Shuai Liu
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Alberto Bucciero (Eds.)

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Shanghai, China, April 5–7, 2018
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Preface

We are delighted to introduce in this volume the proceedings of the fourth edition of the EAI International Conference on e-Learning, e-Education and Online Training (eLEOT 2018) held in the dynamic, multifaceted city of Shanghai, PR China.

The main purpose of this conference is to offer a fruitful occasion for discussion, dissemination, promotion, and cooperation in the core topics of e-Learning, e-Education, and online training among the international scientific community. Therefore, our core mission is to address the most recent and innovative trends in this broad area, ranging from distance education to collaborative learning, from interactive learning environments to the modelling of STEM (science, technology, mathematics, engineering) curricula.

The program of this year's edition of eLEOT was especially interesting, as it covered the advancements in the ICT sector, the most effective educational paradigms, the most prominent learning strategies, and several other related topics, which were brought to the attention of our community by engaged authors who sent their contributions from all around the world.

This year, we received 120 submissions from seven countries. At least two Technical Program Committee (TPC) members were assigned for each submitted paper during the rigorous, peer-review phase. At the end of the reviewing process, 74 papers (acceptance rate: 61%) were accepted as they met the requirements of scientific quality, novelty, and relevance set by the conference.

The coordination with the Steering Committee chairs, Prof. Imrich Chlamtac and Prof. Giovanni Vincenti, proved to be key to the success of this event, as well as the precious contribution of the general chair, Prof. Shuai Liu, the general co-chair, Prof. Matt Glowatz, and the local chair, Prof. Honghao Gao. We also wish to thank the publications chair, Prof. Marco Zappatore, the TPC chairs, Prof. Bing Jia and Prof. Alberto Bucciero, and all the other conference chairs for their valuable support during all the phases leading to the hosting of this conference. Special thanks also to our EAI conference manager, Dr. Katarína Antalová, and to our EAI proceedings editor, Dr. Eliška Vlcková, for their constant dedication and help during all these months.

We would also like to thank the City of Shanghai for hosting the conference and all the authors who attended the event for their participation.

We hope that the readers find several interesting research themes and insights into the topics in this volume and that they are encouraged to participate in the future editions of eLEOT!

May 2018

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Matt Glowatz
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Discussion on Training Students' Ability to Solve Complex Engineering Problems from the Perspective of Professional Certification

Lina Yu, Haizheng Gao, Fang Hou, Zhengping Hu, Zhaohui Li, and Yingwei Li(✉)

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Abstract. China formally joined the "Washington Accord" and China's engineering education ushered in new opportunities and challenges. In order to meet the requirement of "the ability to solve complex engineering problems", we take the profound teaching reform and the actual project as the background and take the engineering technology as the main line. We should continue to enhance the students' practical ability. The development of new professional certification standard can improve the level of engineering education at institutions of higher learning and enhance the international recognition and competitiveness of graduates. In professional accreditation, we should pay attention to the cultivation of students' abilities to solve complex engineering problems, that is, students are required to transform from learning book knowledge to solve practical problems, which is in line with the idea of Outcome-Based Education.

Keywords: Complex engineering problems · Professional certification Engineering education · Practical ability

1 Introduction

"Engineering education certification work guide" issued by China Engineering Education Professional Certification Association: The teaching process of undergraduate engineering education needs to be oriented to "complex engineering problems". Under the new situation in which the demand for innovative talents and advanced engineering technicians in the country has risen sharply, the Ministry of Education has carried out many engineering education reforms in practice, such as the excellent engineer education and training program, the construction of CDIO [1]. How to cultivate students' ability to solve complex engineering problems has become an important issue in engineering education.

From the perspective of setting up teaching links in undergraduate course teaching, project-based practical teaching and practical activities are highly significant links [2]. It is a comprehensive link for the professionals to achieve the goal of personal training. It is a comprehensive innovative practice and a professional certification for graduation

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required the degree of achievement, which has a strong supportive role in the course. With the goal of R&D, design, experiment and production, students should learn and solve engineering problems in an active, which can enhance their knowledge of the project, cultivate students' basic knowledge of engineering, personal skills, interpersonal skills and teamwork Engineering System Capabilities to further enhance students' ability to solve complex problems. This article focuses on the analysis of the specific connotation of complex engineering problems and puts forward some plans to train students to solve complex engineering problems, with a view to gradually improve undergraduate practical ability [3].

2 Constructing a Scientific Practice Teaching System

The result-oriented education is a kind of educational idea guided by the achievement-oriented learning of students. The goal of instructional design and teaching is that the students finally achieve the learning outcomes through the educational process [4]. The core point is that students become "masters of learning". Aiming at the ability to solve complex engineering problems, this paper constructs a communication practice teaching system scientifically and reasonably. As shown in Fig. 1.

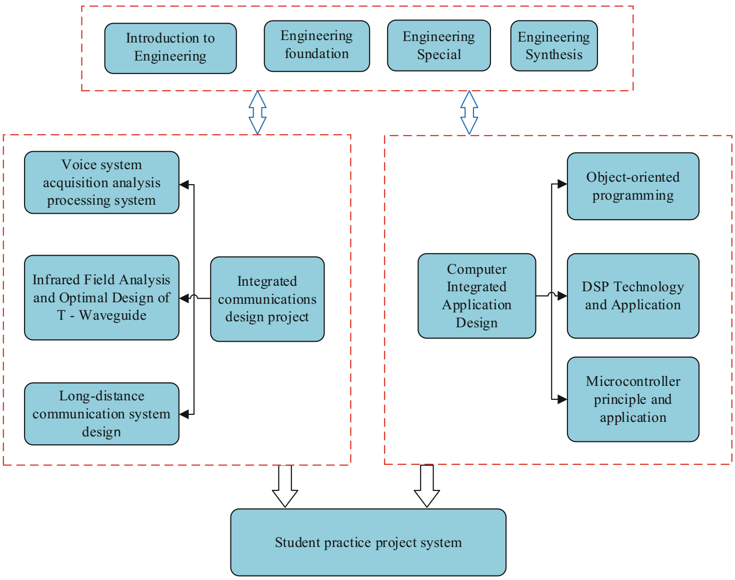

Fig. 1. Student practice project system

The practice teaching system of communication is divided into the following aspects. Engineering practice includes basic experiments such as physics and other basic experiments and circuits. It focuses on cultivating students' good practice habits and the concept of learning to apply, cultivating students' rigorous learning attitude and meticulous working habits, and achieving the training of students' basic engineering practice ability; The practice of engineering technology is carried out according to basic engineering training and comprehensive engineering training; Comprehensive practice includes production practice, professional design, technological innovation activities, etc., which can cultivate students' good engineering quality, engineering norms, engineering awareness and engineering practice ability [5].

During the four years' study, students undergo a series of practical activities such as teaching experiment, curriculum design, professional practice and graduation design, and most of them have special training or practice every semester. In 2015, in the practice of electromagnetic field and microwave course, we added the discussion of the current distribution of rectangular section metal waveguide wall based on "Coulomb's law and Biot-Savart law". And in 2016, the design and implementation of the automatic temperature control system were added to the practice of Microcomputer Principle course.

3 Training Students' Ability to Solve Engineering Problems

The electronic information engineering specialty taught by the author is an excellent pilot project. The author conducted a three-level project curriculum reform plan and added the corresponding course. During the process of writing the self-assessment report on professional certification, we have deepened our understanding of the complex engineering problems in graduation design and explored innovative ideas to enhance undergraduates' ability to solve complex problems by the reform of professional teaching. The author conducted a three-level project curriculum reform plan and added the corresponding course. Teachers design different projects according to the content of the course, assign project topics to students and four or five students in each group, students team members conceive, design, implement and operate the project together and finally according to the student's overall performance score. The project to learn the basic methods to solve complex engineering problems, which are to solve the core of complex engineering problems, lay the foundation for students to move to work eventually.

Based on this, through the actual project implementation, students can sort out the basic principles, basic knowledge and basic skills of the course they have learned while in school, and establish an appropriate abstract model through in-depth engineering principle analysis [6]. Most of the engineering students are engaged in solving practical engineering problems. Display complicated factors as engineering problems, and reasonably simplified them as scientific problems with mathematical models. This not only enables them to learn the basic process of solving engineering problems through curriculum knowledge through actual engineering projects but also help to develop students' team awareness and academic communication skills. Training students to solve complex engineering problems, but also lay a solid foundation for their future jobs.

3.1 Construction of Practical Engineering Environment

As the state pays more attention to engineering students' ability to solve practical engineering problems, related universities in China have studied how to improve students' practical ability. Although there are different research angles in colleges and universities, there is a common problem that the overall practice environment can't meet the training program [7]. In particular, the lack of advanced commercial equipment and technology systems has let students simulate related experiments only through software simulation. Inaccessible to the latest real equipment, engineering practice skills such as empty talk.

In the view of the requirements of professional certification for the ability training of complex engineering problems, combined with the specialty of communication specialty and the development trend of the industry, the author's institutions successively cooperated with Huawei Communication Technology Co., Ltd. and Ruijie Networks Co., Ltd. to carry out the cooperation between school and enterprises based on the technical equipment of enterprises advantages, in deepening the capacity of student engineering practice to discuss training mechanism, formulated a number of personal training program. Undertook such as "Huawei Cup Electronic Design Competition", internships and other practical activities. In recent years, the hurricane software innovation laboratory created by our university has achieved some achievements by the enterprises putting into the project funds each year and adopting the engineering management mode. Currently developed by Wantong Universal Financial Software.

3.2 CDIO Engineering Teaching Philosophy to Improve the Teaching

The traditional teaching model adopts the inculcating education method, pays attention to the students' academic achievement but ignores the students' application ability, the design ability. In order to cultivate students' abilities to solve complex problems, this paper proposes the CDIO teaching concept, namely conceive, design, implement and operation [8]. Taking the life process of products as the train of thought, from design and development of research and development to actual assembly and off-line application, students' engineering design ability, engineering management ability and innovation ability are exercised throughout the whole process so that students can understand the current enterprises' Problems in the processes and methods. The CDIO teaching model is oriented toward engineering design and aimed to cultivate practical ability. Students can take the initiative to participate and practice through the organic combination of course. Specific project implementation plan is shown in Fig. 2.

In the concept session, teachers put forward the project requirements. Students collect information to complete the project needs analysis, teachers comment on the students' project analysis, and gradually improve students' ability of independent thinking during the interaction. During the design process, students should take the initiative to analyze the needs of the project according to the concept. By consulting the data resources such as dissertations and technical resources, the overall design of the project is designed. The teacher mainly analyzes the feasibility of the project. This process can train students' design ability. In the implementation process, the students at

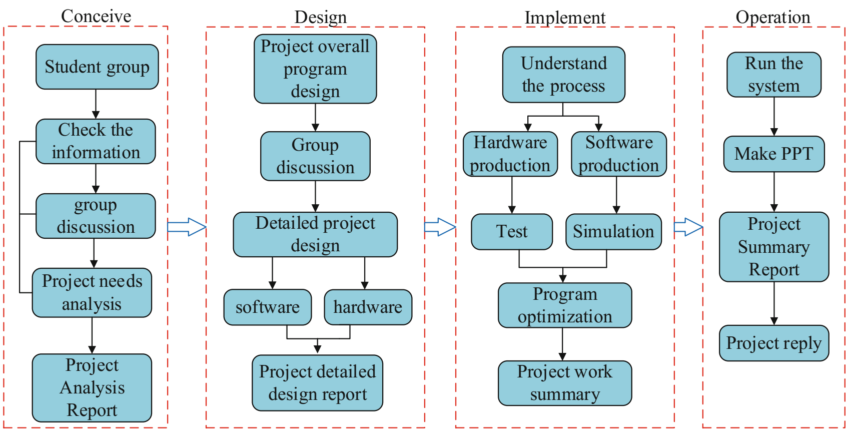

Fig. 2. CDIO-based project implementation process

the laboratory site implementation, including the entire process, hardware equipment building, software debugging, system debugging, program optimization and other sectors. Finally, to complete the project implementation summary reports writing. This process is mainly to cultivate students' practical ability, teamwork ability and so on. In the running session, teachers should check the quality of the project and analyze the problems that occur in the student project to ensure the reliability of the project implementation. Finally, the results show this process fosters students' ability to communicate and synthesize.

3.3 Establish a System of Assessment

In order to effectively cultivate students' ability to solve practical engineering problems, all aspects must be close to the actual project. Therefore, the core of the assessment mechanism is how to evaluate students' ability to solve practical engineering problems. This requires organizational units and mentors to strictly enforce process monitoring [9].

Specific Requirements in the practice of the project, first of all, strengthen the management of the practical aspects of the project topics, open questions, mid-term inspection, project reply and performance evaluation and other aspects of the project to ensure the orderly conduct of the project. Strictly require students to take project practice seriously, while strengthening management of students should also strengthen the management of the instructor, to seriously examine the work of the instructor, to check the quality of their guidance. In addition, graduates of the outstanding performance of the design of the students and instructors rewards, but for those who can't meet the requirements of graduate design guidance teachers and students should be punished to some extent, so as to form a fine style of study and graduation design tradition and enable students to graduate the beginning of the design is not lucky.

Since 2014, the author unit has conducted outstanding project practice exhibitions, and all teachers and junior students are encouraged to vote. During the review process, all of the design prototypes and design prototype system to be examined. Personally, for students participating in practical projects, the author sets out the clear requirements of the project at the beginning of the project. As long as the students have reached the project design goals and demonstrated in the project team, they will complete the project practice. In this end, let students develop a graduation design timetable, require students to complete the task in strict accordance with the time node. Form a weekly report system. This system is a warning to some of the more inert students. Through these practices, students can gradually improve their ability to solve complex engineering problems.

4 Conclusion

The ability to solve complex problems is an important part of undergraduate training, and which an inevitable requirement for students to practice and innovate. In the field of education, the vast majority of front-line teachers backbone and have a major responsibility. Hoping that through in-depth study of undergraduate expertise during the study for students to lay a solid foundation for work. Fully mobilizing the enthusiasm of instructing teachers and students and strengthen the effective management of all intermediate links to students' learning and life so as to develop students' ability to solve complex system problems and improve students' practical ability.

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A Brief Discussion About the Accessibility and Usability of Web-Based Instruction in Software Design Teaching

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Abstract. Web-based instruction is the product of the new era and it has the characteristics of time and place. So people can arrange their own learning time and place freely when they are learning through the network. Software design is composed of the processes of requirement analysis, outline design, detailed design, implementation and testing. Software design does not require too much basic knowledge for learners. The software design processes can be realized easier via computer, so it is suitable for network teaching. Now, the web-based instruction of software design already exists, but it still has some shortcomings and needs to be improved. In this paper, we first introduce the traditional teaching and web-based instruction as well as the existing software design web-based instruction. Then analyze the accessibility and usability of web-based instruction in software design teaching.

Keywords: Software design · Web-based instruction
Traditional teaching

1 Introduction

The development of Internet technology has promoted the development of various businesses. We have made new changes in all aspects of our life and work, including education. E-schools with different teaching mode have appeared in the public field of vision, and web-based instruction has become a very common phenomenon. Broadly speaking, web-based instruction refers to the teaching methods that use multimedia devices or network technologies. In a narrow sense, it refers to the distance learning method that connects teachers and students through the Internet and computer [1]. The teaching of web-based instruction in software design in this article refers to the web-based instruction in a broad sense.

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1.1 Classification of Web-Based Instruction

There are many ways to classify web-based instruction. According to synchronization of the web-based instruction, it is usually divided into two types, one is the live mode, the other mode is taped. In a nutshell, live streaming is a simultaneous teaching of teachers and students. A live room usually has a dialog box to get students' real-time feedback on the content of the course. So the teacher can master the teaching progress. The live mode has no spatial requirement, but has strict temporal requirement. The teacher records the teaching video in advance in recording mode. Then students watch and study. There are no real-time dialogs in this format, but the teaching video can be viewed repeatedly. Hence, the space and time are not required strictly in recording mode.

According to the spatial limitation of web-based instruction, it can be divided into: short distance web-based instruction and long-distance web-based instruction. Short-distant web-based instruction is limited by space and time, so it is basically the form of live broadcast. It is usually the case that the teacher and the students are in the same room in short-distant web-based instruction. If only teacher client, then teacher makes presentations. If not only the teacher client but also student client, then teacher can do some operations as explains knowledge, distributes file and locks student-side operations etc via teacher client. Long-distance web-based instruction does not require teachers and students to be in the same place. In other words, long-distance web-based instruction is not limited by space, so it can use live form or recording form. But teachers can use fewer operations that they generally have operations of explanation of knowledge and prohibition of students' speech. The short distance web-based instruction is always as the auxiliary means of traditional teaching, but the long-distance web-based instruction can completely replace the traditional teaching [2].

According to the network range, web-based instruction can be divided into LAN teaching and Internet teaching. LAN teaching is required for space and time, so it is suitable for the teaching of short range network. And the Internet teaching is suitable for both short distance web-based instruction and long-distance teaching.

1.2 Traditional Teaching

Traditional teaching is face-to-face teaching, and its teaching environment is generally composed of blackboards, students' tables and chairs, and lecturing.

Because of face-to-face teaching, teachers can capture students' real and effective responses to the contents explained in a timely manner. Subsequently teachers quickly adjust the contents, teaching ways and so on. Moreover, if a student happens to be absent from class, teachers can generally find out and stop it in time. If students have any questions, they can consult teachers separately after the class.

On the traditional teaching class teacher teaches students in one-to-many way. Because of limited teaching time and heavy teaching tasks, in general, it is mainly the teacher explains and students listen in the class. During the class, teachers may ask questions and students think and answer. Students lack initiative and enthusiasm for the reason that they rarely ask questions voluntarily [3]. In the traditional teaching, the teacher's explanation is generally irreversible. That is to say, students need to follow their teacher's explanation for better understanding. If someone is hard to understand or distracted, or cannot see clearly because of seat location, light or other reasons, it is likely to miss the teacher's explanation. If the student wants to complement the knowledge, he or she can only ask teachers and classmates in private or wait for the teacher to repeat this part of the knowledge. But because of this, students will learn more seriously.

1.3 Web-Based Instruction

Web-based instruction is generally composed of multimedia devices, networks and other teaching environments.

In the broad sense, there is also face-to-face teaching mode in the web-based instruction, which is usually only the auxiliary means of traditional teaching. Face-to-face web-based instruction has the advantages of traditional teaching: teachers can obtain students' real and effective responses, and teachers can remind students of bad situations. And it has corrected the shortcomings of traditional teaching, such as the use of computer fonts instead of handwriting to avoid the misclassification of students. However, some shortcomings in the traditional teaching are also reflected in the face-to-face web-based instruction, such as the mode in which the teacher talks and students listening [4,5].

In the narrow sense, web-based instruction is long-distance web-based instruction, and it can be a substitution for some courses. Long-distance web-based instruction does not exist poor seat position, blackboard reflective and so on as long as the network to keep it open. For students, the teaching effect of long-distance web-based instruction is not different from that of traditional teaching. Long-distance web-based instruction does not limit time and space, so the degree of students' freedom is greatly improved. And because it is not face-to-face in long-distance web-based instruction, the shyness of students is greatly diminished, so that they dare to ask their own questions directly [6]. Whether live (can be recorded in a live screen) or recorded, long-distance web-based instruction generally allows multiple watch. It's helpful for students to understand the difficulty. But long-distance web-based instruction adds some difficulties to teachers. Generally speaking, long-distance web-based instruction can only watch teachers, and can not see the state of students, so the teacher can not know the students' response to the teacher's explanation in time. Even in the form of live broadcasting, teachers can only get feedback from students by asking questions. This way not only the teacher grasps the situation inaccurately, but also delays the time. And if students have problems, it is not as convenient as traditional teaching, especially after class.

2 Analysis of the Existing Web-Based Instruction of Software Design

The theoretical part of the software design is not very different from the traditional teaching in the web-based instruction. Their differences lie in the practical part of software design. The practice parts of the existing software design are generally divided into two kinds. One is short-distance. We can call it classroom web-based instruction. One is remote, and we call it remote web-based instruction. Classroom web-based instruction is generally the teacher's on-site operation for students to watching. If there are student clients in the classroom, the teacher can do something with the student client [7–9]. Figure 1 shows most of the teacher client's functions given by the existing software of classroom web-based instruction. The software has three functions: teaching, online examination and management. Teaching includes teaching demonstration, writing on the screen, watching student screens, sending files to students, collecting homework, roll call, special instruction, student demonstrations, locking student client, warning students, groups discussions, etc. Online examinations include making examination papers, invigilation, collecting test papers, terminating the exam, sending answers, evaluation test, and statistics of results. Management includes group management, seating arrangement, machine management, network management, permissions setting, application restriction, and operation

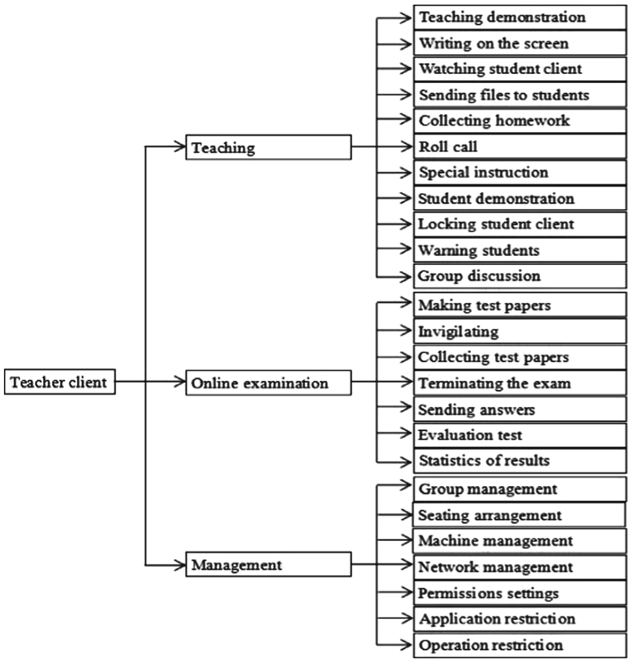

Fig. 1. Teacher client's functions of software of classroom web-based instruction

restriction. Figure 2 shows that most of the functions of the student client are given by the existing software of classroom web-based instruction, including operation, presentation, sending information, online examination and request.

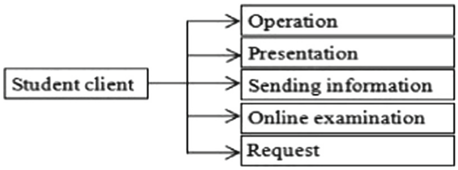

Fig. 2. Student client's functions of software of classroom web-based instruction

Classroom web-based instruction solves troubles of traditional teaching due to seats and other issues. And classroom web-based instruction inherits advantages of traditional teaching methods, such as convenience of tutoring and so on. Teachers can make sure that students do not have irrelevant actions during class by looking at student clients' screens and restricting their programs. But they do not guarantee that students are listening attentively and weakening students' real-time monitoring.

Remote web-based instruction is mostly recorded, and the operations of live broadcast are less than the short-range. Figure 3 shows that most of teacher client's functions in the existing software of remote web-based instruction, and they include teacher demonstration, writing on the screen, recording course, sending files to students, collecting homework, group management. Figure 4 shows the student client's functions of remote web-based instruction, which include operation, presentation, and sending information.

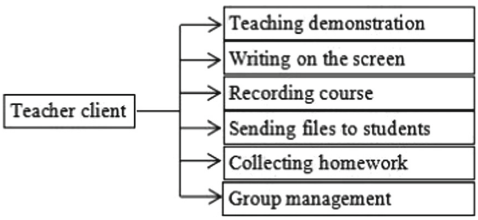

Fig. 3. Teacher client's functions of software of remote web-based instruction

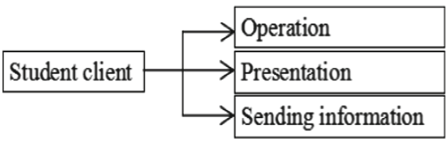

Fig. 4. Student client's functions of software of remote web-based instruction

The functions of teacher client in remote web-based instruction are much less than in classroom web-based instruction, and teachers almost completely lose the supervision of students. But remote web-based instruction does not require space. Teachers and students can teach and study wherever they want. And the recording function allows students to repeat their studies where they don't understand.

3 The Accessibility and Usability of Web-Based Instruction in Software Design

3.1 Extensive Applicability

Now, the existence of web-based instruction is common. Web-based instruction has a wide range of application, including preschool education [10], primary education [11], secondary education [12], higher education [13], adult education [14], vocational education [15] and so on. In this paper, "web-based instruction" is input on CNKI. After the search results are classified according to subjects, it is easy to find that the proportion of computer software and applications is large, reaching 17.30%. The specific situation is shown in Table 1.

Table 1. An analysis of the subject for web-based instruction

Subject	Proportion
The theory of education and the management of education	27.36%
Computer software and its application	17.30%
Secondary education	13.60%
Foreign language and literature	9.48%
Higher education	6.36%
Primary education	5.53%
Internet technology	3.54%
Vocational education	3.35%
Medical education	2.31%
Other	11.17%

The population of software design learning is mainly concentrated in higher education, adult education and vocational education. These students have basically completed the study of compulsory education. Software design is not required for students' basic knowledge. Each student has different grasp of the basics of computers, but he or she can learn as long as he or she masters computer-based operations. Other professional knowledge can be complemental by learning. Of course, people who have no access to computers can also learn, but they are only suitable for learning through traditional teaching methods and short range web-based instruction, which is not suitable for remote web-based instruction. Therefore, for these three groups of people, it is feasible to learn software design through network learning.

3.2 Supplement of the Deficiency of Traditional Teaching

Network teaching can alleviate the problem of time and space of campus learning. In the information age, there are more and more people learning software design. If there is no network teaching, for schools, the increase of students means that schools need to provide more computers and classrooms for teaching. For full-time workers, they can only study in their spare time at work. There will be a lot of inconvenience: time is limited, and it is not sure, space also has a certain limit [16]. While network teaching is not so high in time space, it can ease the time and space of traditional teaching and the problem of resources.

Web-based instruction drastically liberalized the number of students. In software design learning, it is subject to teaching space, equipment and energy of teachers. Although traditional teaching is a teacher teaching a lot of students, the number of students is very limited that fifty people are already very much. Network teaching allows teachers to teach hundreds or even thousands of people at the same time.

Web-based instruction can drive the students' enthusiasm for learning. In traditional teaching, students can only acquire knowledge through teacher's narration and textbook. When the actual situation and the teaching material are different, it will cause great difficulties for the students' practice. When students are stuck, they will get rid of their enthusiasm for learning [17]. Even if a teacher uses a multimedia device as auxiliary teaching to demonstrate code, students can only use their notes to memorize, not follow the operations. The memory of a person is limited so that when the student is stuck, he or she will fade away the enthusiasm of learning. If the students follow the teacher to demonstrate the code, the students' chances of mistakes will drop and their enthusiasm for learning will rise.

Web-based instruction can reduce the teacher's duplication of work. In practice, many problems of students are repetitive, but students are equivalent to isolated islands. Their problems do not connect with each other. Therefore, in traditional teaching, teachers need to solve students' problems one by one, and do a lot of repetitive work. In network teaching, a student raises questions, and the teacher demonstrates solutions. Other students can get solutions. They save time and reduce the workload of teachers.

3.3 The Feasibility of Teaching Environment

Software design is the process of analyzing software requirements, designing software, writing code, and testing. The learning of software design can be divided into two parts, one part of which is the theoretical part. It mainly studies the things of concepts and designs all aspects of the software. The part of the learning achieved by web-based instruction is no problem. The other part is the practical part, which is the programming process and the testing process. This part is mainly the teacher's explanation and the students' practice. Using a computer for instance demonstration can achieve better explanation effect. The student's practice part must be operated by the computer. In short, both parts of the software design can be done on the computer without having to use other tools. And the web-based instruction also needs to be carried out in the computer environment, so the teaching environment of the software design meets the conditions.

Software design does not require teachers' hands-on teaching. Web-based instruction is very common, but not all traditional teaching can be replaced by web-based instruction. Some of the content of learning requires a teacher's face-to-face guidance, such as the learning of basketball, web-based instruction is at the most as an auxiliary means. Software design tools, computers, have not strict operational requirements for users. If someone finishes the entire software design with one finger, no one will think that the person's design is wrong because the person uses only one finger. Therefore, the teacher does not need to correct the student's mistake face to face. So the advantage of software design is that both theory and practice can be done on a computer than other learning courses that need to be implemented.

4 Conclusion

Software design is the process of requirement analysis, summary design, detailed design, implementation and testing. In this process, many requirements for software design are not high, such as interaction requirements between teachers and students, time and space requirements, operation requirements and learners' basic knowledge requirements. And software design teaching process involved a single tool - the computer. Therefore, web-based instruction in software design teaching is feasible and easy to use.

Software of web-based instruction in software design teaching has already existed, and has a relatively complete function. In the course of short range web-based instruction, a teacher client has three functions, such as teaching, online examination and management, and a student client has the functions of listening, examination and so on. In the distance web-based instruction, although a teacher client has two functions of teaching and management, its sub functions are much less than the sub functions of a teacher client's in the short range web-based instruction. In any case, the teachers' interaction with the students and the teacher's monitoring of the students still need to be improved, especially in the distance web-based instruction.

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Research on Data Mining Technology of Social Network Associated Information

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Abstract. With the popularization of Internet social networking service, the results of association data mining between friend dynamic, microblog and moments that user posting and giving feedback information, which have important influence on government planning, business management and personal affairs decision-making activities. This paper studies the data mining technology of social network related information, analyzes the text data in social network by using the finite state automata (DFSA) and word frequency - reverse file frequency (TF-IDF), and using tree algorithm to sort the data. The simulation results show that this method can realize the classification data mining of social network related information.

Keywords: Social network · Data mining · Ideological · Political education

1 Introduction

Social networking has evolved from the traditional World Wide Web. The main characteristic of the traditional World Wide Web is that the information of the graphic contents is organized and presented to the visitors through the links. Social networks pay more attention to the relationship between the creator and the reader of the graphic content. Usually, they can indicate the consistency of the content or the degree of concern by publishing the argument, reading, commenting or replying, praising, forwarding, and the like.

The six-degree theory of division proposed by Professor Stanley Milgram who is in Harvard University states that no two strangers will be separated by more than six people [1]. Through the analysis of social network related information can be found in the core content of social networks and the relationship G can be expressed as formula 1.

$$G = \langle V_c, V_u, E_f, E_r, E_c, E_a, E_t \rangle \tag{1}$$

Where Vc represents a content point set, Vu represents a user point set, Ef represents a side set of friend relationships between users, Er represents a side set of reading relationships, Ec represents a side set of comments or reply relations, Ea represents a point-like relationship side set, Et represents the edge set of the forwarding relationship.

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This project mainly studies the influence of social network on the current college students 'groups and how to make use of the analysis of social network related data to understand the students' thoughts. On the basis of a large number of researches, the paper designs a university ideological and political support system based on social network associated data mining. The system uses DFSA and TF-IDF algorithms to record and analyze students 'social network data. Based on the decision tree theory, this system conducts an early warning assessment of the students' thoughts which release abnormally sensitive words. Then, the improved frequent set algorithm is used to find the people who are highly correlated with the problem Or the reason, and the key factor to solve the problem, prompt the mental educator to divert the pressure of the trainee, so as to put an early stop of the malignant event caused by the psychological reason in the stage of less damaging germination.

DFSA algorithm is an effective multi-pattern matching string algorithm. This algorithm constructs a finite automaton to convert the multi-pattern string matching problem to a relatively simple one-pattern string matching problem, and only needs to scan the body part once to check the matching of all the key words [2]. The system uses the DFSA multi-pattern string matching algorithm to compare sensitive words with the text of social network articles as well as to count a number of times and the importance of the expression of sensitive words in social network articles.

2 System Structure

The system solves the common problems of ideological education in colleges and universities by using social network-related information analysis. It consists of social network data collection and processing, decision-making early warning decision-making and auxiliary intervention and other three major modules, the specific structure shown in Fig. 1.

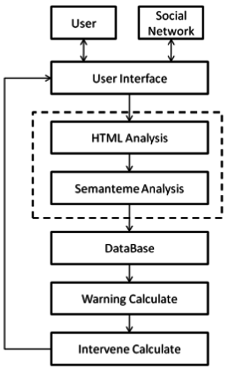

Fig. 1. Chart of system architecture.

2.1 Development Tools and Database

Due to the generally high security of social networks, traditional web crawler development tools often fail to log in and retrieve data. Therefore, the system adopts to introduce the Internet browser component, and completely simulates the live action to log in to the social network as a legitimate user, complies with the network application norms without violating the privacy of others, but only improves personal browsing speed and data sorting efficiency. However, in view of the current university computer hardware configuration level is generally not high, the database using Microsoft Office integrated Access database for the local database.

2.2 System Module Division and Function

As we all know, undergraduates are curious and exploratory. Majority of them don't have enough sufficient social experience, lack of correct judgment as well as control over things. What's worse, they are easily influenced by the outside world. [3] For instance, some students are addicted to the games that affects not only performance decline, but also their education and employment, which even lead to drop out of school; some students can't properly handle the relationship of classmates or roommates, then they do some over-excited behavior; others couldn't face the family, work and emotional problems properly, prone to psychological and emotional fluctuations, unable to extricate themselves, leading to suicide or self-mutilation [4]. And there is no doubt that we are in the era of "Internet +", the Internet has become an indispensable part of people's study and life. It is not uncommon for students on the campus even in the classroom to use their mobile phones frequently that deeply impact the students' learning concentration. Furthermore, it is also easy to give false guidance to public opinion. As has been stated above, it is the ideological and political work in colleges and universities that will face new problems and challenges.

