Research Article

Competency Evaluation Model of English Teaching Position Based on Nonlinear Random Matrix

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Nowadays, the economic globalization is advancing day by day. As the most widely used language for international communication, English is becoming more and more important. English education is the most important part of the whole English basic education, and English teachers play an important role in developing the cause of English basic education. Job competency assessment is a technical method to assess the staff’s working ability, which can comprehensively and objectively evaluate the English teaching position competency. Based on the in-depth study of the relevant theories of the job competency model, the nonlinear random matrix is applied to the job competency evaluation, and the components of English teachers’ job competency are deeply explored. The competency evaluation elements are constructed from three levels of knowledge ability, technical ability, and potential ability. Based on the established job competency evaluation model, this paper evaluates and analyzes the English teachers’ job competency. The results showed that the model had good structural validity, and the correlation between factors and the scale was 0.3–0.8, with no significant difference in each factor, which provided strong support for the assessment of English teaching competence.

1. Introduction

Modern human resource management science plays an extremely critical role in social and economic development. Job competency refers to the ability of practitioners to complete their jobs. Only employees with job competency can do good jobs, while those without job competency cannot complete their jobs [1]. It can be seen that post competency is one of the key factors related to the employer’s work efficiency, work process, and work completion. Therefore, employers need to evaluate the job competency of employees, in order to master the situation of the employee’s job competency, find the problems of the employee’s job competency in time, and formulate corresponding countermeasures to solve the problems of the job competency to ensure that every employee can have the job competency. The post competency evaluation can help the employer master the staff’s post competency, provide support for the employer’s recruitment system, performance management, staff incentive and training, and then improve the staff’s work efficiency and promote the work process. English teaching has high requirements for English teachers, which require not only high knowledge and technical ability but also professional character and personal characteristics. The job competency of English teachers directly affects the quality and effect of English teaching and is related to the survival and development of training institutions [2]. Only by evaluating online English teachers’ job competency and finding out the existing problems of English teachers’ job competency, effective promotion strategies can be put forward. At present, the job competency evaluation mainly adopts the method of establishing the job competency evaluation model to complete, but there is a lack of research on the English teachers’ job competency evaluation, so it is necessary to establish the English teachers’ job competency evaluation model and evaluation system. The job competency of English teachers helps the job competency of English teachers, provides support for performance
management, staff motivation, and training, improves the 
quality of English teaching, and promotes the stable de-
development of English teaching. However, at present, there 
is still a gap in the research on English teachers’ job compe-
tency evaluation, which leads to the unclear problems of 
English teachers’ job competency and the inability to put 
forward effective strategies to improve their job competency.

2. Related Work

Competency theory originated from Taylor’s research, 
which is called “Management competency movement” in the 
industry. In the study of job competency, attention should be 
paid to the actual situation of practitioners’ personal be-
behavior and technical ability, instead of taking theoretical 
assumptions and assumptions as the basis of assessment, so 
as to realize the improvement of the overall operating ef-
ciciency of the employer. In order to clarify the job com-
petency evaluation, the performance evaluation standard of 
the post practitioner should be able to evaluate the post 
practitioner; feedback on learning ability; the evaluation 
mechanism of post practitioners should be responsive and 
feasible. Clear operational mode of thinking on the position 
of the practitioner behavior. At home and abroad, a large 
number of post competency models have been studied and a 
series of post competency evaluation models have been 
constructed. Vaughn S and others to carry out the research 

on the construction of teachers’ post competency model, this 
study puts forward teachers post competency includes ed-
cuation competency and collaboration competency two 
constituent elements, in the concrete of the construction of 
the teachers’ competency model, need from the teachers’ 
professional ability, teaching ability, learning ability, co-
operation ability and discipline, and so on [3]. El Asame and 
Wakrim established a comprehensive evaluation model of 
knowledge competenc of vocational and technical teachers 

