The Construction of College English Ecological Teaching Mode in the Era of Big Data

Xuan Cai

1School of International Education, Wuhan Sports University, Wuhan, Hubei, China, 430079

*Corresponding author e-mail: 2438401349@qq.com

Abstract. The teaching mode in the era of big data is based on the accurate analysis of data to form an ecological teaching mode so that college students' English level has been greatly improved. This paper mainly introduces the construction of College English ecological teaching mode in the era of big data. In this paper, the formulation of precision teaching plan in precision teaching is transformed into an optimization problem, and the basic ideas to solve the problem are described. This paper focuses on the optimal design of teaching mode from the perspective of learning time to stimulate the students' motivation to learn English. In this paper, the reinforcement learning method Q-1 learning is used to solve this multi-stage dynamic decision-making problem and find the optimal decision-making function. According to the optimal decision-making function, a targeted teaching scheme can be given to students with any characteristics and behavior. The experimental results show that under the teaching mode of big data age, college students' English level has improved significantly, their English scores have increased by more than 25%, and their class efficiency has increased by more than 46%. The teaching mode of big data age is the trend of future development.

Keywords: Big Data, College English, Teaching Mode, Precise Algorithm

1. Introduction

1.1. Background and Significance

In recent years, with the rapid development of information technology, the ability of data storage and data management has been greatly improved. More and more human behavior data has been recorded in the network. The amount of data generated in the world is growing explosively, and the data model is highly complicated[1]. Massive complex data implies great value, bringing new opportunities and
challenges for human development. The era of human "big data" has arrived[2].

Under the construction of teaching mode in the era of big data and the exploration of big data related theories, college students' English comprehensive ability and basic literacy have been greatly improved, and college students' English in-depth learning has been promoted[3].

1.2. Development Status at Home and Abroad

In the era of big data, accurate teaching no longer relies on result analysis, but also considers other factors such as the process of learning behavior. By collecting various kinds of state information generated by college students in the process of learning English behavior, forming a data source reflecting learning situation can also customize more effective intervention methods and improvement measures for individual college students, so as to ensure the individualization of college students Development[6].

At present, the research of foreign scholars on precision teaching mainly focuses on evaluating the effect of precision teaching through teaching experiments. Through the research, it is found that precision teaching can significantly improve the reading ability of students[5]; research shows that precision education can significantly improve the learning performance of students with English learning difficulties[6].

1.3. Relevant Work Content

Big data can accurately measure city characteristics and result variables. Glaeser e l proposes that big city data is most valuable for urban research when it allows measurement of previously opaque data, or when it can be combined with external shocks to people or places. However, big data itself cannot solve the social science problems of big cities[7].

Under the development trend of education accuracy and learning personalization in the era of big data[8], this paper uses statistical theoretical knowledge and analysis methods to build a mathematical model of precision teaching in the era of big data[9], studies the evaluation and formulation of precision teaching scheme, makes full use of education big data information, provides scientific support for education decision-making, and provides better English service for college students[10].

2. Big Data Precision Method

2.1. Accurate Method Parameter Estimation

In order to get the accurate teaching plan, we need to estimate the data and adopt the idea similar to the least square method. Given the observation data of N college students, the loss function is defined as:

$$L_n(\beta, \gamma) = \frac{1}{n} \sum_{i=1}^{n} \left[ Y_i - \gamma^T - \beta^T X_i (A_i - \pi(X_i)) \right]^2$$

(1)

When $\tilde{\beta}, \tilde{\gamma}$ is used to express the parameter estimation of the evaluation model of the accurate English teaching scheme, it can be concluded that:
\begin{equation}
(\beta^*, \gamma^*) = \arg \min L_n(\beta, \gamma)
\end{equation}

2.2. Big Data Teaching Development Method

The essence of making a single-stage English teaching plan is to optimize the decision function \(d:X\rightarrow A\), making the teaching effect \(Y\) optimal. In other words, it is necessary to find the optimal decision function \(d^*(X)\), so that:

\begin{equation}
d^*(X) = \arg \max E(Y | d(X), X)
\end{equation}

Therefore, the single-stage English teaching scheme only needs to find the optimal decision function to maximize the value of \(E\). From the evaluation of precision teaching program, we can get:

\begin{equation}
d^*(X) = 1(\beta^T X > 0)
\end{equation}

According to the decision function, given the student's characteristics and behavior performance \(x\), we can judge which teaching plan to take for the student through the positive and negative of \(A\). For example, if \(a=1\), indicates early warning intervention for students in teaching. If \(a=0\), it means that there is no early warning intervention for students in teaching, and when \(\beta^T X\) is more than 0, the students will be given early warning intervention. When \(\beta^T X\) is less than 0, the students will not be given early warning intervention. According to the decision function, each student can be given a targeted teaching program, so as to complete the formulation of accurate teaching program. It is worth noting that the formulation of precision teaching program is determined by the cross item of teaching program velocity in the precision teaching program evaluation model. It's up to \(\beta^T X\). Therefore, the estimation of parameters in the evaluation model of precision teaching plan has a key impact on the formulation of precision teaching plan.

3. Teaching Model Experiment in Big Data Era

This paper designs the experiment of College Students' English level change in the era of big data. The experiment mainly takes college students as the experimental objects. The experimental content is to select a part of students with stable scores, carry out an English test, count the scores and calculate the data to determine the scores, and then let these students learn English under the teaching mode constructed by big data. Two months later, do another statistics, taking the test data just made at the beginning as the control group and the test data under the big data teaching mode two months later as the experiment, the highest score, the lowest score, the average value, the variance and the standard deviation of them were counted respectively. Compare the two data. The specific experimental contents are shown in Table 1:

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline
             & Number of students & Highest score & Minimum score & average value & variance & standard deviation \\
\hline
control group & 100                & 89           & 61          & 66          & 2.1       & 1.2         \\
\hline
\end{tabular}
\caption{English test results}
\end{table}
4. Analysis of the Results of College Students' English Teaching Mode in the Era of Big Data

4.1. Data Analysis of College English Scores

The proportion of English teaching courses that can understand at first and that can understand at present in the era of big data is shown in Figure 1 below. "Initially" refers to the time when 100 college students have just entered school, while "currently" refers to the time when they have studied under the English teaching mode in the era of big data for two months.