According to questionnaire survey to some college students, we have found that the vast students use social networking software to give vent to their emotions and express their stress and emotional inclination when they are under the influence of pressure or mood swings [5]. The dangers of misanthropy and misanthropy in college students often show up in their personal social software [6]. If Ideological and political workers can use the Internet to understand students' psychological and emotional changes, using data mining techniques to reflect the student thought in social software dynamic integrated data statistical analysis, they will find the problems in a timely manner so they can admonish and stop students, complete promptly warning education and undertake to the student psychological construction and channel. Only by doing so, can they urge college students better achieve academic record, reduce involved is not deep, personal injuries and property losses [7, 8].

According to users' requirements, the system is roughly divided into three functional modules. Firstly, the social network information acquisition and processing module is to log in the social network to obtain data and process the irrelevant information and query the frequency and effect of the sensitive words. Secondly, the early warning data mining module is to deduce the classification rules of the data and form an early warning rule for the students who need to make early warning of ideological and political education. Last but not least, the function of auxiliary module Ideological education is to accept early warning education students strongly associated with friends or trigger students' psychological changes and any other main factors in order to carry out more targeted education or counseling.

3 Social Network Information Acquisition and Processing Module Design

3.1 Use DFSA Algorithm to Find the Key Words in the Main Body of Social Network

The system takes advantage of Microsoft Visual Basic's Internet Explorer component to log on to the social network as a normal user and retrieve the original Hypertext Transfer Protocol code from the social networking server. It is possible to legally obtain the important information of the network article body, the good friend ID, the good friend comment body and the like posted by the social friends by the analysis and filtering of the protocol code.

System uses the DFSA algorithm matching process to achieve the main pseudo-code described below:

```
Input: Social Network body content [] and its length n, jump function goto (), failure
function failure () and output function output ()
Output: Match the number of sensitive information
1. state = 0 ;
2. count = 0 ;
3. text_mentality = NULL ;
4. for( i=0 ; i<n ; i++){
5.   while( goto( state , content[i] ) == FAIL )
6.     state = failure( state ) ;
7.   state = goto( state , content[i] ) ;
8.   if( output( state )!=EMPTY )
9.     count = count + 1;
10. }
11. if(count>=1)
12.    text_mentality = "dispirited" ;
13. return count;
```

Using the DFSA algorithm, the text of a student's social network can be preprocessed, the keywords extracted and counted, and these text tags can be marked as the game related text, the text related to negative emotions, the text related to positive emotions and criminal related body. What's more, it can pre-process multiple social networks for multiple students to facilitate early warning data mining.

3.2 Using TD-IDF Algorithm to Determine the Importance of the Key Vocabulary in the Social Network Text

However, in social network articles, the frequency of the mere statistics of sensitive words does not necessarily indicate whether the author's emphasis is on the semantic meaning of the sensitive words. Therefore, the system makes use of the TF-IDF algorithm to evaluate the importance of the word in the text and the corpus. In TF-IDF algorithm, TF represents the word frequency, that is, the number of occurrences of sensitive words in the document. IDF represents the inverse document frequency, meaning that if the document containing sensitive words is fewer, the short text's disguishability is better.

Take ti for an example, which is in a social network text and its importance in short text can be expressed as (2)

$$\mathrm{TF}_{i,j} = \frac{n_{i,j}}{\sum_k n_{k,j}} \tag{2}$$

Wherein, the number of occurrences of this word in the text dj indicates the total number of occurrences of the word in the document set. For a particular sensitive term ti, the higher the frequency of occurrence in social articles, the lower appears in the entire document set, and the higher the TF-IDF value is, the greater the weight in the entire database.

4 Early Warning Data Mining Module Design

Decision tree classification method is one of the most widely used inductive inference algorithms. It is a method of approximating discrete-valued functions and it can obtain a tree-like representation [9]. In addition to, its algorithm is easy to understand and convert to binary or multi-branch classification rules with high classification efficiency.

The system adopts the popular ID3 algorithm in decision tree classification method to conduct early warning data mining. The ID3 algorithm can form an early warning decision tree by calculating the information gain by using the training class marked by the database class, and then it can use the established decision tree to analyze and predict the sample data.

ID3 algorithm is as follows:

```
Input：D：data set
C：classification attribute
Output：decision tree
create node N;
if(without other attribute in D)
  label N with most common value of C in D;
else if(all instances in T have the same value V of C)
  label N, "X.C=V with probability 1" ;
else {
 for each(attribute A in D)
   AM=the attribute of mini Avg Entropy(A,C,D);
 if (Avg Entropy(AM,C,D) is not substantially smaller than Entropy(C,D))
    label N with most common value of C in D;
  else{
    label N with AM;
    for( each value V of AM ){
      N1=ID3(subtable (D,A,V),C);
      if(N1!=null)
        arc from N to N1 labelled V;
      }
  }
}
return N;
```

5 Intervention Module Design

Once found that students who by reason of mood swings, or distracted with serious decline in academic performance or abnormal behavior trend, closely related to the need to immediately find classmates or relative personnel to understand the details such as making psychological counseling programs.

The Apriori algorithm is an efficient method to discover frequent itemsets in one-dimensional mode, which uses iterative methods of layer-by-layer search to explore larger frequent itemsets. Furthermore, the basic nature of this algorithm is that all non-empty sub-sets of frequent itemsets are frequent [10, 11]. Although the classic Apriori algorithm describes the steps and methods of discovering frequent itemsets more concisely, as a number of data items increases, the demand for system memory and CPU resources increases rapidly, and the system I/O load is huge as well [12].

Considering the time and space of ideological and political education in colleges and universities are limited, the system adopts the Apriori frequent set algorithm which is improved when the students need to look for students and social relations closely related to the early warning students, and excavates and sorts the network ID according to the degree of social concern [13].

That is to say, the first step is to mark all occurrences in the relevant social network ID as a set of elements. Next, the social network ID and social network ID of students who like the daily social network are marked as 2 sets of elements. Next, the number of occurrences of each 2 sets of items is recorded as p(i, j). Then, the number of times the social network ID and the social network ID of the student who responded to the message in the daily social network of a student is represented as r(i, j). Lastly, the two network ID's attention function can be expressed as (3)

$$a(i,j) = p(i,j)^{\wedge}(r(i,j) + 1) \tag{3}$$

According to the attention function, the network ID is arranged in descending order as a reference for the close relationship with the trainee students. And give priority to the students or friends who are closest to the social network to try to understand the cause of the problem or the way to solve the problem. If the initial communication is not sufficient to acquire enough information to construct three sets of items, and try to make an appointment with two other members to find out the nature of the problem as soon as possible

6 System Implementation and Simulation

The ideological and political education work is a thousand times, the space limit cannot be listed in detail. Here is one of the contents of the academic warning part of the design of simulation experiments to test the practical effect of the system.

In the experiment, 32 students' average grade and data of the first six semesters were selected. Based on the recent seventh semester's online social data texts, DFSA algorithm and TF-IDF algorithm were used to determine the frequency and importance of using sensitive keywords, obtaining social network data Parameters as well as forming training data sheet for the seventh semester of academic assessment of early warning (Fig. 2).

Using the previous semester's social network data (see Fig. 3), the average grade (see Fig. 4), and the hanging data (see Fig. 5), the ID3 algorithm was used to construct the decision tree. We have the social network text-sensitive words, the average score,

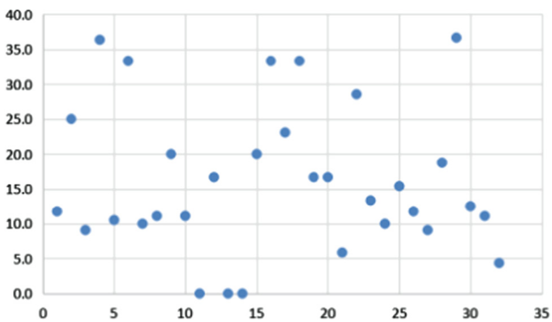

Fig. 2. Chart of social net data parameter distribution.

with or without history as a property. In other words, there are two types of social network text sensitive words, namely, more than 20% of social networking texts refer to sensitive words, less than 20% of social networking text Mention sensitive words. Also, the average grade is divided into three categories, a class of 65 points or less, a class of 65 points to 80 points, a class of 80 points or more. Besides, there is no history of hanging into two categories, with or without. The ID3 algorithm is used to mine the training samples to get the decision tree (see Fig. 6).

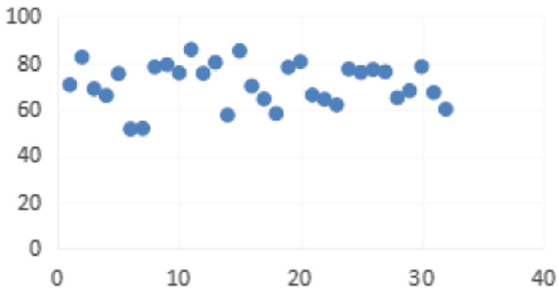

Fig. 3. Chart of average score distribution.

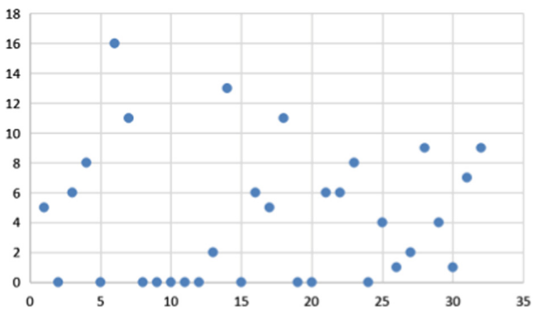

Fig. 4. Chart of fail the exam data distribution.

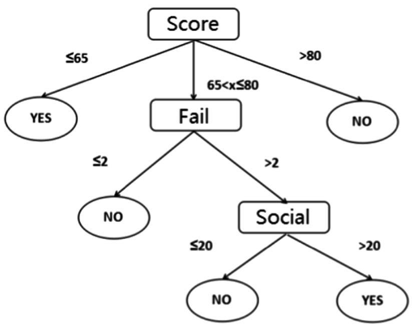

Fig. 5. Chart of early-warning decision tree.

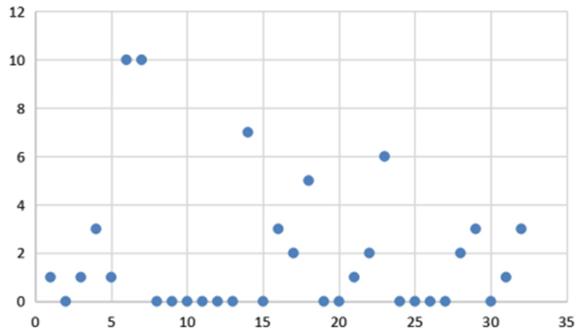

Fig. 6. Chart of early-warning data distribution

According to the results of the early warning, 12 students with the serial numbers of 4, 6, 7, 14, 16, 17, 18, 22, 23, 28, 29 and 32 were in a highly dangerous state and were in line with the actual results of the Seventh Semester and the distribution of hanging branches Fig. 6.

In combining with the frequent set algorithm, students who had close contact with early warning students active in social networks were found to have in-depth exchanges and we found that some of the major reasons of the drop in their academic performance were the fact that they recently participated in too many extracurricular practical activities. Thus, they couldn't arrange their time and energy very well. What mentioned above has accumulated experience for the follow-up ideological education guidance.

7 Conclusion

Designing and implementing a dynamic thinking system of college students is based on social network data mining technology. It uses DFSA and TF-IDF algorithms to analyze social network articles, ID3 algorithm deducing the early-warning decision tree and the improved Apriori algorithm finds frequent itemsets, so as to achieve early warning and timely disposal of college students' academic and ideological and political education.

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Teaching Effect of College English Based on Cloud Class Platform

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Abstract. Based on the theory of "production-oriented approach", the mobile internet and information technology are applied to college English teaching. Through the blended learning model of cloud class platform and traditional classroom, this paper analyzes the teaching effect of cloud class platform. It could make teaching vivid and interesting, so as to realize the leading role of teachers, stimulate students' critical thinking consciousness of English learning, and improve their subjective initiative.

Keywords: Production-oriented approach · Cloud class platform
Teaching effect

1 Introduction

With the development of science and technology, and the increasing forms and means of English teaching, it is an inevitable trend to apply the Internet and cloud platform technology to college English teaching. In order to achieve good teaching effects, teachers in the new era should cultivate students' ability to use various skills in English flexibly. Moreover, they should pay attention to imparting knowledge and training their students' critical thinking so that English learning can become a bridge of cultural communication and enable students to have more in-depth thinking about the culture of different countries, as well as generate a collision of thinking sparks. For the young Chinese people in the new era, they should accurately express the Chinese situations and meet the challenges brought about by internationalization, and become innovative talents with unique ability of critical thinking. In the modern classroom, to make rational use of resources, online and offline platform should be combined, so as to better accomplish the teaching objectives, and cultivate students' innovative ability and practical ability.

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2 Cloud Class Platform

2.1 Advantages of Cloud Class Platform

Under the support of mobile internet and information technology, the cloud class platform is produced. There are significant advantages.

First, the accumulation of knowledge is broad. Learning resources can be shared publicly on cloud class platform. Due to different teachers for the same course content will have different understanding and different teaching resources, it is convenient for teachers and students to share and download the content of interest through this platform, generating sparks of thought collision so as to expand knowledge [1].

Second, both teachers and students can do effective cloud computing analysis. Teaching related resources such as pictures, audio, video and courseware can all be shared by teachers and students on cloud class platform [2]. The cloud computing function of cloud class platform can assist teachers and students in data analysis, so that teachers can make timely adjustments to teaching resources and students can learn about the learning condition of their peers, which will stimulate students' self-reflection.

Third, students could give full play to their initiative. The combination of online and offline learning mode, enables students to learn independently anytime and anywhere, which means they could participate in learning activities initiatively without the constraints of time and space. Under the guidance of teachers and the stimulation of peers, students can think deeply about their learning content and improve self-learning ability. The interaction between teachers and students can be enhanced [3]. The use of the cloud class platform enables teachers and students to promptly raise questions and solve problems. It is no longer a traditional classroom–teacher's dominant classroom, which was a waste of time waiting for discovering problems and analyzing problems. The platform enables good interaction between teachers and students, and students and students, greatly improving the efficiency in class and after class.

2.2 Cloud Class Platform—Lanmo App

Lanmo App, is a mobile environment for teaching new mobile interactive teaching assistant. The app hosts both PC and mobile and is free for teachers and students.

As for teachers' teaching, the class can be easily managed. For instance, by using the App, teachers can send notifications, share resources, arrange assignments, organize discussion and answer questions, do timing tests, and conduct teaching interactions effectively. There are varieties of forms for interaction. Before the course, teachers can click the online preview function to view the progress of resources being watched by the students. As for a particular resource, teachers can even master the total number of students spent on it, and the exact time spent by each student. As for one student, teachers can check how many resources a student watched, and how many activities a student participate and how long he/she spent on activities. It realizes the function of monitoring students' extra-curricular autonomous learning. During the course, teachers may carry out the voting questionnaire and brainstorming activities at any time, so teachers and students can jointly conduct feedback and comment immediately. After the course, teachers can arrange such things as reviewing and testing so as to enhance the effect of teaching by combining the online and offline teaching and learning.

As for students' learning, students' interest in autonomous learning increases. Through mobile devices, students can immediately see all the information of the course released by the teacher, in terms of learning requirements, courseware, video and other learning resources, so that students' mobile devices can no longer just do social interactions, play games, and take part in other activities, but change into the tool for learning ubiquitously. Students could get the relevant "experience point" after completing the task set by the teacher, which will improve students' interests in the accumulation of "experience points", and stimulate students' motivation to learn independently.

Lanmo App, enables students to learn and exchange information instantly, and improve the efficiency of learning. So the teaching effects improve greatly with the combination of teaching, learning and assessment.

3 Teaching Effect of College English Based on Cloud Class Platform

The production-oriented approach (hereinafter referred to as POA) is a university foreign language teaching theory with Chinese characteristics proposed by Professor Wen Qiufang. The procedure of POA teaching is broadly divided into three phases: motivating, enabling and assessing [4].

Guided by POA, the cloud class platform is applied to college English teaching, in order to understand the teaching effect of cloud class in college English teaching, a questionnaire survey was conducted. The subjects of the survey were second year undergraduates who are non-English majors. The students, 50 boys and 50 girls, use "Lanmo App" to assist English learning. The result shows that 78% of students hold a position of approval (willing to use), 12% of students hold a neutral attitude, and 10%

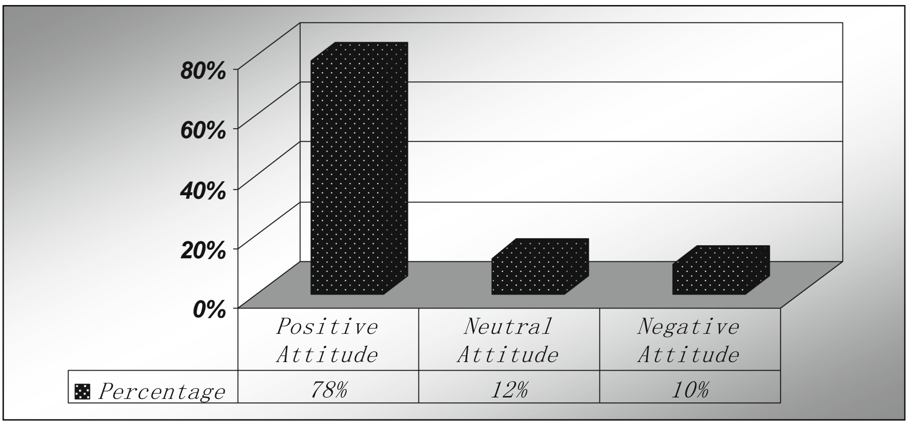

Fig. 1. Attitudes towards cloud class platform

of students hold a negative attitude, indicating that they are not accustomed to using App learning, or, the learning effect has not been significantly improved by using App to learn English. But overall, as technology advances, teaching with the help of mobile apps has become a trend, and learning effect has improved for most students. There are 60% of students made it clear that their test scores and English learning interests improved by using the App, and willing to complete the tasks with it so as to obtain "experience points". In college English class, the combination of online and offline teaching model has made good teaching effects with the help of Lanmo App (Fig. 1).

3.1 Accumulating Knowledge

The ways of accumulating knowledge are increased and the speed of sharing knowledge becomes faster by using Lanmo App. As for the ways of learning, online and offline learning could be combined together. As for the forms of learning, there are diverse types to input and output information, such as videos, audios, texts and pictures. As for the resources of learning, they can be learned at anytime and anywhere. If the resources are not enough, students can retrieve instantly. As for the content of learning, students can choose different courses lectured by different teachers from different institutions. It is beneficial for both teachers and students to learn from others and make up their shortcomings.

Sharing the knowledge related to texts, the students could be inspired to combine their preview work with personal opinions and output their ideas by answering teacher's questions and participating activities [5]. The specific teaching activities, such as scene shows, which will to some extent, stimulate students' interest in learning so as to improve teaching effectiveness and accumulate knowledge, or encourage students to engage in effective and interactive communication based on the contents of the texts, in terms of imitating speeches, cultural explanations, mutual questions, debates and group competitions. With Lanmo App, students could complete the writing products as well as oral products.

Lanmo App, as a mobile learning tool, meets the living habits of students, whether it's a supplement to background knowledge of culture, an expansion of text-related contents, or a consolidation of practice and testing. It greatly enhances the efficiency of college English learning in the class and after the class. Students' knowledge structure is improved through all-round multiple channels, which are more conducive to students' accumulation of knowledge.

3.2 Enhancing Learning Motivation

The process of obtaining "experience points" through the learning in Lanmo App, improves the students' interests in learning greatly, so that students treated the learning process as upgrading in games. They continue to accumulate experience, challenge themselves and truly achieve the enjoyable and educational experience [6]. In the past, with the aid of multimedia teaching, audio, video and pictures have been able to give students visual impacts, which could arouse association of ideas and think in depth. 75% of students think they are more motivated to learn English in conjunction with the cloud class platform. The result demonstrates that with the development of the times, the progress of network technology and the increase of ways to acquire knowledge, it is more beneficial for college English classrooms using cloud class platform—mobile Apps, to improve the teaching effects.

Take one teaching process as an example. The teaching material entitled "Time-Conscious Americans", from *New Horizon College English (second edition).* During the class, teacher selects the "Brainstorm" item in the App with the theme—Time. Teacher and students can interact instantly and the students can see their peers' thoughts through the App, which avoids the shortcomings that teachers can only ask individual students to share ideas and save a lot of time. Then, all the students select several answers that are most interesting, so the students who gave these answers could share the reasons. The procedure could stimulate students' interests and inspire students to think about the same and different things that may appear in the text [7]. All the relevant information could be shared through the cloud class platform vividly, so as to form good learning environment conveniently and quickly, which gives students a visual and auditory impact and helps students to improve their interests and curiosity in English learning.

3.3 Promoting Critical Thinking

Students do better critical thinking by using the cloud class platform. For instance, as for a reading text, teacher can set a few reading comprehension questions, allowing students to do "self-test" on the platform. What makes the test different is the variability of scores—students can change their answers within a certain period of time and increase their rankings by improving their scores. It is reflected as "experience points" increasing in the App. On the one hand, this function arouses students' interests in the forthcoming text. On the other hand, it makes the students carry out preliminary thinking on the topics involved in the text. During the class, by analyzing the text, students can not only read and do critical thinking, but also share the personal thoughts on the platform by participating in the "Brainstorm" part effectively. After class, there are some discussions and tests about the reading materials on the platform, in terms of the main idea, logical structure, writing techniques and other tests and discussions, which will stimulate students to output their knowledge.

Critical thinking could be realized by writing activities in the App. For instance, in the pre-class and classroom teaching activities, more emphasis is placed on the interaction and exploration analysis among peers, group discussions and the mode of teamwork reported by groups so that students can effectively discuss the depth and breadth of texts and foster critical thinking [8]. The output form of after-class online is as follows: divergent writing and follow-up writing. In the App, divergent writing is related to the theme of the text, the core sentence or a chapter abbreviation, expansion and rewriting. Follow-up writing could continue writing follow-up content, and this process requires students to propose questions and solve problems, release imagination, so as to develop innovative thinking ability.

Another function in the App, voting or giving a thumb, can raise students' awareness of critical thinking. On the platform, teachers and students could conduct in-depth discussion on the opposite end of the reading materials. The statistics made by the platform will demonstrate students' thoughts of a certain topic. With the support of

Big Data, all the students could find their peers' ideas, so as to stimulate themselves to do more critical thinking.

4 Conclusion

This paper provides an initial understanding of students' idea of using the cloud class platform in college English classes through questionnaire survey. Under the guidance of POA, the effect of college English based on cloud class platform is good. It is a good real-time interaction by sharing the materials vividly and concerning students' habits, which makes great contribution to the efficiency of college English teaching. However, the teaching model puts forward more requirements for the management of classes. While the cloud class platform is integrated with the traditional classroom, teachers should avoid students' distraction—use the mobile phone to do something irrelevant to the content of the course. Both teachers and students should make good use of online and offline resources, give full play to the cloud class platform in teaching, so as to improve the teaching effect of college English and cultivate talents with excellent ability of critical thinking.

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Research and Practice on Advanced Language Programming Teaching Mode Based on O2O

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Abstract. There is no doubt that O2O-based teaching mode is a requirement for university's courses in the current information society. The course offering that base on O2O teaching mode needs the whole teaching team to understand and change the teaching philosophy in the first place. The construction of O2O teaching resources which is the common product of the whole teaching team requires the cooperation of the whole teaching team, and it is a continuous improvement dynamic process. In advanced language teaching process over the last two years, aiming at developing computational thinking abilities of academician, the author not only has made repeated operation and modification of the previous O2O online and offline flipped classroom teaching mode, but also summarized some more perfect experiments of flipped classroom teaching mode according to the feedback of students and teachers. In brief, it provides good experience and methods for the future individualized quality education.

Keywords: Advanced language programming · Computational thinking Flipped classroom · O2O

1 Analysis of the New Era Teaching Mode

The advent of the Internet age and the rapid development of mobile Internet has driven a qualitative change in the teaching model of higher education. For different levels of institutions and students, they use MOOC (Massive Open Online Courses) teaching mode and SPOC (Small Private Online Course) teaching mode. The main objective of the reform of teaching mode is to improve teachers' teaching efficiency and students' learning efficiency, and enhance the computational thinking ability of teachers and students'.

1.1 MOOC Teaching Mode

In the present context of information society, «Ten years development plan of education information (2011–2020)» has put forward the core task of higher education, "Promote the in-depth integration of information technology and higher education, innovate in personnel training mode" [1]. MOOC was first applied by Dave Coymar of Prince Edward Island University in Canada and Brian Alexander of the National

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Institute of Liberal Technology in 2008. Some of the world's leading universities have launched MOOC online courses. In 2013, Tsinghua University established "School Education Research Center" and it is also the first university in China to launch the MOOC course [2].

Courses based on MOOKS are generally established by some key university masters, without the restriction of source, time and place [3]. Students study from the beginning to the end (certificate) in the platform independently; it focuses on process-based assessment to achieve a high quality of resource sharing. But not all types of schools and students could be able to accept this teaching model. Students and teachers are virtual contact, and they lack understanding in the processes of teaching. Meanwhile, there is a problem that graduation certificates cannot be recognized by one another.

1.2 SPOC Teaching Mode

SPOC is a mixed teaching model, it's an improvement of the MOOC mode and O2O-based teaching mode [4]. It can make virtual contact between teachers and students like MOOC online, and also achieve the real contact between teachers and students which like the traditional class. It is an organic combination of MOOC teaching mode and traditional teaching mode [5].

Besides, SPOC has two modes. One is that using the resources on the network learning platform as a supplementary learning tool for students to broaden their horizons. Another is flipped classroom, it asks students to study online first, and then teachers Q&A in the classroom, so that teachers and students can exchange roles.

1.3 O2O Teaching Mode Based on Flipped Classroom

The research object of this article is the advanced language programming courses. O2O-based Flipped Classroom teaching mode is adopted for the characteristics of students in the school. The teaching process is one that requires continuous learning and practice. Base on the experience of other universities' MOOC and SPOC teaching modes, we can make O2O-based Flipped Classroom teaching mode suitable for our school. Usually, it could deepen and improve the teaching mode of SPOC, which not only improves teachers' teaching quality and efficiency, but also increases students' free space and learning efficiency.

2 Network Platform Resources Construction

In science and engineering colleges, advanced language programming courses are basic computer courses. The teaching process is composed of instructional design, teaching contents, teaching methods, homework assignments, assessment methods, network resources and so on. The establishment of these systems cannot be separated from the requirements of the National Education Steering Committee which devotes to the cultivation of contemporary college students [6].

2.1 Team Teaching Concept Changes

As the basic course of computer science, the two main discipline abilities of advanced language programming capacity training objectives is that the cognitive ability of computer and the ability of computer to solve problems. Thus, computational thinking ability is the core content of computer-based teaching abilities. Therefore, the goal of personnel training has gradually transformed from application talents oriented for process to innovative talents oriented for many fields.

In the teaching exploration of advanced language programming courses, the teaching methods have changed a lot, they gradually shifting from the methods that focusing on solving problems by programming to the methods that base on case-driven or to the methods and concepts which base on computational thinking and these methods all focus on algorithmic analysis. The classroom teaching methods has changed from traditional teacher-centered methods to methods based on network resources but still teacher-centered, then to the teaching methods called Flipped Classroom which is based on O2O online and offline simultaneous learning that is student-centered.

The O2O-based teaching mode is a task that can be accomplished only with the support and cooperation of the teaching team. It is a complete teaching process that only when everyone's ideas and concepts are transformed.

2.2 Video Resource Building

Video resources are an important part of network platform resource construction. From the point of view of content of the organization, there need to be driven by the case-based, and focus on algorithmic analysis and the context to inherit. In order to prevent students tired while watching the video, teachers need to limit the video size and don't take too much time on the explanation of knowledge points and usually it's better to be within 10 min.

In the process of organizing video, the first problem is the lack of video funding, the second is that time is running out and the third is that whether video is recorded by a professional or self-teaching department. These issues are mutually restricting. In a time-intensive situation, we could not employ professional video recording staffs due to the lack of funds. The main solution to these problems is not to require special funds and professional video recording staffs, but lower demand standards and use local resources to record videos by teachers themselves. Each chapter is divided by different teachers to complete and teachers organize video resources according to the knowledge points.

We use the following two video recording methods to organize video resources.

1. Classroom video. We use video recorder to record real classroom, then the teachers divide the video into a series of video clips according to knowledge point and time. Such videos are endorsed by some students, they could not only feel the classroom atmosphere, but also they can experience the teaching methods of different teachers. Video recording can easily be organized, but the most of students will feel that it is slow of online learning. The videos which explain one or more related knowledge points in more than 10 min are suitable for students with poor receptivity who feels

difficult to understand the certain knowledge points. It can be used as an emergency solution to the construction of network resources as well.

2. Record video. It means to record screen by recording software. This screen recording process seems simple, in fact, it is not. It requires the teachers to design the courseware in advance, moderate teaching speed and try not to pause for too much time. PPT and programming environment needs to be switched smoothly.

The teachers need to clip the screencast video and throw a question when a certain point of knowledge is over. If students cannot answer back, there is a need to go back to the position where teachers design to learn again.

Screen recording video is actually just a machine screen video, students cannot see the teacher, so there is a lack of close feeling. The next step is to integrate teachers into the video, at the same time updates video resources regularly according to the requirements of teaching materials and other aspects.

2.3 Test Database Resource Construction

The purpose of the resource construction of the test database is to achieve the process and the comprehensive final assessment.

The Question Types in respect of mastering degree of knowledge points: Single or Multiple choices, Completion, True or False.

The Question Types in respect of Analyzing problem and understanding ability: Programming completion, Programming error correction.

The Question Types in respect of mastering degree of algorithm and ability of solving problems: Program design.

The construction of the test database is a dynamic construction process, it is supposed to improve and update constantly along with different periods, different stages of development, different training objectives.

2.4 Fair Use Other Platform Resources

At present, many comparatively mature e-learning platforms have been developed, it is a waste of time to develop another e-learning platform by university itself. However, none of these platforms fully meet the requirements of teaching. It requires us to use a combination of two or three platforms effectively in order to complete the teaching process, in other words, use different platforms comprehensively.

For instance, E-learning platforms cover the function of basic video learning, teacher-student interaction, student management, automatic examination of the objective questions. The authors develop an examine system for programming test and a final comprehensive examination system. These three systems have been used organically and we have received good teaching results.

3 Teaching Process

3.1 Teaching Content and the Course Preparation

The authors have developed a complete teaching system based on the O2O flipped classroom teaching mode, which mainly reflects in the following aspects.

1. The degree of flipping. It is unsuitable for most universities to flip the advanced language programming teaching completely, and it is necessary to teach properly according to the characteristics of students and difficulty level of knowledge points. It is indispensable to emphasize and promote important algorithms in class and even illustrate their roles in practical fields.
2. Teaching calendar. The author added the main explanation, Q&A session during the courses, and offered student the previewing content, reviewing content and school assignment etc. This is shown in Table 1.
3. The teaching plan. Redesign the content of the teaching plan according to the teaching calendar, point out the key and difficult points of this course, and mark whether it is synchronized with the teaching calendar.
4. Assign the Homework and arrange classroom questioning. Teachers publish the previewing content and reviewing content in the classroom or by other interaction tools such as QQ Groups and WeChat Groups, grasp the real learning situation and common problems of students through classroom questioning, and explain mutual problems.
5. Supervise and urge studying. Teachers could understand the learning situation of students by seeing video Ruminant ratio on the network platforms, learn about questions that raised by students through discussion forums on other interactive tools and platforms. Through test scores of the network platforms, teachers could understand the students' masteries of the previous knowledge. Teachers release learning status of students through the QQ group or WeChat group, and urge students who have not lean well to pay close attention to learning.

3.2 Studying Process of Student

The students can learn knowledge points directly through the resources of network platforms by themselves at any time and anywhere, these resources not only can help students complete learning tasks as normal, but also could help curious students to learn more about the subsequent chapters. If the student's learning process is chaotic and unexpected, teachers cannot master their learning situation and solve the problems in time. Therefore under the unified teaching progress, all students should complete tasks online according to pre-set content, and regard this as a part of process assessment in order to supervise and control their learning progress.

Students online learning methods include the following two situations.

1. See video recording video. Videos with mission points are suitable for self-study, the explaining speed of the videos is much faster than the classroom. The task points are set according to the relevant knowledge points. For students, completing

Table 1. Teaching calendar paradigm.

Week	Month. Date	Time	Lecture content	Classroom questions	Experiment	Review and preview
1	3.1	2	Chapter two data type, operator and expression Instance 1: The difference between two numbers Instance 2: Calculate the area of the circle 1 Type of data 2 Constants and variables	1. What is the meaning of different data types of data? 2. How to calculate the variable's memory size? 3. What are the keywords defining data types? 4. How to define data 3.14 as a symbolic constant? 5. What is the meaning of variables? 6. What's the difference between character constants and string constants? 7. What is the rule of identifier? 8. What's the meaning of ASCI? 9. What is the ASCII of the character 'b'?	2	Review: 1. The five types of data that make up the number of bytes in memory? 2. How to calculate the number of bytes in a variable? 3. What's the C++ definition rules of the identifier? Preview: 1. How to calculate the remainder of two integers? 2. What's the meaning of self-plus and self-add? 3. How to calculate the value of the assignment expression? 4. What's the rule of data type conversion? 5. Understand the C input and output rules 6. In VC6.0 editor, compile and run instance 1, examples 2 and 3.4 7. Record the problem cannot be understood in the preview

the task points shows that they have mastered a certain amount of knowledge and completed the teacher's arrangement about related issues in advance.

2. Classroom video. The videos are from the real classroom, they contain more detailed explanations about the teaching content and are particularly suitable for students who have a low starting point or poor acceptance. They can successfully complete the task points and preview content by watching the classroom videos at first and then watching recording videos.

