanding of various performance appraisal methods. Taking teachers as the object of assessment, due to the characteristics of their work and different positions of analysis, the results of the assessment will also be

different. Based on this, we need to conduct a comprehensive analysis of the information to make the assessment results more comprehensive and objective.

The performance evaluation of teachers in a college is mainly based on the 360-degree evaluation method, which is used to evaluate the teachers of the college. The 360-degree assessment method is a comprehensive assessment and feedback assessment method. The results it draws are fair, impartial, and objective.

In this paper, the evaluation method combining quantitative and qualitative is mainly used to evaluate the performance of teachers in a university. Quantitative assessment and qualitative assessment are both indispensable methods in performance assessment, but it should be noted that there are differences in the focus of assessment between the two methods. Qualitative assessment is only a vague intuitive judgment, mainly from behavior, quality, and other aspects of teachers. Evaluation, quantitative evaluation, is easy to ignore the quality characteristics of teachers and evaluate from the effect of behavior. Combining the two to conduct teacher performance assessment to achieve effective complementarity can make a reasonable, scientific, effective, and comprehensive assessment of teachers' performance.

The content of teachers' self-assessment includes teachers' morality, work methods, work effects, etc. Although teachers have a clearer understanding of their own strengths and weaknesses, this assessment method is easy to exaggerate their achievements. Teachers' self-assessment must be based on the premise of adhering to fairness. Self-assessment can reduce teachers' resistance and help to reach a consensus. It increases teachers' awareness of participation, and this assessment method is more objective.

3.6. Determine the Weight of Performance Appraisal Subjects.

In performance appraisal, because appraisers have different levels of cognition of appraisal information, their evaluations of appraisal information are naturally different. Therefore, when conducting performance appraisal, we should pay more attention to the subject of appraisal and conduct appraisal from different perspectives. In this paper, the selection of the weight of the performance appraisal subject firstly uses the defer method to design the performance appraisal subject weight distribution table, distributes the opinion solicitation form to various experts, summarizes and analyzes the suggestions given by the experts, and gives the performance evaluation. The weight distribution table of the assessment subject is shown in Figure 3.

3.7. *Determine the Assessment Criteria.* This paper mainly combines the actual situation of the college with social services, teachers' morality, characteristics of scientific research activities, and the laws of teachers' teaching activities, and evaluates teachers' performance.

It is set that social services, teachers' morality, and scientific research activities are assessed once every academic year, and the teaching quality is assessed once every semester.

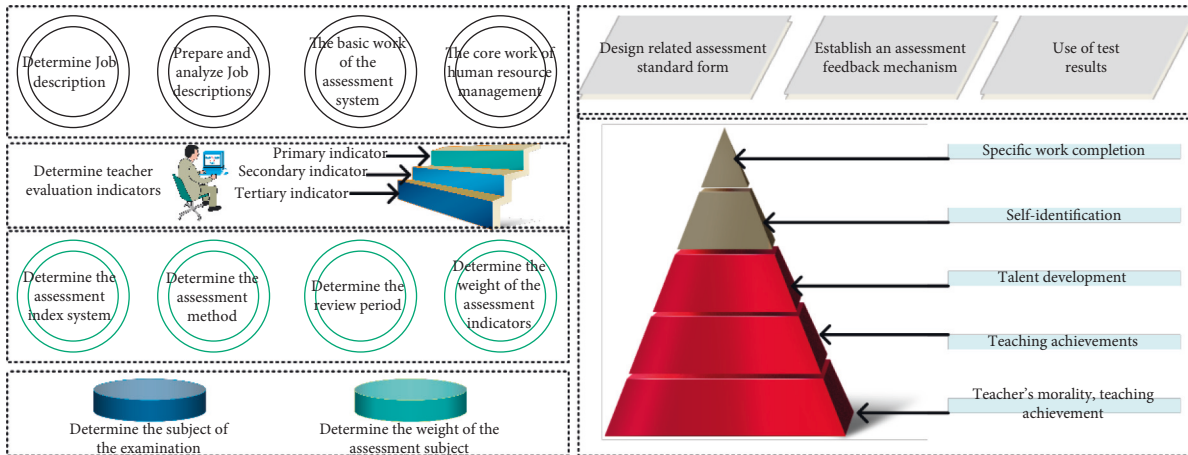


FIGURE 2: Design idea of teacher performance appraisal system.

