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Challenges and Construction Path of Modern Internet of Things College Education under Algorithm Recommendation

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Abstract: The Internet of Things (IoT) and artificial intelligence(AI) and multimedia technology are hot topics in academia and industry in recent years. As a typical representative of the IoT, AI and multimedia technology, the challenges and construction of modern Internet of Things college education based on algorithm recommendation have attracted the attention of the educational community. With the advent of network technology, it has ushered in the IoT era under algorithm recommendation. The traditional teaching mode and content of college education have lagged behind. How to seize the opportunity and meet the challenge is an important issue facing Chinese universities. IoT has the characteristics of convenience and multimedia, which promotes the reform of university teaching and provides new development opportunities for university teaching. However, the development of IoT in China is relatively late. Although IoT education is quite common, there is a big gap between IoT education and traditional education. Students' understanding of IoT education is relatively low. The construction of education platform is not yet mature. Educational resources are scarce, and the evaluation system is not perfect. Therefore, IoT technology should be fully used to promote the healthy development of schools. This is not only to create a good educational ecological environment, but also to achieve the effectiveness of education. The research showed that students' satisfaction with IoT college education was as high as 98%, and the teaching efficiency was relatively stable at 85%~97%. However, traditional college education was relatively low in all aspects, which could not stimulate students' enthusiasm for learning. IoT style classroom model jumps out of the traditional classroom model and avoids many unnecessary troubles. The research in this paper has important guiding significance for the application of IoT, AI and multimedia technology.

1. Introduction

IoT, AI and multimedia technology are hot topics in the academic world today. As a typical representative of the IoT, AI and multimedia technology, the challenges and construction of modern Internet of Things college education based on algorithm recommendation have attracted the attention of the educational community. With the new trend of social development of IoT's deep integration with various fields, many industries are facing great pressure.

In such an environment, college education must reflect on the reform of educational environment, teaching methods, teacher-student relationship and other aspects and elements, so as to build a new educational concept on the basis of conforming to the essence of education. IoT industry has developed rapidly in recent years, which has brought great impact to various industries. IoT is a complete set of information technology based on the Internet, which enables the objects and objects that cannot communicate to communicate with each other, so as to spread or apply in all aspects of economic and social life. It is no accident that IoT enters the educational world. Its root lies in that education is the dissemination of knowledge and information, while IoT is the transmission and exchange of information. The development direction of both is the same.

However, college education under the new situation of algorithm recommendation should also face up to the opportunities and challenges faced and innovate constantly. At present, the rapid development of information technology and artificial intelligence has had a huge impact on education, making the traditional teaching model have undergone tremendous changes. IoT has promoted the development of teaching with its unique advantages. Education must be based on the Internet. The following models in many aspects have undergone fundamental changes, and the concept of education has also changed. Nowadays, with the rise of IoT in the world's higher education, the emergence of new things, such as admiring lessons, flipped classrooms, open loop teaching, not only changes the traditional teaching model, but also changes the talent training mechanism in colleges.

In recent years, with the rapid development of network technology, the tide of informatization, intelligence and modernization has been rising. Students are affected by the network thought in their study and life, which has a certain impact on the educational model of universities. Through the comparison between modern Internet of Things college education and traditional college education under the algorithm recommendation, the paper finds that the goal of common development can be achieved by organically integrating modern information technology and college education.

2. Related Work

With the rapid development of IoT, "IoT+education" has become an effective means of resource allocation, which can effectively shorten the gap in resource allocation. Simultaneously, high-quality resources can be brought to all parts of the world for better use. IoT is a rapidly developing network carrier. In academia, the application of the IoT has brought a new change. It brings new opportunities and improves the teaching process and the basic structure of educational institutions.

