Teaching Effect Evaluation of BTEC Mode Based on Big Data Analysis

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ABSTRACT

In order to realize the accuracy and reliability of tearning effect evaluation, we have built a big data platform, which uses the PHP API of Elasticsearch to realize data storage operation and data aggregation analysis. The operation of Elasticsearch is based on RESTful Web interface, and the visual analysis effect is built by using Larvel5 framework. The data format submitted and returned by the interface is JSON. Based on the visual analysis technology of the platform, the teaching process of BTEC Teaching mode is analyzed from two aspects: the whole process data and the sampling data of individual homework. Based on this platform, a course homework inspection system based on sampling technology is designed. Through the data analysis of "comprehensive" + "spot check", the whole process control of teaching quality is realized. Teaching experiments show that the platform can visually analyze the different target values set in each stage of the whole process of the classroom, and carry out random homework sampling and analysis. On this platform, the learning effect of BTEC Teaching mode is analyzed to provide an effective basis for scientific decision-making and improving the effect of curriculum teaching reform.

Keywords: *Tearning effect evaluation; Big data analysis Elasticsearch; Course homework inspection system; BTEC Teaching Mode; Big data analysis*

1. INTRODUCTION

BTEC (Business & Technology Education Council) is the abbreviation of the business and Technology Education Council. It is a famous examination and certification body in the UK. It focuses on transforming the job responsibility requirements of enterprises into corresponding knowledge and ability, integrating the professional job ability into non-general professional ability achievements, and then specifying the curriculum outline and constructing the curriculum content [1-2]. BTEC's training goal is vocational talents, which coincides with the concept of cultivating high-quality technical and skilled talents in China's vocational education. However, BTEC pays more attention to the "guidance" of teachers and the "learning" of students in the teaching process. Teachers should fully develop the role of management, guidance, service and organization [3-5].

Considering the interests and hobbies of students in the Internet era, if students' "learning" can be driven through the teaching implementation of teaching cloud platform, students' autonomous learning can be realized in a real sense, which is conducive to students' mastery of knowledge and skills [6]. Teaching cloud platform teaching implementation is an open, democratic and efficient universal learning mode that uses smart service platforms (smart campus app, smart teaching software, etc.), smart phones, computers and other equipment to customize personalization, intelligence and adaptation for students. It runs through before, during and after class, which will help to promote students' autonomous learning behavior and improve students' learning effect.

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2. DATA PLATFORM CONSTRUCTION AND PROJECT-BASED LEARNING STRUCTURE UNDER BTEC MODE

In order to better collect teaching process data, we use elasticsearch as the data storage server and data analysis engine to design and implement a big data analysis platform, which is used to collect related data for students' learning effect before, during and after class, as shown in Fig. 1.

With the goal of cultivating students' post skills, breaking the traditional disciplinary knowledge points, taking the ability training of a specific post as the main line and the post ability requirements as the skill points, the discipline knowledge of manufacturing specialty is fragmented, broken up and reorganized into multiple modules, such as humanistic quality module, mechanical manufacturing module, electrical and control module, hydraulic and pneumatic module, intelligent manufacturing unit module, etc. Taking the intelligent manufacturing unit module as an example, the secondary project can be divided into "quantitative loading" project and "automatic filling unit" project. Further subdivided, the project can be subdivided into three-level knowledge points, including five courses on professional ability and two courses on business, safety and environmental protection. The teaching effect index focuses on the "teaching activity" itself to explore teachers' teaching design and teaching practice ability.

