Research on the Effectiveness Evaluation of College English Competition and Teaching Integrated Teaching System Based on Group Sample Testing

Zhumin Huang

Nanchang Institute of Technology, Nanchang, 330044, China

christal2023@163.com

Abstract. In the context of the integration of competition and teaching, in order to improve the level of English teaching in colleges and universities, in view of the lack of practical and application of current English teaching, combining micro-class and flipped classroom mode, and introduce oral English, composition and debate. Statistical analysis and the equilibrium game control method are used to evaluate the effectiveness of the integrated teaching system. Information analysis and adaptive evaluation are conducted by mining the association rules in the statistical big data. At the same time, grouped samples are used to test and verify the effectiveness of the teaching system. The empirical research shows that the evaluation method has significant effectiveness for the integrated teaching system of English competition in universities.

Keywords: Integration of teaching, college English, big data, group sample testing.

1   Introduction

The reform of the English teaching system in colleges and universities is gradually advancing, integrating the teaching methods of multi-disciplinary, flipped classroom and micro-curriculum, and combining with the integration of competition and teaching, aiming to improve the English application and practical ability of college students [1]. Various competitions are also used to improve college students' practical communication skills, writing and application skills. It is very important to evaluate the teaching effect after the integration for improving the teaching methods. This paper proposes a teaching system effectiveness evaluation model combining statistical analysis and equilibrium game control, and realizes adaptive evaluation and effectiveness analysis through big data analysis and association rule mining [2].

2   The Realization Way of the Teaching System Reform

2.1   Integrate English Teaching Resources

Under the development of information technology, the English teaching mode of multidisciplinary and multi-disciplinary integration and multiple information integration, combined with flipped classroom teaching, aims to improve English teaching methods and promote the development of English quality education [3]. This teaching mode is novel, through the English speech competition and oral English competition to stimulate students' enthusiasm, realize the integration of competition and teaching, and improve the ability of resource integration. In order to optimize and reform this teaching mode, we should study and use multimedia English teaching, integrate modern teaching methods, and enhance the initiative and practicality of English teaching. At the same time, the teaching system improves the integration of English teaching resources, analyzes the shortcomings of teacher dominance from the perspective of micro-course, emphasizes students' learning subjectivity, and realizes interactive teaching.

2.2   Improve the Practicality of English Teaching

The integrated teaching system of college English competition uses network resources and multimedia technology to promote teaching reform and interactive teaching in the form of diversified English competitions, aiming to promote the progress of English quality education. This system is based on the optimal allocation of English teaching resources and teachers [4]. Through the combination of competition and classroom learning, it helps students to master English practical application skills and improve the teaching effect.

2.3   The Level of Quality-oriented Education Has Been Improved

Under the English teaching mode of competition and teaching, integrate the English classroom teaching resources, develop the new English teaching mode, share the advantages of English teaching resources, and improve the level of classroom teaching. Build an English teaching system integrating competition and teaching to improve the level of quality education [5]. Using this system, an interactive English teaching platform is established, and integrated information teaching means are adopted to integrate differentiated teaching resources in micro-courses. With quality teaching as the center, we should optimize the reform of teaching mode, improve the initiative of learning English, introduce micro-class and English competition into the teaching mode, and realize the reform of English teaching system integrating competition and teaching [6].

3   Effectiveness Evaluation of the Teaching System Reform

3.1   Big Data Mining and Statistical Feature Analysis

Questionnaire and sample monitoring were used to collect the statistical sample sequence of the effectiveness of the integrated English teaching system [7]. Using statistical method to construct the big data distribution model of this system. Through quantitative regression analysis, big data features are extracted and information regression analysis is performed. First, an intelligent evaluation model for the effectiveness of college English competition and teaching is constructed. The statistical pool of the statistical sample sequence is composed of N statistical nodes. The sample regression sequence of the statistical sampling of the effectiveness survey of the teaching system is $h(x) = \sum_{1 \le i \le xN} i^{-a} / \sum_{1 \le i \le xN} i^{-a} \to x^{1-a}$. When $N \to \infty$, sample the sequence points of the validity of the English competition fusion teaching system in N universities, meet the association mapping relationship formula 1 is:

$$x = [s_1, s_2, \cdots, s_k]_n = (x_n, x_{n-\tau}, \cdots, x_{n-(m-1)\tau}) \tag{1}$$