To solve this problem, Gul S discussed the use and application of the IoT in the field of education. In addition, he tried to present the latest research work and challenges of the Internet of Things and its impact on future education [1]. Aiming at the problems of poor teaching effect and high energy consumption of the current traditional IoT teaching platform, a new idea of teaching effect evaluation based on long and short-term memory distance teaching platform has been adopted. First of all, the current IoT education platform under the network environment had been studied, and its current situation had been analyzed. Then, the Long Short Term Memory (LSTM)

model has been constructed to realize teaching evaluation. Finally, Chen Y evaluated the implementation effect of the IoT education platform based on this model. Through the analysis of practical application examples, it was found that the energy consumption accounted for 12.84% of the total energy of the system when this method was used for teaching effect evaluation, which verified the effectiveness of this method [2]. From the perspective of Internet, AI and multimedia technology, the process of knowledge-based production, sales and use was analyzed. The IoT is a network of interconnected objects that can generate new functions in all aspects. Ahmadvand A M aimed to explore the opportunities and challenges faced by the application of the IoT in higher education systems. The concept of interconnecting devices and objects is a new development in the IoT. No matter where, everything can be connected to the Internet and intelligent. The popularization of the IoT makes the educational environment at all levels benefit from it. In the field of higher education, the Internet of Things is widely used. Compared with previous technologies, the biggest difference of the Internet of Things is that its coverage of higher education is limited. By using a variety of IoT devices, education, scientific research and services can be intelligentized [3]. Under the background that the Ministry of Education promotes the construction of university education informatization, the idea of "smart campus" construction is widely applied. However, at present, Chinese universities are still in the primary stage of digital campus and are still facing many problems. The transition from digital campus to Internet of Things campus is a very difficult thing. Li W realized comprehensive statistics and analysis of campus resources through integrated data resources, so as to obtain valuable campus big data. Based on the design principle and purpose of the system, a set of modern university education management system was designed and implemented [4]. It can be seen that IoT college education is no longer limited to simple classroom teaching, nor simply using network video or media to convey meaning. It can also use some new means to convey information.

Now, the content and behavior of education must be reformed to redesign the higher education system, especially the education mode, so that researchers and the educational community can make more efficient use of the Internet of Things. A well planned university campus can be combined with the Internet of Things technology recommended by the algorithm, and the Internet of Things technology based on the algorithm recommendation has many advantages. Abd-Ali R S discussed the Internet of Things and its role in the development of education in a series of previous studies. He analyzed the composition of the AI classroom, the differences between the AI classroom and the traditional classroom, and introduced the application of the AI classroom. Finally, taking accelerating learning, developing and improving teaching processes as an example, he summarized the important role of network technology in universities and teachers and students [5]. Khan S aimed to explore the importance of using the Internet of Things (IoT) in higher education. Because there is no specific and broad traditional definition, several important concepts have been proposed in the scientific literature after careful consideration, which continuously brings revolutionary changes to the educational community on the basis of algorithm recommendation. According to various studies, the current higher education must approve the latest relevant technologies, and must get used to the new way in which multiple carriers are interconnected. In view of the fact that the reform of higher education still needs time, all stakeholders should actively prepare to provide support for the construction and development of modern college education informatization [6]. As the Internet industry pays more attention to the IoT, the IoT education projects are also expanding. Jang Y J aimed to analyze, design, develop and evaluate the problems encountered by students in the basic teaching process of the IoT. At the same time, he also analyzed the needs of students and teachers and proposed corresponding design guidance. On the basis of demand analysis, he proposed the functions of the hardware board, the miniaturization of the board, the modularization of sensor components, the ease of use and scalability of tools. The hardware board was carried out

according to the guiding principles. On this basis, a teaching platform based on IoT technology was proposed and applied to students' basic education of Internet of Things [7].

Therefore, on the basis of mastering relevant professional knowledge and skills, the network application ability should be constantly improved. The latest educational information is mastered. Under the premise of making full use of modern network technology, educational teaching methods must be constantly innovated to improve the quality and continuously export talents to the country.