3. Process of teacher-student interaction. If students have problems with their learning, they can interact with the teachers through multiple channels. The first platform is a forum of online learning, where Questions can be answered by teachers or another students; the second platform is QQ Groups, it will be set to have a "Homework" form, teachers not only can assign homework in class but also can post problems in the "Homework" to show where students need to review and preview. Students can either ask questions by writing or by leaving voice mail, by program screenshots as well. The same questions can also be answered by other students or teachers; the WeChat group can also complete the teacher-student interaction process. With QQ groups and WeChat groups, teachers can regularly release the students' online learning progress and status of online homework completion of students. The status of students' video watching in a section is as shown in Table 2.

Table 2. The status of students video watching in a section.

Name	Video viewing	Total viewing time	Ruminant ratio
Yuchen Tang		3.5 minutes	106.57%
Xiaodong Chen		4.0 minutes	123.21%
Daolu Li		10.6 minutes	324.4%
Zhenbin Wei		3.6 minutes	111.44%

3.3 Assessment Process

The exam resources need to be established on different network platforms in order to achieve the process of assessment and the final comprehensive assessment. Process assessment is mainly to examine the learning outcomes of different stages of students, and also play a supervisory role to promote students learning at the same time. The final assessment is mainly to assess students' comprehensive ability. Process assessment is divided into two types, the one is to examine how the students master the basic knowledge points. The main questions include multiple choice questions and blank questions. At the end of each chapter, the questions will be posted on the network platforms and teachers set the limited answer time in order to make sure that students complete questions in a certain time. The second is to understand the students' mastery of algorithms and problem-solving skills. The main question type is programming and it will be released on the operating system platform after explaining the structure of the choice of programming.

Table 3 shows Student statistic of online learning scores, the table indicate that the teacher focused on video scores and process test scores.

Table 3. Student statistic of online learning scores.

Name	Student ID ↑	Course video (50%)	Examination (50%)	Consolidated results ↑
Yuchen Tang	1603010120	50.0	50.0	100.0
Xiaodong Chen	1603010101	46.99	49.17	96.16
Daolu Li	1503050106	37.35	48.33	85.68
Zhenbin Wei	1603010124	36.75	41.67	78.42

4 Conclusions

Actually, it is viable to enhance the creativity and quality of education through in-depth integration of the "Internet +" and personnel training. Teaching reform and innovation is a dynamic process that requires the teaching team to work together. Do not stick to one form of teaching mode, we should learn the good ideas of MOOC platforms of key institutions and improve SPOC inadequacy, and then control the degree of flipped classroom. The resources on the network learning platforms should not only ensure the normal teaching needs, but also provide the preconceived knowledge that needs to be paved, such as basic computer knowledge, someone needs to understand some of them before learning advanced language. The platforms also need to provide extended knowledge about the related courses. It will lay the foundation for students to solve problems in other classes or projects later.

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Machine Learning and Modern Education

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Abstract. Machine learning is an important branch of artificial intelligence, which simulates human's real learning activities by machine so that the machine can acquire corresponding skills, knowledge and processing means to achieve artificial intelligence. The process of machine learning is the process of obtaining certain knowledge by a specific activity for a machine with a certain purpose, which is manifested as knowledge from unknown to known, and from the concrete to the abstract. The learning process of human brain is the process of acquiring knowledge, skills and attitudes through interaction with teachers, students and teaching information in the teaching context. It also shows the unknown and the known, and focuses on migration and application. Based on the consistency between machine learning and modern education, and based on the analysis of the theoretical basis and relationship between the two, machine learning is applied to modern education, which paves the way for the common development of the two.

Keywords: Machine learning · Human brain learning
Learning ability · Educational technology

1 Introduction

Machine learning is a multi-field interdisciplinary subject which involves probability theory, fuzzy theory, brain science, cognitive science, algorithm complexity theory and so on. It is based on the understanding of human learning mechanism based on physiology and cognitive science, and reorganizes the existing knowledge structure and constructs a computational model of human learning process. The common algorithms for machine learning include Bayesian algorithm, convolution neural network, ADABOOST algorithm, support vector machine algorithm and so on. In the era of big data, machine learning has made great changes in image recognition, speech processing, Natural Language Processing and other fields, showing great potential and development advantages.

We will explore the implications of machine learning education and its impact on the future development of educational undertakings under the background of large data in this paper.

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2 The Development of Machine Learning

2.1 The Development Process of Machine Learning

AlphaGo and nine players Li Shishi man-machine war, let us enjoy the potential of artificial intelligence technology. Data is a carrier, intelligence is the target, and machine learning is an important way to help us to realize artificial intelligence from data carriers in the era of large data. Therefore, machine learning is the core of data science and the essence of modern artificial intelligence.

The development of machine learning can be roughly divided into three stages. The first stage is the neuron learning neural network learning machine, which began in the middle of 1950s. At that time, the research of neural network promoted the research of pattern recognition and automatic control. At this stage, artificial intelligence research in the “reasoning”, from logic theorist A. Newell and H. Simon is derived and then the general problem solving program, made exciting achievements at that time. With the development of research, people gradually realize that only the ability of logical reasoning is far from artificial intelligence. E.A. Feigenbaum and others believe that in order to make a machine intelligent, it is necessary to try to make the knowledge-based machine.

In the 1960s, machine learning entered the second stage which is learning from the parameters to the concept of symbols.

2.2 Machine Learning Model and Human Brain Learning Model

Learning and memory are inseparable. If learning does not have memory, learning will lose meaning. For the learning process of the human brain, memory is the product of the learning process, and the memory is inevitable in the learning activities. So the learning process of the human brain always contains the memory process.

Learning is a skill that human beings are different from many other organisms. “Machine learning” aims to achieve human’s learning activities by learning certain processes or results through the intervention and training of people in the periphery. Robert gamier, a famous American educational psychologist, believes that the process of learning can be reflected by the following patterns of information processing:

In this pattern, execution control and expectation are two very important parts. They can stimulate or change the processing of information flow. Executive control is the effect of existing experience on the current learning process, and it is expected that it is the influence of motivation system on learning, and it plays a directive role. They achieve the supervision of information flow processing. In a sense, the learning process of human brain is the process of information absorption, processing, feature extraction, preservation, use and acting on the next information processing (Fig. 1).

The process of machine learning is that machines form their own “knowledge base” through a large number of training samples, thus having the ability to

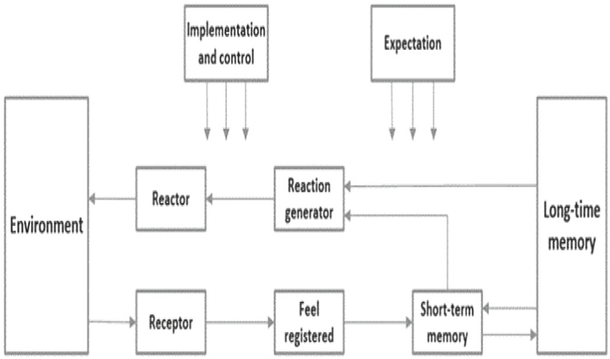

Fig. 1. The information processing model of Gagne's learning and memory

deal with an event. Machine learning processes information in the process of sample processing, preprocessing and extracting features of a large number of samples, and then building a certain model based on features. It is found that although human brain learning and machine learning are quite different in terms of self-organizing learning ability, timeliness and information processing capacity, the two processes of internal information processing are very similar. Therefore, it is of great practical value to think and explore the internal migration and application of the two.

3 The Exploration and Development Significance of Machine Learning in Education

3.1 A Wave of Deep Learning in the Wave of Education

Deep learning is a method based on the representation of data in machine learning. Observations (for example, an image) can be expressed in many ways, such as the vector of each pixel's intensity value, or more abstract to a series of edges and specific shape areas. It is easier to learn tasks from an instance by using certain specific representations. The advantage of deep learning is to use unsupervised or semi-supervised feature learning and layered features to extract efficient algorithms to replace handmade features.

Deep learning is a new field in machine learning research. Its motivation is to establish and simulate human brain's analysis and learning neural network. It simulates the mechanism of human brain to interpret data, such as image, voice and text. In recent years, there has been a wave of deep learning based on machine learning in the field of education in the world. In 2010, the William and Flora Hewlett foundation launched a strategic plan for deep learning in the United State of America. The program is committed to 2025, and 80% of American students are committed to deep learning. In addition, the document issued by National Association of State Boards of Education in 2015 also used deep learning as the national policy of twenty-first Century education in the US. Besides, as one of the important branches of machine learning, deep learning has penetrated and is about to set off the wave of education.

3.2 The Significance of the Development of Machine Learning in Education and Teaching

First of all, in the era of big data, the real-time acquisition of students' learning data will become very easy. Combining machine learning analysis, studying and identifying student's learning mode will become an easy way to achieve. At the same time, combined with the analysis of students' learning data and the real-time change of learning mode, we can also make adjustments to the corresponding teaching contents and methods, so as to better achieve the two-way development of teaching and learning. For example, students through the stages of testing, the data collected can reflect the corresponding content in each small stage and grasp the situation; the big data collected by students doing different types of test in the course of time, accuracy, migration ability and other information, learning model can help teachers construct students, better understand the learning characteristics, in order to make the next step fit the development of teaching plan for it; and at a higher level, by comparing a large number of students in different knowledge points of mouse clicks, time information, completeness, it reflects the whole process of teaching system of what are the purpose of teaching and the actual situation of the students to accept the entry and other issues, this is also the general education teaching mode which can not be achieved.

Secondly, with the help of machine learning, the platform of data acquisition and the reliability of the evaluation system will be realized in the future education. Through platform education, teaching information collection, the corresponding system will be more standardized and practical, the same student feedback teaching information will be preserved as its identity information, and used for its feedback from many stages of learning. The record of student information year by year and the two-way function of the teaching are also the major progress of the reform of the whole education and teaching system.

4 The Application of Machine Learning in Future Education

4.1 The Application of Machine Learning in Distance Education

In the development of nearly ten years, machine learning has been very gratifying achievements in many fields, for example, show the advantages and great potential for development in many fields Chinese characters recognition, image recognition, voice recognition, and Natural Language Processing translation, and in people's lives has created a huge production value. The combination of machine learning and network distance education is becoming more and more closely.

With the popularization of computers and the development of the big data era, the rapid development of online education has been launched. And it has occupied a significant position in the field of education. Therefore, the more practical and intelligent network education system is also one of the important needs of the development of network education in the future. And any intelligent network teaching system must have machine learning technology to participate in it. For example, detection and summarization of students' topic styles and habits may involve neural network system, machine learning technology based on inductive and statistical learning, deep learning and many other aspects. After analyzing the statistics of learning, the induction of learning mode and the style of learning and understanding, if we combine the mechanism of reinforcement learning, the system will automatically feedback to the next learning task and make ladder goals.

4.2 Machine Learning Helps People to Better Understand and Promote Brain Learning

The ultimate goal of Robert gamier learning theory is to promote and improve people's learning, he proposed the learning hierarchy theory and learning accumulation of these theories, the construction is the basic form of psychological research learning and learning chain: Lenovo, which has a strong similarity between the neural network in machine learning. The process of learning "Gagne who raised the scientific information processing model" is mainly composed of three aspects: (1) to ensure that using mathematical method to describe the study of variables involved in the models; (2) the process of human brain simulation process of processing the information to the computer; (3) the language of science is dedicated to understanding people how to use language learning. Study on machine learning statistics and probability theory can be used to analyze and discuss related variables in the model of Gagne in learning, there are also conducive to improve the diversity and reliability analysis of the sample data in the background, the learning model is established to analyze the actual situation more fit, the mathematical model and is suitable for different learning styles and characteristics the students. At the same time, it also helps us to make up for the deficiency of human learning. Compared with the process of machine learning, the process of human mind and brain learning is longer and more complex. Besides, people's learning is influenced by many factors, such as environmental factors, intelligence level, interest and hobbies, learning background and so on. Machine learning has many advantages such as high efficiency, good effect and easy preservation of learning results. The task of putting some of the tasks completed by the human brain is done to the machine can save people from doing complicated and complicated work in person.

In short, machine learning in many aspects of the existing theory and research results if they can properly migrate to either Gagne's learning model, analysis of the actual teaching process, or to make up for each of human learning is not enough to replace the human aspects of the work, will be something groundbreaking and will have great practical value.

4.3 Realizing the Realization of Real-Time Update and Completion of Knowledge Base

At present, the automatic acquisition of knowledge and the real-time intelligent updating are the bottleneck of the development of the intelligent education and teaching system. In the background of large data, machine learning has the potential to solve these problems. For example, machines will hopefully achieve real-time knowledge, classification, organization and arrangement for knowledge acquisition, and how to solve the problem of migration between new knowledge and old knowledge, and how to ensure consistency and complete constraint of knowledge integration. People constantly improve their learning ability through continuous training of machines, so that they can improve the knowledge base in various problems, which is very meaningful for the preservation and development of knowledge.

5 Summary

The trend of times in machine learning is applied to modern education and teaching, the learning process of the human brain to help people understand and improve human knowledge base system, has great prospects for development to improve the network distance education teaching mode and the feedback mechanism. The collision between machine learning and traditional learning will also be a new attempt to combine and promote the development of AI and traditional education in the new era.

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Application of WINDLX Simulator in Teaching Practice to Solve the Structural and Control Related in the Pipeline

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Abstract. In the actual teaching of course Computer Architecture, such as parallel execution of instructions in the pipeline mechanism, as well as the three typical pipeline-related that affect the performance and the performance improvement after the elimination of three performance-related and other content, some students understand relatively difficult. WINDLX simulator not only can demonstrate the working principle of DLX instruction in the pipeline machine through the program written, but also can provide the statistic of program status which is executing on the pipeline machine.

Keywords: WINDLX simulator · Computer architecture · Related Instruction set

1 Introduction

As an important branch of computer science, computer architecture include the following aspects: Instruction system, data representation, addressing of operands, definition of registers, definition of terminal structure and exception conditions, storage system and management, I/O structure, definition and switching of machine working state, based on the above aspects and then study the internal computer software and hardware functions of the distribution mechanism, and ultimately to achieve the purpose of efficient and orderly system to complete the task. We hope we can point out and analyze the existing problems in existing disciplines, and plan the future development trend of disciplines. However, there are many problems in the actual teaching, for example: many concepts and principles of the content is not accompanied by the image of the intuitive experimental teaching environment, students can not clear learning objectives, the curriculum knowledge to practical application is difficult. Therefore, we adopt a combination of theoretical teaching and practical teaching. The introduction of DLX simulator to the actual teaching, achieve a win-win situation in both teaching and learning to.

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2 DLX Instruction Set Structure

DLX is a pipeline example that runs through this topic, many discussions in the course, the simulation is based on DLX. DLX is a multivariate unsaturated instruction set structure, have a simple Load/Store instruction set, second, pay attention to instruction flow efficiency, third, simplifying instruction decoding, efficient support for the compiler.

DLX can deal with data types of 8-bit bytes, 16-bit halfwords, 32-bit integer numbers, and 32-bit single-precision floating-point numbers and 64-bit double-precision floating point numbers. The reason why there are 8 bytes in the recommended minimum data type is because the DLX needs to process character data. The reason why there is 16 halfwords, because it appears in a language similar to C, half-word data types are also very popular in the operating system code, after all, for these codes, the speed and length are equally important. The operation of the DLX is mainly for 32-bit integers and 32-bit or 64-bit floating-point numbers. When a byte or halfword is loaded into a 32-bit register, the upper bits of the 32-bit register are filled with zeros or sign bits and, once loaded into registers, are calculated as 32-bit integers.

3 WINDLX Simulator Introduction

The entire WINDLX folder contains WINDLX.EXE and WINDLX.HLP files, also need some assembly code files with. s extensions. When creating the installation directory for WINDLX, chinese characters can not appear in the path, to prevent the occurrence of some of its features can not be used. Double-click WINDLX.EXE start WINDLX platform. Under the interface of WINDLX, there are six sub-windows: Register, Code, Pipeline, Clock Cycle Diagram, Statistics and Breakpoints.

4 WINDLX Simulator Application

4.1 Structure Related and Processing Methods

Instructions in the process of overlapping implementation, the hardware resources can not meet the requirements of the implementation of overlapping instructions, resulting in hardware resource conflicts arising from the structural correlation. The second of these two instructions must wait until the previous one has been executed and can no longer be executed using the operator.

Computer hardware resources are limited, but also very expensive. In order to solve this phenomenon, there are many targeted simulators. Among the many simulators, WINDLX simulator has a very powerful hardware simulation capabilities. You can set the addition, multiplication and division of the units in the platform according to the needs of the experiment.

After the program is correctly run into the platform, you can find the number of structure related in the Statistics window (Statistics window), as shown in Fig. 1.

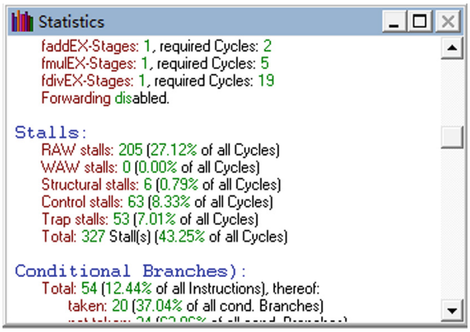

Fig. 1. Related statistical results window

Then, based on the original hardware resources, we see that the number of structural relations in the statistics window is 6 (Structural stalls). Take a piece of code in the bubble sort as an example, as shown in Fig. 2.

```
addf    f2,f10,f1
addf    f10,f1,f11
addf    f11,f1,f2
```

Fig. 2. Generates structure-related code segments

The execution of this statement in Fig. 2. requires a continuous floating-point addition, Because there is only one adder, so the program execution to the three instructions generated structurally related, as shown in Fig. 3.

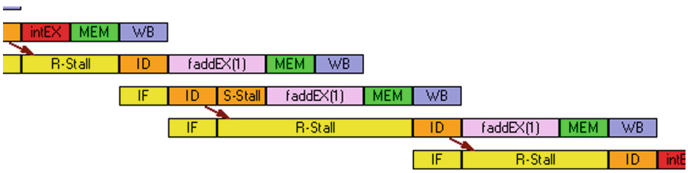

Fig. 3. Produces structure-related pipeline spatiotemporal plots

In the WINDLX platform, eliminating the number of structures related to the operation is very simple, reset the platform, reload the program to the platform, navigate to the Configuration option in the above navigation, click and select the Floating Point Stage Configuration function bar, the number of Addition Units (Addition Units) rewritten into 3, the effect shown in Fig. 4.

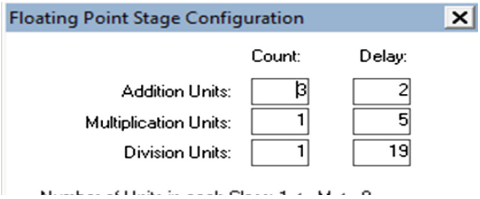

Fig. 4. Add addition unit

After running the pre-loaded program again, this time enlarge the statistics window below the platform (as shown in Fig. 5.), After solving the structure of the code shown in Fig. 2 pipeline space-time map shown in Fig. 6.

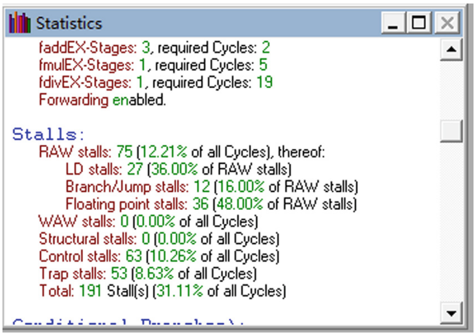

Fig. 5. Statistics window

After running the pre-loaded program again, this time enlarge the statistics window below the platform (as shown in Fig. 5). After solving the structure of the code shown in Fig. 2 pipeline space-time map shown in Fig. 6.

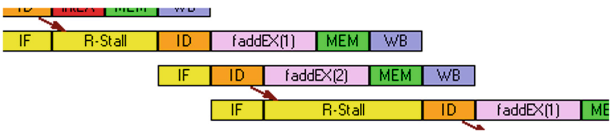

Fig. 6. Produces structure-related pipeline time-space map

By changing the number of floating-point adders, all three instructions in Fig. 2 can be performed on different adders, eliminating the structural dependencies of the code, according to the program's chart, it can be seen that the structural stalls have become zero. Through the WINDLX platform, we can virtually increase the number of addition units in the hardware, and use the statistics window to clearly see the sharp contrast before and after dealing with the structure, which is something that can not be done without the introduction of the platform.

4.2 Control Related and Processing Methods

Control-related means that the instruction read in advance enters the value phase of failure due to various branch instructions (conditional branch instructions, rotor program instructions and interrupts, etc.) resulting in a jump in the program. Since the control-related effects are much larger in scope than the data and may cause changes in the direction of execution of the program, the control correlation may also be referred to as global correlation.

In the case of a bubble sort program, all the sorted integers are output by loop one by one. Since the loop is used, a branch instruction is used and the control is unavoidably generated. In the control-related code, by copying the code in the loop body multiple times, the execution of the jump instruction is reduced. As shown in Fig. 7, the code fragment often need to jump back to the beginning of the output, resulting in the previous stage of the pipeline fetch phase of the code read failure, and then generate the control in the pipeline.

```
output:     subi      r8,r8,1
            lf        f2,   PrintfValue(r3)
            cvti2d    f0,f2
            sd        Printf,f0
            addi      r14,r0,PrintfPar
            trap      5
            addi      r3,r3,4
            beqz      r8,over
            j         output
```

Fig. 7. Generates control related code screenshots

In order not to affect the pipeline performance, the specific method is to copy the loop code in the output function twice to achieve the purpose of reducing the execution of the jump instruction. Then we reload the program, after the implementation of the statistical window shown in Fig. 8.

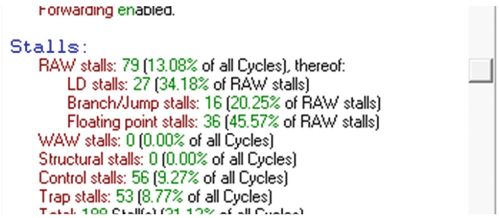

Fig. 8. Statistics window using the loop unrolling technique

Comparing the data in Fig. 1, we can see that the reduction of control stalls from the original 63 to the current 56 did exactly what we wanted. And this platform gives us such a visual intuition, truly a simple, quick and accurate purpose. Observe the number of control related and the total number of program clocks before and after comparison in the Statistics window (Statistics window).

5 Conclusion

In a modern society characterized by rapid development of informatization, we are constantly accepting information from all sources. Educational innovation is exactly what we need to see as it relates to the key issues in the development of education. In the future, we envisage and are more convinced that we will further combine theoretical teaching with curriculum experiments to further enhance students' autonomous learning ability and ability to accept class knowledge, truly happy to carry out the teaching and learning of knowledge, and strive to push the computer architecture course to a new level.

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Analysis Model of Teacher-Support and Learning Engagement in E-Learning

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Abstract. Recently, millions of persons research e-learning which has important social significance and extensive application background. E-learning influences the global higher education significantly. Based on the applied superiority of MOOC (the chief kind of e-learning), the main research aim of this paper is to provide effective learning strategy and to increase the engagement and the learning effect in e-learning. This paper utilizes the acquired big data during e-learning to analyze three dimensions of teacher-support and five dimensions of learners' learning engagement in detail. An effective model is proposed to analyze the relation between teacher-support and learning engagement. Based on the acquired big data, the mean, variance, correlation coefficient and other datum are analyzed to compare teacher-support and learning engagement in the effective model, all path coefficients of the result achieve significant level: $p > 0.05$. This paper proposes improved recommendations and supplies effective learning strategies.

Keywords: E-learning · Big data · Comparative model · Teacher-support
Learning engagement

1 Introduction

E-learning is the use of electronic educational technology in learning and teaching. Conceptually, e-learning is a word of broadly generalization with instructional technology, information and communication technology in education, multimedia learning, technology-enhanced learning, computer managed instruction, computer-based training, web-based training (WBT), online education, virtual education. In e-learning, the learner utilizes online platform to execute autonomic learning: online learning courseware, online video course, online test, online exercise, online interaction and so forth. E-learning is still a learner-centric educational activity like the traditional education; teacher-support makes great difference to the learners who execute the learning process in e-learning [1–3]. So the relation between teacher-support and learning engagement should be deeply analyzed to research the learning needs, the learning motivation and the learning habit. The analysis model can contribute the teachers to maximize the teaching effect during the previous course construction and the later

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teaching process, the research can also contribute the teachers to update teaching concept and lead to a sharp improvement in the quality of teaching.

Data acquisition and dimension measurement in learning engagement. Learning engagement is a key factor in e-learning, this paper utilizes five dimensions to measure the learning engagement in e-learning [4]. Online engagement dimension mainly measures the level which the learner utilizes online system to increase the learning effect; Online active learning dimension mainly measures how to execute the learning process with the suggestive learning methods of e-learning; Online social interaction dimension mainly measures the level which the learner utilizes online system to attend the social interactions in e-learning; Online teacher-student interaction dimension mainly measures the level which teacher and learner carry out the interactive issue; Online cooperation dimension mainly measures the level which the learner participate in the online cooperation.

Data acquisition and dimension measurement in teacher-support. Teacher-support is another key factor in e-learning. In the traditional education, Fredricks discusses the relation between teacher-support and learning engagement, the result shows that the learners increase the learning engagement while the learners get the better teacher-support [7]. What the relation between teacher-support and learning engagement are shown in e-learning? The research result from Shea shows that if the teachers supply the behavioral support and the strategy support, the learner will obtain social presence and increase the learning engagement [8]. The conclusion from high-level documents and researches shows that all the teachers' behavior, the teachers' attitude, the teaching method selection, the learning task design and feedback on learning all can affect the learning engagement in e-learning [5, 6]. Further research shows that the needed content from teacher-support has three aspects, those aspects are autonomous learning design, emotion encouragement and learning strategy support. Autonomous learning can also be called autonomic support is that teacher support the learner to autonomously choose the learning task, the learning content and the problem solving method; emotion encouragement called emotional support is that the teacher timely and actively concern the emotion which the learner evokes facing the challenge in e-learning; learning strategy support called cognitive support is that the teacher supply the challenge, the higher learning strategy and the further exercise to the learner.

Based on the research and analysis above, in e-learning, teacher-support makes important effects on the learning engagement. At present, related researches mainly focus on the model between teacher-support and learning engagement in the traditional teaching, and some other researches focus on elucidating the instructional theory of teacher-support in e-learning [9–12]. It needs further authentication that what is the relation between teacher-support and learning engagement and which aspect can deeply affect the learning engagement in e-learning [12–15]. So this paper models the relation between teacher-support and learning engagement to research and to analyze the above issues and appropriates the analytical model to propose the improvement measures for e-learning.

2 Research Technique

2.1 Data Acquisition

Experimental measurement is the main research method based on the data acquisition. The main research object is 1351 Harbin Institute of Technology undergraduates participating in e-learning, and the random sampling and cluster sampling methods are used in this experimental measurement. Field survey and online survey are used in the data acquisition, 1225 valid questionnaires are collected, and the efficient is 90.6%. Every research object completes at least one e-learning course which includes “Communication Principles course”, “Microwave Technique course”, “Higher Mathematics course” and other related courses, these undergraduates are all between the ages of 18 and 24. The specialty ranges from communication engineering, materiality, machine building, boiler, welding, management, electronics, automation, biochemistry, to physics and chemistry.

2.2 Research Method

Learning engagement model depends on e-learning. The model utilizes learning engagement data table as the quantitative index. The learning engagement data table consists of five dimensions: online engagement dimension, online active learning dimension, online social interaction dimension, online teacher-student interaction dimension, online cooperation dimension. The learning engagement data table utilizes five points scoring method, the points from “1” to “5” respectively represents “all mismatch” to “exact match”, and higher points represent more learning engagement. In the learning engagement data table, the measured reliability coefficient (*Cronbach*’*s alpha*) of five dimensions and internal consistency respectively are 0.81, 0.82, 0.79, 0.85 and 0.87, the confirmatory factor analysis is $\chi^2 = 217.5$, $df = 95.6$, $\chi^2/df = 2.28$, $GFI = 0.86$, $CFI = 0.95$, $TLI = 0.97$, $RMSEA = 0.08$, $RMR = 0.07$. The datum shows that the table involves better construct validity.

Teacher-support model depends on e-learning. The model utilizes teacher-support data table as the quantitative index. The teacher-support data table consists of three dimensions: autonomic support, cognitive support, emotional support. Autonomic support involves four problems, cognitive support involves four problems, and emotional support involves three problems. The teacher-support data table utilizes five points scoring method, the points from “1” to “5” respectively represents “all mismatch” to “exact match”, and higher points represent more perceptive teacher-support. In the learning engagement data table, the measured reliability coefficient (*Cronbach*’*s alpha*) of three dimensions and internal consistency respectively are 0.80, 0.81 and 0.87, the confirmatory factor analysis is $\chi^2 = 55.93$, $df = 40$, $\chi^2/df = 1.33$, $GFI = 0.89$, $CFI = 0.97$, $TLI = 0.98$, $RMSEA = 0.06$, $RMR = 0.07$. The datum shows that the table involves better construct validity.

2.3 Data Processing and Analysis Method

The model mainly utilizes SPSS and AMOS to process data. Descriptive statistics is utilized to analyze the collected data by SPSS22.0. Based on the theoretical basis and the research hypothesis, this paper sets up a structural equation model. In the data processing procedure, correlation analysis, confirmatory factor analysis and path analysis are used to verify parameters by AMOS21.0.

3 Research Results

3.1 The Overall Level of Learning Engagement in E-Learning

The descriptive statistical analysis of learning engagement for e-learning is shown in Table 1. The holistic mean value of learning engagement is 3.57 which is just higher than the theoretical mean value 3.0. In the five dimensions, the engagement level is sorted in order from high to low: online engagement, online active learning, online social interaction, online cooperation and online teacher-student interaction. Specifically, in online engagement, “learning-platform investigates the needs of learners before the formal curriculum” (*Mean* = 4.03), “learning-platform recommends the learning content for the learners referred to personal characteristic” (*Mean* = 3.96), “learning-platform provides many useful details of cases for learners to analyze the problem and make the decision” (*Mean* = 3.72); in online active learning, “have good learning habits, such as real-time notes, preview, periodic summary for learning” (*Mean* = 3.74), this item gets the highest score, followed by “have a set of personalized learning methods for e-learning” (*Mean* = 3.59), the lowest score item is that “keep e-learning on time” (*Mean* = 3.30); in online social interaction, the score of each item is generally low, such as “feel like face-to-face chat when using the chat function in learning-platform” (*Mean* = 3.48), “get the good advice based on the comments of other learners” (*Mean* = 3.41), “share their learning experiences and feelings with other learners” (*Mean* = 3.25), and “share learning resources with other learners” (*Mean* = 3.28), in above aspects, learners do not put enough enthusiasm; in online cooperation, “classmates supervise and promote each other in the learning process” (*Mean* = 3.29), “regularly discuss the problem in online cooperation situation” (*Mean* = 3.21), “hold a group discussion activity, positively think and answer other learner’s problems” (*Mean* = 3.37); in online teacher-student interaction, “firstly tend to ask teachers for

Table 1. Descriptive statistics of learning engagement for online learners

Variable	Mean (M)	Standard deviation (S.D.)
E-learning engagement	3.57	0.57
Online engagement	3.90	0.77
Online active learning	3.55	0.59
Online social interaction	3.31	0.65
Online teacher-student interaction	3.16	0.61
Online cooperation	3.28	0.58

help when having learning problems" (*Mean* = 3.08), "teachers participate in the discussion to solve learner's questions in time" (*Mean* = 3.21), "according to the learner's online examination and homework, teachers supply the pertinent advice" (*Mean* = 3.14).

3.2 The Overall Level of Teacher-Support Perceived by Online Learner

By describing the statistical analysis, the mean value and the standard deviation value of teacher-support perceived by online learner in all dimensions are shown in Table 2. The overall level of teacher-support perceived by online learner is in normal state (*Mean* = 3.67). In three dimensions, the support level perceived by the learner is sorted in order from high to low: autonomic support, cognitive support and emotional support. The specific content of each dimension: in autonomic support dimension, "make pluralistic online learning evaluation modes" (*Mean* = 3.81) gets the highest score, followed by "give the learner enough free time to arrange own study plan" (*Mean* = 3.69), "make learning tasks or learning plans flexibly" (*Mean* = 3.65) and "realize the importance of the course in the learning process" (*Mean* = 3.52) both get low scores; in cognitive support dimension, teachers get the highest score in "provide plentiful resources for the learners to extend their learning" (*Mean* = 3.95), followed by "encourage and guide the learners to carry out inquiring learning/rethinking learning" (*Mean* = 3.72), "provide relevant learning tools" (*Mean* = 3.63) and "provide online learning guide" (*Mean* = 3.60) get the lowest score; in emotional support dimension, the details in each item are "put high attention on the suggestions and ideas from the learners and give feedback timely" (*Mean* = 3.69), "focus on the learner's performance and learning motivation" (*Mean* = 3.47), and "understand the learner's learning difficulties" (*Mean* = 3.44).

Table 2. Descriptive statistics of teacher-support perceived by online learners

Variable	Mean (M)	Standard deviation (S.D.)
The overall level of teacher-support	3.67	0.59
Autonomic support	3.75	0.65
Cognitive support	3.72	0.68
Emotional support	3.51	0.77

3.3 The Influence of Teacher-Support on E-Learning Engagement

The letter makes the detailed correlation analysis between teacher-support and e-learning engagement to explore the correlation between the two variables. The result can be statistically represented by the product-moment correlation coefficient. *Spearman Correlation Coefficient* of teacher-support and e-learning engagement are shown in Table 3. Three dimensions of teacher-support involve significant correlation with all factors of e-learning engagement, and the result indicates that teacher-support makes a great impact on learner's e-learning engagement. Further regression analysis and path analysis can be made according to above conclusion.