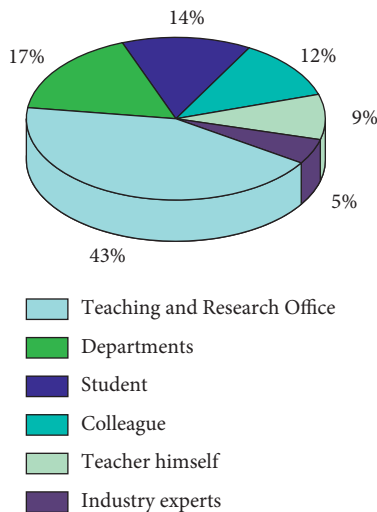


FIGURE 3: Weight distribution of performance appraisal subjects.

The content of teacher assessment is mainly based on teachers' work innovation ability, work attitude, achievement, professional ethics, and political ideology. Therefore, it is necessary to take the weighted average of the teaching quality scores of the two semesters, then add them together with other assessment scores, and finally obtain the annual total score.

The scoring standard refers to the score achieved by the situation of the assessee when a certain assessment index reaches a certain standard, and the scoring standard represents the relationship between the completion of a certain assessment index and the assessment score. Determining the index scores can realize the effective use of the assessment results and is an important link in the design of the assessment standard system. The rationality and fairness of the teacher performance assessment results are directly related to whether the scores are fair, scientific, and reasonable.

In this paper, the defer method is used to design the weights of teachers' assessment indicators in a university. Based on the characteristics of the college, the nature of teachers' work and related information, and the successful

experience of other colleges, the scores of teachers' performance assessment indicators are determined.

3.8. Methods of Reward and Punishment for Assessment Grades. After the assessment is completed according to the assessment score, the teacher's personal score will be finally determined according to the teacher's score and the discussion of the party and government joint meeting, corresponding rewards and punishments will be given, and the result will be used as one of the bases for future personal promotion and professional title evaluation.

- (1) Those who have obtained an excellent grade of A will be given priority consideration in the salary promotion of the next year according to the requirements of the college salary management regulations and institutional management rules and other documents, and 110% of the year-end rewards will be distributed and included in the relevant training plans for key teachers, famous teaching teachers, etc., giving priority to candidates.
- (2) Obtaining a good grade of B, the salary promotion in the following year shall be carried out according to the requirements of the college salary management regulations and the management rules of public institutions and other documents, and 100% of the year-end rewards shall be distributed.
- (3) Obtain the C qualified grade, maintain the original remuneration package, require self-summarization of the improvement suggestions put forward by the assessment subject, put forward the improvement plan for the next year, and strengthen the education and teaching work.
- (4) Obtain a D basic qualified grade, maintain the original remuneration package, require self-summarization of the improvement suggestions put forward by the assessment subject, put forward an improvement plan for the next year, and strengthen education and teaching; the personnel who are required to participate in off-the-job training must

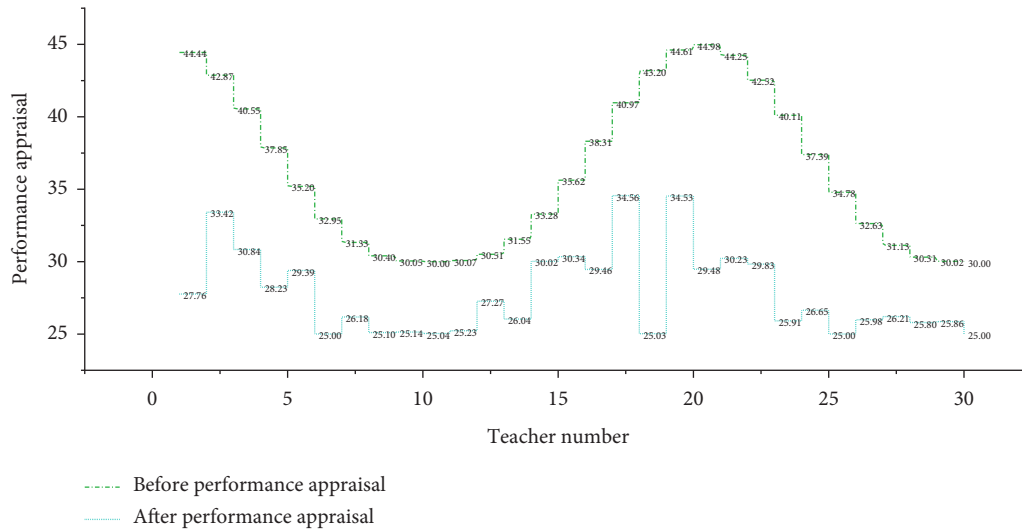


FIGURE 4: Hypothesis testing sampling situation.

stop all kinds of allowances in the hospital during the training period. If necessary, they can adjust their positions or persuade them to be transferred from the work department.

