Adult Education Based on Legal Finance for Higher Applied Economics Majors in the Era of Big Data

Mingguang Yao[1,2,a*]

[1]*School of Economics, Shanghai University, Shanghai, Shanghai, 200444, China*
[2]*School of Tourism &Leisure Management, Shanghai Institute of Tourism, Shanghai, 201418, Shanghai, China*
[a]*yaomingguang2023@163.com*
corresponding author

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Abstract: With the advent of the era of big data, higher education is also facing enormous opportunities and challenges. In this context, how to apply the theory and practice of big data technology, economics, and other disciplines to promote the development of adult education in China is currently a research hotspot in the field of adult education in China. This article intended to conduct a research on adult education in law and finance for higher applied economics majors in the context of big data, with a view to providing certain reference and reference for the teaching reform and educational informatization construction of Chinese universities. The research on adult education based on higher applied economics, law, and finance in the era of big data is of great significance. It can promote professional development and interdisciplinary integration, improve professional quality, promote industry-university-research cooperation, and make greater contributions to economic and social development.

1. Introduction

The advent of the big data era has provided new opportunities and challenges for the development of multiple disciplines such as economics, law, and finance. With the continuous development and application of big data technology, research and application in these fields would also face broader space and deeper changes. The adult education of higher applied economics and legal finance majors also needs to be reformed and innovated accordingly to adapt to the development of the times and the needs of the market. In the context of the era of big data, people can better use big data technology and apply it to online teaching, thereby improving students' teaching efficiency and quality, exploring the impact of big data on economics and legal finance, conducting new theoretical and applied research, and paying close attention to the market demand and development trend of adult education. These are issues that people must pay attention to. This article would explore adult education for higher applied economics majors and legal finance majors in the era of big data from multiple perspectives, with a view to providing some reference and inspiration for teaching and research in related fields.

With the integration of new technologies and the widespread use of the Internet around the world, there is an increasing demand for and sustained cultivation of talents. Around the world, there are more and more forms of online education. Online education would enter the mainstream society in 2025. Palvia Shailendra documented national level factors that affect the quantity and quality of online education. These factors include industry (commerce), local, state, and federal levels of government, national laws, information and communication technology capabilities, Internet or mobile technology diffusion, as well as the income and digital divide, providing inspiration for countries and world organizations on online education [1]. Although the first educational application of the knowledge fund concept was conducted in the late 1980s, there have been many developments and suggestions since then, many of which have been proposed in the past few years. Llopart Mariona has identified 92 review publications that date back to 2011 and 2015. Some contributions of the literature review to teacher candidates and teacher professional development were also proposed [2]. Klapper Leora measured financial literacy by assessing the basic knowledge of four basic concepts in financial decision-making: interest rate, compound interest, inflation, and risk diversification. Globally, only one-third of adults understand financial knowledge, which means they know at least three of the four financial concepts. Women, poor adults, and respondents with low educational levels are more likely to lack financial knowledge. This applies not only to developing countries, but also to developed countries with mature financial markets. As increasingly complex financial instruments enter the market, relatively low levels of financial knowledge exacerbate risks for consumers and financial markets. Access to credit products has become more convenient, with many loans having high interest rates and complex terms. In major emerging countries that use credit cards or borrow from financial institutions, only about half of adults have financial knowledge. However, these scholars have not conducted a detailed analysis of adult education in legal finance for higher applied economics majors in the era of big data, but have only explored it at a shallow level.

In order to provide a deeper understanding of adult education, this article first analyzed the application of big data in legal finance for higher applied economics majors, and proposed the algorithm of BP neural network in big data. This technology was also widely used in higher education. Finally, a simulation experiment was conducted on the application of big data technology in higher applied economics majors.

2. Adult Education Methods Based on the Era of Big Data

2.1 Application of Big Data in Legal Finance for Higher Applied Economics Majors

In higher applied economics majors, big data technology is widely used in market research, consumer behavior analysis, and market forecasting [4-5]. Traditional market research often only uses a small amount of sample data, while big data technology can more accurately understand market demand and trends through the analysis of millions of user data. At the same time, big data technology can also help enterprises predict future market development and provide support for strategic decision-making [6-7].

In the field of legal finance, big data technology can help professionals better understand and handle complex financial issues [8-9]. For example, in the field of asset management, big data technology can help investors analyze market trends and assess risks, thereby formulating more scientific investment strategies. In the legal field, big data technology can also help lawyers better handle litigation cases, improving the efficiency and accuracy of case processing [10-11].