Table 3. Analysis of the relation between teachers support and e-learning engagement

	Autonomic support	Cognitive support	Emotional support
Online engagement	0.61^{**}	0.65^{**}	0.55^{**}
Online active learning	0.60^{**}	0.58^{**}	0.56^{**}
Online social interaction	0.56^{**}	0.60^{**}	0.56^{**}
Online teacher-student interaction	0.59^{**}	0.62^{**}	0.57^{**}
Online cooperation	0.61^{**}	0.58^{**}	0.66^{**}

Remarks: ** is significantly correlated at the level of 0.01(bilateral)

3.4 Structural Equation Model Analysis on the Proposed Relation

For an in-depth analysis the effect and path coefficient of teacher-support on e-learning engagement, based on research theory and related analysis, this paper establishes a hypothesis model which uses teachers' autonomic support, cognitive support and emotion support as external variables, and uses e-learning engagement as an internal variable. Then confirmatory factor analysis and path analysis are carried out in the model. Finally, after the evaluation of fitness and model correction, a structural equation model for the impact of teacher-support on e-learning engagement is formed, as shown in Fig. 1.

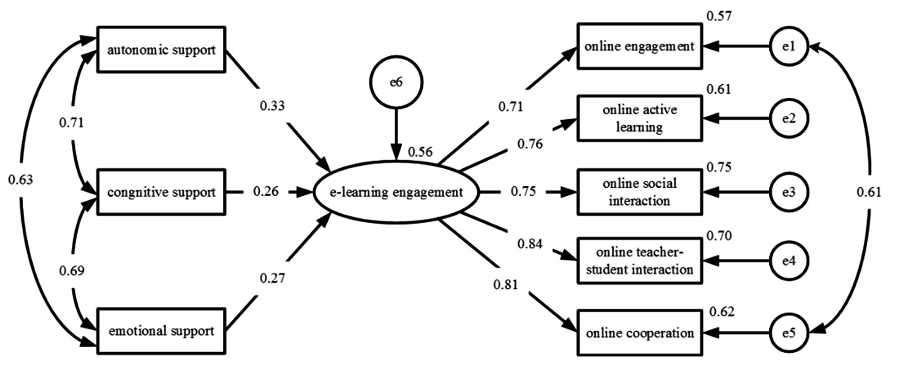

Fig. 1. Structural equation model on the relation between teacher-support and e-learning engagement

The fitting index of this model is: $\chi^2 = 10.51$, $df = 6.87$, $\chi^2/df = 1.52$, $GFI = 0.99$, $CFI = 0.96$, $TLI = 0.98$, $RMSEA = 0.03$, $RMR = 0.07$. All indicators match the model fit standard, and the model-fitting degree meets the requirements. Referring to the value of path coefficient estimated by the maximum likelihood method, the standard regression coefficient and the significant level are shown in Table 4.

According to the significant test standard value of parameter estimation ($p < 0.05$, $C.R.$ is higher than the absolute value of 1.96), all three path coefficient reached 0.05

which are in a significant level as shown in the Table 4. In Fig. 1, the path regression coefficient (β) is all positive, which indicates that the autonomic support, cognition support and emotional support from teachers can positively influence e-learning engagement. The values of specific effects on the three factors to the internal variable ("the direct effect of e-learning engagement") are 0.33, 0.26, 0.27. Teachers' autonomic support has the greatest impact on the e-learning engagement in all dimensions, followed by emotional support, and finally cognitive support. The total effect of the three factors values 0.56.

Table 4. Standard regression coefficient and the significance

Path	Standard error (S.E.)	Critical Ratio (C.R.)	Significance (p)
Autonomic support → E-learning engagement	0.05	3.73	***
Cognitive support → E-learning engagement	0.08	2.82	.002
Emotional support → E-learning engagement	0.07	3.51	***

4 Conclusion and Suggestion

E-learning is the inevitable trend with the internet information technology development. Through analyzing the relation of teacher-support and e-learning engagement, it is clear that teacher-support plays a key role in improving the effect of the learners. Teachers, platform developers, maintainers, and curriculum producers who undertake the task of curriculum construction can rationally design curriculum system, scientifically allocate teaching resources, set up humanized function in learning-platform and improve the learner's sense of achievement and acquisition. This paper holds that there are three points as follows:

(1) Construct the curriculum system rationally. The scientific allocation and the quality of teaching resource are important factors which affect the learning interest and attitude of the learners. The arrangement should be based on specific objects and should contain professional rules in online courses. The learning-platform should optimize the curriculum system, set scientific and flexible plans and facilitate the learners to learn courses. Conversely, the poor quality and dull content of learning resources easily make learners to evoke a negative learning attitude. In the process of curriculum system development, designers should pay attention to setting online course combining with offline practice and learner's psychological audio-visual, strengthen the research and construction of teaching

resources, design teaching plans scientifically, make full use of modern teaching media, design plentiful and interesting teaching situation. Furthermore teaching resources should be scientifically allocated. While constructing the curriculum video resources library, developers should upload course plans, reference texts, assisted videos and any others related contents to the learning-platform, so as to facilitate the further learning for the learners. Under the right circumstances, the individualized course can be pushed in accordance with the specific requirements of the learners to meet the diverse and individualized needs from the learners.

(2) Develop the humanized function in learning-platform, optimize the discussion community. Because e-learning is a kind of autonomic learning, in this way, learners and teachers are in physical isolation, so the virtual discussion community on learning-platform should be friendly, perfect and fully interactive to help learners to solve the puzzles and problems in the first time. The above methods can be used to reduce the loneliness of the learners in e-learning. Learning-platform interface should be designed simply and clearly. Its function should be easy enough to allow the learners to grasp the usage method. Opening web page quickly and accessing to learning materials timely can avoid losing control in the learning application and learning media. What's more, WeChat-Moment develops the chat function which allows the teacher to upload voice or video files. Above methods are used to enhance learner's interaction, communication and share behavior and promote the sense of individual achievement. By discussion community, learners can set up a communication among peers, encourage and help each other, share successful experiences, and help the learners to be interested and confidence in e-learning. Because the online communication between users (include learners and teachers) is the result of independent thinking. It can organize effective language in a limited time and fully express personal opinions. Learners are also enable to feel the concern of the teachers and learning partners, which will satisfy learner's emotional needs, promote and mobilize the motivation and initiative of learners.

(3) Combine e-learning with offline activity. Online learners need more positive self-efficacy as support for providing internal motivation and for the further learning. Learner's achievement sense is required to improve. The "Ranking List" column can be set up on learning-platform to motivate learners. "Ranking List" aperiodically gives honorary titles (such as the best learner, the best debater, the best fans and the most active person) to specific person who is up to standard as rewards. In addition, some offline activities can be hold, such as creating opportunities for some learners who get the title to have an offline meet with teachers, convening a symposium on exchange of learning experience, recording special video about learning experience pushed on platform, organizing incentive activities. In a word, holding offline activities for learners can effectively improve their belongingness and initiative, and their learning motivation is roused.

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An Early-Warning Method on e-Learning

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Abstract. Early-warning is an important way which can promote teaching effect on e-learning. However design a better system of early-warning based on big data is an open issue. This paper systematically analyses five key factors which act on e-learning, compare the effect on early-warning, summarize the insufficient of existing systems. Besides one kind of system framework on e-learning proposed, the system establishes functional model and procedural model for early-warning system. Research results show that the system can promote teaching effect for e-learning and can benefit the development of early-warning model.

Keywords: Big data · Early-warning · e-Learning · Prediction modeling
Promote teaching effect

1 Introduction

With the application and development of Internet Technology, e-learning has become increasingly popular and drawn wide attention from governments, schools and enterprises. It has become an important learning method in the information age. At present, the development of e-learning is increasing rapidly, but there are also many problems, such as low learning quality and efficiency, poor ability of teachers in adaptive teaching, inadequate supervision and untimely feedback system [1–4]. Among them, the most important problem is that it is difficult to guarantee the quality of learning, resulting in many learners cannot successfully complete the online course learning. Therefore some researchers have proposed early-warning to solve the above problems [5–9, 13].

Early-warning system can acquire and analyze the massive data generated in the process of e-learning. And then it will understand the learners' learning situation and discover problems in learning in time [10, 11]. By issuing reminders or warnings to learners, early-warning prompts and guides learners to complete online course successfully. The research and practice of online early-warning are overall in their infancy both at home and abroad. For example, the curriculum warning system developed by the Purdue University in the United States, social network visualization tools developed by Wollongong University in Australia. In China, Institute of educational data of

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the University of Electronic Science and technology has also developed a forecasting and warning system for colleges and universities. Compared with the traditional education data, the collection of education big data is more real-time, comprehensive and natural. The analysis and processing are also more complicated and diversified, and the applications are more diversified and in-depth [3, 12]. Based on big data, it is an important issue to figure out how to implement early-warning in the process of online education successfully. In this paper, based on the analysis of five typical early-warning system cases, a general framework is proposed for learning warning system, and functional model and process model are designed. It can help researchers to understand the framework and process principle of e-learning early-warning system better.

2 Typical Models of Early-Warning System in e-Leaning

The United States is the leader in big data. Some schools and agencies in the United States have taken the lead in developing different e-learning early-warning systems according to their own needs. These early-warning systems have made some achievements in related applications, especially in preventing dropout, and have accumulated valuable experience.

Table 1. Realization and algorithm in the typical models

System	Realization form in e-learning	Technology, algorithm and instrument
Curriculum signal system	Standalone early-warning system which institute develops	Predicting success algorithm, Data mining, Analysis tool
Student success system	Standalone early-warning system which enterprise develops	Semantics decomposition, Prediction modeling, Learning analysis, Data visualization
Learning instrument panel in Khan Academy	Introduce visual tool in learning management system	Information tracing, Mirroring technology, Learning analysis
E-consultant	Introduce personalized tool	eAdvisor™ demand, Learning analysis
Starfish Early-warning system	Modularization Design	Big data, Distributed computation system, Self-rectification mechanism

According to the form of early-warning function, the existing early-warning system can be divided into four categories: (1) Independent development of online early-warning which can be divided into two classes: One is self-developed by the school, such as Curriculum Signals developed by Purdue University; other one is developed by business organizations, such as Student Success System developed by Desire2Learn institutions. (2) Combined learning management system and visualization tools to achieve early-warning functions, such as learning dashboard in Khan Academy. (3) Embedding personalized tools in the learning system to achieve early-warning function, such as eAdvisor™. (4) As a module exists in learning early-warning system of e-learning platform, such as Starfish Early Alert System. The five typical learning early-warning systems have differences in the form of realization, content and way of early-warning. There are also merits and drawbacks as shown in Tables 1, 2, 3.

2.1 Curriculum Signals System

Curriculum Signals System is an online early-warning system developed by Purdue University to monitor the learning status of students. The system attempts to use Student Success Algorithm (SSA) a new algorithm to identify the students who are in academic crisis. It gives a warning, which is similar to the traffic lights. The "warning signal" is set in different color when different state for the teachers and the students. According to the "warning signal", the teachers intervene and guide learners through e-mail, short message, online messages and other means, so that the learners can complete studies.

Table 2. Method and content in the typical models

System	Warning method	Warning content
Curriculum signal system	E-mail, short message, system messages	Course grade, effort level, dropout
Student success system	Visual figure, E-mail develops	Academic alert, dropout
Learning instrument panel in Khan Academy	Instrument panel, E-mail	Knowledge point
E-consultant	E-mail	Learning path
Starfish Early-warning system	Small red flag, E-mail, short message	Course grade, effort level

2.2 Student Success System

The Student Success System (S3), developed by Desire2Learn in the United States. The system provide a range of services, such as viewing student learning situation, predicting academic risk, providing interventions and generating learning analytics reports. In addition, the system can also form a variety of prediction models by analyzing factors that affect students' learning, including in student attendance, course completion, participation and social learning. Through the system the model is able to predict which students are in a state of academic danger accurately, and provides them with appropriate interventions.

2.3 Learning Instrument Panel in Khan Academy

The Learning instrument panel is launched by Khan Academy in September 2013 and is originally applied to Khan Academy's math course. Based on information tracking technology and mirroring technology, Learning instrument panel is able to track, record and integrate a large number of learners learning information. At the same time, it analyzes the data according to the needs of the users. Finally,a visual form such as figures and charts is provided to learners, teachers, researchers and education administrators in e-learning.

2.4 eAdvisor™

eAdvisor™ is developed by Arizona State University. By playing the image game Me3, learners' professional interests can be explored and eAdvisor™ can develop a learning path accordingly. It sets out the courses to be completed each semester and the credits to be obtained. Throughout the learning process, eAdvisor™ provides learners with personalized on-demand tools, as well as providing guidance and support for the learning process, including early-warning.

2.5 Starfish Early-Warning System

The Starfish Early-Warning System is a module in the Starfish Enterprise Success Platform, dedicated to helping students to complete their studies. Based on big data, learning analysis, distributed computing and so on, Starfish early-warning system tries to understand students by analyzing the engagement of learners, thereby to reduce the dropout rate.

3 Learning Early-Warning System Framework

Learning early-warning system involves four key points, namely, the reason for early-warning (purpose layer), warning for what (content layer), how to warning (way layer) and the results of warning (result layer). Starting from these four points, this research constructs a general framework of early-warning system, as shown in Fig. 1.

Table 3. Effect and insufficient in the typical models

System	Effect	Insufficient
Curriculum signal system	Reduce dropout rate, grade improvement, administrative timesaver, administrative cost saving	Insufficient individuation, overmuch same intervention, not provided diagnostic message, not provided effective remedy
Student success system	Predict academic alert, offer suitable intervention, simplify administration	Low universality, non-technical person cannot execute predicted results
Learning instrument panel in Khan Academy	Improve mastery knowledge degree, improve self-skill, recommend personalized learning content	Apply to limited subjects, only mathematics curriculum, univocal early-warning content
E-consultant	Recommend professional curriculum, formulate learning path, arrange curriculum plan, assist graduation on time	Incomplete early-warning content
Starfish Early-warning system	Early understand student reduce dropout rate	Course grade effort level

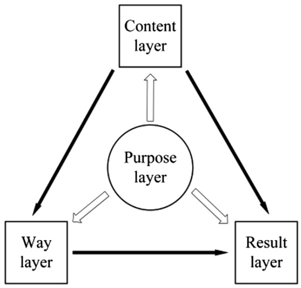

Fig. 1. Warning system general framework

3.1 Purpose Layer

There are four warning purposes: reduce the dropout rate, increase employment rate, promote academic success, and enhance the efficiency of learning. Confirm warning purpose determines the direction of the establishment and operation of warning system. It will directly affects the collection and acquisition of data, and influences the content layer, way layer and result layer, which is the basis of the warning process. The purpose layer is shown in Fig. 2.

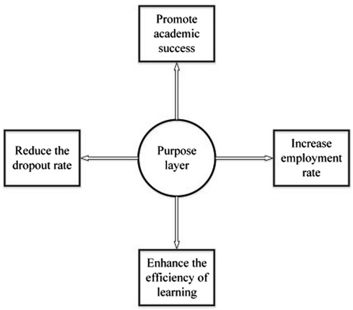

Fig. 2. Purpose layer

3.2 Content Layer

The warning contents include warning drop out, academic success, knowledge mastery, employment situation, learning path, learning effect and so on. The specific content will vary according to the purpose of warning. When the warning content is different, the warning way will be different, as shown in Fig. 3.

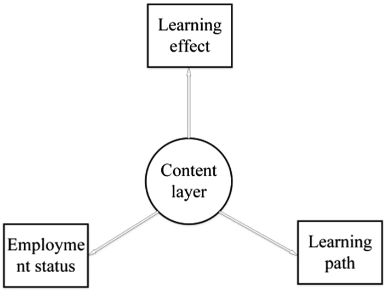

Fig. 3. Content layer

3.3 Way Layer

The warning way mainly contains data acquisition and data analysis. Data acquisition clarifies that which acquisition technology needs to be used and what data to be collected for data acquisition. Data analysis is based on the collected data; it decides which data analysis technology and warning algorithm to adopt. In the era of big data, the omnidirectional data of learners are collected, and different data will be selected for analysis and process when the purpose is different, as shown in Fig. 4.

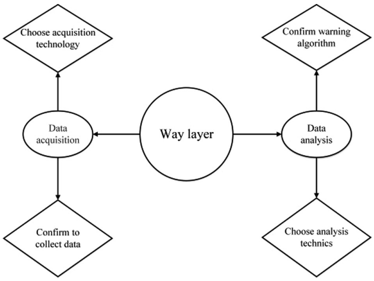

Fig. 4. Way layer

3.4 Result Layer

According to the purpose layer, content layer and way layer, the warning results provide the presentation way of warning information and intervention strategies. The presentation way of warning information is the intuitive manifestation of the learning warning system, and the intervention strategies are mainly to supply personalized advice or feedback for the learners, as shown in Fig. 5.

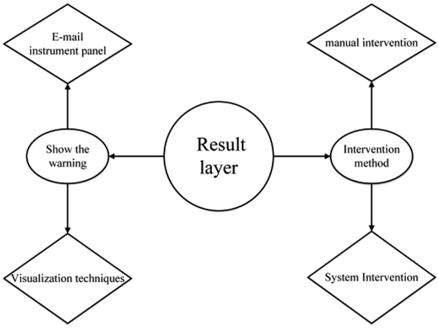

Fig. 5. Result layer

4 Learning Warning System Model

The Fig. 6 gives the function model of learning warning. It presents the workflow of the learning warning system. Specifically, there are four stages to realize the learning warning function: data collection, data analysis, warning information presentation and provide intervention. According the knowledge mastery of learners, behavioral data and academic emotion, this research constructs the e-learning warning function model refer to the technical framework of big education data, and warning from the full range of learners, including knowledge, practice and emotion in e-learning.

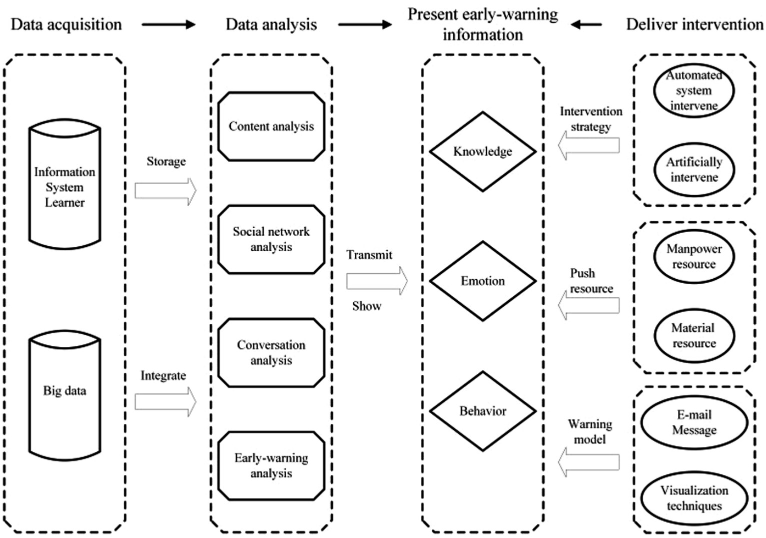

Fig. 6. Learning warning function model

4.1 Data Collection

The collected data in e-learning system includes the related data of learners, teachers and courses. Among them, the specific data of learners are as follows: essential data (learning style, attitude), behavior data (visit count, online time, download time, last access time), interactive data (interaction with online resources or classmates, interactions number, discussion content, and posts), performance data (academic achievement, ranking, and progress), emotional data and so on. Data collection needs acertain platform or technical tool, such as Sakai, Blackboard, Moodle, Learning Meta Platform and social network visualization tool.

4.2 Data Analysis

The massive collected data can be classified after storage integration, which can be divided into knowledge, behavior, and emotion. At present, the knowledge and behavior analysis technologies are more mature, such as content analysis, discourse analysis, social network analysis, context analysis and personality analysis. The recognition of facial expression and speech emotion both are emotion recognition technology. In addition, it also can identify the emotional information of voice, text, drawing from learner through content mining and intelligent analysis. The technology of emotion recognition and acquisition based on brain waves has become an important channel of emotional data acquisition and emotion recognition. The above technologies promote the data analysis carried out smoothly, to predict whether there is an abnormality in the knowledge, behavior and emotion of the learners.

4.3 Warning Information Presentation

The warning information presentation includes knowledge, behavior and emotion; it is a visual representation on status of learners. Knowledge is the mastery of the knowledge point by the learners. In order to adapt to the development of society, we must continue to accept new knowledge and continuously improve the quality and ability. Moreover, it can judge the mastery situation of the knowledge by achievement and content analysis. The behavior of the learner includes login, browsing, and interaction on e-learning. To a certain extent, the behavior of learner maps the attitude and the learning effect. Emotion is the mood of the learner on e-learning, is an important variable that affects the learning effect online and offline. Warning information presentation correctly identifies the learning situation and status of learners through analyzing massive data, and shows them intuitively through red and green lights, red flag, magnetic stripe, background color and text.

4.4 Provide Intervention

Provide intervention refers to afford corresponding improvement strategies and positive intervention for warning learners. The warning system involves a perfect library of learning intervention strategies, which contains specific strategies to deal with all kinds of problems. Teachers or systems can provide personalized intervention to learners accordingly. Personalization means that when the learners with different starting points achieve the same results, the interventions obtained are different. Moreover, when the learners and warning contents are different, the intervention methods will also be different.

5 Learning Early-Warning Process

Learning early-warning process is shown in Fig. 7, it mainly describes the specific steps during the early-warning system,In general, there are seven steps in the learning early-warning process for e-learning:

1. Confirm the early-warning purpose and the early-warning content. On the basis of the early-warning purpose, detailed steps are formulated to e-learning.
2. Data acquisition. Depend on the early-warning purpose, choose the appropriate data acquisition technology, and confirm that which data needs to be acquired.
3. Data analysis. Transmit the acquired data to the analysis engine, choose the appropriate analysis technics and the specific early-warning algorithm to analyze the acquired data, appraise whether or not the learner needs the early-warning.
4. Present the early-warning information and the learning state. Based on the acquired data analysis of the third step, if the learner needs the early-warning, early-warning information is presented; if the learner doesn't need the early-warning, the learning status is shown.

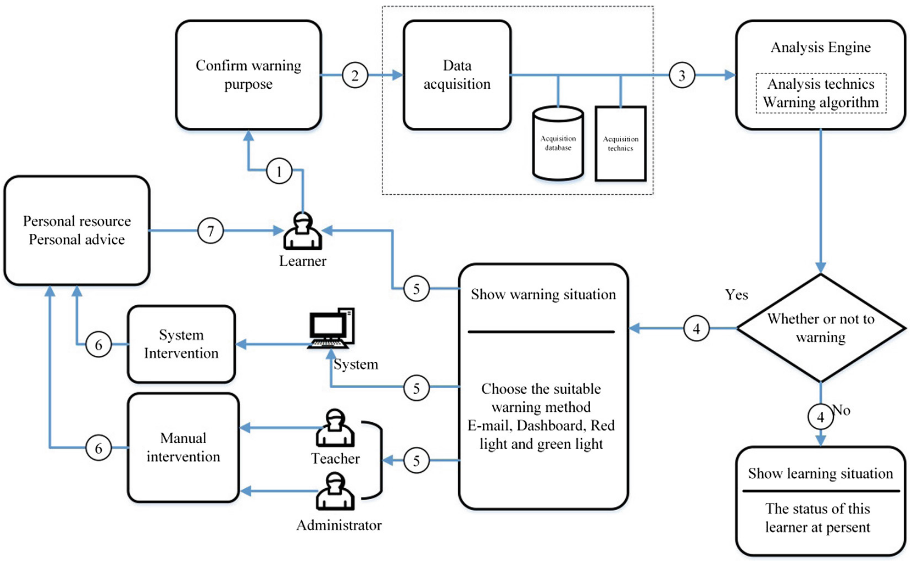

Fig. 7. Learning early-warning process

5. Transfer the early-warning information. There are three objects which the early-warning information is transferred to, include the teacher and the administrator (who can examine the whole early-warning information); the system (which stores the early-warning information in big database); the learner (who can acquire part of the early-warning information, because some of the early-warning information could hurt his self-respect).
6. Propose the personalized recommendation and recommend the personalized resource. Based on the transferred early-warning information, the teacher and the administrator execute the manual intervention, propose the suitable recommendation and the personalized recommendation, and recommend personalized resource for the learner. On the basis of the transferred early-warning information, the system combines the adaptive analysis engine, automatically generates the personalized recommendation and the personalized resource for the learner.
7. The personalized recommendation and the personalized resource are transferred to the corresponding learner.

6 Conclusion

This paper designs the early-warning mechanism, and develops the early-warning system prototype in e-learning. In this early-warning mechanism, the various elements which exist in the knowledge, the behavior and the emotion during the e-learning are designed in detail. It shows clearly what data needs to be acquired, what data needs to be analyzed, which algorithm needs to be chosen and which mode needs to be presented for the early-warning result in e-learning. Not only the knowledge that learner master can act on the learning effect, but also the behavior and the emotion of the learner can apply to the learning effect, so the early-warning is an integrated process in e-learning. Based on the knowledge, the behavior and the emotion, this paper proposes the early-warning model in e-learning, and designs the early-warning mechanism in e-learning. The research contents of this paper can guidance the designer to develop the early-warning system, and can promote the learning quality in the e-learning. The early-warning mechanism and the early-warning system prototype possess the practicability and the maneuverability.

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Research on the Innovative Education Practical Teaching Mode of Electronic Information for Outstanding Engineer

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Abstract. In order to meet the requirement of "the Plan for Educating and Training Outstanding Engineers" and to continuously improve the practical ability and comprehensive innovation ability of undergraduates, we should continue to deepen the education reform. This article puts forward a new system of innovative education practical teaching: the reform of teaching methods and teaching ideas at the same time. The teaching method adopts progressive teaching; the teaching philosophy adopts interactive teaching and competitive learning. Through the combination of the two, we will construct a virtuous interactive teaching system of "classroom teaching + curriculum design + electronic competition".

Keywords: Excellence plan · Innovative education · Practical teaching Education reform

1 Introduction

Electronic information industry belongs to technology-intensive industries. In recent years, some breakthroughs have been made in interdisciplinary fields such as Internet of Things. The electronics industry poses new challenges to the knowledge reserve and professional abilities of practitioners. In accordance with the traditional electronic professional training methods, students must not adapt to this new development situation [1].

In order to cultivate talents with practical ability and innovative ability to meet the needs of economic and social development and to serve the country in taking a new road of industrialization development, the Ministry of Education launched the "the Plan for Educating and Training Outstanding Engineers" ("Excellence Program"). The cultivation of students' engineering practice ability and innovation ability is the core and key of "Excellence Program". This is a weak link in our practice teaching system over the years and also a deficiency of our college students' ability. The cultivation of engineering college students lies in practice, and the cultivation of practical ability relies on the practical teaching system. However, there are many problems in the existing practice teaching system, which restricts the cultivation of practical ability of engineering college students. The top priority is that colleges and universities should actively promote the reform of practice teaching system [2].

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On December 20, 2013, the Ministry of Education and the Chinese Academy of Engineering issued a circular titled "General Standard for Education and Training Program of Excellent Engineers" to optimize the training programs for pilot professionals, to promote the reform of the personnel training mode and to enhance the level of personnel training. Under this premise,the school training standards of participating colleges and universities should basically meet the requirements of the three principles [3]: to be based on industry standards under the guidance of common standards; to position the school personnel training to highlight the school personnel training features; the school standard must be a viable, achievable, evaluable standard.

Practical teaching is an important component of college personnel training, which is an important teaching link in cultivating students' creative thinking and innovative ability [4]. It plays an irreplaceable role in cultivating students' practical ability of combining theory with practice and overall improvement of comprehensive quality. Based on the common standards and school standards, this paper further proposes the innovative education practical teaching plan for the excellent engineer of electronic information, that is, constructing a new system of practical teaching: the reform of teaching methods and teaching ideas at the same time. The teaching method adopts progressive teaching; the teaching philosophy adopts interactive teaching and competitive learning.

2 Progressive Teaching Methods

Progressive teaching refers to the use of a method from shallow to deep to gradually improve students' practical ability and innovative ability: taking experimental class as the basic content of practical teaching to cultivate students' basic ability; taking curriculum design as the core content of practical teaching to train students' comprehensive ability; taking electronic design competition for the extension of practical teaching to develop students' research and development capabilities.

2.1 Emphasis Experimental Class, Improve Basic Ability

In view of the lack of experimental teaching at the present stage, the contents and methods of experimental teaching also need to be reformed. In the current experimental class, although many courses have their own experimental class, many experiments in the experimental class are used to prove the correctness of the experimental principle. And the experiment often has the independent experimental instruction book, many students just follow the procedure according to the guideline in the line connection, finally draw the result, verify the result whether accords with the experimental principle. In this process, many students do not seriously think about how to use the hardware, what is the principle of connecting lines. So that the experimental equipment used, many students can't really use after.

In order to avoid the emergence of the above phenomenon, so the current experimental class should pay more attention to hardware and software proficiency. Through the experimental class, students should be able to master the use of hardware and software, so as to truly achieve the purpose of classroom teaching and basic experiments, so that students not only know some theoretical knowledge, but also have some hands-on ability. Only in this way can students lay a solid foundation for the future of integrated curriculum design. In the experimental class, we should master the basic hardware skills and basic software skills. For one thing, students should master the commonly used experimental equipment and device line connection and use. Such as multimeter, oscilloscope, development board and signal source. Only in this way can students take full advantage of these devices in the future practice. For another thing, students should master the installation of required software, the establishment of the project, the compilation of program and how to copy the program into the chip, laying a solid foundation for the future use of the software. The software involved Multisim, Quautus and so on. At the same time, the virtual simulation software breaks the space-time limitation of the routine laboratory site and equipment. Students can conduct autonomous experiments and exploration research through software to improve their practical ability and innovative ability [5].

2.2 Based on Innovative Design, Improve Comprehensive Ability

After mastering the basic skills, students began to participate in comprehensive innovative design. In order to meet the industry standards, the comprehensive innovative design combines the SCM knowledge and the National Undergraduate Electronic Contest Design. The National Undergraduate Electronic Design Contest is a subject competition hosted by the Ministry of Education. The contest content not only reflects the application and development trend of modern electronic technology, but also is a comprehensive test of students' scientific and technological knowledge and practical skills [6]. This event is fully in line with industry standards. Therefore, the comprehensive innovative design based on the National Undergraduate Electronic Design Competition can also meet the industry standards.

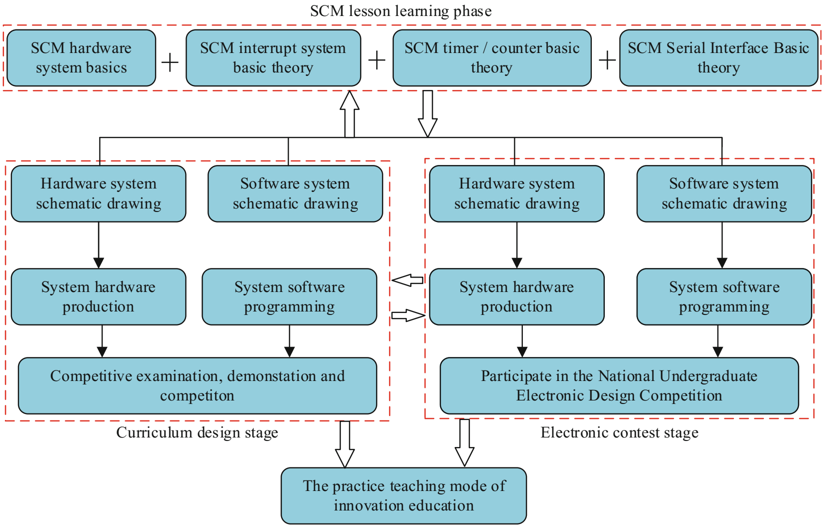

Fig. 1. The practice teaching mode of innovation education

Comprehensive curriculum design requires students to independently design a smart car with obstacle avoidance function, including car motor drive module design, infrared tracking module design, ultrasonic barrier module design, Bluetooth control module design, LCD display module design. The way of acceptance: smart car needs to complete a given job tasks, such as body movement, intelligent tracking, intelligent obstacle avoidance, information display and other functions. The way of the competition: four or five students in each group, each group needs to complete the design, production and commissioning of the entire set of smart car, to draw the circuit schematics, and to write the project design report. In the process of comprehensive design, students closely related the knowledge of the relevant courses with the actual production so as to deepen the students' understanding of the classroom knowledge. The project space is reserved for the students in the project planning. Therefore, students can develop innovative ability through the development of hardware and software; in the process of the project, the students can also effectively improve the practical ability throughout the operation of their own. In order to lay the foundation for participating in the National Undergraduate Electronic Design Contest, we build a benign interactive teaching system of "classroom teaching + curriculum design + electronic competition", and form an innovative education practice teaching mode [7]. The practice teaching mode of innovative education as shown in Fig. 1.

2.3 Based on Electronic Competitions, Train Elite Talent

Comprehensive Innovative Design is based on the National Undergraduate Electronic Design Competition designed by the Ministry of Education sponsored by the enterprise. Most subject competitions at the present stage are sponsored by enterprises. Therefore, the purpose and content of the competition are closely integrated with the electronic information industry, and the actual exchange platform between school and enterprise is automatically established. It also greatly promotes the reform and innovation in the training mode of electronic information students. Discipline competition not only cultivates students' practical ability and innovative consciousness, but also enables students to truly understand the importance of integrating theory with practice and teamwork. It realizes the overall improvement of ability and qualities of electronic information outstanding engineers and creates the conditions for outstanding talents to stand out [8].