- (5) For those who have obtained the unqualified grade of E, the salary promotion in the following year shall be carried out in accordance with the requirements of the college salary management regulations and institutional management rules and other documents, the performance salary will be reduced accordingly, and 90% of the year-end bonus will be distributed. It is also required to conduct self-summary, put forward an improvement plan for the next year, strengthen education and teaching, and be evaluated by teaching supervisors. If you fail the assessment for two consecutive years, it will be included in the personal file, and the teaching ability training will be reorganized or the job position will be adjusted. If they still fail to meet the job requirements, do not obey the organization arrangement, or fail to pass the school year assessment after rescheduling, they will be dismissed.

4. Results and Analysis

4.1. Quantitative Assessment Results. Hypothesis testing is used to test the validity of the assessment. The content of performance appraisal is not static and should be adjusted appropriately with the development of economy and society. With the development of the times, the society has different requirements for students' overall ability, which urges teachers to develop their own quality. If a college wants to assess teachers, it must first ensure the effectiveness of its own assessment system, so as to conduct reasonable assessments on teachers and maintain the objectivity and fairness of its results. Therefore, schools should be good at investigating teachers and their surrounding environment, and then build a reasonable and effective performance

appraisal system. Only the effective combination of the two can objectively understand the comprehensive quality of a teacher and the value realized. But how do colleges and universities combine the actual construction of the assessment system? How can colleges and universities verify whether their own assessment system has promoted a certain teacher? Here, the performance appraisal department needs to introduce the method of hypothesis testing in quantitative analysis, as shown in Figure 4.

If the principal wants to know whether the school's evaluation system has improved the teaching level of teachers, he can take ten samples and see the changes in students' evaluation of teachers after the performance evaluation.

The performance appraisal of the university is not perfect and cannot improve the teaching level of teachers. Principals should take corresponding measures in response to this situation and improve their reward and punishment methods.

Therefore, the comprehensive assessment of a teacher should combine qualitative and quantitative methods, not only to grasp the teacher's situation in quantity, but also to grasp subjective information in evaluation, and to reflect the comprehensive quality of teachers at different levels. When evaluating, teachers will be given corresponding rewards or suggestions according to the situation.

4.2. Performance Indicators Combined with the Characteristics of Disciplines and Departments. From a philosophical point of view, there are no identical things in the world. In the construction of performance appraisal, the establishment of indicators cannot be applied invariably. Each organization has its own characteristics. Within colleges and universities, specialization is clearly distinguished. Therefore, for different professional directions, the content of teacher assessment should also be different. Different performance indicators should be distinguished, and an assessment system that conforms to professional characteristics should

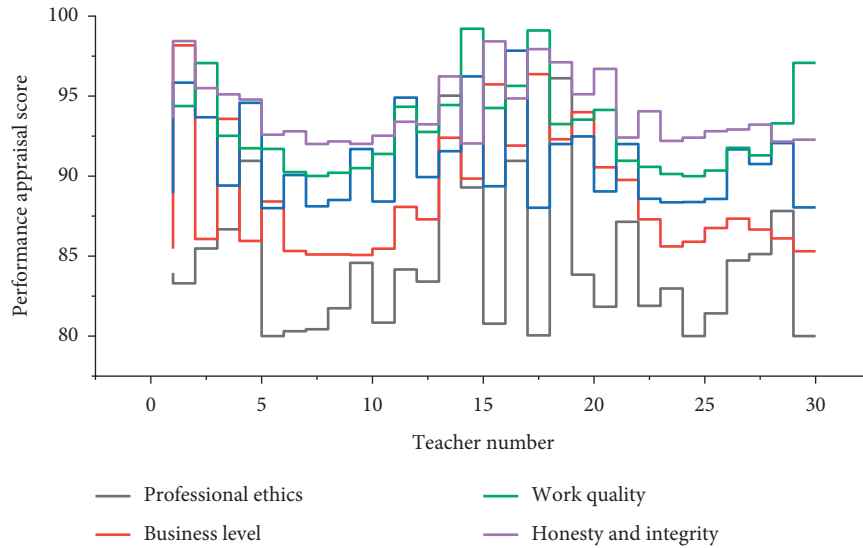


FIGURE 5: Index scores of college performance assessment.