by using expert interview method, and the constructed 
multidimensional knowledge competence evaluation model 
of vocational and technical teachers has validity and 
goodness of fit, indicating the validity of the established 
competency evaluation model [4]. The competency evalu-
amon model is on the basis of iceberg model and onion 
model development, Akmandor et al. such as analytic hi-
ernarchy process is employed to establish the competency 
evaluation model of university teachers, including language 
ability and general ability, computer skills, management 
ability and professional talents from the five indexes, set up 
the competency model for evaluation of university teachers 
to practice. The competency model and its evaluation prove 
the possibility of using ANALYTIC hierarchy process as a 
potential tool for evaluating university employees [5]. For 
different industries and different types of posts, the con-
struction and application of the competency evaluation 
model are studied. Sun and Bin proposed that competency 
evaluation should be related to job requirements, with 
knowledge, skills, ability, characteristics, or motivation re-
lated to the job\ and be able to effectively distinguish out-
standing practitioners from mediocre practitioners and 
predict their performance [6]. Moradi et al. proposed that 

teachers’ job competency is the sum of various character-
istics formed according to the professional characteristics 
and job requirements of college teachers [7]. Gómez et al. 
put forward the teachers’ competence is teachers under the 
background of core literacy should have the knowledge, 
ability to learn, practice experience, teaching mode, and 
personality characteristics of the current teachers’ post 
competency is the core of quality education competency, 
including professional ability, professional knowledge, basic 
concept and professional ethics, etc., on the structure of both exist independently and interconnected [8].

Competency model connects organizational strategy and 
human resource strategy closely and becomes a very im-
portant tool and link linking strategy to execution. This 
model establishes the human resource management model, 
which is development oriented and aims at improving the 
ability and quality to achieve human resource management. 
It ensures that the human resource strategy effectively fol-

ows the organizational strategy. Through behavioral event 

interviews and questionnaire surveys, Hilty et al. prelimi-
narily constructed the competency model of graduate tutor 
in colleges and universities and divided the competency 
model into 17 competency characteristics, which can be 
classified into three levels: personality traits, knowledge and 
skills, and management ability [9]. Diaz et al. constructed a 
competency model of university teachers by interviewing 
university teachers with behavioral events. The model in-
cludes five dimensions, including wisdom teaching concept 
and motivation, use and construction of intelligent envi-
nronment, teaching organization, evaluation and feedback, 
and teaching improvement, 15 competency elements, and 31 
competency indicators. The model has been verified, which 
proves that the constructed model has good robustness and 
can be used to effectively evaluate the competence of college 
teachers [10]. The research of Velasco-Martínez and Tójar-
Hurtado shows that the competency model structure of 
college teachers includes four factors: personality charm, 
student orientation, teacher level, and scientific research 
ability [11]. Theories and models are used for reference in the 
research on teacher post competency evaluation, but there 
are great differences in competency evaluation models for 
different teacher posts. Therefore, the establishment of the 
corresponding post competency evaluation model needs to 

combine the characteristics of English and teachers. The 
research of applying nonlinear random matrix to English 
teacher’s job competency evaluation is still in the blank 
stage. How to apply nonlinear random matrix to English 
teacher’s job competency evaluation model has become the 
research focus.

3. Job Competency Evaluation Model Based on 
Nonlinear Matrix

3.1. Nonlinear Random Matrix. With the development of 
science and technology, nonlinear matrix equation has 
played a very important role in various fields, and the so-

lution of nonlinear matrix equation has become a hot topic 
in the research field. In this paper, the range of $\lambda_1$ and $\lambda_2$ in 
generalized transformation is given on the basis of the
existing conclusions, and the values of \( \lambda_1 \) and \( \lambda_2 \) are selected. Step size selection in this paper is 0.1. The transformation value was calculated to obtain the new observation matrix \( Y \) [12]. The matrix \( Y \) is shown in formula (1).