3. Challenges and Construction of Modern Internet of Things College Education under Algorithm Recommendation

3.1. Challenges Faced by College Education of the Internet of Things

With the rapid development of information technology and network technology, AI and multimedia technology have become important topics for social progress. IoT, AI and multimedia technology complement each other, integrate and upgrade. Its integration in technology, industry, culture and policy is deepening, and it is moving towards comprehensive integration. Looking at the trend of education integration of IoT colleges in the industry in recent years, it can be said that the innovation of related technologies is the basis for the long-term development of colleges. It can be said that the innovation of relevant technologies is the basis for progress. At the time of continuous technological innovation, from the perspective of IoT network, AI and multimedia technology, the "Internet of Things" is still at the exploratory stage. Although many universities are already using the Internet of Things for teaching, there are great differences compared with the "classroom teaching" for a long time. In traditional classroom teaching, teachers and students can communicate face to face, and students' participation is higher. In the "Internet of Things" teaching, the interaction awareness between teachers and teachers is relatively weak, and the acceptance ability is not strong [8].

First, teachers and students are highly required. Different from traditional education methods, the "Internet of Things" does not simply teach online, but transmits more information through more advanced tools. Therefore, teachers should be relatively familiar with all aspects. At the same time, "Internet of Things Education" also requires students to have self-discipline awareness and be willing to accept the teaching method of "Internet of Things", which requires high quality of teachers and students.

Second, the platform construction is not perfect. The "Internet of Things" education can not be separated from the education platform based on the Internet of Things. At present, the representative ones are Baidu Chuanke, Tencent Classroom, Netease, etc. Baidu Chuanke focuses on online education, among which primary and secondary students are the main targets. Tencent Classroom focuses on simulating the real classroom and so on. Most of the university platforms are still in the initial stage. They do not have their own network teaching resources and can not meet the needs of network teaching.

Third, there is a lack of educational resources. At present, the main form of educational resources still stays in the traditional mode. The number of traditional resources is considerable. However, due to the large number of universities in China, different schools are located in different locations, and the required curriculum teaching needs are also different. For a specific major of a university, the adaptive resources required are relatively small, and the academic impact on itself is limited.

Fourth, the evaluation system is not perfect. At present, the application of "Internet of Things Education" in the daily teaching of universities is still rare. One of the main reasons is that the effectiveness evaluation has not formed a system. At present, in the context of the Internet of Things, education pays more attention to the allocation of resources. Its teaching effect is generally

realized through network learning and network testing. However, due to the limitations of the platform's functions and economic benefits, real-time monitoring and testing on the network may not be able to achieve real results, and it is difficult to objectively evaluate both teachers and students. Table 1 shows the differences between traditional classroom and IoT classroom.

Table 1. Differences between traditional classroom and IoT classroom

Classroom mode	Participation	Literacy requirements	Platform maturity	Educational resources	Evaluation system
Traditional classroom	Better	80%	73%	Less	Immature
Internet of Things Classroom	Poor	96%	92%	More	More mature

3.2. Construction Path of College Education Based on IoT

(1) Enrich network carriers

Nowadays, WeChat is used frequently. It has voice, text, video, transfer and other functions. Students have strong dependence and trust on the network. How to take WeChat as a unique carrier of college students' ideological and political education has become an important issue in college students' education. Colleges should strengthen the education consciousness of students by setting up characteristic WeChat official account, characteristic WeChat group and other carriers. The design of the WeChat official account for higher education is an important way for educators to use the Internet for education. First of all, representative short articles are selected. They not take much time to read short articles, and the number of reading increases, which can ensure the number of visits [9]. Secondly, in the layout design, some elements with a strong sense of the times can be added to mobilize and stimulate college students' sense of participation and curiosity. In the new media era, the emergence of WeChat has brought great convenience to people. Many universities have opened their own official account on their WeChat and added some new functions to make the communication between students and teachers more smooth. However, students have many WeChat accounts, which is impossible

Only one account is concerned, so the government and schools should grasp the content expressed in these accounts from a macro perspective, so as to suit the remedy to the case.

(2) Innovative discourse system

Network language is a very easy to understand language, which is closely related to the daily life of college students. The combination of the expressions in daily life with the network expressions they are familiar with can transform the abstract words in textbooks into vivid words, which is more easily understood by students.