be established. Science and engineering teachers focus on the application of students' practice and technology, so in the evaluation process, emphasis should be placed on teachers' guidance on students' practical ability and the impact of teachers' scientific research projects on students. Teachers of literature and history should focus on students' theoretical mastery and academic research. Although there are no large-scale practical projects, the usual academic exchanges and guidance occupy an important evaluation content, especially the mastery and innovation of academic issues. In this way, the assessment of majors can avoid the situation that teachers of literature and history are far behind teachers of science and engineering in practical projects, and can give a more fair result to performance assessment.

Generally speaking, teachers' performance evaluation indicators are divided into five types, namely, morality, ability, diligence, achievement, and integrity. Morality refers to the ideological, political, and moral quality of the staff, energy refers to the intelligence level and professional level of the staff for their current positions, diligence refers to the diligence and professionalism of the staff, achievement refers to the work results and actual performance of the staff, and integrity refers to the work. In order to make the assessment operational, it is necessary to refine the assessment indicators. On the basis of work analysis, summarize the important factors that reflect the nature of the work and form an assessment index system. The school performance evaluation index system is shown in Figure 5.

Because the nature of different jobs is different, the selection of assessment indicators will have different emphasis in the specific assessment of faculty and staff. However, the assessment of teachers and staff must be carried out within the scope of the above five indicators. Generally speaking, the assessment of full-time teachers, teaching assistants, and leaders of middle-level colleges focuses on three aspects: morality, ability, and performance.

The assessment of party and government personnel and student counselors focuses on three aspects: morality, diligence, and integrity.

The performance appraisal of full-time teachers is a key content in the construction of the appraisal system in colleges and universities. The performance evaluation indicators of full-time teachers should be quantified as much as possible to enhance comparability and operability. The main contents of full-time teachers' performance appraisal are teachers' teaching workload, scientific research workload, teaching ranking, and so on. According to the comprehensive ranking of teacher applications and outstanding indicators, the outstanding candidates with the difference of grades are recommended to the performance appraisal team of the college. At the same time, the school organized retired old professors to set up a teaching supervision committee, through listening to and evaluating lessons, checking the situation of teaching plans and homework corrections, and ranking teachers in each department. The leaders of each department conduct a comprehensive ranking of teachers through quantitative data. The faculty performance appraisal team of the college conducts examination and approval through the materials, reports, sorting, and original scientific research results submitted by each department.

Engineering teachers should focus on scientific research and projects, and specific practice and operability when establishing assessment indicators. Liberal arts teachers should pay attention to the results of research and focus on the application of theoretical parts and innovative thinking. The content of teachers' classes and student evaluation are also important indicators of assessment. The proportion of these contents is adjusted according to the development direction of the discipline. It is not necessary to pursue the unity of teachers in the whole school, but only needs each college to reflect its own characteristics.

4.3. Analysis of Performance Appraisal Mechanism.

Performance assessment is divided into monthly assessment, quarterly assessment, and annual assessment. According to the special circumstances of different departments or changes in the school’s development strategic goals, assessments can also be conducted for different strategic goals. Due to the complexity of the school system and the diversity of disciplines, each discipline or system may have different assessment strategies and development goals. Therefore, the school needs to set up a special assessment department to conduct assessments for each college and each category. Professional departments need to build different assessment indicators for different situations, set up assessment teams, and conduct assessments in different time periods.

In the assessment of management personnel, emphasis will be placed on management ability, management efficiency, organizational coordination, and service attitude. The assessment can be completed directly by the assessment department, and a unified assessment can be conducted for the management teachers of the whole school. It can also simply reflect the requirements of management capabilities and other aspects. Figure 6 shows the performance appraisal of university managers by performance departments optimized by random matrix.