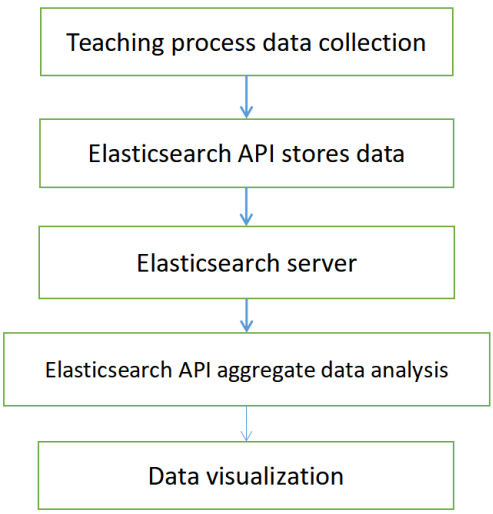

Fig. 1 Overall framework of teaching data analysis platform

3. TEACHING METHOD REFORM OF BTEC MODE BASED ON BIG DADA PLATFORM

BTEC Teaching mode is student-centered, teachers focus on "guidance", give full play to students' subjective initiative, and drive the learning process with project-based tasks. According to the complexity of the project, each knowledge point involved in the project is guided by different teachers. The project teaching team is generally composed of 2-4 teachers. According to this design, the teaching scenario of teaching cloud platform is introduced in the teaching process. Taking the "fixed loading" project as an example, teachers can first release the project task requirements through the "class" end of the teaching cloud platform, and students can form a learning group of 3-4 people according to the requirements to obtain project materials and project information; Then, carry out group discussion and formulate the project implementation plan. During the formulation process, you can ask teachers to assist and participate in the discussion; After the implementation scheme is determined, the role will be assigned. According to the task requirements, each student in the group plays a role, such as mechanical design engineer, and receives his own task; Other students may take over the task of electrical design engineer; The next step is task implementation. At this time, students can carry out data query and scheme design with the help of computers, mobile phones and other Internet tools. After the final task is completed, each group can publish their answers to the intelligent learning cloud platform for all students to consult. At the same time, it is also a process of mutual evaluation. In this process, students from different groups can leave messages on the web page to discuss and share their solutions with each other. After full discussion, each group will make the final modification and improvement of its own scheme and enter the defense link. In the process of defense, the group will deliver a speech, and other group members will ask questions; The last part is the evaluation link, including self-evaluation within the group, mutual evaluation between groups and teacher team evaluation. According to the tripartite evaluation, the grade of the task completed by the group is obtained. The BTEC mode framework is shown in Fig. 2.

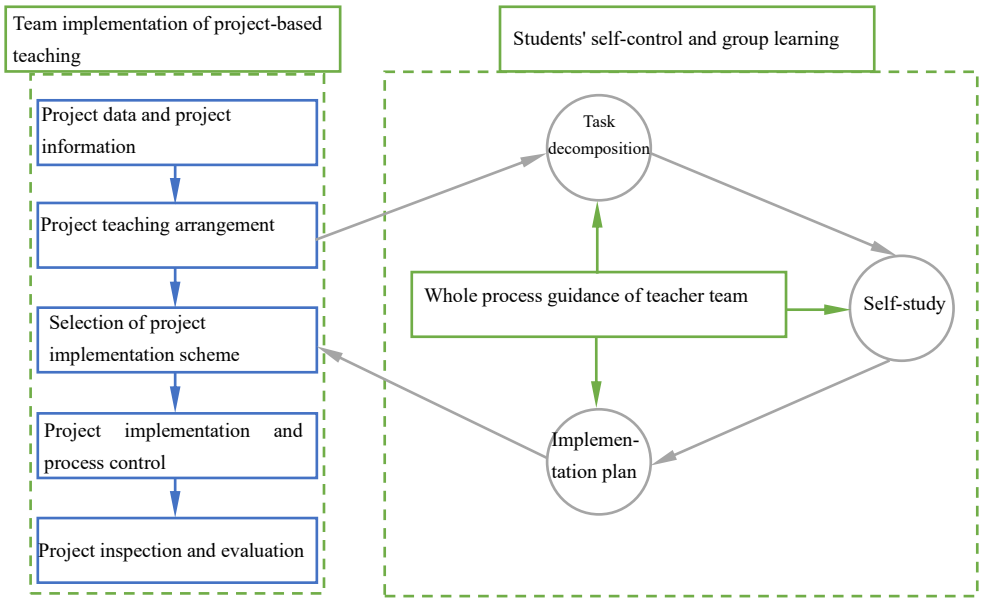

Fig. 2 Teaching mode reform of BTEC teaching mode

In order to truly obtain the students' learning effect data, based on the big data platform, we designed multiple data collection objectives, including pre class self-study, resource acquisition, group tasks, light live /discussion, testing, etc., to comprehensively judge the students' learning participation at different levels. The evaluation of students' learning effect is also carried out from many aspects, which takes the learning experience value as the quantitative embodiment, including: the average experience value of the whole class at a certain stage, the experience value of excellent students and the experience value of the examination object, and evaluates students' learning from both macro and specific aspects. At the same time, the platform has also developed a part for students' teaching evaluation. Students can analyze the evaluation grade and students' satisfaction from multiple dimensions of teachers, majors and departments, and visualize it in the form of charts, so as to provide a reliable basis for the reconstruction of BTEC model and the revision of curriculum system. The design of platform analysis index is shown in Fig. 3.