The mining method of the correlation rule distribution formula 2 is used to obtain the correlation integral of the effectiveness evaluation of the teaching system.

$$C_{N,m}(r) = \frac{2}{N(N-1)} \sum_{i=1}^{N} \sum_{j=i+1}^{N} H(r - \|x_i - x_j\|) \tag{2}$$

Contrast the statistical sample sequence $\{x_n\}_{n=1}^{N}$ of the effectiveness of the teaching system into the high-dimensional phase space and obtain the statistical sample sequence formula 3:

$$Q(a, b_i) = -\sum_i \sum_j [y_{ij} - (\hat{a}x_{ij} + \hat{b}_i)]^2 \tag{3}$$

Taking the minimum value, the fuzzy rule set of validity statistics satisfies formula 4:

$$\begin{cases} \frac{\partial Q}{\partial \hat{a}} = -\sum_i \sum_j 2[y_{ij} - (\hat{a}x_{ij} + \hat{b}_i)]x_{ij} = 0 \\ \frac{\partial Q}{\partial \hat{b}_i} = -\sum_i \sum_j 2[y_{ij} - (\hat{a}x_{ij} + \hat{b}_i)] = 0 \end{cases} \tag{4}$$

When Q reaches the minimum, formula 5 is obtained.

$$\begin{cases} \hat{a} = \frac{\sum_i \sum_j (x_{ij} - \bar{x}_i)(y_{ij} - \bar{y})_i}{\sum_i \sum_j (x_{ij} - \bar{x}_i)^2} \\ \hat{b} = y_i - a\bar{x}_i \end{cases} \tag{5}$$

Combined with statistical analysis and equilibrium game control methods, the statistical big data of university English teaching system is extracted, and the recursive graph $R(i, j)$ is constructed to mine the correlation rules for the effectiveness evaluation of teaching system reform. The solution formula 6 is:

$$R(i,j) - H(\varepsilon_i - d_{ij}), i, j = 1, 2, \cdots, N \tag{6}$$

The quantitative recursive analysis model is used to quantify the characteristics of point x_i and x_j, and the cost function formula 7 of the effectiveness statistics is written as follows:

$$G(U|\mu_k, \Sigma_k) = (2\pi)^{-d/2} |\Sigma_k|^{-1/2} \times \exp\left[-\frac{1}{2}(U - u_k)^T \Sigma_k^{-1}(U - u_k)\right] \tag{7}$$

Under the constraint of fuzzy correlation, the intelligent evaluation of the effectiveness of the university English teaching integration teaching system is conducted.

3.2   Teaching Efficiency Assessment

To obtain the optimal estimation of the association dimension features a and b_i of the bit sequence, such as the calculation formula 8 and formula 9.

$$D'_{t+1} = 1 - (1 - \lambda) \sum_{n=0}^{\infty} \Omega_{m+n+1}(n + 1)(b - t) \tag{8}$$

$$x_k = f\{x_{k-1}, u_{k-1}, w_{k-1}\} \tag{9}$$

The feature extraction model of validity statistical analysis is constructed, and the grouped sample detection method is used for adaptive optimization control, and obtains the output statistical analysis model of validity evaluation formula 10.

$$\begin{cases} x(k+1) = \left(\begin{bmatrix} 1 & 0.6 \\ -0.4 & 0.5 \end{bmatrix} + \begin{bmatrix} 0.02 & 0.01 \\ -0.02 & 0.12 \end{bmatrix}\right) x(k) + \begin{bmatrix} 1 \\ 1 \end{bmatrix} kx(k - \tau_k) + \begin{bmatrix} 0.1 \\ 0.1 \end{bmatrix} w(k) \\ z(k) = \begin{bmatrix} 1 & 1 \end{bmatrix} x(k) + 0.1u(k) + 0.1w(k) \end{cases} \tag{10}$$