If each college has other development strategic goals, it can also conduct performance appraisals on faculty and staff according to the college’s own development strategy to complete the college’s tasks. The characteristics and the development of the college improve its own assessment system, so that the assessment results are more meaningful. Figure 7 shows the performance evaluation of college declaration optimized by random matrix.

The significance of an independent assessment department for the performance assessment of college teachers is very important. Usually, the establishment of specific indicators and the selection of assessment subjects or the independent assessment plan of the college are all managed by the assessment department, which is responsible for the development strategy of the university.

4.4. Analysis of Scientific Research Assessment Cycle. The knowledge and innovation of college organizations require college teachers to have certain scientific research achievements, and the most effective way to evaluate a teacher’s achievements is to conduct performance appraisal. Generally speaking, the performance evaluation of employees by enterprises and other organizations is basically based on a one-year cycle, and this evaluation cycle is obviously not suitable for the current scientific research in colleges and universities.

Teachers in colleges and universities have their own particularities, and teachers’ scientific research results are also delayed and lagged. A scientific research result does not appear immediately, but only after long-term accumulation can it have innovative and in-depth research. According to the assessment indicators, it is difficult to reflect the work performance of a teacher if the assessment standard is purely based on quantity. If a teacher’s scientific research

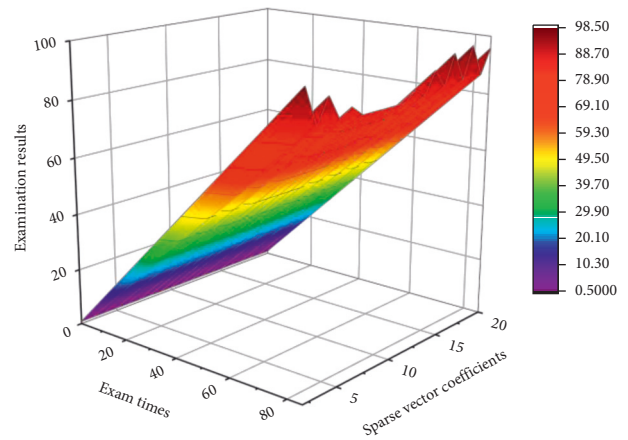


FIGURE 6: The performance appraisal of university managers by performance departments optimized by random matrix.

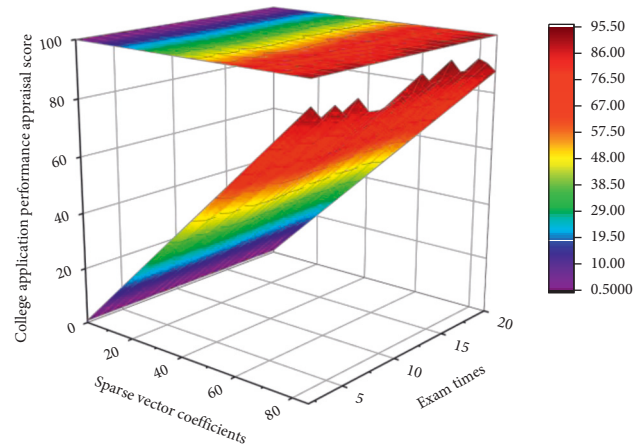


FIGURE 7: Performance appraisal of college declarations optimized by random matrix.

publications are simply measured by volume, then the majority of scientific research is published but the published scientific research is not innovative. The performance of research teachers should depend not only on their evaluation, but also on their output ability, that is, the level and quality of teaching and scientific research. Then, further evaluation needs to be combined with quantitative analysis. The comparison of teachers’ scientific research output is shown in Figure 8.

Figure 8 shows the scores of the two teachers’ published scientific research in the past 5 years. From the special quantitative point of view of publishing scientific research, the academic research level of teachers should not be viewed purely from one year, but should be based on a longer period of time. Otherwise, improper performance appraisal methods will often dampen teachers’ enthusiasm for scientific research.