In order to give full play to the role of electronic information subject competitions in enhancing students' ability of practice and innovation, the outstanding talent selected by the comprehensive innovative design will participate in the National Undergraduate Electronic Design Competition, the National Undergraduate Intelligent Automobile Competition and the China Robot Competition. By teaching students according to their aptitudes, we should focus on cultivating students with high comprehensive quality, innovative ability and practical hands-on ability. This will not only enhance the school's reputation in implementing the "Excellence Program", but also inspire more students to devote themselves to learning knowledge and skills. In order to cope with the implementation of the School Excellence Program, elite education is implemented [9].

3 Interactive Teaching and Competitive Learning Philosophy

Interactive teaching is a teaching method for teachers and students to communicate and discuss with each other. In the teaching process, teachers should give students adequate guidance and students should actively consult the teacher when there is a problem on the basis of equality, acceptance and honesty with each other. Through the entire guidance, the teacher will give full play to the guiding role. Specific performance: the steering group of all teachers complete and issue the design task book and the design guide book, and plan the competition form before comprehensive design.

The instructors are responsible for certain work of the comprehensive design in accordance with their respect specialty expertise and ensure the entire guidance. The teacher provides the necessary reference materials and demonstrate the program with the students to help students determine the final design proposal. On the other hand, students actively ask the teacher questions and solve the problems in the design process. In this way, the teacher can know the student's question and enhance the teaching effect effectively. Competitive learning refers to students' learning in competition. This will also be fully reflected in the comprehensive innovative design. Firstly, integrated innovation design takes the form of group competitions. Secondly, the members of the team work together and each member plays their own advantages to form a complementary advantage in this process. Finally, the group formed a competitive relationship with each other.

In the teacher's active guidance, Students can form a healthy concept of competition. Competition can promote human growth and social development. While we cultivate students' cooperation, we should also focus on cultivating the students' sense of competition and correct the students' attitudes to further improve the overall quality of students. We should focus on cultivating students with high comprehensive quality, innovative ability and practical hands-on ability. We hope that students can lay a solid foundation for work through in-depth study of undergraduate expertise. Figure 2 shows the new mentor-student interaction and the benign student-student competition model.

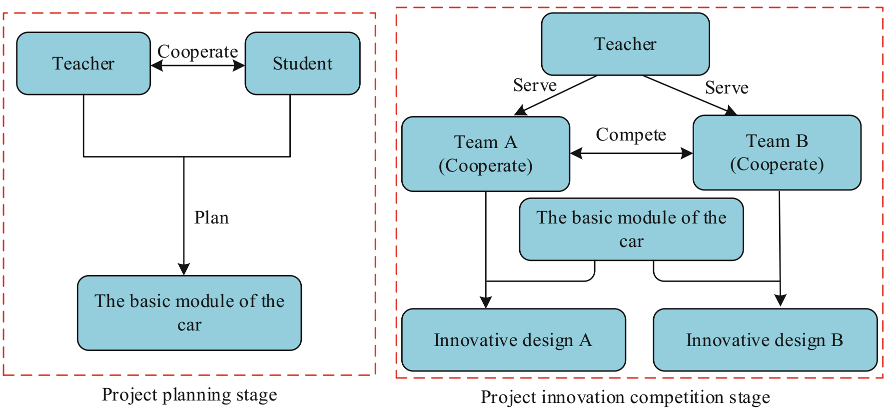

Fig. 2. New mentor-student interaction and benign student-student competition model

4 Conclusion

The “the Plan for Educating and Training Outstanding Engineers” requires universities to change their teaching philosophy and cultivate talents. This paper proposes a new system of innovative education and practical teaching. Through the combination of teaching method and teaching concept reform, students’ basic ability, comprehensive ability and scientific research ability are effectively improved so as to train applied talents to meet the social requirements. In the process of deepening education reform, schools should be gradually overcome the shortcomings of the traditional education model and construct a new system of innovative education practice teaching.

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Research on Elective Courses Construction of General Education in *Web Technology and Practice*

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Abstract. The development and update of Web technology are affecting more and more people, especially for the students in the university. They need to learn more about this technology so as to meet the needs of the society. It is necessary to set up an elective course in general education related to Web technology in colleges and universities. So this paper will establish the elective course which called *Web Technology and Practice*. It combines the technical characteristics of both basic course and technical practice course. And it helps students to understand the computer knowledge, learn the necessary computer skills, so as to serve the society better in the future.

Keywords: Web technology · Teaching mode reform
Course construction

1 Introduction

The development of Web technology [1] affects the social and personal life constantly. The driving force behind the development of Web technology comes from the maturity of network technology. Network technology [2] is also called computer communication [3] or data communication [4]. The main research direction is the safe, reliable and efficient transfer of data signals generated by computers or other devices. Another impetus for the development of Web technology is derived from the upgrading of computer hardware and software. In the aspect of hardware, it experiences from the bulky desktop computer to laptop. And it also has a great promotion in appearance and performance. In the aspect of software which is mostly the browser side, from the launch of the first browser "World Wide Web" to the latest "Google Chrome". The browsers that appear during this process are "Mosaic", "Netscape", "IE", "Opera", "Mozilla", "Safari" and "Firefox". The development of hardware and software all promote the development and change of web technology, in order to make better use of hardware and software resources and achieve more front-end applications. There is another important driving force that is the user's need, the rapid expansion of the number

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of Internet users and the rapidly of Internet demand. For more and more college students, especially those who are not majoring in computer science. They are more and more eager to understand the principles, functions and effects of network technology. So they need to acquire this knowledge and skills through general education [5]. *Web Technology and Practice* is an elective courses in general education of engineering technology and technological innovation, which for non-computer majors student. It combines the characteristics of both basic course and technical practice course. This general education requirement helps students gain a better understanding of computers and makes them adapt to their jobs. They will also respect the people who engaged in computer science and communicate with them very well.

2 Course Objectives

The goal of this course is enable students to understand the logical thinking and implementation of Web application design. At the same time, they can understand the grammar structure, function and usage principle of Web programming language [6]. Through this course, students can design and develop a simple and practical Web application project by themselves. This course seeks to connect the theory with practice, and the traditional teaching mode, which is the main line of theoretical knowledge, is transformed into a new teaching mode integrating which combine "Project Guidance" [7], "Task-Driven" [8] and "Teaching-Learning-Doing" [9]. This course gives top priority to self-learning [10] and interest development, and wound them through the teaching process. We take flexible and varied teaching forms. Such as application examples demonstrate, programming practice training, discussion, report, large-scale operations. Through this way, we can stimulate students interest in learning and participate spirit, make them master and apply the knowledge better. The specific goals are shown in Fig. 1.

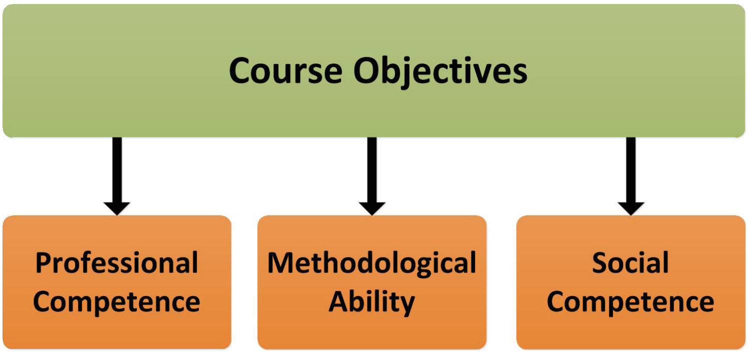

Fig. 1. Course objectives

2.1 Professional Competence

The professional competence [11] is enable students to master the basic knowledge and development techniques of web programs introduced in the course, and use it to complete the production of dynamic Web pages and website maintenance. And understand the development of the latest website design technology.

2.2 Methodological Ability

Methodological ability is integrated classroom learning through practice. Students will obtain the strong practice ability and the necessary basic knowledge. Besides, they will also have the certain ability of data collected, technical learning, ability to migrate, implementation plan and the ability of self-learning [12].

2.3 Social Competence

Through the study of this course, students will have a scientific attitude of seeking truth from facts and they are willing to realize, test and judge various technical problems by hands-on practice. The most important thing is that they will have a strong entrepreneurial spirit and teamwork skills.

3 Course Construction

Course construction [13] follows the operational principle and process of the web-application and introduces the coding environment, software design and development and its application method. The course is based on web-based deployment, design and development tools, basic techniques for describing web applications, and methods for developing website instances using the web language. The content is divided into four parts, which is the basic concepts, application environment, front-end design and program development. The course from theory to practice, displays the overall framework of Web applications systematically, explores the site's resource organization and development process. As shown in Fig. 2, we will describe course construction in detail according to the above structure.

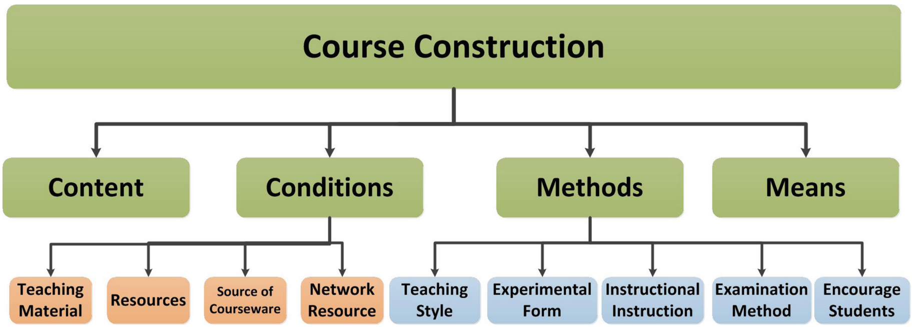

Fig. 2. Course objectives

3.1 Construction of Teaching Content

The construction of teaching contents mainly integrates teaching resources through the teaching process and absorbs a certain amount of the latest scientific and technological achievements and advanced teaching experience in the subject field so as to make the teaching contents more scientific. It should be noted that we should pay more attention to reasonable arrangements for teaching and experiment time.

In classroom instruction content, firstly, we must clear the knowledge context system. According to the characteristics of the course, teachers extract the meta-knowledge and use it to analyze the knowledge points. After obtaining the elements, logic and function of each knowledge point, the relationship between the knowledge points and the knowledge points should be established to form the knowledge system of this course. Secondly, we must optimize the contents of each point of knowledge and example to remove textbooks on the text of a large description and large length of the program, according to the characteristics of knowledge points and student characteristics, to redesign a short, targeted examples. Finally, the teaching content also needs some important problem solving techniques in computer science, which helps students to cultivate strong knowledge and technical updating ability, such as parameter transfer technology, array technology and recursive technology.

In the experimental content, we need build a rich experimental resource base. First of all, based on the classroom instruction content, we must consider the technical feasibility and development trends. And we should design some medium-sized and easily distinguished experimental training topics for each chapter. And the training topics which including daily exercises and homework exercises. The title must Practicality and funny so that the students can feel the joy of programming. Secondly, we also need try to design some open-ended homework topics. It can give students independent thinking space, making their homework has obvious personal characteristics. Finally, the design of each chapter is not independent. The topics must be some functional modules of a comprehensive project such as website. When the course over, the students consolidates the homework of the previous chapters and this becomes their final assignment which is a complete project.

3.2 Construction of Teaching Conditions

Teaching Material. Beside the *Web programming* design which is edited by Genlin Ji et al., we also use some classical books of computer science. Such as *Web programming (version 8)* which edited by Robert W. Sebesta. Through Integrate these books, we sort out a set of general elective teaching materials to meet the requirements of multi-disciplinary students to adapt to the characteristics of teaching material.

Resources. During the course construction, teachers not only select reference books, but also collect cutting-edge theories, methods and techniques. Such as Web 2.0, Mobile Web, Grails 2.0, including technical documents, reports, papers. And then they analysis and sorting out a set of reference resources which supplement the textbook, making the course more in line with the requirements of the times.

Source of Courseware. In the process of teaching, teachers need to update, improve and enrich the courseware [14] constantly. So the courseware can reflect the teaching ideas and content clearly, scrupulously and completely. For example, through animations, describe the behavior and function of the program clearly and inspire teaching. Build a complete courseware repository for students to strengthen their learning and use after class.

Network Resource. During the course construction, we are planning to build "WEB-School" which is a collaborative learning platform for *Web technology and practice*, in order to form a learning system and share resources. The platform can be used as an experimental tool for collaborative learning to expand students' space for collaborative learning. By using the platform, teachers can make teaching administration which includes release the syllabus, courseware, homework and answer the question. At the same time, students can also use "WEB-School" to submit assignments, raise questions and start discussions. In addition, "WEB-School" collaborative learning platform also provides the functions about grouping, learning, communication and cooperation and collaborative performance evaluation.

3.3 Construction of Teaching Methods

Teaching Style [15] We add new methods (the classroom group discussions, reports) to supplement the traditional teaching methods such as multimedia instruction, example demonstration and blackboard-writing. Through the process of problem solving, we develop students' abilities to analyze and solve problems autonomously, emphasize students' autonomous learning, and encourage students to learn to explore research-based learning and group collaborative learning.

Experimental Form. Based on the students' basic training and homework practice, this paper proposes to increase the group's project practice. This practice requires students to work together as a team to build a specific project and combine the personal programming and cooperation projects, focusing on group collaboration, collective evaluation, improve students' ability of teamwork.

Instructional Instruction. In this paper, we propose to enrich the way of instructional instruction [16] with the help of the popular online tools such as

QQ, WeChat and so on. Besides, we also encourage students to participate as coaching teachers in teaching counseling so that students are both problem-solicitors and problem-solvers. When out of class, students and teachers can also communicate and interact online through the "WEB-School" learning platform.

Examination Method. The examination method proposed in this paper is comprehensive which including the students' class performance, daily homework, class reports, examinations, hands-on practice and help students solve problems and many other aspects of evaluation. This examination method pays more attention to assess the overall quality of students.

Encourage Students' Autonomous Learning and Group Collaborative Learning. Through a great deal of practice, students not only deepen the understanding of abstract theoretical knowledge, but also can feel the important role of curriculum in basic research and applied fields. Increase students' interest in learning, cultivate students' basic research norms and comprehensive quality, and lay a solid foundation for future research and work [17].

3.4 Construction of Teaching Means

In construction of teaching means, this paper pays more attention to the combination of traditional teaching methods and modern technology, and makes full use of modern technology such as multimedia teaching and network resources to improve teaching quality and form the online teaching resource base of this course. Specific practices are as follows:

In the first instance, we build "WEB-school" collaborative learning platform for PC, and build networked learning system, real-time communication, answering and discussion between teachers and students. Design the teaching and operation subsystems of "Network Technology and Practice" to realize the network sharing of course teaching materials, program examples, reference materials and work resources.

Secondly, after a period of operation of the platform, if all conditions are met, it is proposed to construct a learning platform suitable for mobile devices, including applications based on IOS and Android operating systems.

Furthermore, it is proposed to set up a WeChat public number for the course of *Web Technology and Practice* based on the WeChat platform for the push of knowledge and the notification of important news.

4 Conclusion

The course of *Web Technology and Practice* not only meet the requirements of general education, but also refine the course according to the construction principle of fine resources sharing course in the future, and share the resources for college teachers, students and social learners.

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A Model of Mobile Learning Application for Tertiary Education in Rural Area in China: A Preliminary Study

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Abstract. This preliminary study is conduct a survey to understand the expectations and elements of mobile learning education in rural area of China. After analysis the results from survey, a mobile learning model has been constructed. This model has considered the factors on mobile learning devices, the speed of internet service, the courses contents, the non-paper-based teaching materials, teacher or teacher's teaching method, use of the mobile applications, and social networking. Therefore, the motivation of students might be brought up though this model to archive much higher academic results.

Keywords: Mobile learning · Higher education · Modelling design
Education in rural area

1 Introduction

Mobile learning is a trend of adopting the technology in education. Educational Games [1, 2], the Educational system through iPhone and iPad [3, 4], and e-learning [5] are the emerging tools for information communication technology (ICT) in education. The technology advance in mobile services that are in internet speed and capacity have introduced the use of high volume data materials for the teaching purposes. In addition, the advantage of the mobile phone technology has also brought the concepts and needs, which are learning at home or work [6]. For these reasons, mobile learning may satisfy the demands of learning out of school. Therefore, the academic outcome would be as high as compared with the traditional classroom teaching method.

In the rural area of China, it has limited resources, for example, the financial and educational background of the teaching staff to input to its educational system [2, 7]. The disadvantage is that college is very unusual to obtain and use the technologically advanced ICT system [8]. As a result, the implementation of mobile learning

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in the colleges or universities might need a different approach compared with the urban area of China or even other well-developed countries. There are many mobile learning modellings that show in the recent researches [8]. The mobile learning devices [7], the speed of internet service [7], the courses content [6], the non-paper based teaching materials [9], teacher or teacher's teaching method [10], use of the mobile applications ('Apps') [11], and social networking [12] need to be awarded. Therefore, a survey is needed to investigate in detail how the students expected.

The requirements and essential elements of the model should be identified in order to investigate further in the research study. This study has undergone a survey that conducted in a tertiary college in the rural area of China students. The survey could understand the advantage of mobile technology in the tertiary education in rural China, as the financial capacity is the relative disadvantage to the capital city in China [6, 8]. Furthermore, the survey could also be able to e-learning [1] and mobile learning [13] are able to narrow down this gap, which the quality of teaching is not as well as the college in the major cities in China. It is because the well-educated teaching staff would prefer the key colleges and universities around China, as they will have diverted teaching recourse [3]. Therefore, the results of the survey may build up a solid foundation to the model of mobile learning.

Freely studying outside the classroom just like classroom teaching is the trend of reformation of the educational system. The motivation of study might be increased concurrently, as study become limitless in the classroom [14]. Mobile learning has improved the ability and capability to replace e-learning and classroom learning as a studying framework in this technology advanced century. It might bring the educational advantage, for example, teaching resources, from the capital city to rural area [3, 15].

2 Methodology

This study has established a survey at the tertiary college in China (DaZhou Vocational and Technical College, DaZhou, China). The aim of the survey is understanding the perceptions of students, which is about what subject is applicable to implement the mobile teaching, in the rural area in China. The questions of the questionnaire and the structure of the questionnaire have designed and organized following by the guideline [16, 17]. The 5-point scale design has employed for the deigns of the question [17]. Furthermore, the requirement of the mobile learning is identified from the literature review in this paper. Total students (N = 700, Female = 379, Male = 321) are a random selected from 13 different departments in the DaZhou Vocational and Technical College, DaZhou, China. The statistical analysis has performed the outcome to investigate any significant relationship between the results and the requirement of the mobile learning. All statistical analyses were done using SPSS 16.0 (Chicago, IL). All statistical tests were two-sided. A P-value 0.05 was considered statistically significant. Finally, a model that followed the results was constructed in this paper.

3 Results

The survey result shows that high percentage of students are interested in mobile learning. The requirements or elements have not limited the findings only from the literature review, which have included in the questionnaire, but the financial problem and view from parents and peers also become a concern.

Figure 1 shows the study area distribution of the students, who ages in between 17 to 20 years old. More than half of the students (N = 380) are studying Science, Health and Medical Science in this study. In addition, about thirty percent of students (N = 251) are studying Art and Humanity, Education and business.

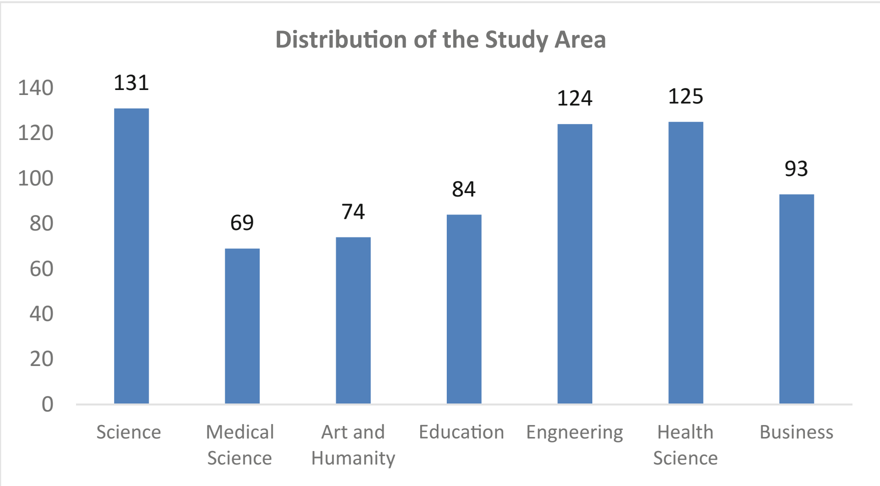

Fig. 1. Distribution of the study area

Figure 2 shows the students that selects the three areas of concern in mobile learning. Firstly, high percentage of students, which has mean = 4.2 and SD = 0.45, believe that teaching materials and contents are the main issues. Secondly, the mean = 4.2 and SD = 0.6 of students aware of the communication between the teacher and classmates. The other concerns, which are speed of internet, the devices, and the Apps, has the mean in between 2.3 to 3.6. It shows that students have its own understanding of studying mobility.

Figure 3 shows the reasons for using mobile learning or studying outside the school. Students consider that it provides a freedom of study with Mean = 4.2 and SD = 0.3. In addition, the result shows students (Mean = 3.75, SD = 0.6) presume that it could improve the study outcome. However, few students believe that mobile learning is a trend of future education, which has Mean = 2.9 and SD = 0.8.

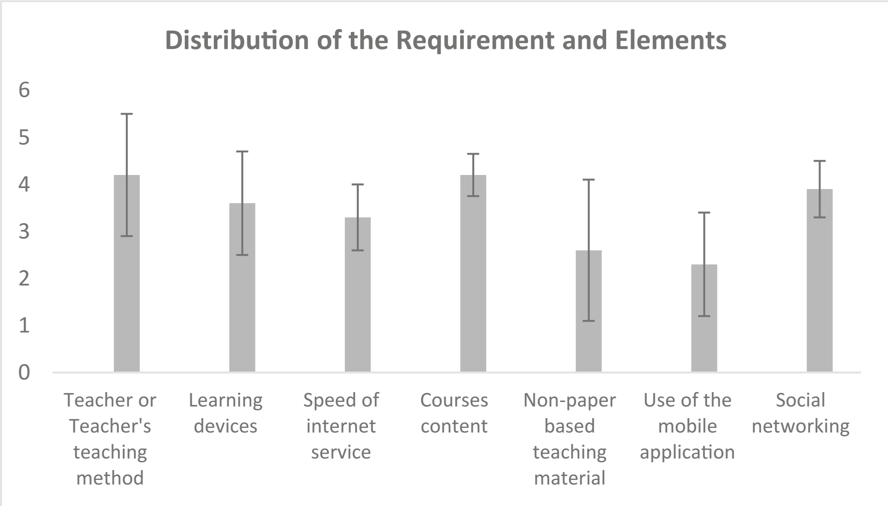

Fig. 2. Distribution of the requirement and elements

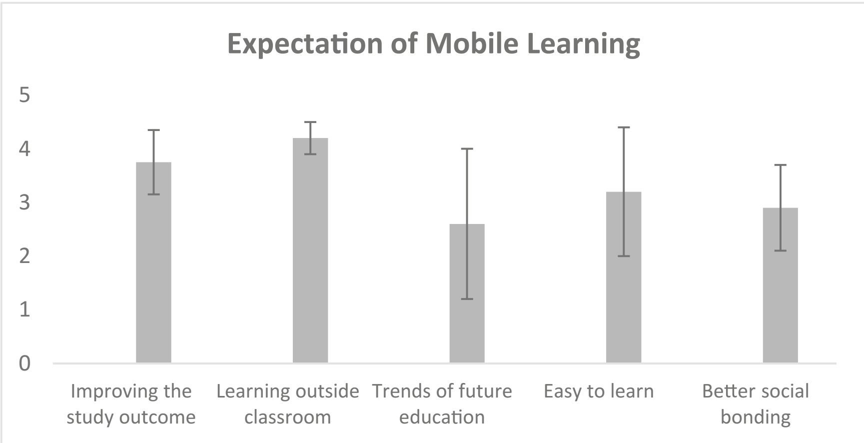

Fig. 3. Expectation of mobile learning

The results from an open question that is about the concern of using mobile learning shows in Fig. 4. More than half of students indicated that the opinions from their parents or peers into account are the main concern. Also, the financial issues of mobile learning are an important area that student would aware.

The statistical analysis was performed to investigate any significant difference in between the study area and requirement from the students. Table 1 shows the statistical results and have significantly different on teaching materials and contents with

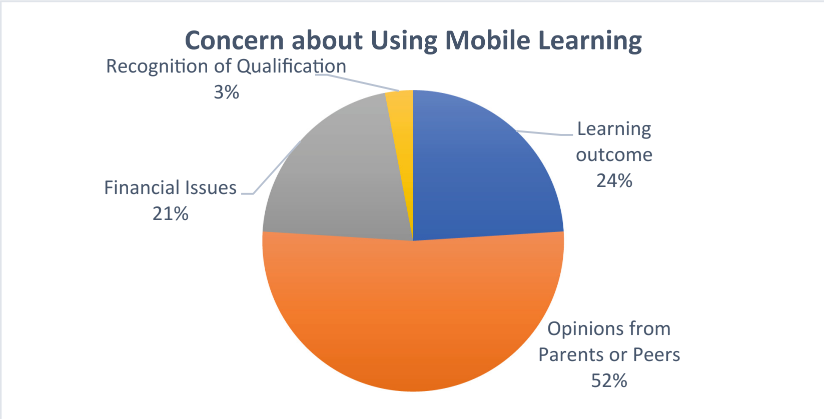

Fig. 4. Concern about using mobile learning

the medical students, which *P*-value is 0.02. In addition, the other statistical different is the Art and Humanity students and communication around the teacher and classmates with *P*-value 0.045. Therefore, the results show that students studying in the different area would have a meaningful impact on the requirements and elements in the mobile learning.

Table 1. The statistical result of each study area and the requirements or elements of mobile learning

	Science	Medical Science	Art and Humanity	Education	Engineering	Health Science	Business
Teacher or teaching method	0.03*	0.02*	0.17	0.04*	0.07*	0.05*	0.23
Learning devices	0.09	0.067	0.02*	0.06	0.075	0.092	0.12
Speed of internet service	0.13	0.056	0.06	0.07	0.08	0.043*	0.05*
Courses content	0.08	0.02*	0.24	0.14	0.11	0.07	0.06
Non-paper-based teaching material	0.22	0.13	0.19	0.08	0.058	0.098	0.12
Use of the mobile Apps	0.23	0.09	0.18	0.12	0.06	0.087	0.07
Social networking	0.03*	0.04*	0.045*	0.02*	0.076	0.011	0.06

* *P*-value < 0.05

3.1 Model of Mobile Learning for Tertiary Education in Rural Area

The construction of the model has taken the statistical results and the results of the survey into account. Figure 5 shows the model of mobile learning for tertiary education in a rural area in China. The results are consistent with the expected demand on each study area in the college. For example, the Science, Medical Science, Engineering, and Health science major study show a high demand of the course content and internet speeding, as these majors might include high-quality photos or videos into the teaching material. Therefore, the design process has involved these combinations.

For the mobile technology, a high-speed mobile network is required, as it might have high data transformation in between the users and the Apps. The current 4G or 4G + mobile network is able to encounter this problem now. Furthermore, the processing power of the mobile devices is also well enough to process a higher volume data flow at the same time without any bottom neck. Therefore, the mobile learning is applicable and feasible in term of mobile technology.

The model is encouraging students to study and improve their motivation. The interaction in between Apps and students is very important. It is because students have become more independent than before. They might ability to autonomous studies, such as references searching and notes taking skill. In the end, teachers may reduce the loading and the monitoring effect on student performance. Therefore, teachers could devote their time and energy to developing the teaching contents.

This model has integrated the assignment and examination elements. It is because students might like to have quizzes or mid-semester examination in a computerized way. Moreover, the online practical experiments could also be organized as an assignment tool for students, whom are studying science and engineering. It is true that online practical experiments are not applicable and feasible for some majors. However, it is necessary to put online practical experiments, as students might like to review the process of experiments about each experiment, which have done in the college. Therefore, assignment and examination maybe an element in the mobile learning Apps rather than paper-based rules and regulations to study.

Finally, the feedback from students is crucial to teachers' development. Teachers could review the discussion neither from the mobile learning or social networking Apps. Although students would like to have their own privacy to operate its group of discussion, this action is still encouraged students may get involved in their study and monitor each other.

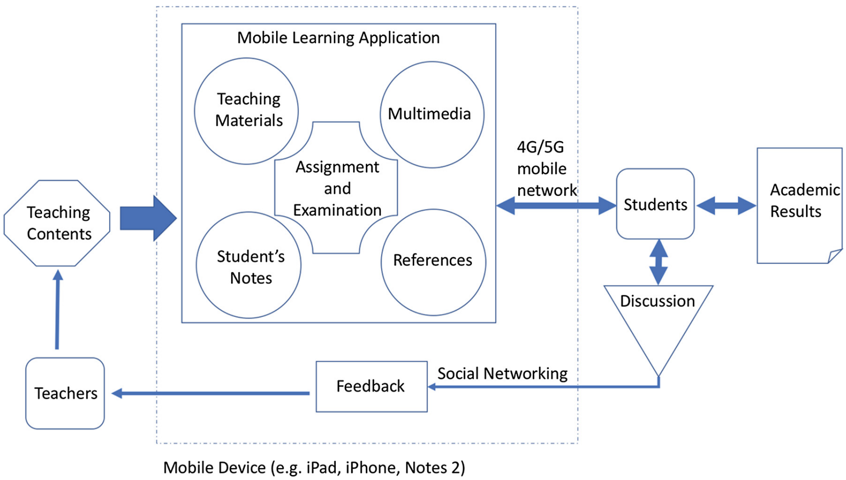

Fig. 5. The model of mobile learning for tertiary education in rural area in China

4 Discussion

The result shows that majority of students would prefer mobile learning as a study tool to help them outside the classroom. The perceptions are students would become active and freely in learning. Furthermore, the other understanding is that mobile learning could provide the benefits of improving the teaching resource and contents of the study.

The results on expectation on mobile learning show the motivation of study would be improved. It is because students are able to study freely outside the college. For example, students might not catch up the lectures very well. Since the computer technology has advanced and applied to the education system, mobile learning would create perform for students studying in a small screen. In this case, they can review the lectures and concurrently ask the questions while they are travelling back home. Furthermore, students have depended on the mobile devices. Further, they are willing to share the solution and help each other to resolve the problems in the study through the social media network. These Apps or software is easy to use and gives instantly responds. As a result, a study has integrated into the student's daily life, as their peers are kept pushing, coordinating, and monitoring each other. Finally, the study motivation and the study outcome would also be increased.

The model shows an improvement of teaching resources is not proportional because of the background or location of the college. Many of teachers may have already overlooked the creativeness of students. The results show that students are welcome to post and share their own study notes or simple drawings about the lecture. Furthermore, they may devote study times to reviewing the related lecture materials form other overseas colleges or universities. These approaches are encouraged in the learning process, as they keep learning something meaningful and filtering the study information. In addition, students could also share the result on the implementation in their own practical experiments and cases at home or in their workplace by making some movies. It is no doubt that e-learning system has already provided a perform to students in the college. However, mobile learning has removed the barriers in the e-learning, such as carrying a computer with a network connection. The advanced functions of mobile devices offer students an out of the box creativeness in the Apps. Therefore, students may be going to create its own learning process and resources that without the physical and financial limitation of college.

The limitation of this model has limited advanced educational tools. It is because the development of these tools requires many recourses, like manpower and financial. It is not practical for a tertiary college especially in a rural area in China. For this reason, a practical model should be refined in this study. Furthermore, the model does not have any measures about privacy protection. The right of using student's posted photos or videos might not be protected and limited for the college. Also, the copyright of teaching materials of overseas college and universities also have not been examined in this study. Further research studies are necessary to investigate issues on privacy and copyright protection and the effectiveness and the study outcome of students after experiencing mobile learning.

5 Conclusion

The technological advanced in the mobile industry has introduced the advantage and tools to the field of education. The survey results show that students believe that mobile learning could bring the freedom of study. Therefore, the model of mobile learning in China would be effective and applicable to tertiary college in rural China. However, further research should be initiated to investigate the effectiveness and application of mobile learning in China.

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Research on Learning Resource Design Model Based on Mobile Learning

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Abstract. The mobile learning resource is the basis of mobile learning, and its quality may directly affect the effectiveness of mobile learning. At present, the domestic mobile learning resources are characterized by lack of quantity, mostly lingual contents and simple content structure, and some of the resources have become direct relocation of network learning resources, so it is hard for them to meet the real demands of mobile learners. Therefore, the research on design and development of high-quality mobile learning resources suitable for learners is of great significance to the popularization and promotion of mobile learning. Based on customer needs, the Customer Value Theory maximizes the business competitiveness and value while enhancing the customer satisfaction and loyalty. In the implementation process of mobile education, learners are not only the object of education, but also the customers who enjoy educational services. In this study, the Customer Value Theory is introduced to the design of mobile learning resources, orientation is taken for learners, and the mobile learning resources that meet the needs of learners are designed and developed. It has been proved that the design of mobile value products based on customer value can effectively meet the needs of mobile learning.

Keywords: Mobile learning · Customer value · Learning resources

1 Introduction

The mobile learning resources are a carrier for learners to implement mobile learning. To effectively promote the rapid development and popularization of mobile learning, attention should be paid to the research on mobile learning resources. Due to the late development of mobile learning in China [1], the research on mobile learning resources lacks comprehensiveness and depth, as well as mature design principles and development models for theoretical guidance, resulting in scarce resources, low quality and failure in satisfying the mobile learners' updated learning needs. As a result, in order to promote the development of mobile learning, the researchers should lay more emphasis on the development of mobile learning resources to form high-quality mobile learning resources and further improve the learning performance of mobile learners [2, 3]. By

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absorbing the concept of customer-oriented in the commercial field, this paper focuses on the field of mobile education, carries out research on mobile value based on customer value, develops and designs mobile learning resources suitable for learners, and meet the learners' learning needs, hoping to further boost China's mobile educational development. In the meantime, this paper introduces the Customer Value Theory into the design of mobile learning resources. Through the customer value hierarchy model, the customer value formation of mobile learners can be understood, which can effectively understand the learning needs of learners, truly achieve learner-orientation [4, 5]. Also, the design principles of mobile learning resources are developed and improved, and the mobile learning resource design and development model is built based on customer value, playing a positive role in guiding the design and construction of mobile learning resources.