Adult education has played an important role in the development of these fields. By providing professional training and education, adult education can help professionals better master big data technology, thereby improving their professional level and market competitiveness [12-13]. At the

same time, adult education can also help professionals continuously update their knowledge and skills to adapt to the continuous changes and development of the market [14-15].

In short, the era of big data has become an indispensable part of life. Higher applied economics majors, legal finance, and other fields also need to master big data technology to better respond to market demand [16-17].

2.2 Algorithm of BP Neural Network

The process of BP neural network algorithm is mainly completed by three iterative processes, namely initialization, forward propagation, and reverse weight update. Specific algorithm flow and some derived formulas:

(1) Network initialization

The main task of the network initialization part is to assign values to the connection weights of the input layer, hidden layer, and output layer, determine the neuron threshold values of each layer, and set the number of samples, target error, maximum learning times, and learning rate. Usually, some optimization algorithms also use momentum factors to dynamically adjust the weights to accelerate convergence.

(2) Forward propagation

The input data is transferred layer by layer to the output layer. During the process, the target neuron calculation result y_i of each layer is obtained from the corresponding connection weight value w_{ij} of the pointing target neuron and the input neuron data x_i:

$$y_i = \sum_{i=0}^{n-1} w_{ij} x_i \tag{1}$$

i and j represent the i-th input node and the jth target node. The target neuron calculation result y_i is activated by an activation function θ, which converts the sum of target neuron data from a bounded interval to a real number.

$$s_j = \theta(y_i) = \theta \sum_{i=0}^{n-1} w_{ij} x_i) \tag{2}$$

The forward propagation process is completed after obtaining the output layer results.

(3) Reverse weight update

During the forward transfer process, the input data is influenced by the connection weights of each layer to obtain the output layer results. The error between the output result and the target output is calculated. To ensure the continuous derivability of the function, a square type stop loss function E is used, and the square of the error e_j of all output results y_j and corresponding target output t_j is accumulated:

$$E(e) = \frac{1}{2} \sum_{j=0}^{k} e_j^2 = \frac{1}{2} \sum_{j=0}^{k} (y_j - t_j)^2 \tag{3}$$

The BP neural network algorithm is widely used in higher applied economics majors, promoting the continuous development of adult education in economics majors, and can be used for tasks such as prediction, classification, and optimization in multiple fields, providing strong support and assistance for economic research and practice.

3. Evaluation of Application Experiment Results of Big Data Technology in Higher Applied Economics

3.1 Experimental Design

In today's world, with the rapid development of science and technology, the demand for big data is becoming increasingly urgent. In this era, all industries need to master big data technology to better respond to market demand. This article aims to explore the effectiveness of adult education in legal finance for higher applied economics majors in the era of big data and its impact on students' learning outcomes.

This article would adopt a randomized controlled group experimental design, and randomly divide the subjects into an experimental group and a control group. The experimental group would receive adult education in legal finance based on higher applied economics in the era of big data, while the control group would receive traditional adult education in legal finance in higher applied economics. A total of 100 students majoring in advanced applied economics were randomly selected and divided into two groups, with 50 students in each group. Eight students from each group were selected to conduct data analysis on their test results.

First, participants were randomly divided into an experimental group and a control group to ensure that the basic information such as average age, educational level, and work experience of the two groups of participants were similar.

Experimental component education mainly includes the following links. Learning materials: the experimental group would learn legal and financial textbooks for advanced applied economics majors based on the era of big data, including theoretical knowledge and practical case analysis. Online learning: the experimental group would learn relevant knowledge through online courses, including video explanations, interactive Q&A, and online testing. Practical operation: the experimental group would use big data technology to analyze economic, legal, and financial data through practical operations to improve practical problem-solving capabilities.

The control group would learn traditional legal and financial textbooks for higher applied economics majors, including theoretical knowledge and practical case studies. Offline teaching: the control group would learn relevant knowledge through traditional offline teaching methods. Practical operation: the control group would also pass practical operation, but does not include the application of big data technology.

After the experiment, a comparative analysis of the learning outcomes of the two groups of participants was conducted to explore the effectiveness of adult education in law and finance for higher applied economics majors in the big data era and its impact on the learning outcomes of participants.