POST evaluations/doc

{
"Week": "The second semester of 2020-2021",
"Department": "Intelligent Manufacturing",
"Major": "industrial robot",
"course": "Delivery of Engineering Processes Safely as a Team",
"teacher": "Doctor Lin",
"grade": "excellent" ,
"score": 90,
"reason" : ""
}

Fig. 3 Create a RESTful interface

Taking Caitlin as an example, her learning from January to June 2021 can be comprehensively judged through the visualization of the experience value table, as shown in Fig. 4. This can be called vertical self-evaluation. Similarly, for better evaluation, you can also obtain the horizontal comparison data between Caitlin and other students, as shown in Fig. 5.

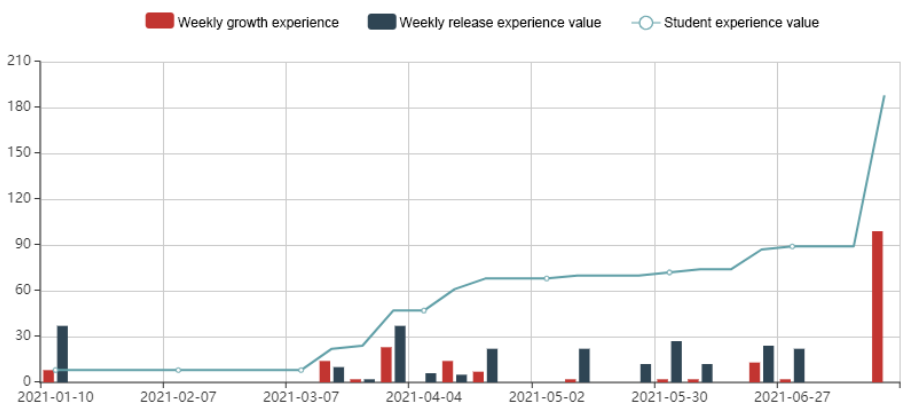

Fig. 4 Caitlin's experience points report

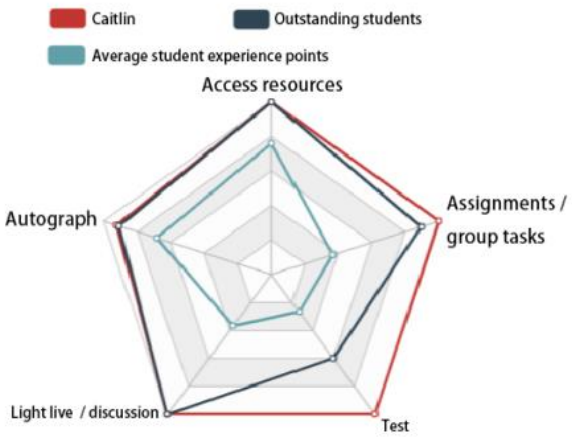

Fig. 5 Comparison of experience values of students at different level

4. DATA COLLECTION AND ANALYSIS IN THE WHOLE PROCESS OF THE COURSE

4.1. Outstanding effect of pre class Preview

Push resources and guide students to preview independently. The teacher team will release the prepared preview resources to students through the teaching cloud platform and information technology platform. The resources released are in various forms, including micro videos, selected online courses, courseware, links, preview questions, etc. students can choose to study independently. The pre class preview of the teaching cloud platform is controllable. Whether students preview, preview and answer will be presented intuitively in the form of data on the teacher side. Teachers can understand students' Preview in real time through relevant software platforms. At the same time, students can express their opinions on the preview materials shared by teachers or recommend materials they think are better to everyone. They can communicate with teachers on the learning platform and raise questions or opinions. Teachers adjust the teaching content according to students' feedback, design the teaching content and teaching implementation plan, and make full preparations for classroom teaching.