2 Related Concepts

2.1 Mobile Learning Theory

Based on distance education, Chabra et al. defined it broadly [6]: Mobile learning was the ability to use any device and learn at any time or at any place. Combined with D-Learning and E-Learning, Georgiev et al. argued that M-Learning was a new stage of development in D-Learning and E-Learning [7], and it was a special existence form. From a technical point of view, Alexzander Dye et al. defined mobile learning as follows: Mobile learning was a type of learning that could be performed at any time or at any place, with the help of a mobile computing device, the mobile computing device used in mobile learning must be able to effectively display learning contents and provide two-way communication between teachers and learners [8, 9].

2.2 Mobile Learning Resource

It refers to anything that helps individuals learn and operate in an effective manner. The mobile learning resource falls into the category of learning resource. According to its own characteristics, the mobile learning resource can be defined as various information resources that learners learn through mobile terminal under the mobile learning environment. Due to the late development of mobile learning and imperfect theoretical system, unsound resource construction principles and models, it draws on the network learning resources from many aspects.

2.3 Customer Value

With the gradual development of market economy, the customer value has begun to attract the attention of Western marketing scholars and entrepreneurs. The creation of customer value can meet customer needs and improve customer satisfaction and loyalty, thereby maximizing business value while enhancing the business competitiveness. PilipKeteler's delivered Customer Value Theory illustrated customer value from customer satisfaction and the customer delivered value, which were visually expressed as

Customer Value = Total Customer Values - Total Customer Cost, i.e., the difference between benefits that a customer obtains through a product (or service) and the cost of purchasing this product (or service). The greater the difference is, the greater the value pursued by the customer is and the greater the customer satisfaction obtains. The model map is shown in Fig. 1.

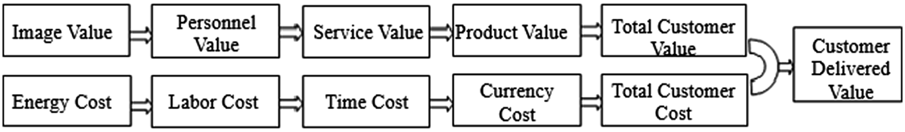

Fig. 1. Customer delivered value model

2.4 Mobile Learning's Customer Value

Under the background of mobile education, great changes have taken place in the mobile education as compared with the traditional education. Therefore, it is unfeasible to implement mobile learning by the traditional educational method. The place for mobile education provides mobile learners with the appropriate mobile learning products and mobile learning services. The mobile learning's customer value stands for a subjective feeling formed while the mobile learning customers are using mobile learning products to enjoy mobile learning services, as well as the senses of gain and loss and the subjective judgment and evaluation on the difference between ideals and reality after the end of mobile learning.

3 Analysis of Learning Resource Needs in the Mobile Learning Environment

The learning needs analysis is a systematic process of investigation and analysis. The results got by collecting and analyzing the results of the questionnaire may objectively demonstrate the learning needs and preferences, providing a prerequisite for the design and development of mobile learning resources. Based on the relevant questionnaires and the above analysis, the author mainly investigates the mobile learners' current application situations of mobile learning resources, learners' preferences and needs, and attitudes towards mobile learning. The survey respondents were undergraduates from Heilongjiang International University, and covered normal freshmen, sophomore and junior students majoring in literal art and science, including 200 female students and 35 male students. A total of 235 questionnaires were issued, 230 were recovered, of which 220 were valid questionnaires, with the effective rate of 96.7%. A total of 17 questions were raised in this questionnaire. Besides, the questionnaire mainly consisted of four parts, with the contents as shown in Table 1.

Table 1. Questionnaire setting

Composition	Dimension	Segmented contents in dimension	Number of questions
Part I	Basic information	Grade, major and gender	1
Part II	Current situations of mobile learning	Selection of mobile learning device, mobile learning time, hindering factors and concentration distractions	4
Part III	Mobile learners' preference over product attributes	Product contents: type of required contents, presentation method, learning method, time spent in learning content complexity of the contents taught, and the solution to learning difficulties	6
		Product services: effective learning interaction, personalized services, interface rendering and resource operations	4
Part IV	Attitudes toward mobile learning's prospects	Development trend and the difference with traditional learning	2

4 Design of Mobile Learning Resources Under the Guidance of Customer Value Theory

4.1 Establishment of Mobile Learning's Customer Value Model

Professor Woodruff's definition of customer value has received wide support and recognition from academia. Customers choose and buy products based on the product efficacy, the attributes of the services, and the likelihood of expected realizable value. Based on the analysis of customer value, the author built the customer value hierarchy model for mobile learning, and knew about the expected learning goals and learning outcomes, the expectations and preferences for mobile learning resources and related mobile services through an in-depth survey of mobile learners. Afterwards, the customer value hierarchy theory was applied to mobile learning, and the mobile learning's customer value hierarchy model was analyzed from the aspects of mobile learners' learning motivation, preferences and psychological needs, as shown in Fig. 2.

In this study, the customer value hierarchy model is applied to mobile learning resources. For different types of learning content, the mobile learning customers' expected goals and learning outcomes when conducting mobile learning should be understood in a profound way. Based on this, the author helps learners to narrow the difference between expected value and actual value to a certain extent, increase customer satisfaction and loyalty, and further enhance the value of mobile learning customers.

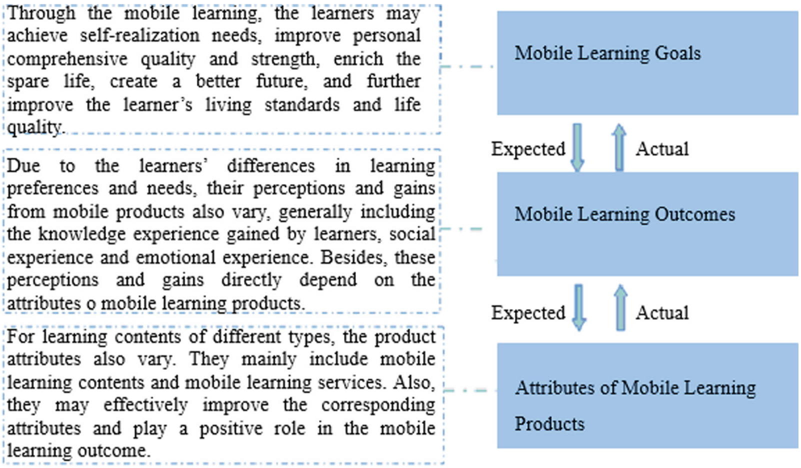

Fig. 2. Mobile learning's customer value hierarchy model

4.2 Establishment of the Design and Development Model for Customer Value's Mobile Learning Resources

For the design and development of mobile learning resources, Professor Huang Ronghuai proposed a macro process model, as shown in Fig. 3.

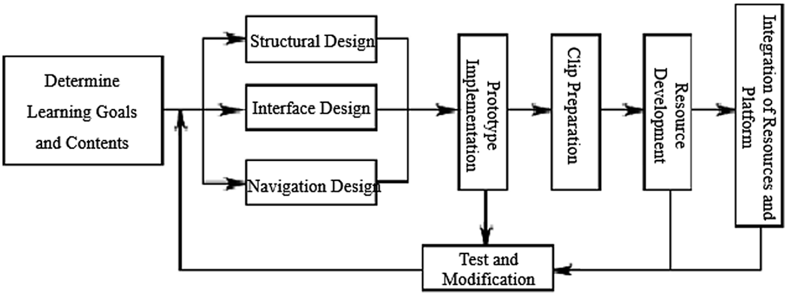

Fig. 3. Design and development process of mobile learning resources

According to the characteristics of mobile learning resources, combined with mobile learning's customer value hierarchy model and development principles, together with the model shown in Fig. 3, this paper takes the learners as orientation and builds the mobile learning resource design and development model based on the Customer Value Theory, as shown in Fig. 4. The model is mainly divided into four modules: preliminary analysis, resource design, development & integration, and testing evaluation feedback.

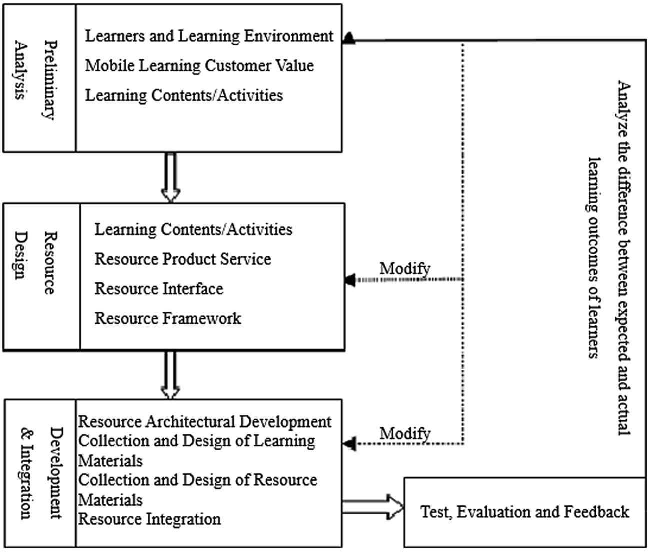

Fig. 4. Mobile learning resource design and development model based on the customer value theory

Preliminary Analysis

Preliminary analysis is the foundation for all product designs, and the mobile learning resources are not an exception. For preliminary analysis of Professor Huang Ronghuai's mobile learning resource development process, it includes the analysis of learning contents and learning goals. The resource products are oriented to mobile learning customers, so the author believes that preliminary analysis should include analysis of mobile learning's customer value, learners, mobile learning environment, and learning contents and activities.

Mobile Learning's Customer Value: It can be concluded from the above mobile learning customer value hierarchy model that the mobile learning's customer value includes the learning goal layer, the learning outcome layer, and the attribute layer. The mobile learners have different expected learning outcomes and goals for different kinds of learning contents, and the learners have expected values of the language and arguable resources, so the learners' expected learning goals and learning outcomes should be analyzed according to the corresponding learning contents, in order to form an in-depth understanding of the learners' learning needs and preferences, design the attribute of resource products, and enhance the learning effectiveness of mobile learning resources. Learners Analysis: Comprehensive analysis made on the learners' personality traits, learning psychology, learning backgrounds and learning styles. After a full understanding of learners, the designer will conduct effective analysis and design of the learning contents and learning activities from the perspective of learning contents.

Analysis of Mobile Learning Environment: The mobile learning environment is the foundation of mobile learning activities. Due to the flexible mobile learning time and space, the mobile learning environment is relatively random. Therefore, the mobile learning resource designers should fully consider the mobile learning environment when developing resources, such as mobile terminals and network environments. Analysis on Learning Contents and Activities: There are different types of learning contents, such as verbal learning, professional knowledge learning and certification exams. The appropriate learning activities should be designed according to different learning contents, so that they may be suitable for media organization, content presentation and granularity division.

Resource Design

Design of Learning Contents and Activities: The design of learning contents and activities is the core of resource design. Based on the above analysis of learners, learning environment and mobile learning customer value, the author sets the appropriate presentation and organization according to the type of learning contents, and then design appropriate learning activities according to the type of learning contents. For example, the language resources are mainly for the exercises of listening comprehension and reading skills. As a result, the design of learning activities should focus on setting listening comprehension exercises and the corresponding tests, whereas the design of certification test resource products should pay attention to learning activities that increase the exercise test based on the appropriate contents.

Development and Integration

Based on the above analysis and design, the resource development & integration are carried out. First of all, according to the above analysis and design, the author builds the resource framework module interface and other contents, and collects, organizes and designs the material resource framework according to the overall framework of resources, such as navigation icons, background images and resource interface map. Afterwards, the author analyzes and designs according to learning contents and activities, designs the corresponding mobile learning resource content materials, and integrates the resource framework materials with the resource content materials and framework to form the complete mobile learning resource products.

Test, Evaluation and Feedback

In the development process, the development tool's simulator can be used for stage testing, or can be imported to the smart mobile device for physical testing. After the initial resource development, through the use experience of the research object, the resource design developer may collect the evaluation feedback data of the research object and analyze the learners' actual learning effects. Afterwards, the designer may compare the learners' learning goals with learning outcomes at the beginning of their learning activities, find out the satisfaction gap, and then re-optimize the analysis and design process of resources according to the analysis results. In this way, the learners' learning effects can be further optimized to further narrow the satisfaction gap, enhance its perception of resource products, finally enhance the value of learners, and improve the quality and services of resource products.

5 Case Application of Mobile Learning Resources Based on Customer Value

5.1 Preliminary Analysis of Mobile Learning Resource Case

The preliminary analysis of this case is mainly made from the corresponding aspects of customer value, learners, learning contents, learning environment and learning activities, further paving the way for the following development and design.

Customer Value Analysis Based on the COREL Learning Contents
In preparation for learning COREL, the learners hold the expected goals and outcomes. The design of resource case should meet the expectations of learners on the resource case to enhance learners' perception and evaluation of resource products, thereby enhancing learners' satisfaction and utilization over resource products. COREL belongs to the operative professional knowledge learning. After an interview with students majoring in educational technology, the learners' expected learning objective is to increase learning skills, and add bright spots for future employment; the learners' expected learning outcome is to grasp COREL video production operation and process through the case resources, and produce complete videos after learning and practice.

Analysis of Learners, Learning Contents, Learning Environment and Learning Activities
Through effective preliminary analysis, the resource design is guided, and the corresponding analysis is shown in Table 2.

Table 2. Analysis of learners, learning environment, learning contents and learning activities

Analysis of learners	The research group is oriented to undergraduates. They have higher degrees of freedom
	Plenty of after-school hours, good independent learning, strong self-learning skills, and proficiency in the use of mobile terminals. Therefore, the learning contents should be designed as comprehensive and hierarchical as possible with simple interface operation, and the interaction with learning partners should be appropriately increased
Analysis of mobile learning environment	This is for students majoring in education technology at Liaoning Normal University. The school has a rich extracurricular learning environment and most of the campus is covered by wireless networks. Therefore, the learners can enjoy mobile learning freely after school without the restriction of network traffic and speed, which creates a good condition for the development of mobile learning
Analysis of learning contents	COREL belongs to an operational exercise with strong practicality, vivid learning contents, and small link between the various functional operations. Besides, it can bring learner

(*continued*)

Table 2. (*continued*)

Analysis of learners	The research group is oriented to undergraduates. They have higher degrees of freedom
	sense of accomplishment, which is ideal for mobile fragmented learning
Analysis of learning activities	Learning process is divided into before-class, in-class and after-class processes. The schools provide learners with the corresponding course profiles, so that in-class learners can watch learning resource video, discuss learning problems with partners and share learning experience; the after-class students will obtain the corresponding test exercises to deepen the learning impressions, and the learning resource evaluation function will be provided for learners

5.2 Case Design of Mobile Learning Resources

In the case design, the service design learning contents, learning activities and resource products as well as the module design of resource case are mainly conducted, and the resource development and application are implemented based on the effective design.

Design of Learning Contents and Learning Activities

Design of learning contents

The learning theme is COREL. There are six learning units: getting video clips, adding transition effects and filtering effects, adding titles and captions, adjusting audio clips, and export movie files. The contents are mainly presented in the form of video. In the design of video contents, the author will start with a case study to illustrate the production process of the case, help learners sort out the learning tasks of the corresponding learning contents, and carry out resource content learning along the main line of the learning task. Besides, the author will add text and PPT about COREL learning so as to deepen the learning contents. Learners can also study by online query and offline downloading.

Design of learning activities

Based on the preliminary analysis and content design, the learning activities of this case design mainly include three aspects: video watching& learning, exchange and discussion with learning partners, and after-class testing.

Design of Resource Product Services

In terms of resource product services, there are four modules - learning favorites, learning download, learning record and learning experience - to provide personalized services for learners, so as to enhance learners' perception of using resources and increase customer value of mobile learning. The favorites function can help learners effectively record the appreciative and valuable learning resources; the offline download function helps learners continue the fragmentation learning in the absence of network connection; the learning record function may effectively remind learners of the learning progress; finally the learners may record their own learning experience through the learning experience module. In such a way, the design can truly achieve learner orientation, enrich the learners' learning experience, and improve their learning outcome.

6 Conclusion

With the rapid development of the information era and the quick changes in the information knowledge, the emergence of mobile learning has enriched and changed the learning method and promoted the construction of lifelong learning community. In this study, the Customer Value Theory is introduced to the field of mobile education, and the design concept and mode of mobile learning resource products are innovated, satisfying the learning needs and preferences to the maximum degree. The conclusions of this study are as follows: The questionnaire survey is adopted over students majoring in education from Heilongjiang International University, in order to make an in-depth analysis of the mobile learners' current learning situation, and know about their needs and preferences for mobile learning resources as well as the learners' attitudes toward the mobile learning development. This has laid a solid foundation for the study. Based on the analysis of customer value concept and model by different scholars, this paper summarizes the meaning of mobile learning customer value, and builds the mobile learning customer value model on this basis. According to the survey results and the mobile learning customer value model, this paper also puts forward the design and development of mobile learning resource design and development principles based on customer value, builds the mobile learning resource design and development model by combining with Woodruff's customer value hierarchy model, in order to guide the case development of the corresponding resource products.

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Analysis of Course "Applied Mathematics" in Postgraduate Education Based on Change of Training Objective

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Abstract. During postgraduate education, "Applied Mathematics" is the most important public basic course for most science and engineering majors. However, fusion of applied mathematical theory and academic application is needed to analyze because of current change of training objective in postgraduate education. Therefore, this paper improves the teaching approach of course "Applied Mathematics" in order to press close to current training objective. Firstly, the difference is studied between classical objective which is inclined to theoretical theory and current objective which is inclined to academic application in postgraduate education. Furthermore, based on the difference we analyzed, an improved teaching method based on practical teaching is provided to solve this problem. Finally, experimental results show effectiveness and practicability of proposed method.

Keywords: Postgraduate education · Training objective · Applied mathematics Academic application · Teaching approach

1 Introduction

Since "State Council of China" promulgates enactment "the regulations of the People's Republic of China on Academic Degrees" in February of 1980, Chinese academic degree has three levels, which are degree of bachelor, master and doctor [1]. Implementation of enactment represents that Chinese degree and postgraduate education system is formally established. The State Educational Commission of China is predecessor of current Chinese Ministry of Education, which is the department to formulate postgraduate education and degree granting regulations of China.

During nearly forty years, there has been a high development of Chinese postgraduate education. However, based on great growth for quantity of postgraduates, many problems have been appeared recently. One significant problem is dislocation between the changes of training objective and classical theoretical inclined teaching approach.

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Earlier, training objective of postgraduate education is to cultivate high level scientific talents, which means most of them will still engage in scientific or social study in their research subject after their degree study. Therefore, classical teaching approach is constructed inclining to theoretical study because of the objective. However, with the increment of postgraduate quantity, a master or doctor degree now is a basic requirement in the senior employment market, which means that training objective of postgraduate education needs to be declined to real application. However, some classic postgraduate courses are facing great challenges because these courses cannot help postgraduates in their future work. Unfortunately, "Applied Mathematics" is such a course that needs to change its teaching approach.

2 Related Works

For years, many scholars, whatever in China or abroad, have researched on this problem. Since the problem became so pronounced, Xie researched construction of a reasonable curriculum system of the postgraduate education at earliest [2]. He researched curriculum designing, update stressing, classification making and individuality emphasizing. Afterwards, many scholars studied postgraduate education of China. Recently, Zhu et al. discussed status of graduate students' creativity and its influence mechanism [3]. Fan studied the cause of "low guiding effectiveness" for master's supervisor [4]. Meantime, Wang and Mao investigate demonstration for self-efficacy of scientific research in master students [5].

Soon afterwards, postgraduate education is also act as a significant study domain in education domain. Buissink-Smith et al. described and considered an initiative that sought to manufacture postgraduate peer-support groups and communities at a New Zealand university [6]. Kazim et al. explored the development of 'dynamic', collaborative and 'real time' pedagogy for teacher education [7]. Adams et al. researched perceptions of the benefits of learner-generated podcasts for supporting postgraduate engineering students in a mathematics-intensive course [8]. Shao et al. studied the training target, basic characteristics and the law of education on graduate students. They insisted that considerable progress has been made in education of degree graduates, and educational deviation correction of professional degree graduate has become an important task of educators [9]. Gemmell et al. described student views on learning from different countries in an online distance learning environment [10].

Recently, Teeroovengadum et al. measured service quality in higher education with a hierarchical model [11]. van der Valk researched quality assurance in postgraduate pathology by trained with regular assessment, monitoring of programs and examination [12]. Ryan and Zuber-Skerritt published their writing to review quality in postgraduate education [13]. Besides, our team is also working hard in this research domain. We studied task driven for mathematical course, investigated inadaptability between theory and application of mathematical course, applied formative evaluation as an effective teaching method, and found specialty directions of course "Applied Mathematics" for students whose majors are computer science [14–17].

The remainder of the paper is organized as follows.

First, we present and analyze the difference between training objectives of classical and current postgraduate education in Sect. 3.

Moreover, in Sect. 4, an improved teaching approach is presented in order to aim the new objective. This improved teaching approach is applied to experiment and analyze the comparison between the postgraduates who have been taught with the provided approach and classical approach.

Finally, Sect. 5 summarizes the main results of the paper.

3 Comparison Between Current and Traditional Training Objective

For years, training objective of postgraduate education is changing with development of economy and higher education. Traditionally, the teaching and training objective of postgraduate education is that postgraduates must master theoretical knowledge in their research domains and establish the foundation for their future research. Therefore, training objective is rationally inclined to theoretical knowledge without practical application. However, training objective is faced to job market today, which makes traditional teaching approach of theoretical courses, such as “applied mathematics”, doesn’t suit for the training objective. Forasmuch as teaching approach of this course faces problems.

3.1 Difference Between Traditional and Current Training Objective

In fact, the difference between traditional and current training objective can be divided as two cases.

(1) **The difference between knowledge and application**

In this case, difference between knowledge and application shows that the curricular knowledge studied by postgraduates can’t be applied into real application to solve the real problems. For example, in traditional teaching approach, instructional objectives of differential equation and difference equation model is that postgraduates can expertly solve the provided differential and difference equation. However, companies’ expectance is that they can abstract the problem to equations well, and then solve it. In this case, the postgraduates can’t solve the real problems because they don’t know how to get the equations.

(2) **The difference between requirement of related courses**

Since the training objective is changed, the expression of difference is also changed. Current objective shows that the postgraduates need to use applied mathematical knowledge to solve the problem from other related courses. More-over, they need to construct mathematical model for problems of other related courses. For example, in current training objective, postgraduate need to know how the filter reaches filtering, meantime, they need to design filters themselves. However, all of these are not required in traditional training objective, which do not need students to use applied mathematics into network, bioinformatics, image processing, pattern recognition or other courses.

In this way, the course “applied mathematics” need to change its teaching approach to reach its task from “to know theoretical knowledge in complex and future study” to “to help postgraduates know what to do in their subjects”. So we should know why and how can it be changed.

3.2 Reasons of Difference Between Traditional and Current Objective

During my fourteen years high educational teaching time, with discussion of my teaching team, two reasons is found to lead to this appearance of difference between traditional and current objectives.

(1) **The difference between examined mathematics and applied mathematics**

Before Chinese undergraduates enter postgraduate education, they need to pass a “standard postgraduate examination”. However, not all the undergraduates passed the examination can be recommended to postgraduate education, which means they need to get a high score in the examination. In the standard postgraduate examination, higher mathematics is an important examining course. Table 1 is the total score of all examining courses. So we know that 30% of scores are from higher mathematics. To be the hardest course of engineering subjects, higher mathematics is often spent much time by these undergraduates.

Table 1. Distribution of score in standard postgraduate examination

Courses	Higher mathematics	Professional course	Higher English	Politics	Total
Score	150 (30%)	150 (30%)	100 (20%)	100 (20%)	500

Then, in order to gain a better score, many undergraduates put their energy into “higher score”, but not “understanding”. So when they become postgraduates, their undesirable habits are also bringing into studying. This is not a terrible habits if they were in traditional postgraduate education because they will continue to work on theoretical research. Nevertheless, this will affect postgraduates’ future study in current postgraduate education. This is the difference between “examining mathematics” and “applying mathematics”.

(2) **The difference between ability of examination and practical application**

Many Chinese postgraduates lacks innovativeness because of examination-oriented education. This makes them to be a good executor but not a good innovator. We don’t want to comment education before postgraduate, but we have to know that more postgraduates lack the ability of application in inter-courses. So in practice, many postgraduates can’t use mathematics into their own subjects. Actually, they don’t know the meaning of applied mathematics. This makes them harder to understand an equation, construct a model or reach a practical application.

4 Revised Teaching Approach by Training Objective

After discuss the comparison between traditional and current training objective in course "applied mathematics", we here present an improved teaching approach, which is in order to solve the problems in this course.

The improved teaching approach is presented as follows.

(1) **Improved training objective**

In classic theoretical teaching, the training objective is always "to accept/comprehend/understand/master the knowledge of some method". But none of them emphasize the usage and employing. So we improve the training objective to "usage/mimicry/creation of knowledge and methods". So that the postgraduates can use the knowledge into their problems.

(2) **Improved teaching approach**

After the training objective is clear, we have to improve the teaching approach. One effective teaching approach is the case-driven teaching approach, which uses many cases to present the process that applied mathematics is used in problems of computer science.

(3) **Improved examining method**

The examining method has to improve when the training objective and teaching approach are improved. Otherwise, examination-driven mechanism forces the post-graduates go back to the classic studying. In our method, we examine postgraduates with some practical work and one written examination. In these practical work, we give the postgraduates huge data, and require them to classify or find rules in the data. In this teaching, the score of practical work is 60% of the final score, and the score of written examination is 40%. It forces the postgraduates to bring their attention to practical application more.

We have used this method into teaching for two years (fall term in 2016-2017 and 2017–2018, see Fig. 1a–b). Then, with comparison of score in fall term during two years, which are in 2013–2014 and 2014–2015, and 2015–2016 (see Fig. 1c), we have Table 2.

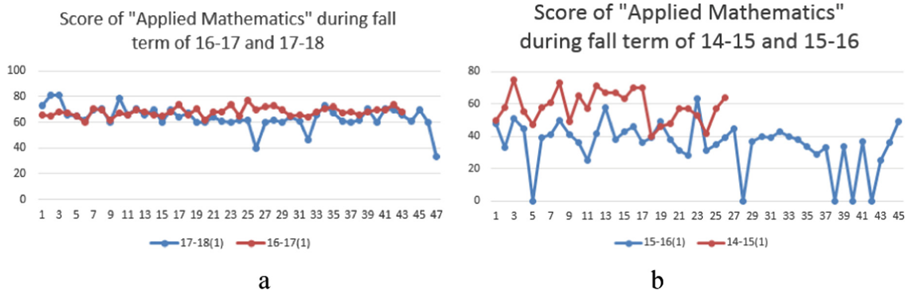

Fig. 1. Score distribution of course "Applied Mathematics" in 2014–2017.

Table 2. Distribution of score in standard postgraduate examination

Term	Mean	hs	ls	dy	dn	dr	ds
14–15	58.46	75	40	0.42	0.24	0.5377	0.1130
15–16	35.20	63	0	0.65	0.32	0.9111	1.2104
16–17	68.16	77	60	0.32	0.08	0.4279	0.1720
17–18	64.15	81	33	0.36	0.18	0.5021	1.1666

Then, in order to research these data, we analyze these scores to get their means, highest scores (hs), lowest scores (ls), degrees of difficulty (dy), differentiation (dn), relative-variance (dr), and degrees of skewness with normal distribution (ds). They are presented in Table 2.

From Table 2, we know that the studying effectiveness is increasing year by year. The dy of terms in 16–17 and 17–18 are lower than in 14–15 and 15–16, which denotes the difficulty of examination is changed to easier. In other words, it denotes that the students learn more knowledge under current training objective. The mean of score of terms in 16–17 and 17–18 are higher than in 14–15 and 15–16, which also denotes that the students can solve more problems under current training objective. The dr of terms in 16–17 and 17–18 are also lower than in 14–15 and 15–16, which denotes the standard relative variance changed lower in recent years. Therefore, standard level of all students changed higher during current training objective.

However, since the improved teaching approach is only lasted for two years, there are also many problems in the approach. For example, dr and ds are not steady in these years, which denotes that the examination method needs to be improved. The index dn is lower, which denotes that the examination can not differentiate the ability of students well. All these problems will be researched in future.

5 Conclusion

In this paper, we discuss the difference between traditional and current training approach in course “applied mathematics” of postgraduate education. Postgraduates in college of computer, Inner Mongolia University is applied as the example to research this difference and study structure of a novel teaching approach to adapt current social requirement. Then, the improved teaching approach is experimented and analyzed by compared difference between the postgraduates which have been taught with the improved and traditional teaching approach. Experimental result shows the effectiveness of this improved teaching approach.

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Research on Cultivation of Internet+ Innovative and Entrepreneurial Talents

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Abstract. It is of significant importance to cultivate innovation and entrepreneurship ability of contemporary university student under the background of "Internet+" and "mass entrepreneurship and innovation". The university-enterprise cooperation is a necessary approach for cultivating practical innovative and entrepreneurial talents in advanced vocational colleges. This paper describes the practical experience of cultivating innovative and entrepreneurial talents based on university-enterprise cooperation in Internet+ era on the basis of analyzing current situation of cultivating innovative and entrepreneurial talents, and focuses on expounding the innovation and entrepreneurship reform mechanism, the great achievements made in the innovative and entrepreneurial talent cultivation program, and the key roles in the construction of quality colleges.

Keywords: Internet+ · Innovation and entrepreneurship · Personnel training

1 Introduction

Premier Li Keqiang clearly defined the "Internet+ Movement" plan in the government's work report in March 2015. Actually, "Internet+ Movement" is the new shape and new form of industry of the Internet under Innovation 2.0, as well as the evolution of Internet form driven by knowledge-based social Innovation 2.0. The development of new generation of information technology has hastened the Innovation 2.0, which, in turn, has affected the formation and development of new generation of information technology form, reshaped the new form of new generation of information technology as the Internet, cloud computation and big data etc., further driven Innovation 2.0 in the knowledge-based society featured by user innovation, open innovation, mass innovation and collaborative innovation, changed the way of people's production, working and life, ushered the "new normal" of innovation-driven development [1].

Colleges and universities assume the obligations of teaching and scientific research, have the quality of innovation, and are the cradle of cultivating innovation and entrepreneurship ability of students. With the economization of socialist market and internationalization of economic development, China is greatly demanding a multitude

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of practical professional talents. The output of high-quality professional innovative and entrepreneurial talents has profound influence on regional development and national competitiveness. China's economy has achieved the development at medium-to-high speed, the great upsurge in mass innovation and entrepreneurship has been rising, and the educational research on innovation and entrepreneurship has become a hot issue for research in higher education. Throughout the results of educational research on innovation and entrepreneurship in China, it is confirmed that innovation and entrepreneurship education is contained in the process of talent cultivation with the cultivation objectives of higher education being set up in advance [2]. Through years of efforts, university-enterprise cooperation of higher vocational technical education has achieved initial success. However, it is far from perfection, especially that the state has put forward higher requirements and standards over the development of good higher vocational colleges. It is thus crucial to focus on improving practical teaching quality, cultivating the entrepreneurial awareness of college students, explore the university-enterprise cooperation mode featured by more sound higher vocational education that is distinct from the secondary vocational education, while enhancing the construction of professional theory education.

With the diversified development of higher education nowadays, the university-enterprise cooperation is a necessary approach for cultivating practical innovative and entrepreneurial talents in undergraduate universities. At present, in the construction of quality colleges, the higher vocational colleges should focus on studying following issues: how the university and enterprise should further promote integration of production and education, develop the resources of both Parties, and establish the cultivation mode of innovative and entrepreneurial talents among undergraduates so as to adapt to the "Internet+" era, meet the demand for talents for social construction, and form an education pattern of university-enterprise cooperation with bilateral interaction and virtuous circle.

2 Present Status of Cultivation of Innovative and Entrepreneurial Talents

Foreign universities have realized that cultivating innovative and entrepreneurial talents is an essential content of education, achieved adequate social and economic returns from cultivation of innovative and entrepreneurial talents, and integrated innovation into entrepreneurship. Moreover, a relatively mature set of supporting system for innovation and entrepreneurship education has been formed in America, Germany, France, Britain Australia, Switzerland and some other countries. Apart from traditional course teaching, colleges and universities in America have established innovation and entrepreneurship clubs and websites, etc., through which the students could obtain real-time information on entrepreneurship. In Japan, colleges and universities have adopted the innovative and entrepreneurial talent cultivation mode as "integration of officials, production and education", as well as the education mode of "industry research laboratory". The UK government has adopted superincumbent and government-driving mode for the management of innovation and entrepreneurship education in colleges and universities. The innovation and entrepreneurship education mode in Britain has become relatively mature and achieved prominent results; therefore, innovation and entrepreneurship education has been a major driving force for British economic and social development. In Germany, establishing a combination with close integration between scientific research and production led by higher education has become the common mode for promoting higher education reform and development, developing open education and teaching, as well as cultivating high-quality innovative and entrepreneurial talents in colleges and universities. In Switzerland and Australia, the innovation and entrepreneurship education courses have been commonly offered in their colleges and universities that implement innovation and entrepreneurship education, being aimed at cultivating students to become successful entrepreneurs in the future [6].

In China, the colleges and universities develop innovative and entrepreneurial talent cultivation on the basis of different universities and professional features, or promote educational practices according to regional economy, and then explore talent cultivation mode based on that. There are three major modes: the mode focused on entrepreneurship course education, the mode centered on competition and activities among students, and the mode centered on Entrepreneurship Park or Science Park.