(3) Change the teaching mode

In the modern classroom, it is no longer a teacher who is lecturing alone, but both teachers and students are lecturing and talking. Students should not only listen, but also express their thoughts and be good at consulting. Simultaneously, teachers can also adopt students' correct ideas. The classroom becomes a place where teachers and students communicate and learn from each other. Both sides are constantly innovating the discourse system of colleges to improve the teaching mode.

(4) Create a comfortable IoT environment

The university's hardware facilities can not only increase the beauty of the school, but also enhance the students' self-esteem and enthusiasm for learning. At the same time, the humanistic atmosphere of the school cannot be ignored. Healthy campus cultural atmosphere can help college

students resist the temptation and corrosion of bad information.

On the one hand, schools should increase the management of campus network environment. First of all, universities should establish an online supervision alliance composed of government, teachers and students. It is not enough to rely only on the supervision of the regulatory agencies for the rapid and huge network. Therefore, the general public must be firstly mobilized to pay attention to the network and give feedback in a timely manner. Secondly, the school network real name system is implemented. By establishing a strategy for students to query online information and save browsing records, teachers can conduct targeted education when they find students browsing bad information at the first time, so as to prevent them from creeping in [10]. Finally, according to the law to create a positive and healthy campus network environment, the review of network content has been strengthened to provide legal protection for creating a good network environment.

On the other hand, it needs to innovate campus network culture. First of all, a group of attractive and capable campus culture teams should be chose. In addition to the network technical team, the online cultural team can also be formed by organizing the Party committee publicity, student work, the Party League, the student union, student associations, etc. Secondly, the online activities of colleges and universities have been reformed. The work for college students should change the old teaching methods, innovate the teaching forms and ideas, and integrate them into the new teaching content [11]. Figure 1 shows a fusion overview of the build path.

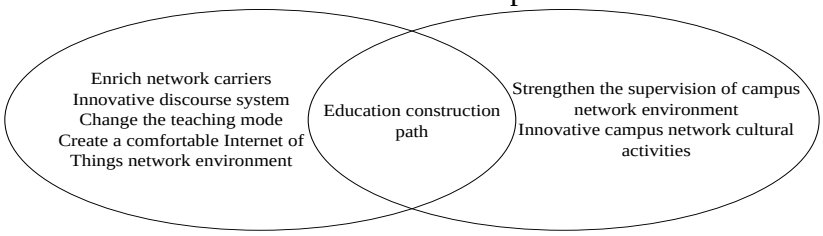


Figure 1. Integration summary of construction path

3.3. Impact of IoT Era on College Education

Marx once said: "The use of mechanical tools, especially the application of scientific principles, is the driving force for progress." Therefore, how to use IoT new media platform is of great practical significance for college education.

(1) Diversified information resources make the form of education more colorful. Under the traditional university education mode, teachers mainly use textbooks to convey knowledge to students in the traditional way of teaching. The classroom atmosphere is dull, and it is difficult to mobilize the enthusiasm of students. Information technology provides a new education mode based on network for college education. Various IoT resources make education more diversified. For teachers, through proper screening of a large number of materials, they are transformed into teaching content and presented to students in diversified forms, making them from abstract to image, from boring to vivid. It enhances the appeal and appeal of education and stimulates students' interest in learning. At the same time, online learning resources can be fully used to build online courses and learning websites, and implement online teaching, so as to form a complementary relationship between teachers and students' independent learning. It allows students to actively learn at any time and anywhere, thus enriching the form of university teaching [12].

(2) Timely access to information and constantly optimize teaching efficiency. With the advent of the IoT era, the information content on the Internet is increasingly rich and updated rapidly, especially the latest trends in education. After obtaining the latest educational information, teachers can timely adjust the structure of educational knowledge and enrich the teaching content to improve students' interest in learning, so as to create a good classroom atmosphere. By understanding and

mastering the latest educational information, it not only broaden the knowledge field, but also deepen the understanding of the course content [13].

(3) Information interaction promotes teacher-student interaction. It provides opportunities for better communication between teachers and students. Simultaneously, teachers can encourage students to express their opinions about cases online. Teachers can also "track" questionnaires to understand their ideas and questions, and carry out targeted teaching. In this way, the status of the educated is reduced, which stimulates their enthusiasm for learning life, improves their interest in learning, which makes their classroom teaching more effective [14].