4.2. The efficiency of interactive learning in class has been significantly improved

The key of teaching cloud platform teaching lies in the three-dimensional interactive process of classroom, in which the key data of teachers and students in teaching activities are collected. It not only makes use of the characteristics of information technology to stimulate students' interest in learning, but also makes good use of platform data for real-time evaluation of teaching effect, so as to provide data support for improving teaching methods and teaching means. In the classroom, teachers can realize real-time interaction by opening the "bullet screen". Students can publish their views or opinions on the screen through the "bullet screen" to share and discuss with others, so as to promote the interaction between teachers and students and students. The classroom atmosphere is active, and students' learning interest and efficiency are significantly improved. Taking the learning robot programming of 32 students in a class as an example, this paper analyzes the data from three aspects: the online test data of the course, the total number of messages in each link of teaching implementation and the data of student participation. Among them, the online test data of the course is mainly to test the learning effect of students, including the pre class preview effect, in class learning effect and after-school review effect; The information data in the process of teaching implementation mainly include teachers' questions, students' replies, teacher-student interaction, interaction between students and students, as well as other forms of interaction, such as interactive communication of rush answers, brainstorming and other activities; The data of student participation mainly includes: check-in and discussion in class, pre class test, post class test, group summary, questionnaire survey, pre class arrangement, post class arrangement, etc.

It can be seen that the data recorded by the data platform is very comprehensive, covering teaching design, teaching interaction, teaching effect test and other aspects. From the data analysis, we can see that the student participation has increased significantly, up to 95.8%. Especially in the group discussion, teachers and students exchanged replies, and all students participated in the discussion. The total number of messages reached 132, and more than 400 people praised each other.

4.3. High degree of achievement of learning objectives

Still taking this class as an example, it can be seen from the data statistics in Figure 3 that the number of students with more than 80 points in the learning assessment of knowledge points accounts for more than 95%. Compared with the platform test data before and

after the task, the student performance has been greatly improved and the value-added effect is obvious. 91.7% of the students have mastered the key knowledge points such as industrial robot programming instructions, and the knowledge goal is highly achieved.

5. INSPECTION SYSTEM OF HOMEWORK

In the whole process of classroom teaching, data collection and analysis can only test students' teaching response in class, while students' actual learning effect needs to be reflected through after-school homework. In order to reduce the students' sensitivity in the course design, we design a kind of software to answer the practical questions in a systematic way. The specific approach is to provide sensitive questions to students for choice through positive and negative options.

Option A: I mainly refer to the work of other students in this assignment.

Option B: I finished this assignment independently.

Option C:.....

The answer to both questions is "yes" or "no". Let the respondents randomly select a question and answer it according to their real situation. Also, set the anonymous answer option. In order to control the randomness of question selection, the random sampling function of questions is designed. After each student clicks the button, the questions selected are random. Click once and the system extracts a question. In this way, the respondents' concerns about the sensitivity of the question are eliminated, so as to expect a true answer.

Through this functional design of the software, the estimator of probability π_A answered "yes" (equivalent to "no" in question b) in question A: "I mainly refer to other students in this assignment" is:

$$\pi_A = \frac{\frac{n_1}{n} + p - 1}{2p - 1} \quad (1)$$

In formula (1), p is the probability that the respondent (the classmate operating on the computer or mobile phone) will draw question A, and the value is different according to different situations; n is the number of respondents' answers; n1 is the number who answers "yes".

In the result of a random inspection of homework, the probability of answering "yes" to question A can be seen from the systematic analysis that nearly 30% of students admit to completely copying homework, nearly 58% of students say they have referred to others' homework, and only a few students (about 12%) complete it independently. In other words, the results show that the characteristics of students' course homework behavior can be summarized as "it is easy to copy people's homework and difficult to complete homework independently". According to this characteristic of homework behavior, teachers can master the actual homework situation of students, so as to adjust the implementation plan of curriculum teaching.

6. CONCLUSION

Data analysis based on big data technology: firstly, it provides the whole process of classroom teaching data, and the analysis results can be used for teachers to understand the teaching response of students in classroom teaching. At the same time, the application of modern information technology to stimulate students' interest in learning, from "want me to learn" to "I want to learn"; Secondly, it can realize the function of after-school homework inspection on the platform, and help teachers obtain real data results through the application of spot check technology and the design of random answer technology. Thus, with the help of big data technology, through the whole process data of the classroom and after-school homework data, teachers can accurately judge the real teaching effect under the BTEC mode, and carry out reform from each stage before, during and after class to optimize the educational effect.

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