All universities select different talent cultivation modes according to their own school-running characteristics and education resource superiority. Among them, Tsinghua University, Central South University, Yiwu Industrial and Commercial College and other universities at different levels have achieved huge progress in entrepreneurship education through adopting different innovative and entrepreneurial talent cultivation modes. For example, Department of Communications of Northeast Forestry University has adopted the innovative and entrepreneurial talent cultivation mode as “1+1+N Mentor System”, where, the first “1” represents the mentor of each class who is hired by the University. The second “1” represents the coordinator of each class who is selected and recruited by mentor group in each Department. Generally, the coordinator of a class should be a professional teacher with stronger professional qualification. The coordinator is responsible for compiling professional study plan for each individual student, and provide them guidance in terms of ideological and moral education, life demands and psychological development, etc. “N” refers to that professional mentor, academic mentor, innovation mentor, entrepreneurship mentor, employment mentor, model mentor and graduation thesis mentor should jointly guide sophomores and above so as to meet demands of individual difference and development. However, the determination of mentors should be realized via two-way selection. The “1+1+N Mentor System” among undergraduates has indeed realized the goal of cultivating innovative and entrepreneurial talents [3] through individualized teaching by different level and category, providing a good reference for the cultivation of innovative and entrepreneurial talents in higher vocational colleges.

However, the cultivation of innovative and entrepreneurial talents in most higher vocational colleges in China starts relatively late, and innovation and entrepreneurship education has only been regarded as an attachment to higher education in many innovative and entrepreneurial talent cultivation modes, thus failing to integrate basic entrepreneurship knowledge and basic quality cultivation with professional education effectively, utilize existing education resources sufficiently, penetrate entrepreneurship education into the entire education and teaching process. In addition, these universities only add credits related to innovation and entrepreneurship education into talent cultivation schemes. As a whole, the innovation and entrepreneurship education only benefits a small portion of students at present, and there are a lot for universities to concern about, such as the indifference and poor degree of participation to innovation and entrepreneurship among many students. Though there are various discipline competitions developed among colleges and universities, there still lacks attention to innovative learning and entrepreneurship training of undergraduates. Some entrepreneurship projects of undergraduates are just simple commercial activities that are divorced from technical innovation and specialized characteristics [4, 5].

3 Practical Experience of Cultivating Innovative and Entrepreneurial Talents Based on University-Enterprise Cooperation in the Internet+ Era

At present, the society is in an information age that is facing the movement, the Internet of Everything and the comprehensive cross-border integration. The Internet thinking is changing the industry dynamics, which requires further integration between the information industry traditional industries. Since 2015, the College has made outstanding achievements by setting up BIM School and laboratory, cultivated more than 30 BIM supervisors, and trained nearly 500 students who have mastered BIM technology.

In addition, through the construction of the ICT innovation base with integration of production and education, the School of Computer and Communication Engineering has cooperated with ZTE Corporation to jointly made cooperative explorations on the transformation and development of the university with application-oriented technology. What's more, the College also jointly establish a practical teaching and scientific research platform for information communication technology with complete functions, jointly set up and operate specializations that can fully realize the education based on university-enterprise cooperation, jointly build the cooperative scientific research system for win-win results and development between the university and enterprise, promote the core competitiveness of teaching and scientific research of the professional teachers team, establish the innovative and entrepreneurial talent cultivation mode among undergraduates, change the traditional single campus classroom teaching mode so as to truly realize the connection between the theory and practice, as well as the open education of integrating curricular and extra-curricular teaching, which is undoubtedly the most effective way to cultivate innovation and entrepreneurship ability of students, improve the quality of talent cultivation, and guarantee the high-end employment of students.

In 2017, the College was selected as pilot unit of the second batch of modern apprenticeship system under the Ministry of Education (MOE). Since taking the project of "MOE- ZTE ICT Innovation Base with Integration of Production and Education" as an opportunity, the network majors have given full play to industrial advantages of ZTE Corporation in the field of ICT, and explored the innovation of innovation and entrepreneurship cultivation among undergraduates under the framework of Ministry of

Education-ICT integration of production and education of ZTE Corporation. On one hand, we have jointly established specializations, compiled talent cultivation schemes, cultivated high-level double-professionally-titled teacher team, promoted practical teaching base, and developed teaching reform and research on new innovation projects in the way of university-enterprise cooperation. On the other hand, with the architectonic-electrical majors as the representative, the College have defined specifications for cultivating innovative and entrepreneurial talents from engineering specializations, explored theoretical and practical teaching modes as well as the education mode based on university-enterprise cooperation for innovation and entrepreneurship by taking two engineering disciplines of computer science and technology and electronic information engineering as the pilot project so as to attract the participation of students from perspectives of technology R&D, innovation projects, etc.

In the process of innovative and entrepreneurial talent cultivation, we have fully utilized the education resource and other relevant resources of schools, enterprises and the society, as well as advanced information communication technology to cultivate scientific and technological innovation sense of students, improve their technical ability, and integrate innovation and entrepreneurship education into talent cultivation schemes so as to realize the new mode of innovation and entrepreneurship cultivation in the "Internet+" era, which is "led by the enterprise, giving priority to the university, participated by teachers and students, and implemented in the university". Through the base construction, we have promoted the new mode of innovative and entrepreneurial talent cultivation, improved the connotation construction level of specializations, improved the scientific research and technical service abilities of teachers, and enhanced the innovation and entrepreneurship awareness of students.

3.1 Innovation and Entrepreneurship Reform

Optimize the Quality Standard for Cultivating Innovative and Entrepreneurial Talents

We have established the curriculum system for innovative and entrepreneurial talent cultivation based on university-enterprise cooperation, and integrated innovation and entrepreneurship thinking, methods and contents into general courses, discipline basic courses, professional basic courses, specialized course, professional selective courses and general selective courses according to specialized characteristics in each industry. We have established the innovative and entrepreneurial talent cultivation system with integration of "study, innovation, research and application" so as to cultivate the innovation awareness, thinking and competence, as well as entrepreneurship spirit and capacity of students. Meanwhile, we have set up new courses as "Fundamentals of Entrepreneurship", "Guidance for Career Development and Employment of Undergraduates", etc., invited experts and technicians from different enterprises in different industries to convey ideas of frontier dynamics of the discipline to students, and set up the entrepreneurship guidance course for students with entrepreneurial intention. See Fig. 1 for the curriculum system for cultivating innovative and entrepreneurial talents.

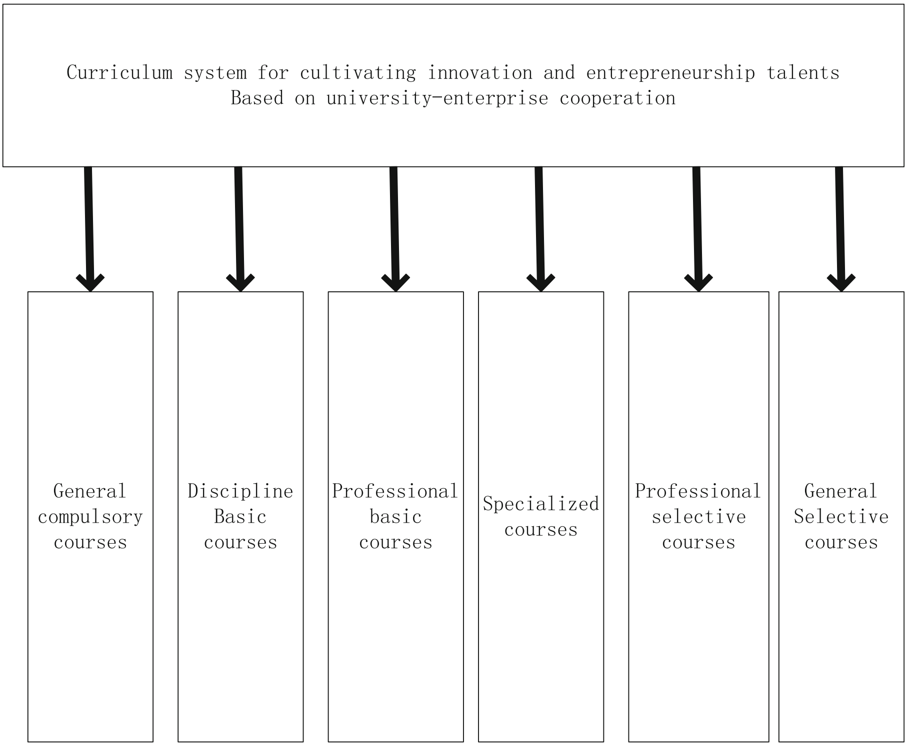

Fig. 1. Curriculum system for cultivating innovative and entrepreneurial talents based on university-enterprise cooperation

Optimize Practical Teaching System

According to the curriculum system for innovative and entrepreneurial talent cultivation based on university-enterprise cooperation, as well as the innovative thinking of students and demands on cultivation of practical ability, the practical teaching system for innovative and entrepreneurial talent cultivation based on university-enterprise cooperation is comprised by three parts, namely, the basic practice course, professional practice course and comprehensive practice course. Apart from experimental course teaching, there is centralized practical teaching link, which specifically involves curriculum design, comprehensive experimental training, social practice, engineering training in enterprise, and internship after graduation design, etc.

Reform Teaching Modes

During the teaching process, we have been aiming at cultivating the critical thinking and creative thinking of students, as well as stimulating their innovation and entrepreneurship inspiration; have actively explored and reformed the management mechanism and methods during teaching process, changed spoon-feeding education and theoretical teaching in the past, adopted multiple teaching modes, such as heuristic, discussion-type, participatory and inverted classroom modes, represented by integration of on-line and off-line teaching modes, as well as blended teaching mode. Meanwhile, we have also adopted results-driven approach advocated by the Sydney agreement as well as the MIMPS teaching method, automated instruction of engineers and other advanced project teaching methods advocated by enterprises. We have utilized the teaching platform that is independently developed by ZTE and dedicated teaching materials independently prepared by enterprises so as to enhance students' initiative and interests of learning. In addition, we have invited engineers and technicians from enterprises to hold lectures, encouraged teachers to integrate the newest academic dynamics, technical achievements and innovation experience in industries related to the disciplines into classroom teaching, integrate education and concept related to innovation and entrepreneurship into the entire talent cultivation process.

Promote the Reform of Course Evaluation System
Under the guidance of Instructive Committee of Specialty Teaching, we have reformed the evaluation method according to characteristics of each course, enhanced formative evaluation, and transformed the examination evaluation mode into the mode where formative evaluation and practical operation are mainly focused. According to characteristics of the course, we have increased the proportion of usual performance instead of its proportion as 20% in the past. Moreover, we have encouraged teachers to adopt diversified evaluation modes, such as interview, practical operation, course paper, course design and course for work appreciation, etc.; defined corresponding incentive mechanism, performed trial implementation of non-standard answers, emphasized on observing students' learning process and examining their capacities of using the knowledge they mastered to analyze and solve problems, promoted the transformation of evaluation of learning results into formative evaluation, knowledge evaluation into capability assessment, as well as single assessment mode into diversified ones.

3.2 Optimize Three Mechanisms for Innovation and Entrepreneurship

Establish Stepwise Operation Mechanism for School-Level, Provincial and National Professional Skill Competition
We have revised and optimized the management methods on innovation and entrepreneurship competitions of some universities on the basis of original management methods on innovation and entrepreneurship, supported and encouraged all students to actively organize and participate into various professional competitions, and established stepwise operation mechanism for school-level, provincial and national professional skill competition. From 2015 to 2017, selection contests for innovation and entrepreneurship projects were organized under the guidance of relevant departments for participation of higher level competitions, from which the students had benefited a lot. Meanwhile, the participation and awards have been incorporated into the examination assessment and professional assessment of each education unit.

Optimize Education Mechanism Based on University-Enterprise Cooperation
The "Three Ones" engineering program has always been promoted, which requires each education unit to develop inter-university cooperation with one famous domestic university and one famous foreign university, develop university-enterprise cooperation

with one famous domestic or foreign enterprise, integrate into a regional pillar industry, insist in coming out and bringing in, actively expand the integration of production and education and the channel of cooperative education, optimize campus and social environment for cooperative education, innovate the talent cultivation mode with integration of production and education.

As a pilot unit of the second batch of modern apprenticeship system under the Ministry of Education (MOE), the architectural-electrical science, network management, hotel management are key construction majors. Among these, currently the School of Mechanical and Electrical Engineering Technology has cooperated with two famous domestic and foreign enterprises, in order to develop the talent cultivation mode with co-cultivation of professional talents and integration of production, teaching, research, study and application, establish the "Pilot Major of MOE Modern Apprenticeship System". Meanwhile, it has further cooperated with Russian universities.

Explore and Establish Overall Education Mechanism
We have established the overall education mechanism that is initiated by the office of academic affairs with the participation of student league, scientific research, employment, ideological and political education, laboratory teaching and management departments; established a platform for innovation and entrepreneurship education for undergraduates, which is based on internship and experiment, takes practical innovation and entrepreneurship projects and professional skill competitions as the core, and regards challenge cup, social practice and entrepreneurship practice as broadening contents; developed a campus culture ecology system with the linkage of all departments, learning while teaching, as well as overall education.

4 Conclusion

Generally speaking, great importance is attached to the cultivation of innovative and entrepreneurial talents, comprehensively implemented engineering for innovation and entrepreneurship education, established the innovation and entrepreneurship cultivation system based on university-enterprise cooperation in the Internet+ era, combined education inside and outside the campus, the curricular and extracurricular education, in-class experiments and centralized practices, as well as innovation and entrepreneurship training projects and various professional skills competitions on the basis of further cooperation with enterprises under the modern apprenticeship system. In addition, these faculties have established a platform for innovation and entrepreneurship education for undergraduates, which is based on internship and experiment, takes practical innovation and entrepreneurship projects and professional skill competitions as the core, and regards challenge cup, social practice, entrepreneurship practice and substituted post internship as broadening contents so as to cultivate the innovation and entrepreneurship thoughts and ability of students through the entire talent cultivation process. This is also the key point of the construction of good institutions in modern higher vocational education.

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Research on Collaborative Learning of Training Task Based on Cloud Computing

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Abstract. In the 21st century, the network technology develops so rapidly that new technologies, new concepts are emerging one after another. Cloud computing – a kind of burgeoning commercial calculation model becomes a hot spot of research in the current. With high capability, low threshold, low cost, convenient services, cloud computing has brought great changes to the people's work and life style, and makes a tremendous impact on educational ideas, models and methods. The using of cloud computing platform for the network to provide learning and environmental assisted instruction will produce fundamental changes in the field of education. Information era requires students to grasp learning ability, creative capability, collaborative and communicative skills. In this paper, the most current technology integrates the cloud service and teaching, meanwhile Task-based learning is carried out in the actual teaching under the collaborative learning research and practice to enhance the independent learning skills, improve the collaborative learning ability of students, and nurture the comprehensive quality to adapt to the social development.

Keywords: Cloud computing · Collaborative learning · Task-drived

1 Introduction

Since the 1990s, computer technology and network technology has developed rapidly, which has brought about tremendous changes in people's way of life and work style, but also had a fundamental impact on the education reform. Education is inseparable from information technology [1, 2]. Technological advances promote the development of education. However, the ultimate goal of education is to cultivate students to develop in an all-round manner, so that they develop the innovative, practical and learning capabilities. In this era of open diverse network, it is essential for every educator to assist teaching with the modern network resources, explore, study and build a learning model for cultivating innovative ability under the network environment. Currently cloud computing is a hot research topic, and the application of cloud

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computing-based services in teaching will create a new prospect for China's education and cultivation of students.

Based on the task-driven collaborative learning and teaching model under the cloud computing environment, the teaching practice over the undergraduate's *Fundamentals of College Computer*, and the learning characteristics of students in the collaborative learning process obtained from practice, this paper studies the roles of teacher in collaborative learning and teaching process, in order to explore how to better play a guiding role, how to design tasks and create scenarios, and how to effectively build a platform for collaborative learning. The task-based collaborative learning through the cloud service teaching platform not only enables students to grasp the teaching contents, but also enhances their self-learning abilities, collaboration spirits and collaborative learning abilities and improves students' learning motivation [3].

The teacher may build a personalized teaching platform by using the free apps and secure data storage centers from the cloud computing and combining with the actual teaching situation [4]. The combination of this online teaching assistance platform with the classroom teaching will greatly enhance the quality of teaching and has very important practical significance for cultivating students' collaborative learning abilities and developing their innovative thinking and innovative capabilities.

2 Theoretical Basis for Task-Driven Teaching Method and Collaborative Learning

2.1 Collaborative Learning

Collaborative learning is a constructivism learning model. In collaborative learning, multiple learners learn the same content, so that they can interact and cooperate with each other and achieve a deeper understanding and grasping of teaching contents through exchanges, negotiations, discussions and cooperation. At the same time, the collaborative learning model is conducive to cultivating the spirit of solidarity and cooperation.

Professor Huang Ronghuai [5] defines "collaborative learning" as follows: "Collaborative learning is related collaborative behaviors that the learners participate in it as a group, and maximize individual and others' learning outcomes under a certain incentive mechanism in order to achieve the common learning goals." Collaborative learning consists of four basic elements: learners, collaboration group, the teacher and collaborative learning environment. Learners refer to the students who are assigned to each collaboration group as per a certain strategy. Collaboration group is the basic organizational unit for collaborative learning. The grouping method can affect the effectiveness of collaborative learning, and the learners can be grouped according to their learning achievements, personality, preferences, etc. The teacher organizes and controls the learners' achievement efficiency of learning target and ensures the effectiveness of collaborative learning.

2.2 The Teaching Design of Task Driven Collaborative Learning

Task-driven method is short for task-driven teaching method. It refers to that in the learning process, students will focus on a common task activity center with the help of the teacher to carry out independent exploration and interactive collaborative learning driven by a strong problem motivation through the active application of learning resources, and the teacher will guide students to produce a practical learning activity while the established tasks are completed. Task-driven method is a teaching method based on the constructivism teaching theory. The teacher will implicitly contain the knowledge to be task, guide students with unique task design and scenario introduction and maintain the students' learning interest and subjective initiative, so that students can grasp the knowledge by completing the task.

In today's highly competitive era, the success of individuals depends not only on their ability but also their collaborative capability. Collaborative learning is an important model in modern teaching. It aims to cultivate students' ability to innovate, cooperate and practice. Collaborative learning with task-driven method can enhance the efficiency of collaborative learning.

In the cloud computing network application model, the only one copy of data is stored in the "cloud". As long as all electronic devices are connected to the Internet, people can access and use the same data simultaneously. Of course, all these are done under strict safety management. Only those people who have access to the data can use or share the data with others. As a result, cloud computing render unlimited possibilities for online learning, unlimited space for data storage and management, and extremely powerful computing ability for various applications. Cloud service is the best embodiment of collaborative learning, in which the teacher may organize and implement collaborative learning activities in the form of assistant teacher and as a supplement of classroom teaching [6].

3 Teaching Practice of Task-Based Collaborative Learning

Fundamentals of College Computer is a public basic course for non-computer major students in higher educational institutions. The course is characterized by rich content, wide range and strong operability, and it belongs to a practical course. The course aims to cultivate college students' information literacy, the basic skills of computer operation and abilities to solve practical problems. Besides, this course includes theoretical knowledge of computer systems, multimedia technology as well as the use of office apps [7].

In most schools, the traditional "class + experiment" teaching model is adopted for this course, being characterized by "teacher teaching and student listening" as well as "students doing experiments and the teacher offer assistance". This traditional teaching-oriented model shows god effect on grasping declarative knowledge, yet it is unsuitable for the acceptance of 'procedural" knowledge and cannot achieve the cultivation of self-learning ability and innovative consciousness. The use of learning-oriented model can stimulate students' enthusiasm for learning. However, considering that the freshmen are the teaching object, there should be an adaptation process from high school to university in all aspects. Therefore, the teaching-oriented model is adopted in terms of theory, and the dual teaching system design of "teacher orientation and students as main body" is employed in the application unit. Also, the task-driven collaborative learning strategy is used, and the collaborative learning is carried out on the application cloud service platform - Baihui.

3.1 Analysis of Learning Goals and Target Ability

This learning unit is the use of Power Point. Speaking of this part, the course has been completed for more than half, and the students have mastered Word, Excel and other software, so they have certain basis for Power Point learning. A few students know the simple operation of Power Point, and most students do not understand the Power Point creating methods and advanced applications.

Knowledge Goal
Master the editing operation of the Power Point2013 presentation. Master the revision of the Power Point2013 presentation framework. Such as the slide template, the application of the format, the master version, the modification of the color scheme. Master the setting of Power Point2013 multimedia effect. Such as audio, video and other object embedding methods, the animation design of slide, the setting of switching effect.

Emotional Goal
The use of Power Point2013 demo production software produces a strong interest in learning, not just for "examination". In the future study and work, we can consciously use Power Point2013 to display the content that you want to express and solve the specific problems. Have the spirit of teamwork and innovation, and the ability to communicate with others.

Ability Goal
Have the ability to design and produce slides. The ability to use the search engine to find the required resources. Improve the ability of autonomous learning and collaborative learning in the network environment. Can objectively and impartially evaluate the tasks of themselves and other students.

3.2 Analysis of Learning Content

The content of this paper is mostly procedural knowledge, procedural knowledge refers to a set of operational steps and processes of business, mainly used to solve what to do and how to do it. Such knowledge relates to the improvement of students' practical ability and operational skills, and is very suitable for the task driven teaching mode, so that students can understand and apply knowledge through exploring problems and seeking solutions.

According to the hour distribution, the theory of teaching is 2 h, the operation is 2 h. The teaching content is shown in Fig. 1.

The acquiring of strategic knowledge (tacit knowledge) is also included in this task. For example, students design Power Point, search for materials and resources, and carry out group collaboration and evaluation according to the topics. All these imply

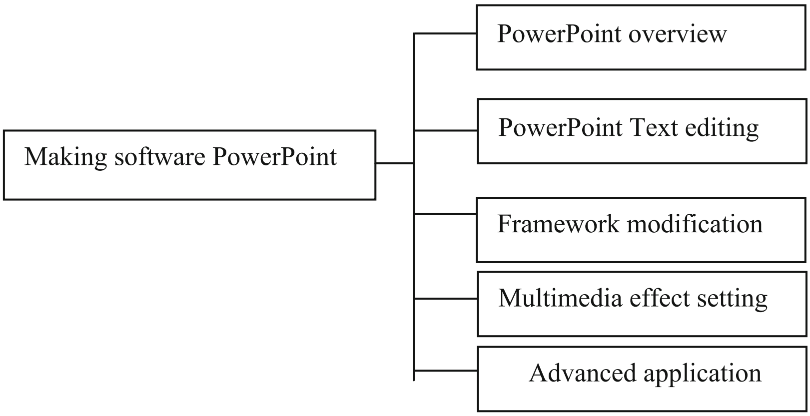

Fig. 1. Part of PowerPoint teaching content

knowledge of "how to learn and how to think". Only after acquiring this knowledge can students know how to learn and create. The process of solving the whole learning task is the application and improvement of strategic knowledge. Therefore, it is essential to focus on reflecting the strategic knowledge in the design of learning strategies, the design of learning environment and the provision of cognitive tools, so that students can acquire knowledge and exercise their abilities in accomplishing their tasks.

4 Conclusion

Based on the constructivism learning theory, this paper uses the concept of cloud service to apply the cloud service platform to the teaching practice of *Fundamentals of College Computer*. In the process of dual teaching, a task-based collaborative learning model is used to achieve a good teaching effect. It provides a good demonstration for other courses and has certain application value in improving the teaching quality. In addition, the cloud-based teaching platform provides strong supports for the implementation collaborative learning. The platform also plays a very good role in cultivating students' innovative thinking, improving their ability to solve problems and enhancing students' information literacy. What's more, the task-based collaborative learning model is very popular among the students, because they believe it will bring great fun to their learning.

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Correlation Analysis Between the Regular Performance and the Final Performance of College Math Courses

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Abstract. Examination scores is a kind of feedback of the teaching effectiveness, The student's regular performance should be the same as the final performance in the assessment. In this paper, the statistical methods were used to analyze the regular performance and final performance of college math course of different majors and grades, such as Advanced Mathematics, Linear Algebra and Economic Mathematics. The results show that regular performance positively correlates with final performance at most times, indicating that strengthening the students' process management and improving student' regular performance plays a key role in improving students' final performance. Furthermore, this paper analyzes some problems in the regular performance assessment and gives the corresponding solutions.

Keywords: College math · Regular performance · Final performance Correlation

1 Introduction to the Problems

Math is the crystallization of human wisdom as well as a very important culture. For university students, math is a compulsory basic course for both science & engineering majors and economy & management majors [1, 2]. It is not only an indispensable knowledge tool for major courses, but also the best knowledge carrier for cultivating rational thinking and scientific thinking methods. In addition, it is also an important way to raise the aesthetic awareness of science.

At present, most colleges and universities carry out the comprehensive assessment of process assessment plus final exam over the college math. In other words, the students' final grade is composed of two parts: regular performance and final performance. Regular performance focuses on evaluating the students' learning process and thus evaluating the students' learning effects [3]. The main purpose of implementing the assessment of regular performance is to strengthen the supervision, guidance and management of students' learning process, promote students' independent learning and

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improve their overall quality and ability. The final exam mainly assess the overall effect of student' learning, which in a sense also tests the learning process. The assessment of regular performance is in fact consistent with the purpose of final exam. If the same student has good regular performance, his or her ability to acquire practical knowledge will be higher, and the corresponding final exam results will also be good; vice versa. There should be a strong positive correlation between the two assessment methods [4].

The regular performance and final performance is usually distributed according to a certain weight. In general, regular performance accounts for 30%–50% of the total score, while final performance accounts for 70%–50% of the total score. Before launching the course, the teacher will formulate the course assessment method based on the course nature, students' major and students' characteristics, and publish the assessment method and grade assessment method for the students at the beginning of the semester. Although the teacher constantly improves the process assessment method in teaching college math, it is inevitable that subjective, unilateral and unscientific phenomena appear in the process assessment form and the assessment program. In order to form a more objective, scientific and systematic assessment method of regular performance and enable it to correctly reflect and assess the students' learning ability and learning attitude in studying college math, the research on the correlation between regular performance and final performance of college math courses is particularly important [5]. The research on this topic has a profound significance on the evaluative judgment of final performance, the feedback and guidance over teaching, the building of academic atmosphere and the improvement in learning motivation [6].

This paper intends to start from the students as a whole, and study the relationship between regular performance and final performance according to the college math of different grades, different majors and different courses. We would like to draw your attention to the fact that it is not possible to modify a paper in any way, once it has been published. This applies to both the printed book and the online version of the publication. Every detail, including the order of the names of the authors, should be checked before the paper is sent to the Volume Editors.

2 Research Process and Method

2.1 Determining the Research Objects and Research Data

According to the principle of sampling, the grades of Advanced Mathematics (I), Linear Algebra, Economic Mathematics (I) and Economic Mathematics (II) from the majors of Grade 2016's computer science and technology, digital media technology, international economy and trade, financial management, marketing and human resource management are taken as the research objects. Details are shown in Table 1.

Table 1. Sampling results

Major	Computer science and technology	Digital media technology	Business administration	Business administration
Course title	Advanced Mathematics (I)	Linear Algebra	Economic Mathematics (I)	Economic Mathematics (II)
Number of students	62	64	135	300

2.2 Research Method

The charts are used to analyze the distribution of regular performance and final performance, explore whether there is a positive distribution between regular performance and final performance, and compare the distribution curve. Linear regression is used to analyze the correlation between regular performance and final performance, and study whether there is a positive correlation between regular performance and final performance, the correlation degree and the significance of correlation.

2.3 Research Process and Results

After carrying out the normal distribution over the regular performance and final performance of the four courses and making preliminary reasonable judgment over the test scores, the author obtains the frequency histogram and normal distribution curve for the regular performance and final performance, as shown below. Among these, the transverse coordinate represents the score (percentile), and the vertical coordinate represents the function of normal distribution. Besides, the data label on the frequency histogram represents the number of students getting this score. It is shown in Figs. 1, 2, 3, 4, 5, 6, 7 and 8.

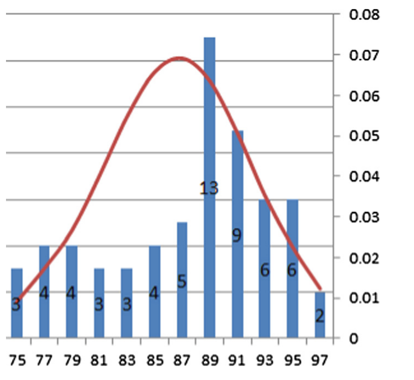

Fig. 1. Regular performance of Advanced Mathematics (I)

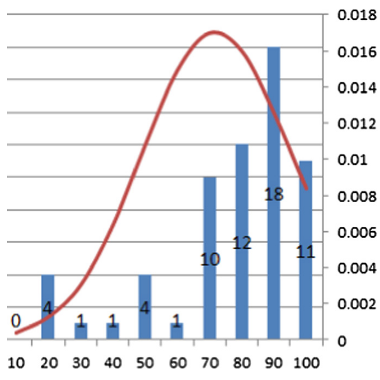

Fig. 2. Final performance of Advanced Mathematics (I)

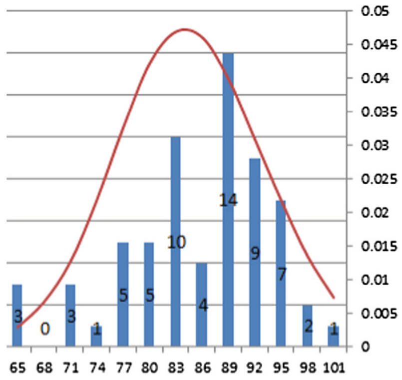

Fig. 3. Regular performance of Linear Algebra

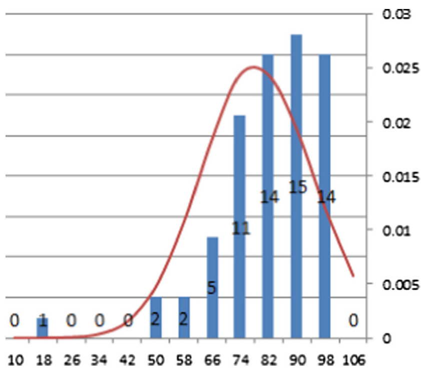

Fig. 4. Final performance of Linear Algebra

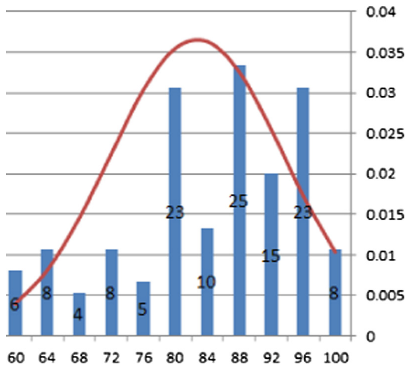

Fig. 5. Regular performance of Economic Mathematics (I)

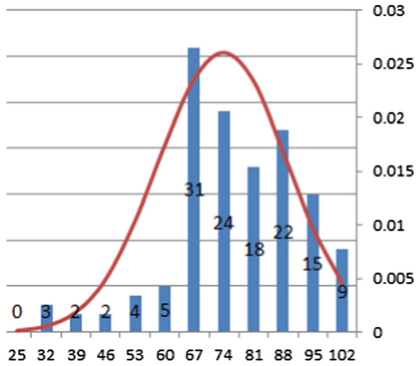

Fig. 6. Final performance of Economic Mathematics (I)

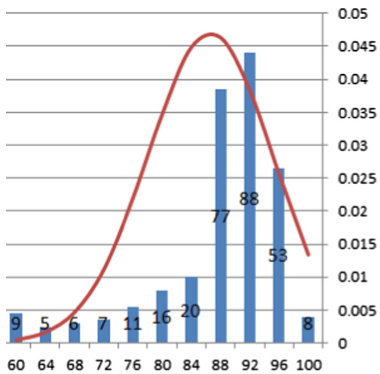

Fig. 7. Regular performance of Economic Mathematics (II)

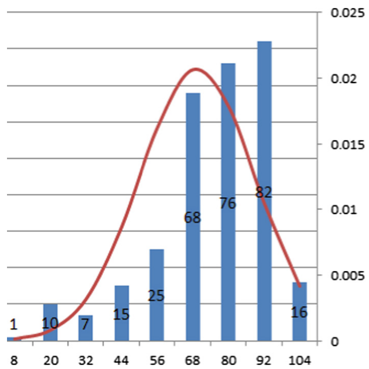

Fig. 8. Final performance of Economic Mathematics (II)

If the regular performance and final performance of each course are studied separately, they are basically in line with the normal distribution, so the grade assessment is more reasonable. However, if the regular performance is compared with the final performance of each course, it is found that the final performance is much lower than the regular performance and there is no failure in the regular performance, yet some students may fail the final exam. This shows that process assessment has not really played a role in promoting learning for these students.

Further analysis of the number and proportion of each score section per course, the average score of regular performance and final performance, and standard deviation are as shown in the following Tables 2 and 3.

From the statistics of average score, the average score of regular performance is higher than the average score of final performance. According to the statistics of score section, there are many higher scores in the regular performance and many low scores in the final performance. According to analysis of standard deviation, the regular

Table 2. Number of students in each score section

Course title	Performance category	100–90	89–80	79–70	69–60	<60
Advanced Mathematics (I)	Regular performance	23	28	11	0	0
	Final performance	12	17	13	10	0
Linear Algebra	Regular performance	19	30	12	3	0
	Final performance	16	17	21	5	5
Economic Mathematics (I)	Regular performance	40	45	32	18	0
	Final performance	18	36	33	37	1
Economic Mathematics (II)	Regular performance	124	126	29	21	0
	Final performance	44	60	63	74	9

Table 3. Statistics of average score and standard deviation

Course title	Performance category	Average score	Standard deviation
Advanced Mathematics (I)	Regular performance	87	6
	Final performance	73	23
Linear Algebra	Regular performance	85	8
	Final performance	79	15
Economic Mathematics (I)	Regular performance	83	11
	Final performance	74	15
Economic Mathematics (II)	Regular performance	86	9
	Final performance	69	19

performance has higher concentration than final performance. This shows that the regular performance plays an important role in promoting students' learning to a certain extent. However, for some students and especially those who fail the final exam, they are not well motivated.