\[
y = \begin{bmatrix}
  x_{11} & x_{12} & \ldots & x_{1m} \\
  x_{21} & x_{22} & \ldots & x_{2m} \\
  \vdots & \vdots & \ddots & \vdots \\
  x_{n1} & x_{n2} & \ldots & x_{nm}
\end{bmatrix}
\]

(1)

Y matrix data is standardized, where

\[
\begin{align*}
\bar{x} &= \frac{n-1}{n} \sum_{i=1}^{n} x_{ij} \\
S^2 &= \frac{1}{n-1} \sum_{i=1}^{n} (x_{ij} - \bar{x})^2
\end{align*}
\]

(2)

Calculate the correlation coefficient matrix:

\[
R = \begin{bmatrix}
  a_{11} & a_{12} & \ldots & a_{1m} \\
  a_{21} & a_{22} & \ldots & a_{2m} \\
  \vdots & \vdots & \ddots & \vdots \\
  a_{n1} & a_{n2} & \ldots & a_{nm}
\end{bmatrix}
\]

(3)

The m eigenvalues of the characteristic equation are

\[
\begin{align*}
\nu(i) &= \nu_1(i), \nu_2(i), \ldots, \nu_m(i) \\
\nu(i) \times \nu(j) &= \begin{cases} 
1 (i = j) \\
0 (i \neq j)
\end{cases} \quad (i, j = 1, 2, \ldots, m).
\end{align*}
\]

(4)

According to the transformation formula, the fuzzy relational matrix \( R \) is transformed nonlinear to avoid the problems in the later calculation. Let any two prominence \( \gamma \) set. \( \Lambda \) refers to the index out of the path degree ground, educational knowledge, and professional knowledge. 

Construction refers to the index out of the path degree set. \( A = [\lambda_1, \lambda_2, \ldots, \lambda_n] \), let \( \lambda = \max(\lambda_1, \lambda_2, \ldots, \lambda_n) \), then the synthesis operator form of nonlinear fuzzy matrix is

\[
f(w) = w_1 \lambda_1 x_1 + w_2 \lambda_2 x_2 + \ldots + w_n \lambda_n x_n
\]

(5)

Where

\[
\lambda_i \geq 1; \quad i = 1, 2, \ldots, n.
\]

(6)

Calculate the comprehensive evaluation matrix. Combined with the above nonlinear fuzzy matrix synthesis operator, the comprehensive evaluation matrix \( B \) is calculated, and the grade with the largest value in the matrix \( B \) is selected as the final comprehensive evaluation grade.

\[
B = \omega \times \begin{bmatrix}
  \lambda_1 x_1 & \lambda_1 x_2 & \ldots & \lambda_1 x_n \\
  \lambda_2 x_1 & \lambda_2 x_2 & \ldots & \lambda_2 x_n \\
  \vdots & \vdots & \ddots & \vdots \\
  \lambda_m x_1 & \lambda_m x_2 & \ldots & \lambda_m x_n
\end{bmatrix}_{m \times n}
\]

(7)

3.2 Elements of Competency Assessment Model for English Teaching Positions. In this paper, the iceberg model is applied to the teacher’s job competency evaluation model, and combined with the actual teaching situation of English teachers, the evaluation indicators are selected and the job competency evaluation system is constructed. For English teachers, their English teaching methods are significantly different from other classroom teaching methods. English teachers need to have innovative spirit, seek innovation and change, and strengthen teaching research and innovation of teaching methods. English teaching can adopt a variety of modern teaching methods, especially information teaching methods, which require English teachers to have the ability to use modern teaching methods [14]. According to the iceberg model and the actual situation of English teachers, it is put forward that the elements of English teachers’ job competency can be divided into three main levels, namely, knowledge level, technical level, and potential level. Knowledge competence usually includes English teachers’ educational background, teaching knowledge, professional knowledge, and general knowledge. The level of technical competence usually includes English teachers’ teaching ability, communication ability, teaching innovation ability, education and scientific research ability, modern educational means use ability, education inspiration ability, teaching summary ability, and so on. The level of latent competence covers the “below the iceberg,” including social roles, self-concept, traits, and motivation. Social role reflects the role orientation of English teachers, mainly in two aspects: professional orientation and dedication and responsibility. Self-concept is mainly manifested in strong self-confidence, physical and mental health, optimism, dedication, and so on. Characteristics are mainly reflected in honesty and integrity, seeking innovation and change, sense of responsibility, and so on. Motivation is mainly reflected in achievement motivation, interpersonal motivation, and so on [15]. According to the iceberg model and the actual situation of English teachers, this paper puts forward the components of English teachers’ job competency, including four dimensions and 22 components. The components of English teachers’ job competency are shown in Figure 1.