For the purpose and method of this experiment, the following indicators can be designed. Theoretical knowledge mastery: online testing is used to assess students' mastery of theoretical knowledge related to adult education in legal finance for higher applied economics majors, and the learning effects of the experimental group and the control group are compared. Improvement of practical ability: through practical operation, students' ability to analyze economic, legal, and financial data is assessed, and the improvement of practical ability in the experimental group and the control group is compared. Learning satisfaction: students' satisfaction with adult education in law and finance for higher applied economics majors is assessed through a questionnaire survey, including the content of teaching materials, learning methods, and ease of practical operation. The learning satisfaction of the experimental group and the control group is compared. Learning costs: through a survey, the learning costs of the experimental group and the control group are compared,

including the price of textbooks, the cost of online and offline learning, and the cost of practical operations.

The above indicators can be scored for statistics, with a total score of 10 points. The differences between the experimental group and the control group are compared to obtain the effectiveness of adult education in legal finance for higher applied economics majors in the era of big data and its impact on students' learning outcomes.

3.2 Evaluation of Theoretical Knowledge Mastery

Theoretical knowledge proficiency refers to the proficiency of students in the content they have learned. In a specific field, theoretical knowledge usually refers to relevant basic concepts, theoretical models, analytical methods, principles, applications, and so on. For students, the mastery of theoretical knowledge is an important indicator of evaluating their learning outcomes. If students can fully understand and master the theoretical knowledge they have learned, they should be able to use this knowledge to analyze and solve related problems, as well as better understand and apply relevant practical skills. The assessment of students' mastery of theoretical knowledge can provide a better understanding of their learning outcomes and results, and provide reference and basis for further improving teaching. Figure 1 shows the scores of theoretical knowledge mastery. Figure 1 (a) shows the experimental group, and Figure 1 (b) shows the control group.
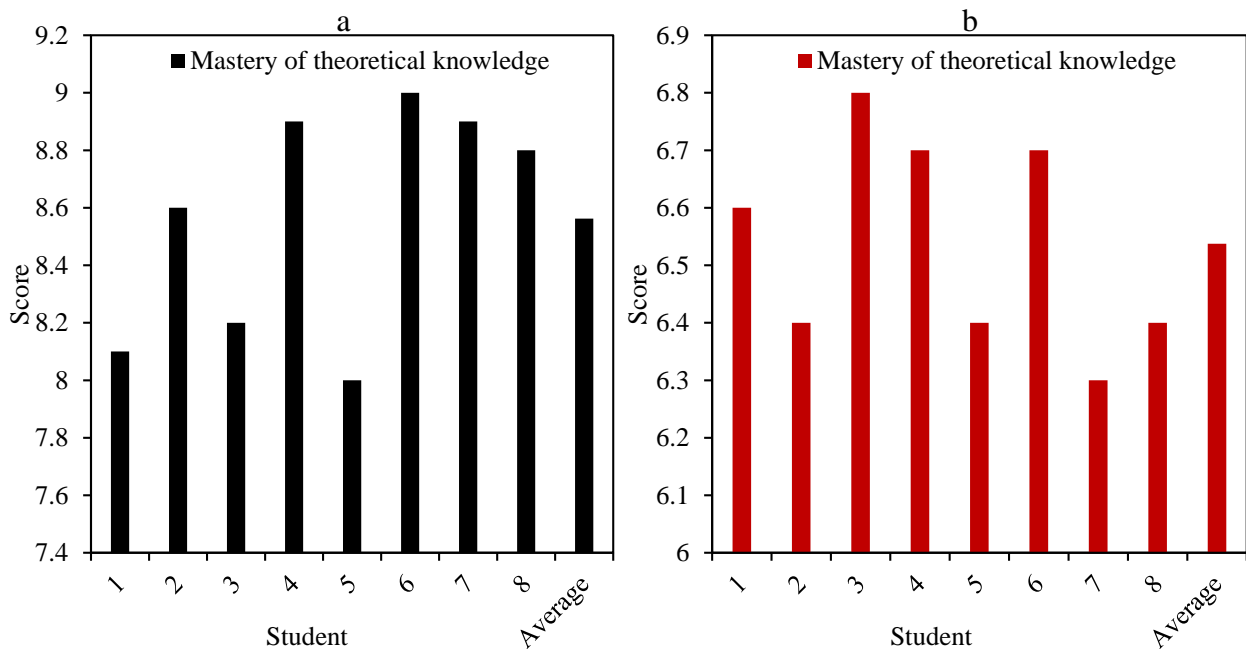

Figure 1: Score of theoretical knowledge mastery

As shown in the figure, the average scores of the experimental group and the control group in terms of mastering theoretical knowledge were 8.6 and 6.5, respectively. This indicated that students had a better grasp of theoretical knowledge in adult education of law and finance based on the era of big data for advanced applied economics majors.