Therefore, the best assessment cycle for the scientific research achievements of college teachers can be appropriately extended, and it can be a cycle of two years, three years, or even longer. This not only avoids the current situation that college teachers display a perfunctory interest in their own scientific

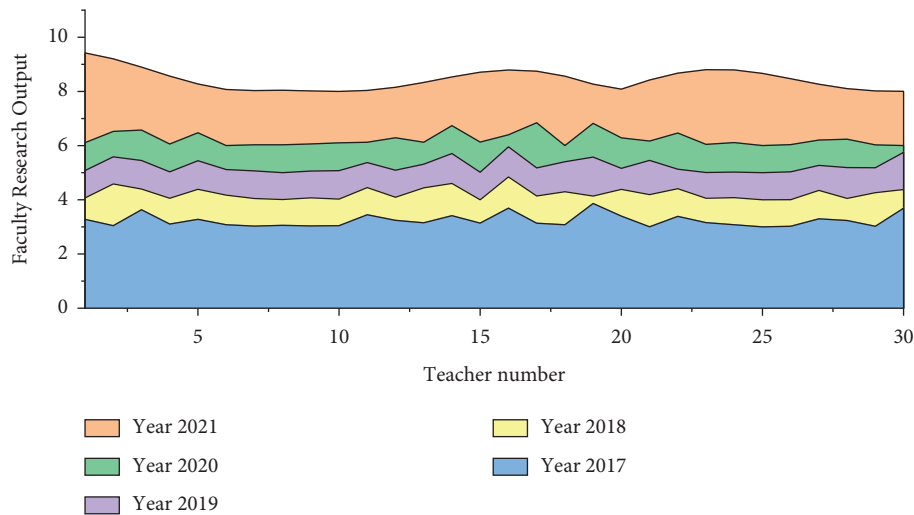


FIGURE 8: Comparison of teachers' scientific research outputs.

research for the sake of evaluation results and professional titles, but also allows college teachers to produce high-quality scientific research results and improve the academic atmosphere of colleges and universities, so that colleges and universities truly have a group of scientific research talents.

5. Conclusion

This paper introduces the optimization of random matrices based on gradient descent and QR decomposition. Based on the theory of compressed sensing, this paper can optimize the random matrix by reducing the cross-correlation between the observation and the sparse matrix and increasing the column independence of the random matrix. Based on this, a new optimization method is proposed—processing with gradient descent Gram matrix, reducing its off-diagonal elements. The assessment of teachers' work performance, with teachers as the main body of assessment, mainly uses assessment to help teachers discover and improve defects in their work, solve problems in a positive way, and give feedback on assessment results in a timely and effective manner. The strategic development strategy and development goals of the college are inseparable, and the overall performance of the college is closely related to the individual work performance of each teacher in the college. The scale of colleges and universities is constantly developing, and the organizational characteristics of colleges and universities are becoming more and more obvious. The construction of the performance appraisal system for teachers should also become more and more scientific and perfect. Only through effective system construction can we generally improve the quality of modern college teachers and promote the development of social education reform. Every organization has its own characteristics. Different from the characteristics of other administrative enterprises, the organizational characteristics of colleges and universities mainly include educational, intellectual, innovative, and social characteristics in terms of attributes, and structural stability in terms of structure and structural duality. The particularity of

college teachers is manifested in rich human capital, high requirements for professional ability, stable work, high degree of freedom, strong demand for achievement, and long-term realization of labor value. Scientific research results cannot be unidirectionally compared. The organizational characteristics of colleges and universities determine the construction direction of college teachers' performance appraisal system. The performance evaluation of college teachers is currently in the stage of coexistence of achievements and problems, and it is necessary to further improve the evaluation system through scientific evaluation concepts and methods.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest or personal relationships that could have appeared to influence the work reported in this paper.

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References

- [1] T. McNamara, D. Meloso, M. Michelotti, and P. Puncheva-Michelotti, "You are free to choose. are you? Organisational punishment as a productivity incentive in the social science literature," *Human Relations*, vol. 75, no. 2, pp. 322–348, 2022.