The elements of model design are educational background, educational knowledge, and professional knowledge. The elements selected at the level of technical competence include education and scientific research ability, classroom teaching ability, teaching innovation ability, communication ability, ability to use modern educational means, and educational inspiration ability [16]. Based on the analysis of the constituent elements of English teachers’ job.
3.3 Job Competency Index of English Teachers Based on Nonlinear Matrix. According to the developed evaluation index system and scoring standard, this study adopts the method of comparative judgment of proportional scale and the form of scoring, as shown in Table 1. The indexes at each level are compared in pairs and scored according to their importance [17]. This paper selects 10 experts with many years of experience in English teacher management in educational institutions and English teacher competency teaching research. These 10 experts have a good understanding of the requirements of online English teacher competency and evaluation of training institutions and can provide relatively authoritative ratings. In the scoring process, WeChat software or e-mail was used to send out the scoring form to the experts, who scored according to the importance. For the judgment matrix of each expert obtained, internal consistency test is carried out. Usually, the calculation method is as follows: first, the sum of the computed rows is calculated, the average of the rows is obtained, then the feature vector of matrix B is normalized, and finally the consistency test is carried out. Consistency index CI is obtained by

$$CI = \frac{\lambda_{\text{max}} - n}{n}$$  \hspace{1cm} (8)

According to the randomness index RI and the CI/RI ratio, when CI/RI < 0.1, it can be considered that the consistency of the judgment matrix obtained by the evaluator's analysis meets the requirement. The above method was used to test the consistency of the judgment matrix of each expert. When CI/RI > 0.1 was found, it indicated that the judgment matrix of the expert did not meet the consistency requirements, and the expert was invited to re-score until it met the consistency requirements [18]. Therefore, the CI/RI of the judgment matrix obtained by the expert score in this paper is all less than 0.1, which has passed the consistency test and can calculate the effective weight without modification. Through expert questionnaire data consistency of the judgment matrix, choosing the way of judgment matrix, and the weighted geometric mean, for all levels of each index weight is calculated, namely the first according to the data of each expert judgment matrix, the average of all the elements of judgment matrix is obtained and the weight of evaluation indexes at all levels of English teacher post competency force is obtained.

3.4 Evaluation Process of English Teaching Position Competency Model Based on Random Matrix. Fuzzy comprehensive evaluation reflects the basic characteristics of decomposition, judgment, and synthesis of people's decision-making thinking. Because it effectively combines qualitative analysis with quantitative analysis, people's subjective judgment experience can be expressed and processed in the form of quantity, avoiding decision-makers' logical mistakes in complex structure and too many plans. Due to the fuzziness of this method, this method is mainly applied to the decision problems with roughly determined evaluation schemes, that is, when the expert opinions in the evaluation matrix are accurate and consistent, otherwise this method will have a great impact on the evaluation results. The comprehensive evaluation judgment matrix method based on judgment matrix method combines the whitening process and standardization process of qualitative indicators, thus simplifying the evaluation steps [19]. The evaluation result is one-dimensional vector, which is convenient to draw the evaluation conclusion and easy to operate. In the processing of the index with the judgment matrix method, several eigenvalues may be obtained when the eigenvalues of the judgment matrix are obtained. Therefore, the problem of how to obtain eigenvectors after determining the eigenvalues and finding the basic solution of the corresponding eigenvectors needs to be further studied. This paper adopts fuzzy comprehensive evaluation and judgment matrix evaluation,
which uses fuzzy evaluation method to evaluate the competency dimensions of the post quality model, so as to get the quantitative evaluation results of the indicators and the evaluation results of the whole post competency model [19]. When ranking the job competency, the judgment matrix method can be used to calculate the ranking results quickly and easily under the premise of ensuring scientific and objective, which provides quantitative support for personnel selection, post promotion, and reserve talent selection and training. The overall process based on the post competency assessment model is shown in Figure 3.