3.4. Modern IoT College Education Experiment Design under Algorithm Recommendation

With the popularity of IoT technology, recommendation algorithms are widely used in daily life and learning. At present, IoT architecture is becoming more and more complex. In view of the current situation of overload of college education resources, a personalized algorithm recommendation system is proposed. It can provide personalized services for students according to their preferences. Because the traditional recommendation methods cannot achieve a good recommendation effect, this paper proposes a method that combines user feature tags with collaborative filtering to improve the accuracy of the algorithm recommendation system [15].

(1) It is assumed that the process of collaborative filtering recommendation algorithm is as follows: ① Based on students' score information, the score matrix is constructed. ② By calculating the similarity between the target user and other users, the closest user is determined as the target user. ③ The target users who have not scored are evaluated. The N items with the highest prediction scores are recommended to target users.

Calculation of user similarity: By using Euclidean distance, the fraction is transformed into a vector to obtain n-dimensional fraction vectors x_i and y_i. Then the distance between two vectors is calculated by Euclid formula. The shorter the distance, the higher the similarity. Among these formulas, Euclid's formula is:

$$\mathrm{Dist}\ (X,Y)\ = \sqrt{\sum_{i=1}^{n}(x_i - y_i)^2} \tag{1}$$

Cosine similarity: In n-dimensional object space, the score vectors of user i and user j are expressed as i and j respectively. The angle cosine between user vectors is calculated by using the cosine formula. The larger the value, the closer the user is. The cosine formula is:

$$\mathrm{Sim}\ (i,\ j)\ = \cos\ (i,j)\ = {}^{ij}\!/_{\|i\|\|j\|} \tag{2}$$

Correlation similarity: $N_{i,j}$ is used to express the common score of user i and user j. $R_{i,g}$ represents the user i's assessment of the teacher g. $R_{j,g}$ represents the user j's assessment of the teacher g. $\bar{R}_i$ and $\bar{R}_j$ represent the average scores of users i and j, respectively. Pearson correlation coefficient method is used for correlation analysis, and the correlation coefficient increases with the increase of absolute value. Pearson's correlation is:

$$\mathrm{Sim}\ (i,j) = \frac{\sum_{g\in N_{i,j}}(R_{i,g}-\bar{R}_i)(R_{j,g}-\bar{R}_j)}{\sqrt{\sum_{g\in N_{i,j}}(R_{i,g}-\bar{R}_i)^2}\sqrt{\sum_{g\in N_{i,j}}(R_{j,g}-\bar{R}_j)^2}} \tag{3}$$

Suggested teaching method: $P_{tu,h}$ represents the expected score of the target user tu for

the non scored method h. $sim(tu,nu)$ refers to the similarity between the target user and neighboring users. $\overline{R_{tu}}$ and $\overline{R_{nu}}$ represent the average scores of target user tu and adjacent user nu, respectively. $R_{nu,h}$ represents the score of adjacent user nu on method h. N_{tu} represents the adjacent user of the user tu. Its expected score is:

$$P_{tu,h} = \overline{R_{tu}} + \sum_{nu \in N_{tu}} sim(tu,nu)(R_{nu,h} - \overline{R_{nu}}) \Big/ \sum_{nu \in N_{tu}} |sim(tu,nu)| \quad (4)$$

Problems of collaborative filtering recommendation algorithm: The quality of recommendation algorithm directly affects the quality of recommendation. Although collaborative filtering recommendation algorithm has its own advantages, it also has its limitations, such as incorrect and effective recommendation of new users at the initial stage, data scarcity in the algorithm, etc. Thus, this paper proposes a personalized recommendation algorithm that combines user characteristics with collaborative filtering.