3.3 Evaluation of the Degree of Improvement of Practical Ability

The improvement of practical ability refers to the improvement of students' practical application ability in the course, including the improvement of technical application and practical ability, and

the ability to solve practical problems. The improvement of practical ability is one of the important indicators for measuring students' learning outcomes, as well as evaluating students' learning effectiveness and teaching quality. Figure 2 shows the score of improvement in practical ability. Figure 2 (a) shows the experimental group, and Figure 2 (b) shows the control group.
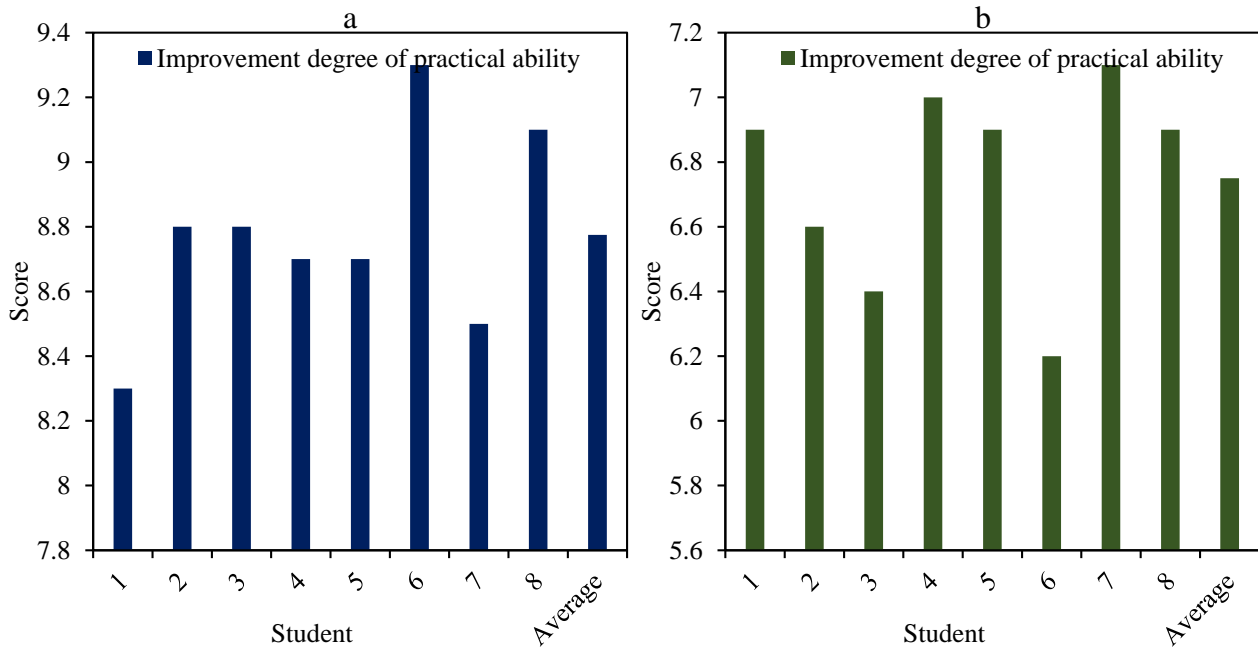

Figure 2: Score of practical ability improvement

As can be seen from the figure, the average score of the experimental group in the improvement of practical ability was 8.8, while the average score of the control group was 6.8. This indicated that the improvement of practical ability of the students in the experimental group was significantly better than that of the control group.