Competency is the judgment matrix of each indicator in the post competency indicator group and its characteristic value. The feature vector of each indicator is used as a column vector to form a matrix. By applying the judgment matrix method to fuzzy comprehensive evaluation, the evaluation results of one-dimensional vector can be obtained, and the competency ranking of employees can be intuitively obtained.

4. Verification of Competency Assessment Model for English Teachers

Random sampling method was used to select in-service senior high school English teachers from 4 cities. This part first summarizes the competency characteristics obtained from the preliminary verification and forms a preliminary test project on the competency characteristics of senior high

![Figure 2: English teacher competency assessment system.](image-url)
school English teachers. Then, the preliminary test and the results are analyzed to verify the validity of the competency model.

4.1. The Impact Degree of the Competency Factors of the Position. The management department of an application-oriented university evaluated the annual performance of full-time teachers in the department and determined the outstanding personnel in the annual performance appraisal. The orientation and training target of the college is professional and technical application-oriented talents with solid theoretical foundation and practical ability. The post competency of English teachers is evaluated by the secondary index. The relationship among various factors of post competency in the performance system was clarified. The university organized five experts to analyze the influence relationship among factors and integrated expert judgment information with mean method to obtain the influence matrix factors, as shown in Figure 4.

According to the comprehensive prospect value in the figure, the annual excellent index is the annual appraisal excellent personnel. In the process of performance evaluation, the linkage between individual goals of teachers and organizational goals of colleges and universities is realized, and then the realization of organizational goals of colleges and universities is promoted. The post competency model varies with organizational goals and positions, rather than establishing a set of post competency model can be done once and for all. Therefore, it is necessary to combine the different positioning of colleges and universities and the different requirements of teachers’ positions to study the competency models of teachers’ positions in specific situations and distinguish the competency differences between teachers with average performance and excellent performance. In the study of post competency model, key elements can be found through the mutual influence of indicators, which can effectively guide teachers to focus on developing key abilities and realize the efficient use of resources. Set up the performance standard of university teachers’ post scientifically, introduce the post competency index into the performance evaluation system, and guide teachers to produce high performance behavior from the driving factors.

4.2. Competency Trait Level Validity Test. In the whole process of logic validity test from preliminary forming to preliminary testing and then to questionnaire modification, psychology postgraduate students of our school participated in many discussions and were supervised and guided by tutors. To some extent, this test can reflect the competence of real high school English teachers and has good content validity. Criterion validity verifies the relationship between test scores and external independent criteria, a measure of whether the questionnaire’s predictions can be confirmed. In this study, the excellent performance group was selected as the index of having won the honors of teaching expert at all levels, special-grade teacher, excellent teacher, model teacher, etc. In the formal test, a total of 35 subjects were selected from the excellent performance group. It can be seen from the figure that the model has good structural validity, and there should be moderate correlation among all factors. If the correlation is too significant, it may indicate that there is overlap among factors. If the correlation between factors is too low, it may indicate that the
content of some factors is too biased. The correlation between test results of various factors should be in the range of 0.1–0.6, and the correlation between factors and scale should be in the range of 0.3–0.8 [20]. Through the analysis of the validity of the test data, the content validity, empirical validity and structural validity of the test all meet the requirements of competency measurement and have good validity, which verifies the feasibility of the competency model of high school English teachers constructed in this study.