![Figure 1. Understanding proportion of big data English teaching mode course](image)

It can be seen from the figure that only 55% of the students can understand more than 70% of the big data teaching content when they first contact the big data English teaching mode, while after two semesters of training, the proportion has risen to 84%. In addition, the proportion of students who can understand more than 90% of the content has increased from 4% to 8% at the beginning, and 80%-90% of them can understand it. This shows that after the application of big data English teaching mode in the curriculum, most of the college students have improved their English understanding and performance significantly.

When college students first entered school, their understanding of English materials was relatively vague, but after learning in big data English mode, there were obvious changes, as shown in Table 2:

|        | very difficult | hard | commonly | Easier |
|--------|----------------|------|----------|--------|
| first  | 16             | 44   | 38       | 2      |
| at present | 5              | 28   | 70       | 8      |
| change | 11             | 16   | 32       | 6      |

It can be seen from the above table that at the time of initial enrollment, 60% of the students thought English textbooks were difficult or relatively difficult, 38% of the students thought textbooks were generally difficult, and only 2% of the students thought textbooks were easy to
understand. However, after two months of big data English teaching mode learning, the proportion of students who still think the textbooks are difficult or relatively difficult decreased by 11%, while the number of students who think the textbooks are generally difficult or relatively easy increased by 48%. The data in the table shows that the number of students who think the textbook is difficult has decreased, while the number of students who think the textbook is general or easy has increased greatly. Therefore, after two months' learning of big data English teaching mode, students' comprehension ability of English materials has been improved obviously.

4.2. Practical Analysis of Big Data English Teaching

Whether the big data English teaching mode can be promoted and applied depends on the students' satisfaction with the model, as shown in Figure 2:

![Figure 2. Big data teaching mode satisfaction](image)

It can be seen from the figure that only 47% of college students are satisfied with the development of the mode, 38% are very satisfied with the mode, 13% are generally satisfied with the mode, and only 2% are not satisfied with the mode. Based on the analysis of various factors and data, it can be concluded that most of the students are satisfied with the big data English teaching mode, which also shows that the big data English teaching mode will be widely used in people's life.

5. Conclusion

In this paper, under the development trend of education precision and learning personalization in the era of big data, using statistical theoretical knowledge and analysis methods, we construct the English mode of precision teaching in the era of big data, and study the evaluation and system of precision teaching scheme. At the same time, this paper explores the advantages of big data through the changes of College Students' English level under the big data application teaching mode, and concludes that the big data English teaching mode is recognized and applied by people.

In this paper, the presentation of problems in the design process is not hierarchical and diversified enough to fully meet the personalized learning needs of different students. The innovation of this paper lies in that only by establishing big data thinking, relying on the great value of data in the development of English education, can we make college English education keep pace with the times, keep vitality and vitality in the rapid development trend, and from the perspective of statistical theory and methods, build a mathematical model of accurate teaching problems in the era of big data, aiming at it provides a new perspective and thinking for the research of education big data and enriches the
research methods of education big data.

Acknowledgements

The research in this paper was supported by Postgraduate Teaching Reform Project of Wuhan Sports University: The Reform and Practice of Postgraduate English Course in Wuhan Sports University Under the Background of Internationalization(NO. YJSJG2019008).

References

[1] Glaeser E L , Kominers S D , Luca M , et al. BIG DATA AND BIG CITIES: THE PROMISES AND LIMITATIONS OF IMPROVED MEASURES OF URBAN LIFE[J]. Economic inquiry, 2018, 56(1):114-137.

[2] Zhang Y , Qiu M , Tsai C W , et al. Health-CPS: Healthcare Cyber-Physical System Assisted by Cloud and Big Data[J]. Systems Journal, IEEE, 2017, 11(1):88-95.

[3] Yu S , Liu M , Dou W , et al. Networking for Big Data: A Survey[J]. IEEE Communications Surveys & Tutorials, 2017, 19(1):531-549.

[4] Bing W . The College English Teaching Reform Based on MOOC[J]. English Language Teaching, 2017, 10(2):19.

[5] Wu J , Ding Z . Research on Mobile Learning Model of College English Based on WeChat Platform[J]. Eurasia Journal of Mathematics Science & Technology Education, 2017, 13(8):5847-5853.

[6] A study on the teaching model of integration of theory and practice in Vocational Education [J]. Science and education guide, 2017, 000 (033): 7-8.

[7] Li Mingshu. Construction and application of Task-based English teaching model [J]. Science and education guide, 2017, 000 (018): 94-95.

[8] Huang T C , Lin C Y . From 3D modeling to 3D printing: Development of a differentiated spatial ability teaching model[J]. Telematics and Informatics, 2017, 34(2):604-613.

[9] Zhang Haiyang, Li Xueqin, Guo Ruili, et al. The application of flipped classroom teaching model in the principles of chemical engineering course [J]. Chemical higher education, 2017, 034 (003): 82-84.

[10] Guo J , Chen Z , Ban Y L , et al. Precise Enumeration of Circulating Tumor Cells Using Support Vector Machine Algorithm on a Microfluidic Sensor[J]. Emerging Topics in Computing, IEEE Transactions on, 2017, 5(4):518-525.