3.4 Evaluation of Learning Satisfaction

Learning satisfaction refers to the degree to which participants are satisfied with the courses they participate in. Learning satisfaction is an important indicator of teaching quality and effectiveness, which can reflect the advantages and disadvantages of teaching content, teaching methods, teaching environment, and other aspects from the perspective of students. The level of learning satisfaction is directly related to the acceptance of the content learned and the improvement of learning effectiveness. Figure 3 shows the scores of learning satisfaction. Figure 3 (a) shows the experimental group, and Figure 3 (b) shows the control group.
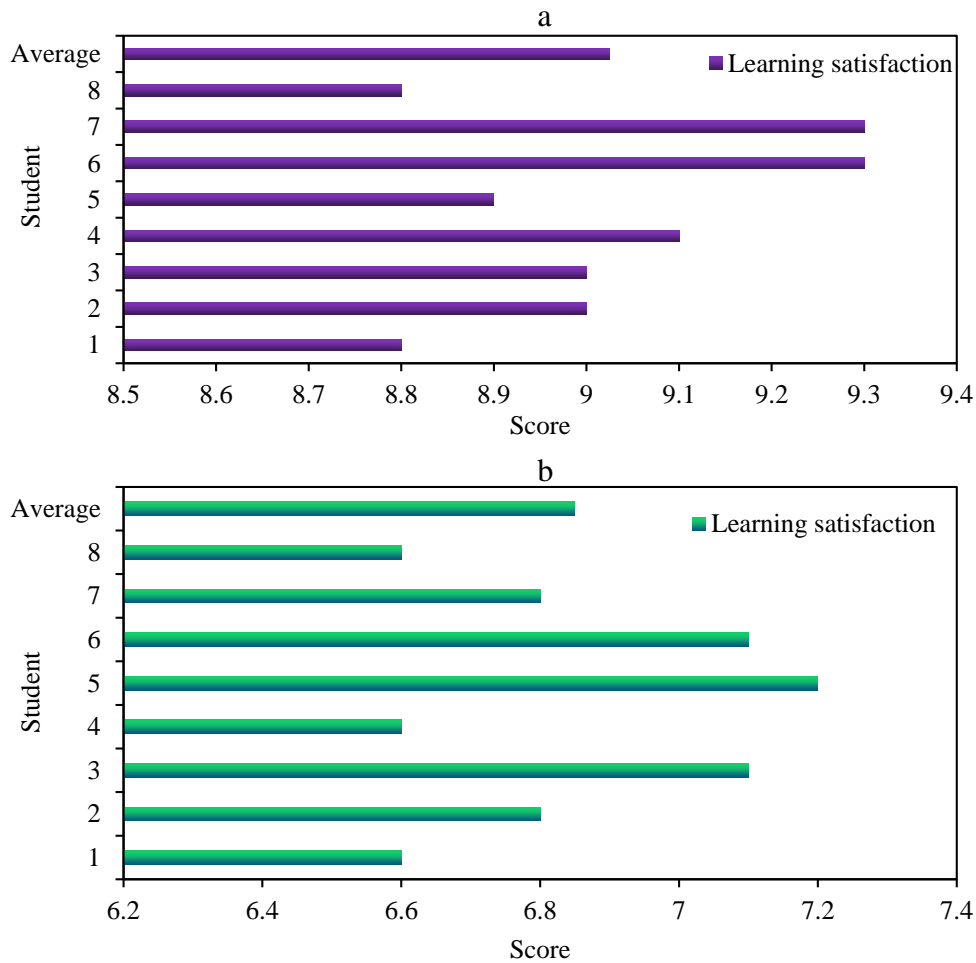
Figure 3: Learning satisfaction score

As can be seen from the figure, the average score of the experimental group in learning satisfaction was 9, while the average score of the control group was 6.9. This indicated that the students in the experimental group were more satisfied with adult education in law and finance based on higher applied economics in the era of big data.