Using the association rule mining method, the probability of the statistical time series $x(t)$ of the validity of the integration of the teaching system in universities is analyzed in i between distribution areas, and the random variables for detection statistics are constructed. When the threshold value $a_k \geq 0, \sum_{k=1}^{K} a_k = 1$ is met, the formula 11 of the evaluation feature distribution model is obtained as follows:

$$x_{ij} = [lgr]_{ij}, y_{ij} = [lgC_n(r)]_{ij} \tag{11}$$

Where $C_n(r)$ represents the correlation integral under the sampling time delay, and calculates the fuzzy correlation feature component of the teaching system effectiveness evaluation when the European distance r of the phase space distribution trajectory is small enough. The mutual information characteristics of the evaluation of college English teaching integration teaching system are recorded as formula 12.

$$I(\tau) = -\sum_{ij} p_{ij}(\tau) \ln \frac{p_{ij}(\tau)}{p_i p_j} \tag{12}$$

When $I(\tau) = 0$, $x(t + \tau)$ said college English fusion teaching system effectiveness evaluation of statistical sample sequence, if meet convergence solution, said unpre-

dictability, namely $x(t)$, $x(t + \tau)$ is completely unrelated, calculate correlation mutual information quantity $I(\tau)$ to predict possibility adjustment, when $I(\tau)$ is the hour, the corresponding sampling time point $x(t)$ and $x(t + \tau)$ is irrelevant, said college English fusion teaching system effectiveness statistical sample sequence is completely predictable. The descriptive statistical analysis was conducted by the least squares fitting method, and the statistical sequence of the big data sampling and information regression analysis of the university English integrated teaching system were combined with the quantitative regression analysis method. The threshold regulation model for the effectiveness evaluation of the integrated teaching system is formula 13.

$$\Pi_2 = \begin{bmatrix} \bar{A}^T P \bar{A} - P + K^T R K & \bar{A}^T P \bar{B} & \bar{A}^T P F_1 \\ \bar{B}^T P \bar{A} & \bar{B}^T P \bar{B} - R & \bar{B}^T P F_1 \\ F_1^T P \bar{A} & F_1^T P \bar{B} & F_1^T P F_1 \end{bmatrix} \tag{13}$$

Assuming the validity of the teaching system time series $x(i)$ in distribution areas i probability random variables meet the convergence conditions, using Um interface to achieve the effectiveness of intelligent evaluation, in all the analysis, the design of the teaching system effectiveness evaluation process is shown in Figure 1.
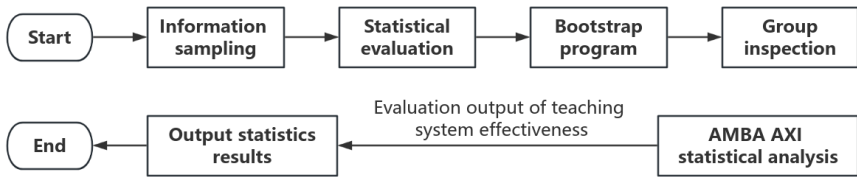

Fig. 1. Implement the process.

4   Empirical Analysis and Validation

The validity of SPSS 22.0 analysis model and the algorithm design combined with MATLAB 7, the Channel_bridge function was called to realize the information loading and data statistical analysis of the effectiveness evaluation of college English competition fusion teaching system [8]. The size of the statistical analysis sample was 2000, and the test object was 205 college students. The results of group samples are shown in Table 1.

Table 1. Grouped sample test and analysis results.