(2) Personalized recommendation algorithm based on user characteristics and collaborative filtering

Generally speaking, before students register their accounts, the website has filled in the user basic information. However, when calculating the initial information similarity of students, such information is meaningless. Therefore, this paper calculates the similarity of the initial information by using the four characteristics of the students' gender, age, personality and address. The above four user characteristics are fused, and a, b, c, d are used to represent the proportion of each weight factor. The similarity formula is obtained:

$$Sim_f = a(a,b) + b(a,b) + c(a,b) + d(a,b) \quad (5)$$

Here, a+b+c+d=1.

In the traditional formula for computing the similarity of collaborative filtering, a formula integrating the similarity of students' characteristics is introduced, as follows:

$$Sim(i,j) = \frac{\sum_{g \in N_{i,j}} (R_{i,g} - \bar{R}_i)(R_{j,g} - \bar{R}_j) Sim_f(i,j)}{\sqrt{\sum_{g \in N_{i,j}} (R_{i,g} - \bar{R}_i)^2 Sim_f(i,j)} \sqrt{\sum_{g \in N_{i,j}} (R_{j,g} - \bar{R}_j)^2 Sim_f(i,j)}} \quad (6)$$

In the traditional algorithm recommendation, the accuracy of the recommendation results has a certain impact due to the scarcity of data, single resources and other problems. The experimental results show that the algorithm can effectively improve the recommendation quality of collaborative filtering. This experiment has provided useful reference for the future development of IoT, AI and multimedia technology. Figure 2 shows the average accuracy comparison between the traditional recommendation algorithm and the algorithm recommended in this article.

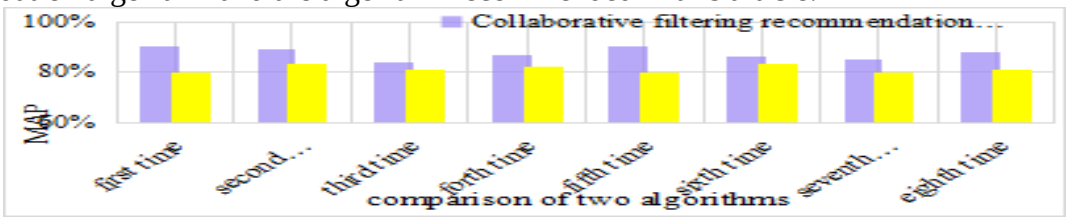
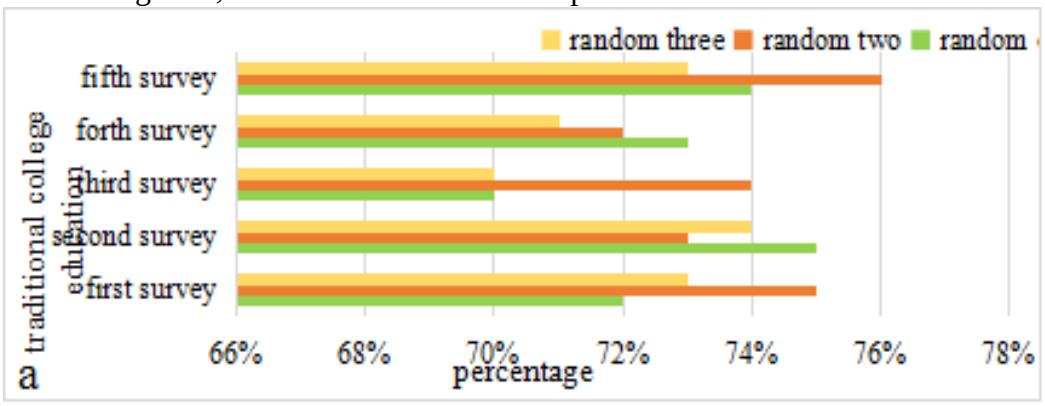