3.5 Learning Cost Evaluation

Learning costs refer to various costs that students need to bear during the learning process, including time costs, money costs, energy costs, and other aspects. The evaluation of learning costs can help students better plan their learning time and resources, reasonably arrange their learning plans, and improve learning efficiency and learning outcomes. At the same time, it can also help teachers better grasp the rhythm and difficulty of teaching, and improve teaching effectiveness and quality. Figure 4 shows the learning cost scores. Figure 4 (a) shows the experimental group, and Figure 4 (b) shows the control group.
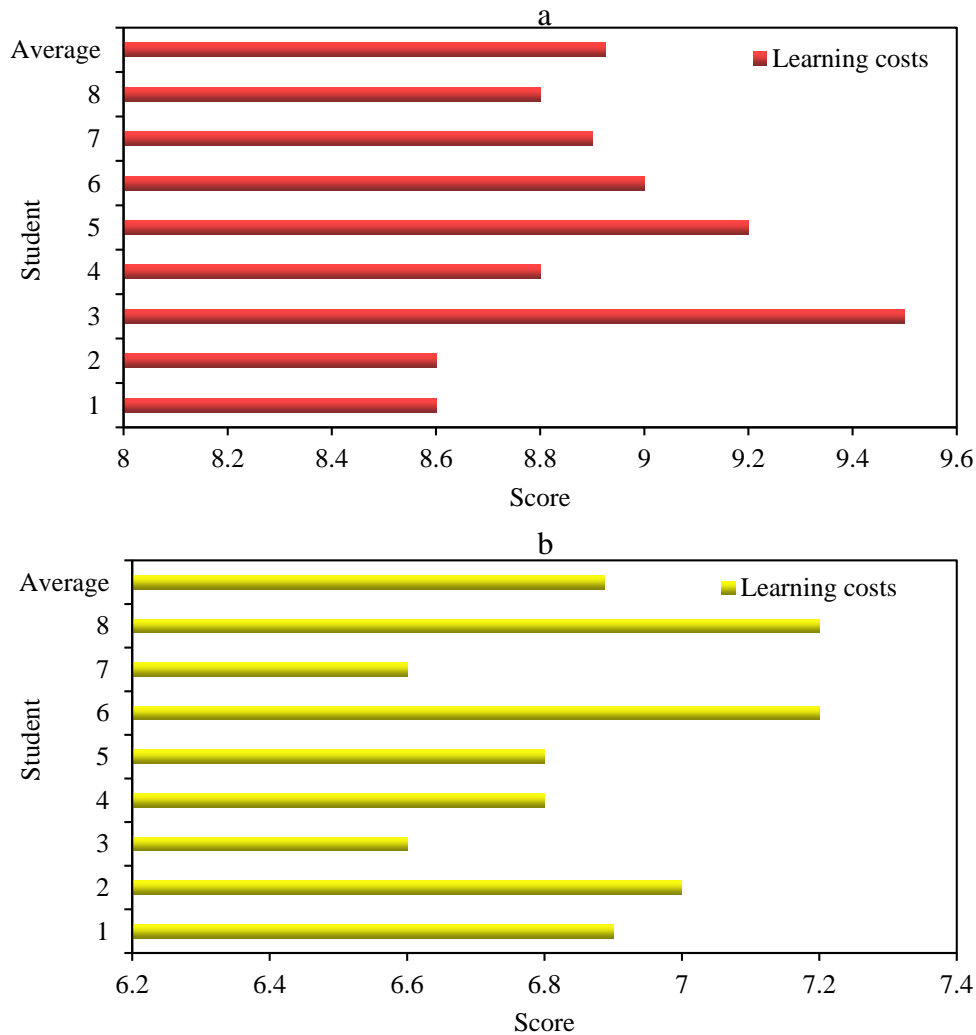
Figure 4: Learning cost scores

As can be seen from the figure, the average score of the experimental group in learning costs was 8.9, while the average score of the control group was 6.9. It showed that the experimental group students' control of student costs was very reasonable.

3.6 Adult Education Based on the Era of Big Data

Adult education can promote professional development through the following aspects:

Strengthening big data analysis capabilities: in fields such as advanced applied economics, law, and finance, the application of big data analysis technology is becoming increasingly widespread. Adult education can improve students' ability to analyze big data by strengthening teaching content and methods, and enable them to have better data analysis capabilities and data driven decision-making capabilities [18-19].

Strengthening the teaching of law and finance: with the constantly changing legal and financial environment, adult education should strengthen the teaching of law and finance to enable students to cope with the increasingly complex legal and financial environment [20].

Promoting interdisciplinary integration: the era of big data requires interdisciplinary integration between various fields. Adult education can promote communication and cooperation in different

fields through various ways, such as offering interdisciplinary courses, organizing special lectures, and improving the comprehensive quality and innovation ability of students.

Strengthening practical teaching: adult education should focus on practical teaching, and improve students' practical abilities and problem-solving abilities through organizing field visits and practical operations.

In short, in the era of big data, the development of adult education in fields such as higher applied economics, law, and finance can provide strong support for professional development and student career development.

4. Conclusions

Through the results of this experiment, it can be concluded that the application of big data technology in higher applied economics majors has significant effects. After mastering big data technology, students' theoretical knowledge and practical application abilities have improved, demonstrating stronger independent thinking and application practical abilities. These conclusions can provide reference for the teaching model of adult education, thereby improving the teaching quality of higher applied economics majors and the practical application ability of students. At the same time, adult education for advanced applied economics and legal finance majors in the era of big data also needs to strengthen the learning and application of big data technology, pay attention to the cultivation of practical and innovative abilities, and reform and innovate educational content and services according to market demand to adapt to the development of the era and market demand.

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