- [2] W. Miao, J. Jaidi, and R. Mohidin, "Corporate governance and Firm performance: Evidence from Chinese listed Firms[J]," *Asian Journal of Accounting and Finance*, vol. 2, no. 2, pp. 118–129, 2020.
- [3] R. Li, "Evaluation and simulation of medical sports health equipment multimedia image based on information asymmetry theory," *Multimedia Tools and Applications*, vol. 79, no. 15–16, pp. 9957–9976, 2020.
- [4] M. Song and K. J. Meier, "Citizen Satisfaction and the Kaleidoscope of government performance: how Multiple Stakeholders See government performance," *Journal of Public Administration Research and Theory*, vol. 28, no. 4, pp. 489–505, 2018.
- [5] Y. Wu, W. Yu, D. Griffith, and N. Golmie, "Modeling and performance assessment of Dynamic rate Adaptation for M2M Communications," *IEEE Transactions on Network Science and Engineering*, vol. 7, no. 1, pp. 285–303, 2020.
- [6] F. Chen, H. Chen, D. Guo, S. Han, and R. Long, "How to achieve a cooperative mechanism of MSW source separation among individuals — an analysis based on evolutionary game theory," *Journal of Cleaner Production*, vol. 195, pp. 521–531, 2018.
- [7] J. Endrikat, T. W. Guenther, and R. Titus, "Consequences of strategic performance measurement systems: a Meta-analytic Review," *Journal of Management Accounting Research*, vol. 32, no. 1, pp. 103–136, 2020.
- [8] P. A. Nguyen, A. H. Nguyen, T. P. Ngo, and P. V. Nguyen, "The relationship between productivity and Firm's performance: Evidence from listed Firms in Vietnam Stock exchange," *The Journal of Asian Finance, Economics and Business*, vol. 6, no. 3, pp. 131–140, 2019.
- [9] Y. El Mokrani, I. El Idrissi, and Y. Alami, "Discretionary loan loss provision in the Moroccan banking sector: the role of governance mechanisms," *Annals of Management and Organization Research*, vol. 2, no. 2, pp. 191–208, 2021.
- [10] Z. Zheng, Y. Peng, F. Wu, S. Tang, and G. Chen, "ARETE: on designing joint online pricing and reward sharing mechanisms for mobile data Markets," *IEEE Transactions on Mobile Computing*, vol. 19, no. 4, pp. 769–787, 2020.
- [11] Z. Li, X. Hu, X. Zhang et al., "Distributed treatment of rural environmental wastewater by artificial ecological geographic information system[J]," *Journal of King Saud University Science*, vol. 34, no. 3, Article ID 101806, 2022.
- [12] M. Rawabdeh, S. Nawafleh, H. Alsari, and M. B. Melhem, "The mediating influence of organisational citizenship behaviour on employee job performance and staff incentive's relationship," *International Journal of Management Practice*, vol. 12, no. 2, p. 200, 2019.
- [13] W. Yue, "Statistical analysis of chain company employee performance based on SOM neural network and fuzzy model," *Journal of Intelligent and Fuzzy Systems*, vol. 37, no. 5, pp. 6287–6300, 2019.
- [14] S. Pu, J. J. Escudero-Garzás, A. Garcia, and S. Shahrampour, "An online mechanism for resource allocation in Networks," *IEEE Transactions on Control of Network Systems*, vol. 7, no. 3, pp. 1140–1150, 2020.
- [15] L. F. He, X. Zhang, Q. P. Wang, and C. Hu, "Game theoretic analysis of supply chain based on mean-variance approach under cap-and-trade policy," *Advances in Production Engineering & Management*, vol. 13, no. 3, pp. 333–344, 2018.
- [16] T. Leiber, B. Stensaker, and L. C. Harvey, "Bridging theory and practice of impact evaluation of quality management in higher education institutions: a SWOT analysis," *European Journal of Higher Education*, vol. 8, no. 3, pp. 351–365, 2018.
- [17] J. Su, "University teachers' scientific research performance appraisal method for quantitative assessment[J]," *International Journal of Social Science and Education Research*, vol. 5, no. 2, pp. 439–444, 2022.
- [18] P. Ong, M. Z. Ghani, and C. S. P. Pei, "Performance appraisal management in A Malaysian secondary school," *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, vol. 6, no. 4, pp. 297–307, 2021.
- [19] S. G. Fashoto, O. Amaonwu, and A. Afolorunsho, "Development of A Decision support system on employee performance appraisal using AHP model," *JOIV: International Journal on Informatics Visualization*, vol. 2, no. 4, p. 262, 2018.
- [20] S. F. Rais, M. S. Perdhana, and Z. Hidayah, "Influence analysis of forced distribution rating performance appraisal and Merit pay to performance of Directorate general of Taxes's employees with job Satisfaction as Intervening variable at Blora Tax service Office," *International Journal of Human Capital Management (IJHCM)*, vol. 5, no. 1, pp. 91–106, 2021.