Controlled variable	Competition and teaching fusion state	Teacher quality	The effectiveness evaluation of teaching system is poor
ICD	0.543	0.854	0.356
ICDS	0.464	0.543	0.432
CASHK	0.323	0.466	0.323
SCALE	0.467	0.433	0.455
MIN	0.433	0.464	0.565

COST	0.477	0.545	0.476
ALR	0.378	0.565	0.365
UIS	0.644	0.564	0.543
Age	0.457	0.433	0.755
Moding	0.675	0.543	0.576

Taking the above statistical data as the analysis object, the sample big data distribution of the effectiveness evaluation of the university English teaching fusion teaching system is shown in Figure 2.
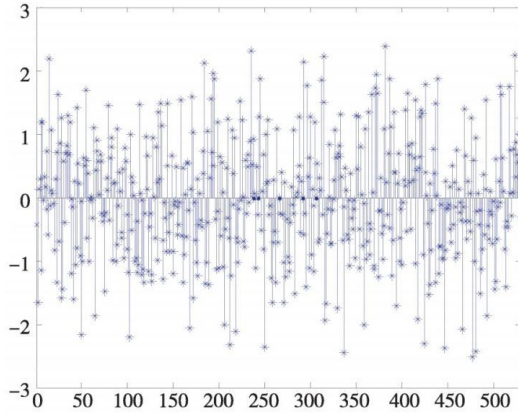
Fig. 2. Sample big data distribution.

Taking the data in Figure 2 as input, the effectiveness of the teaching system is predicted, and the prediction results are shown in Figure 3. The analysis shows that the integrated teaching system of English competition and teaching in colleges and universities has significant effectiveness and improves the quality of English teaching in colleges and universities.
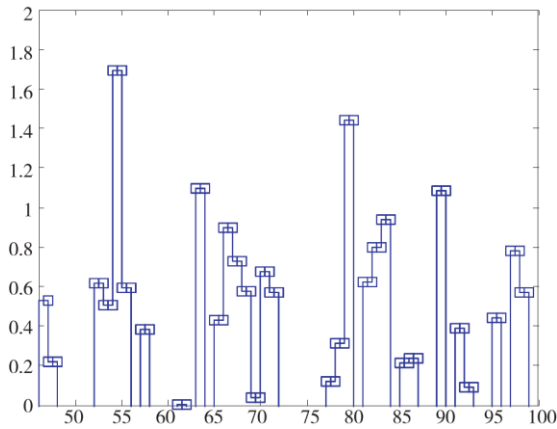
Fig. 3. Effect prediction results of the teaching system.

5   Conclusion

The college English competition teaching teaching mode of multi-disciplinary integration and multiple information integration is adopted to improve the practical ability of college English teaching, integrate modern teaching means, improve students' learning initiative, and realize interactive teaching. Combined with statistical analysis and equilibrium game control method for college English teaching fusion teaching system effectiveness evaluation, extract college English teaching teaching system of statistical data, using associated rules mining method to realize college English teaching system fusion association information analysis and adaptive assessment, using the grouping sample detection method analysis the effectiveness of college English teaching fusion teaching system. The model has a high level of confidence and a good evaluation quality.

References

1. Chen Liqian. (2022). Basis and principle of the construction of practical teaching system of English education in local universities. Journal of Chifeng University (Chinese Philosophy and Social Sciences Edition) (02), 92-96.
2. Mukhtasar, M., Begyor, S., Aleksandr, K., Farrukh, D., Isroil, U., Sodiqjon, K., & Akbarjon, A. (2022). Analysis of the effectiveness of the development of the german education system in our country. Journal of new century innovations, 18(1), 168-173.
3. Geng Wei. (2019). Research on the construction of college English Education based on OBE (achievement oriented). Campus English (32), 13-15.
4. Clayson, D. (2022). The student evaluation of teaching and likability: what the evaluations actually measure. Assessment & Evaluation in Higher Education, 47(2), 313-326.
5. Siqin Gaowa. (2020). Study on the construction strategy of practical teaching system of English Education major in application-oriented universities. Modern English (24), 1-3.
6. Wentworth, D. K., Behson, S. J., & Kelley, C. L. (2020). Implementing a new student evaluation of teaching system using the Kotter change model. Studies in Higher Education, 45(3), 511-523.
7. Zhang Hong. (2023). Construction of high-quality basic English education system: connotation, necessity and path. Foreign Language Teaching and Research (03), 410-419 + 480.
8. Weiwei Yang. (2021). Analysis on the value system of English Curriculum and English Education teaching. Comparative Research on Cultural Innovation (01), 187-189.