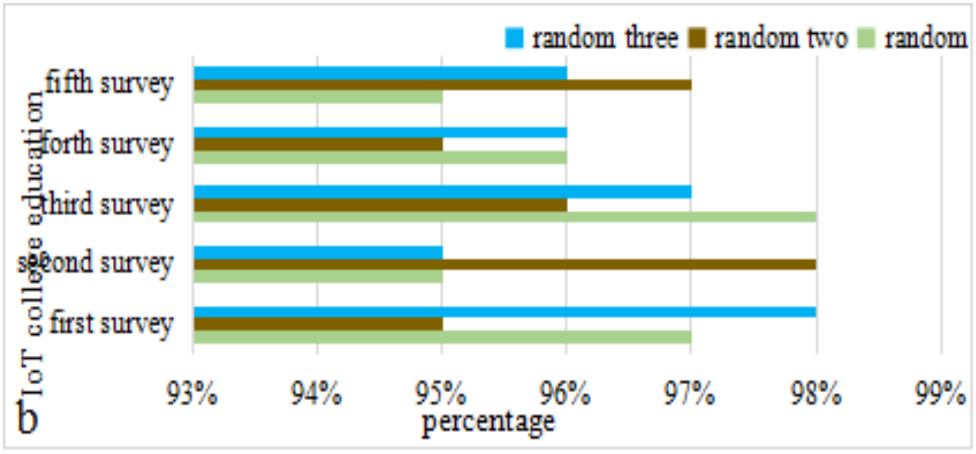
Figure 2. Comparison between traditional recommendation algorithm and collaborative filtering recommendation algorithm

4. Comparison Between IoT College Education and Traditional College Education

Generally speaking, IoT platform presents a different world to college students. This place, called the "New World", is full of mystery and color, which makes people dizzy. The diversity and rapid updating speed of information resources pose challenges to university teaching. IoT college education is superior to traditional college education in many places. At the same time, in the IoT era, everyone can be an organizer or a publisher. There are significant differences between the two in teaching efficiency, teaching resources, classroom interest, student satisfaction and teaching mode. As shown in Figure 3, student satisfaction is compared.



3a. Student satisfaction of traditional college education



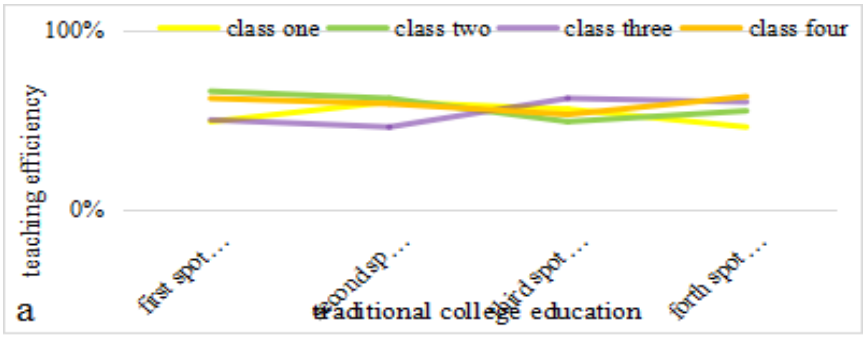
3b. IoT student satisfaction in higher education

Figure 3. Comparison of student satisfaction

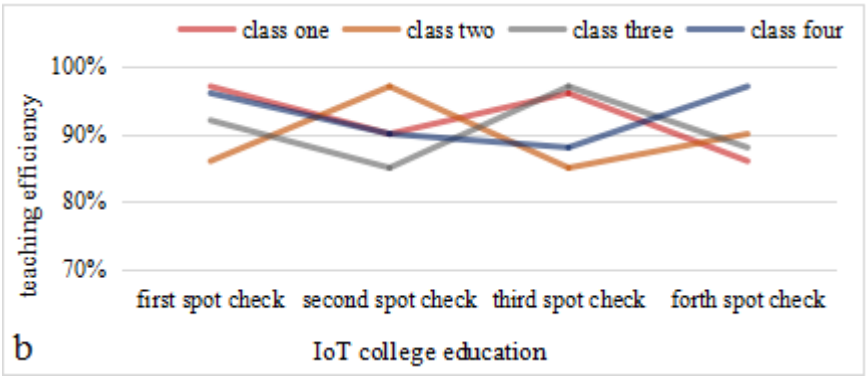
According to the student satisfaction in Figure 3, the student satisfaction of traditional college education in Figure 3a basically hovers between 70% and 76%. It can be seen that college education under the traditional mode can hardly sate the requirements of students, and it is difficult to adapt to the needs of college education development. The student satisfaction of IoT college education in Figure 3b is as high as 98%. In the era of rapid development of science and technology, it can better meet the needs of universities and has broad prospects. Figure 4 shows the comparison of teaching efficiency.