4.3. The Overall Characteristics and Difference Test of English Teachers’ Competence. In order to further investigate the competency characteristics of English teachers in an all-round way, this study conducted a difference test on the overall situation of the competency characteristics of English teachers and different demographic variables. A scientific descriptive statistical analysis was conducted on the scores of all English teachers in each competency feature. The gender of English teachers was taken as the independent variable, and the scores of English teachers in each competency feature were taken as the dependent variable to conduct a difference test. The specific results are shown in Figure 6.

It can be seen from Figure 6 that the overall characteristic level of English teachers is relatively high and falls within the scope of conformity. There were significant differences between male and female subjects in factor care, help and organization management, and there were no significant differences in factor communication ability, means ability, dedication and responsibility, physical and mental health, strong self-confidence, and dedication spirit. The professional title of English teachers is taken as an independent variable, and the scores of English teachers in each competency feature were taken as the dependent variable to conduct a difference test. The results are shown in Figures 7 and 8.

The results showed that there were significant differences in the levels of 6 factors among the participants. The scores of each factor will increase with the improvement of professional title, showing a linear relationship, which indicates that the competency level of English teachers is affected by professional title. In the difference test with professional title as the variable, it is found that there are significant differences in all factors, indicating that with the increase of professional title, English teachers’ quality in all aspects has been improved. There are significant differences in the competence of English teachers in professional knowledge, scientific research ability, teaching ability and innovation ability, but there are no significant differences in the dedication, innovation and honesty of English teachers. Academic background has a certain influence on the basic ability.
of English teachers, so academic background can be considered as a screening condition in the selection and recruitment of English teachers. With the length of teaching as the independent variable and the scores of English teachers in each competency feature as the dependent variable, the results of variance analysis are shown in Figure 9.

It can be seen from the figure that the scores of all factors of the subjects increased with the increase of teaching years. Among them, the competency characteristics of English teachers showed significant differences in seeking innovation and change, sincerity and integrity, sense of responsibility, and achievement motivation, while there were no significant differences in the means ability and dedication and responsibility. This has a certain relationship with the individual development of English teachers and also has a certain influence on the psychological quality of teachers or the way of solving problems. With the growth of working hours, English teachers’ basic abilities are improving, and their teaching methods and abilities are also increasing.

5. Conclusion

The competency assessment can comprehensively and objectively evaluate the competency of English teaching posts. Based on the iceberg competency model, an English teacher competency evaluation model is established. The model takes in-service senior high school English teachers in four cities as the empirical research subject to evaluate the job competency of English teachers. The competency characteristics take teaching experience, professional title, gender, and educational background as independent variables and the scores of English teachers in each competency characteristics as dependent variables. The evaluation results show that there are significant differences in the competency characteristics of English teachers in the factors of innovation and change, honesty and integrity, responsibility, and achievement motivation, but there are no significant differences in the factors of means ability, dedication, and responsibility. The scores of each factor will increase with the improvement of professional title, showing a linear relationship. There is no significant difference in communication ability, means ability, dedication and responsibility, physical and mental health, strong self-confidence, and dedication. The assessment of English teachers’ job competency helps English teachers’ job competency, provides support for performance management, staff motivation, and training, and thus improves the quality of English teaching and promotes the stable development of English teaching. The sample size of this study is not convincing compared with the position, and the competency index needs to be adjusted according to the different influencing factors of the evaluation work. Due to the particularity of English education teachers’ work, in-depth and detailed studies should be carried out from different levels and perspectives in the future, so as to reach a consensus on the progress of education reform and development in the new era.

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.

Acknowledgments

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