From Figure 4a, the highest teaching efficiency of traditional college education is only 66%, which can be said to have been stagnant. The students' absorption rate of knowledge is inevitably at a low level. In Figure 4b, the teaching efficiency of IoT college education is relatively stable at

85%~97%. No matter from any aspect, there has been a qualitative leap before comparison. Figure 5 shows the comparison of classroom interest.

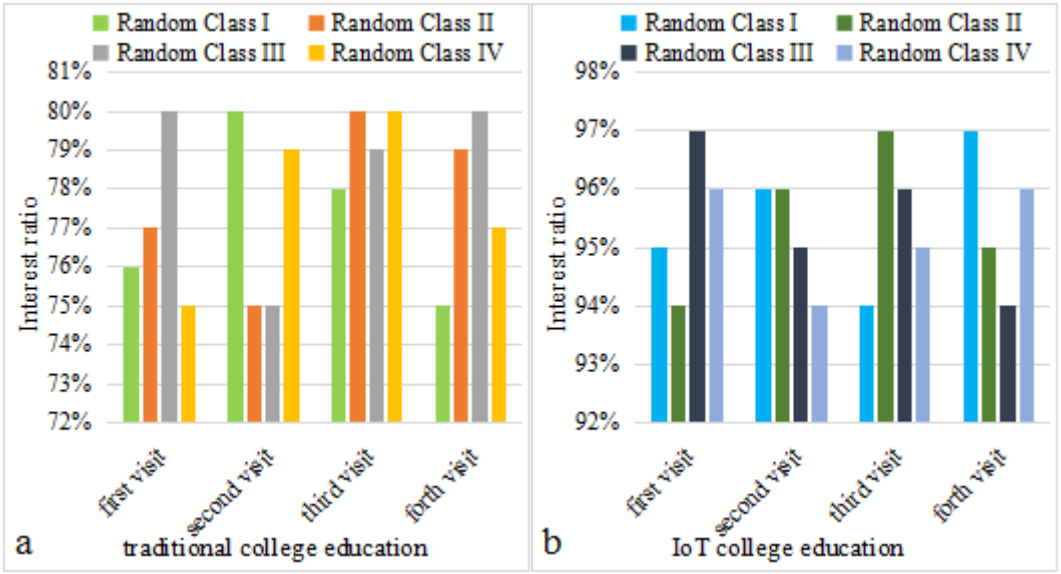


4a. Teaching efficiency of traditional college education



4b. Teaching efficiency of IoT college education

Figure 4. Comparison of teaching efficiency



5a. Traditional college education classroom interesting

5b. IoT college education classroom interestingness

Figure 5. Comparison of classroom interest

From Figure 5a, the traditional college education classroom is relatively low in interest, unable to arouse students' enthusiasm for learning, and the learning atmosphere is poor. In Figure 5b, IoT college education classes are as interesting as 97%, and students' enthusiasm for learning, learning efficiency and other aspects have been improved. IoT style classroom model has jumped out of the traditional classroom model. It makes full use of the convenience and autonomy of IoT education, which avoids many unnecessary troubles.

5. Conclusion

The IoT and AI and multimedia technology are hot topics in academia and industry in recent years. As a typical representative of the IoT, AI and multimedia technology, the challenges and construction of modern Internet of Things college education based on algorithm recommendation have attracted the attention of the educational community. With the wide application of IoT, it has brought new vitality to college education. College education should rely on the idea of IoT to make full use of this platform and fundamentally accept full support from the policy. The future education must be a new type of education based on IoT. It is bound to make education more open, more appropriate, more humane, more equitable and more lasting. In the IoT era, IoT teaching mode has effectively improved the quality of teaching to adapt to the development needs of colleges, and promote the common progress of students. The research in this paper has important guiding significance for the application of IoT, AI and multimedia technology.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

Reference

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