The correlation analysis results over the four courses' regular performance and final performance are as shown in the following Table 4.

Table 4. Data of the correlation analysis between the regular and the final performance

Course Title	P-value	Multiple R	R Square	X Variable 1	Intercept
Advanced Mathematics (I)	6.69E−18	0.62	0.39	2.39	−134.63
Linear Algebra	6.32E−11	0.71	0.50	1.29	−30.03
Economic Mathematics (I)	1.07E−32	0.81	0.65	1.13	−19.81
Economic Mathematics (II)	3.75E−86	0.85	0.73	1.90	−94.98

According to statistics, when P-value is less than 0.01, the model can be considered significant at the level of $\alpha = 0.01$ or the confidence level reaches 99%. As can be seen from Table 3, the P values of the four courses are far less than 0.01. Therefore, linear regression over regular performance and final performance is valid. The value of Multiple R (replaced by r below) is defined as below: $r > 0$ is a positive correlation and $r < 0$ is a negative correlation; $0 < |r| < 1$ means there is a linear correlation of different degrees: $|r| \leq 0.3$ stands for no linear correlation; $0.3 < |r| \leq 0.5$ stands for low linear correlation; $0.5 < |r| \leq 0.8$ for significant linear correlation; $|r| > 0.8$ for highly linear correlation; $|r| = 1$ for complete linear correlation. According to Table 3, the regular performance and final performance of Economic Mathematics (I) and Economic Mathematics (II) are highly linearly correlative, and the regular performance and final performance of Linear Algebra and Advanced Mathematics are significantly linearly correlative. This fully shows that the assessment of regular performance and the assessment of final exam actually have the same purpose. Final exam mainly assesses the overall effect of student' learning and assess the learning process in a certain sense as well. Process assessment complements with the final exam.

3 Conclusion and Suggestions

For college math courses, the regular performance statistically positively correlates with the final performance of college math course. It shows that if the regular performance are good, the results of the final exam should also be good, which shows that the regular performance is an important factor affecting students' academic performance, and reflect the true level of students' course learning in a fair and objective manner. Therefore, the teachers should pay more attention to process evaluation in the teaching process.

There are many factors that affect the regular performance. The regular assessment contents include attendance, classroom performance, regular homework, midterm quizzes, teamwork, essays and mathematics modeling practices. In the future research, the assessment method should be further refined to narrow the correlation gap between it and the final performance and reduce the failing rate of final exam.

Through the analysis of interviews with students and teachers, there are some main reasons for the lack of reliability of regular performance for students with the high regular performance and the unsatisfactory and even failed final performance: Some students have poor foundation. Although they pay attention to completing the regular assessment assignments, they fail to really grasp the knowledge. Some students show wrong attitude toward learning, fail to recognize the significance of process assessment, and handle in a slapdash manner; the teacher fails to control strictly. Some students do not pay enough attention to final exam, and fail the final review.

To solve the above problems, the author puts forward the following suggestions for improvement: The teacher shall properly distribute the proportion of regular performance in the future process assessment. The assessment contents, ways and methods should be designed in a more clear and detailed manner. The teacher should also strictly check the whole process assessment, and try to adopt the same standard, in order to reduce the difference and randomness. The teacher shall emphasize students' review of knowledge points, intensify the training efforts of exercises and enhance students' independent learning ability in the whole teaching process.

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Teaching Practice Research of *Electric Power System Analysis* Based on CDIO Mode

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Abstract. CDIO model is a kind of engineering education mode that aims to cultivate students' engineering application ability and effectively solve the employment problem. Taking *Electric Power System Analysis* as an example, this paper expounds the characteristics and implementation process of CDIO mode in the process of teaching, summarizes the role of CDIO model in engineering education, and improve the quality of double-ability teachers, create project implementation situation, plan teaching materials, innovative evaluation assessment system and other means to improve and perfect the implementation of CDIO mode in the course of teaching. After the teaching of the test and practice, it proved to have achieved good results.

Keywords: CDIO model · Engineering application ability
Power system analysis · Engineering education

1 Introduction

CDIO (Conceive Design Implement Operate) is an engineering education mode that has been explored and studied for four years by four universities such as Massachusetts Institute of Technology and Royal Swedish Institute of Technology in recent years, and has been internationally recognized and widely promoted [1]. CDIO mode refers to the teaching process, which based on the actual product and system concept-design-implementation-operation process, it takes the life cycle from product development to product operation as a carrier, comprehensive engineering basic knowledge, personal ability and teamwork ability to complete an educational activity. CDIO model is a kind of engineering education mode that aims to cultivate students' engineering application ability and effectively solve the employment problem. To date, dozens of world famous universities in France, Finland, Denmark, South Africa, Singapore and other countries have joined the CDIO model [2]. A typical representative of the Swedish National Agency for Higher Education (CDEC) used the CDIO model to evaluate its 100 engineering degree programs. The results show that it is more adaptable and more conducive to quality improvement, and especially important for the systematic

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development of engineering education. In engineering teaching, Mechanical Engineering Department and Aerospace Engineering Department have adopted CDIO model of engineering education concept and syllabus and have achieved good results. The students trained by CDIO model are greatly welcomed by society and enterprises. On January 8, 2016, the "National CDIO Engineering Education Alliance" was established in Shantou. The creation of the alliance brought the CDIO model under a new situation to a higher level, and gave the entire education community a high degree of recognition for the CDIO education model [3].

2 Research Background

In the application of skilled personnel training objectives, Electric Power System Analysis curriculum as a compulsory electrical courses, with strong engineering practice, it plays a role in the professional curriculum system [4]. Teaching plans and course positioning should meet the needs of future graduation and employment of students.

In recent years, teaching reform and practice, according to the *Electric Power System Analysis* the course features, but also try some teaching reform and achieved some results. However, due to the limitations of *theory of power system analysis*, such as strong theory, extensive contents, knowledge abstraction and large experimental facilities, the students 'learning difficulties are difficult to apply and unfavorable to the students' multi-level abilities, so that the traditional teaching of teaching knowledge and ability to cultivate out of touch, fail to achieve the desired teaching effect [5].

In the process of teaching, drawing on the integrated thought of CDIO mode can not only solve the problem of the lack of practical teaching equipment in *Electric Power System Analysis,* but also can realize the integration of theory and practice teaching, break the boundaries of theory and practice teaching, strengthen students 'vocational skills training and improve students' comprehensive ability.

2.1 Teaching Design

At present, the teaching method of *Electric Power System Analysis* is mainly based on the teaching method of combining the blackboard with PPT. Because of the abstract and esoteric theoretical knowledge, and the definition formulas involved are numerous, the computational derivation is complicated and the students are embarrassed or weariness [6]. In experimental teaching, the experimental equipments of the course are more expensive and more expensive, and students lack practical ability to practice. In addition, due to the complexity of the course supporting experiments, once a problem occurs, students and teachers spend a lot of time to solve equipment failure, So as to affect the progress of the experiment, which greatly weakened the enthusiasm of students to learn, resulting in poor experimental teaching. At the same time, due to the application of skilled personnel training, the theoretical class hours gradually decreased, the teachers blind choice of teaching content, resulting in the textbook chapters are not in place, the ability to cover and depth of knowledge is not enough to reach the teaching effect.

2.2 "Double-Double Type" Faculty

"Double-teacher dual-type" teacher is the application of personnel training under the engineering specialty of teachers of the basic requirements. However, most full-time teachers from school to school, identity from students to teachers, the lack of business project experience and workplace technical specifications, good at theoretical knowledge of the "main" fear of project technology development and practical guidance, lead to the project teaching mission did not implement the concept of mission, the entire project because of negligence in management and in mere formality.

Through CDIO mode teaching, teachers should be further urged to participate frequently in social practice and in-depth enterprise research, maintain cooperation with enterprises, understand social needs, market trends, industry standards and technical specifications, and make preparations for the adjustment of personnel training programs. At the same time, it actively participates in the operation of enterprise projects and improves the ability and quality of practical operation. In practice, it grasps the distribution of project processes and their management, and develops them into technical or industrial engineers. It intensifies the combination of theory and practice and gives the students the latest industry concepts.

2.3 Textbook Selection

In recent years, *Electric Power System Analysis* courses are based on planning materials, increasing auxiliary materials, but these textbooks can only complete the concept of conceptual interpretation and verification of elaboration, the lack of application materials in accordance with the task demand model of the project can only rely on the teachers in the teaching aspects of the project tasks to build knowledge and training of knowledge and training students engineering thinking ability [7].

In order to better improve students' hands-on ability, most of the electrical engineering and automation students will serve the local power industry after graduation. According to the teaching concept of CDIO mode, we should take full account of the structure and trend calculation (including the simple trend and the complex trend) of the power grid when assigning the task items when selecting the teaching materials, combined with regional characteristics, textbooks focused on the actual state of the power grid system as an example, to achieve application-oriented undergraduate training objectives.

2.4 Evaluation System

The course of *Electric Power System Analysis* is a practical and practical curriculum. The focus of the course evaluation should include procedural evaluation, practical hands-on skills, ability to analyze and solve problems, reduce the difficulty of pure theoretical examination, truly theoretical and practical combination of engineering. However, due to the subjectivity of the teachers in the evaluation appraisal, the result of the appraisal is not entirely objective.

In order to reflect its objectivity and build a diversified evaluation system, the purpose of teaching evaluation is to give play to the role of guidance and motivation. According to the teaching concept of CDIO model, the evaluation system should focus on formative assessment and focus on the process of constructing knowledge and ability. The evaluation content is subdivided into four evaluation options: Concept (Proposal, Research and Analysis), Design (Diversity, Originality), Implementation (Progress Completion, Design Production), Operation (Entity Outcome, Research Report or Essay). The evaluation form adopts the principle that the comment and the scoring are combined. The evaluation subject introduces social evaluation (enterprise evaluation and expert evaluation) and student evaluation (self-evaluation and peer evaluation) based on the retention of teacher evaluation.

3 CDIO Model Features and Implementation

3.1 CDIO Mode Features

The purpose of CDIO model is to break the inherent logic and integrity of the knowledge structure of Power System Analysis [8]. Through the adjustment, optimization and reorganization of the curriculum content, CDIO mode can achieve the goal of training knowledge, ability and quality into engineering project carrier, emphasize the student easy to learn and easy to use, so that students have completed during the school simulation project "real experience", which allows students to more employment and entrepreneurship capital, and make a new exploration for the teaching reform in the course of *Power System Analysis* in our college.

Guided by the concept of CDIO, the *Power System Analysis* course is based on the requirements of teaching reform of electrical automation major in our college [9]. Combining with the strong engineering features of this course, we give some lessons in the arrangement of design contents and pay attention to the use of engineering conclusions. The specific technical route shown in Fig. 1.

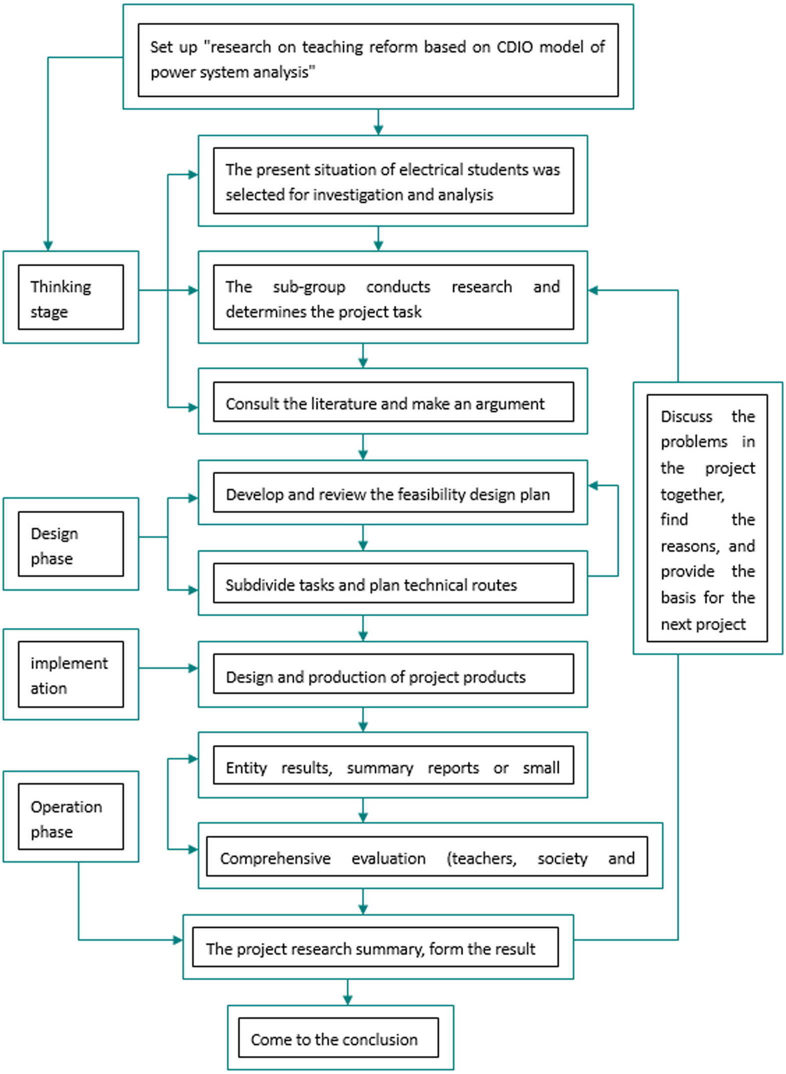

Fig. 1. "CDIO-based *Power System Analysis* course teaching reform" technology route

4 CDIO Model in the *Power System Analysis* Course Implementation

In the power system analysis course, the economic operation of the power system is the focus of this course, students are difficult to learn in depth and master [10]. In this teaching, according to the class of students for the 2016 class of electricity technology, arts and science students each account for 50% of the distribution of hydropower plants and thermal power plants between the day of active load economic optimization process, according to the 2016 class for students of electricity technology class students, arts and science students each accounted for 50% of the distribution of hydropower plants and thermal power plants between the day of the active load economic optimization process, taking into account the characteristics of students grouped, actively organize the teaching content and teaching design of the *Power System Analysis* course and set up the concept, design, implementation and operation stages according to the concept of CDIO education. The specific operations are as follows:

(1) **Concept stage**

Power System Analysis course is mainly to train students to establish the concept of preliminary engineering, improve students' design ability and computing ability of an important practical teaching. Through the forum and questionnaire survey of selected class students thoroughly understand their existing basic degree of electrical professional mastery, as well as the ability to systematically analyze problems, through repeated communication, to determine the task of moderate difficulty in the project, the distribution team to carry out research projects. In this way, we can learn from each other and help each other so that they can make progress together in the further study. To a certain extent, this also fosters awareness of the ability of students in teamwork.

Through the network and literature research, we can comprehensively and thoroughly understand the background of "CDIO mode" in domestic and foreign universities, summarize the achievements, find out the problems, find the problems and put forward the goal of inquiry. According to modern education concept, teaching concept, talent view, choose the appropriate operation and research methods.

Concept stage Teaching organization: teachers use modern teaching methods such as multimedia, blackboard and internet platform, through the implementation of specific projects, enable students to learn the basic theory of economic distribution of power plants and daily active load step by step. Given the original data of power system daily load three. The active power of a time period is shown in Fig. 2. And the various technical indicators of hydropower plants and thermal power plants, such as: rated capacity, daily water consumption, and consumption characteristics. Through various types of power plants and other active distribution of economic distribution of

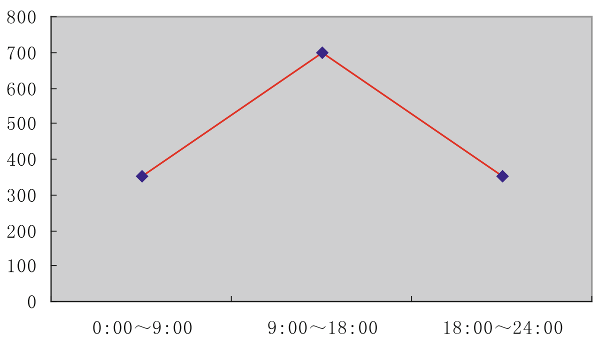

Fig. 2. System daily load power meter

practical training to enable students to grasp such as micro-incremental operating guidelines, and ultimately improve students' understanding of the economic distribution of power systems to achieve the goal of teaching knowledge of this course.

(2) **Design stage**

Constantly improve and perfect together to develop a viable design program, the group task refinement, to determine the project technical route and progress. At this stage, teachers should do a good job guiding students, students should take the initiative to learn, integration of knowledge system, constantly soliciting business experts advice and opinions at the same time, a comprehensive and systematic improvement of the subject.

Design Stage Teaching Organization: Teachers should actively listen to the students' design plan and work out a project implementation plan together with the students. During the implementation of the project, teachers should pay attention to the progress of the project, listen to the students' decision-making opinions, discuss with students to put forward feasible solutions, and help the students rectify the unreasonable decision-making.

(3) **The implementation phase**

According to the characteristics of the course, it is necessary to guide and solve the problems encountered, design and manufacture according to the product requirements of the project, establish and simulate the mathematical model and analyze it. The implementation phase of the project is more crucial. Teachers should supervise and urge all team members to communicate constantly and exchange opinions so as to better and faster find ways to solve the problem. Students should also broaden their thinking and not fight for themselves, appropriate organizational project seminars, repeated evaluation, feedback and correction, in order to achieve the best results with less.

Implementation Stage Teaching organization: Under the guidance of teachers, students establish the mathematical model of economic distribution of active load according to the implementation of the whole project teaching based on the original data, and obtain the equations of operation criterion such as micro-increment rate. Teachers on the selection of γ value and the system's full-time water consumption calculation, targeted guidance to help students solve the implementation process of γ value correction and encountered problems. In the specific implementation process, pay attention to improving students' enthusiasm for learning and ability to solve practical problems.

(4) **Operational stage**

After the design is completed, the project team provides the entity drawings such as the standard drawings and simulation models, as well as the analysis, summary report or essay to form the formative evaluation report. Students self-evaluation, teacher comprehensive points, and finally by the teachers, the community and students to discuss the project assessment of the proportion of each, to make an overall assessment of the results.

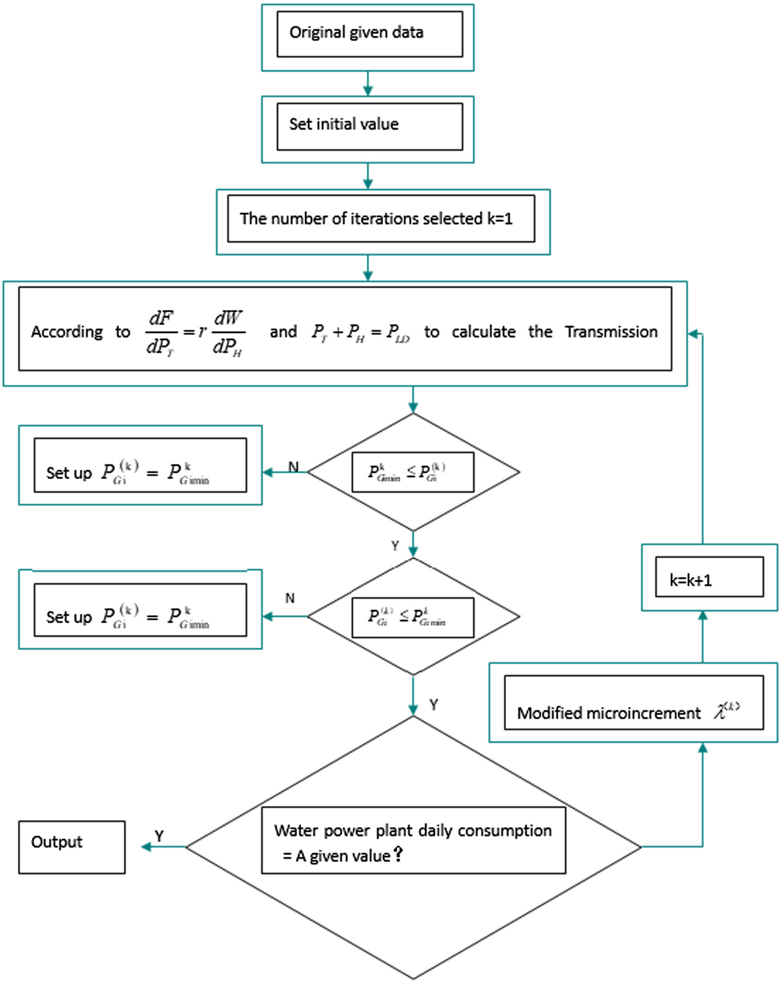

Fig. 3. Active load optimal distribution plan design

Operational Stage Teaching Organization: Teachers classify class students in specific teaching activities and require students in the same group to jointly design programs, prepare objective function procedures, constraint procedures and main programs so as to ensure that the output of thermal power plants and hydropower plants is basically the same in each time period. The optimal distribution plan is shown graphically. This not only fostered the ability of students to communicate, communicate and collaborate, but also help students to form innovative ability. Through the entire design process of teaching the implementation process, now the students initial results shown in Figs. 3 and 4.

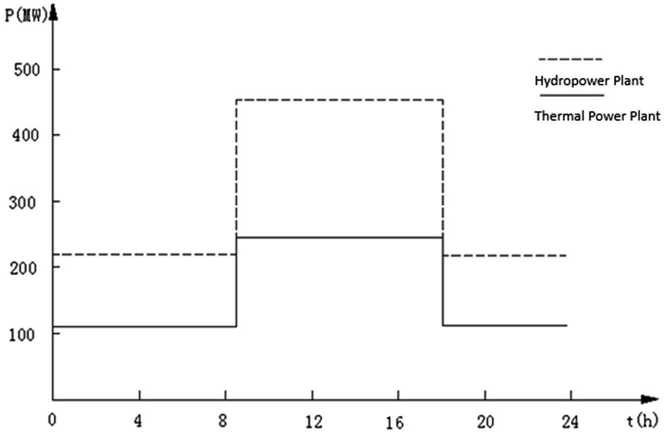

Fig. 4. Active load optimal distribution plan curve

From the design plan and program of economic distribution of active load between hydropower plants and thermal power plants, the final distribution plan of this design project is basically the same as the theoretical curve and the result is correct. However, in the design process complicated solution, the establishment of complex functions, the availability of MATLAB optimization and other issues worth pondering and research in order to better knowledge through and integration, so that CDIO model of education truly into the *power system analysis* course teaching.

5 Conclusions

The characteristic of CDIO mode teaching is to integrate the teaching process into specific engineering projects, cultivate the students' ability target around the project, organize teaching and targeted teaching, and achieve more remarkable results. The power system analysis course aims to cultivate high-quality skilled personnel who meet the needs of various industries in the region. The introduction of teaching philosophy of CDIO can fully mobilize the enthusiasm of students and further enhance students' hands-on ability.

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Research and Practice of Project Teaching Method in CAD/CAM Course Teaching

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Abstract. Taking the design of two-stage reducer in mechanical CAD/CAM course as an example, this paper analyzes the research and practice of applying the project teaching method in the actual classroom teaching. Combining the current situation of CAD/CAM teaching and the characteristics of students' learning, the final assembly plan was completed, the process of project teaching was summarized, and good results were achieved, which instructed the application of other projects in teaching.

Keywords: CAD/CAM teaching · Project teaching method
Guiding significance

1 Introduction

Project teaching method Germination in Europe, the idea of labor education, the earliest by the American educator Dr. Katz and Canadian Chad jointly introduced to introduce the practice of teaching, is a typical teaching method of student-centered activities [1]. The project pedagogy is also widely respected by institutions of higher learning. Its main teaching goal is to enable students to systematically understand the characteristics of CAD/CAM software: grasp the drawing method of engineering drawing, learn to use CAD/CAM related software to complete the relevant professional requirements of a complete graphic analysis, drawing, editing and mapping work, training students have basic pictorial ability, pictorial ability, spatial imagination and thinking ability as well as drawing skills. Due to the specialty of CAD/CAM, the project teaching method is utilized in the CAD/CAM professional course teaching, the project teaching method and professional teaching are integrated, and the key teaching is targeted and the ideal teaching effect can be achieved [2].

2 CAD/CAM Teaching Status

The teaching model of "full house" and "spoon-feeding" is ubiquitous in classroom teaching. Most of the students tend to feel boring and lack of passion in learning CAD/CAM, which can not arouse students' enthusiasm for learning [3]. With the

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characteristics of learning students of mechanical and electrical specialty, after observation, the teacher did not show interest and curiosity when explaining. Students just grasp the textbook knowledge, can no longer meet the needs of society.

Students learn at school, working only a little bit to use, the reason for this phenomenon is to learn too limited to the textbook knowledge, there is no research and innovation [4].

Classroom teaching methods and means too simple, teaching can no longer meet the needs of teaching, need to find a new teaching method to make CAD/CAM curriculum system knowledge system.

Considering the status quo of CAD/CAM teaching, in order to developing students' long-term, students pay more attention to the cultivation of their overall quality and ability. Therefore, a new teaching method—project teaching is introduced in the process of CAD/CAM teaching [5]. "Project teaching" is a kind of design-based teaching activity that aims at specific projects. Students are required to gradually achieve the set goals and develop their research-based learning ability through practical application based on the comprehensive application of the knowledge and skills of each subject research. The project pedagogy advocates the student as the main body and allows the student to play the role of researcher. Under the stimulation of the situation and under the guidance of the teacher, the project pedagogy proactively conducts exploratory activities and masters knowledge and learns analytical and problem-solving methods in the course of inquiry, So as to achieve the purpose of improving the ability to analyze and solve problems. Here, teachers have retreated behind the scenes, only planning and guiding role.

Therefore, we should attach great importance to cultivating students' ability of discovering problems, analyzing problems and solving problems instead of learning from their predecessors. Project teaching method, the course is divided into several sub-projects, sub-projects can also be divided into a number of sub-projects, and the development of sub-projects and sub-project goals. Through the teaching of each sub-project and sub-project, on the basis of realizing the teaching objectives of each sub-project and sub-project, the curriculum objectives should be realized step by step from shallow to deep. Learning any knowledge, only through continuous practice can be used properly.

3 Project Teaching is Applied in the Characteristics of CAD/CAM Course

3.1 Optimize Teaching Content

We focus on CAD/CAM teaching instead of "reasoning" and can read medium-complexity parts drawings [7]. Cartographic drawing is the purpose of cartographic teaching. To rationalize the teaching content, we use the principle of "enough" and necessary" as the principle, take the basic theory as the clue, and then attach various parts drawings and design features to strengthen the explanation. This avoids some difficult, difficult to learn the part, try to make the learning knowledge is simple and effective to improve teaching effectiveness. The assembly drawing should be used as the key content of CAD/CAM course to explain repeatedly and use a lot of time training so that our students finally form a space imagination ability and improve the ability of drawing.

3.2 Improve Teaching Methods

To make students more clearly and intuitively understand the entire assembly process. CAD/CAM courses have their own characteristics—practical and intuitive, we consider the teaching methods from the characteristics of the curriculum, according to the different stages of teaching content, using different teaching methods and means [8]. First of all, in the early stages of CAD/CAM course, students are required to understand the nature and importance of the course with the project. We bring students to the factory or workshop to observe the production process of the work piece, take the students to the exhibition hall to visit or take some factories Drawings, so that students understand some of the actual production of knowledge. Second, in the shaft parts drawing phase, we combine the main training. By the teachers to clarify the basic concepts and basic theory, and then arrange the students to practice training, students in training, teachers do next guidance, students do not grasp the concentration of counseling at all times, so the classroom atmosphere is active, clear purpose, high motivation for learning. This stage lectures mainly use multimedia courseware, 3D animation and other auxiliary teaching. The traditional teaching and dynamic courseware teaching together, the boring, difficult to understand the projection with a colorful three-dimensional dynamic model demonstration to make up for the traditional teaching methods in the sense of intuitive, three-dimensional sense of the deficiencies. Make the teaching process vivid and intuitive, cultivate the students' space imagination. Lastly, during the part drawing and assembly drawing phases, we collect some typical zeroes, components or commonly used mechanical equipment used in life so that students can study the working principle, the folding process, the assembly relationship and the expression method in groups and then group these Principle applied to the assembly diagram. Improve students' reading ability.

3.3 Test Evaluation Method

Measuring the performance of students is good or bad, can not be based on an examination of the results as a basis for assessment. Therefore, in this course learning process, we combine the actual situation of students to establish a reasonable student performance evaluation system, focusing on process evaluation. The CAD/CAM instruction uses a flexible and diverse form of exams that are tested in stages by completing the project. This is to check the mastery of student knowledge, but also targeted counseling. This emphasis on the evaluation of the learning process, not only to consolidate our knowledge of students, but also exercise the learning ability of students is the enthusiasm of students has been greatly improved.

4 Application of Project Teaching Method in CAD/CAM Teaching

Project teaching method fully embodies the teacher as a guide, runs through the "problem-oriented", can stimulate students' interest in learning, change passive learning to take the initiative to participate in, improve students' ability to analyze and solve problems [9]. The project teaching method applied to CAD/CAM teaching, we should first establish teaching programs and goals, and then by the teachers to guide students to develop their own programs to implement the program, and finally by the students and teachers jointly examine the results of assessment [10].

4.1 Teaching Preparation

Site and equipment: computer graphics software installation, related applications and hardware room

Teaching materials: multimedia courseware and so on

Teacher conditions: teachers to students grouping, assigning tasks to guide students to complete the design tasks to correct the students incorrect programs to complete the comprehensive evaluation of students.

4.2 CAD/CAM Curriculum Features and Analysis of Students' Academic Situation

4.2.1 CAD/CAM Course Features

CAD/CAM is a specialized course in mechanical and electrical engineering. This course is a follow-up mechanical course in the mechanical course. It provides the spatial logical thinking and image-based thinking for the mechanism movement analysis, dynamic analysis and common basic mechanism design in the basis of mechanical theory and mechanical design.

4.2.2 Academic Analysis

Mechanical and electronic classes for the four-year general education, high overall quality of students, learning ability is also strong, better self-learning ability and learning foundation, but most students lack the systematic theory of learning methods.

4.3 Teaching Process

4.3.1 Student Group

In order to improve students' ability of group collaboration, the students are divided into 5 groups, a total of 7 groups

4.3.2 Ask a Question

"Problem-oriented" By continuously raising questions and researching questions, the goal of curriculum teaching is established so that students can grasp the ability of computer drawing based on the knowledge of the diagram. Due to different professions, the content of the drawing should also be different. According to the professional characteristics, the appropriate drawing content should be chosen as the training goal of the course.

4.3.3 Teaching Objectives

The CAD/CAM course is divided into two sub-projects. As a basic entry, it requires students to complete some of mechanical engineering parts drawings, such as shaft parts, the learning drawing parts as the first teaching goal. Based on the mastering of CAD/CAM basic skills, students can use the acquired knowledge flexibly to complete the established assembly drawings, such as retarder assembly drawings, and finish the assembly drawing as the second teaching goal. Through the realization of two sub-project teaching objectives, and ultimately achieve the purpose of teaching objectives.

4.3.4 The Establishment of Sub-projects and Teaching Objectives

Sub-project

According to the content of the course, the different, specific and independent blocks of knowledge divided by the teacher after comprehensive analysis, and each sub-project has its own teaching objectives to be achieved. It is to achieve sub-project teaching objectives, so as to achieve the goal of teaching the overall ladder. In the formulation of sub-projects need special attention is consistent with the level of knowledge of students, with maneuverability. Students under the guidance of teachers and students to help each other in the process of mutual learning sub-project content.

4.3.5 Proposed Design

4.3.5.1 Program Design Ideas

First: to combine the characteristics of each group of students, students should give full play to the subject position in teaching practice. Because the project pedagogy is a typical student-centered teaching method, students can only take advantage of the project pedagogy only by adopting an active attitude towards learning and treating themselves as teaching subjects. As the subject of a subject research, it should run through the discipline from beginning to end, because it is the concentration and generalization of the relevant content of the discipline. From the perspective of content, it is manifested in that after continuous investigation and consideration, there is a plan and plan to implement Program, final assessment and evaluation. ① students should conscientiously do a good job preparatory work. Each project has a certain degree of difficulty, both the application of old knowledge, but also the exploration of new knowledge, read the relevant textbooks in advance, prepare the relevant knowledge, access to relevant information, and even drilled ahead of schedule, do a good job preparatory work. ② play team spirit, and actively participate in the project practice. CAD/CAM course project teaching commonly used model group teaching, generally each group of 2 to 3 people, the machine operation, to complete the project goal. Put forward their own solutions to consider, the final optimization, to the best solution ideas, the completion of the project. ③ carefully write analysis report. According to the characteristics and requirements of CAD/CAM, the training report is usually completed on the computer. By compiling the analysis report, students can not only analyze, summarize, summarize, summarize and write the technical documents, but also improve students' computer application ability.

Second: pay attention to the teacher's guidance, guidance and supervision status. As the guide, mentor and supervisor of the project teaching process, teachers should do a good job guiding the development of the entire CAD/CAM course project, which is also the key factor for the project teaching to be successfully implemented. First, teachers should help students identify suitable group development projects based on their own characteristics. Then, in the concrete implementation process, each person collects the information needed for the job. Regular meeting of the project leader, real-time understanding of the development process of each project team, in time to find problems, Q & A, to help students solve the technical problems encountered, appropriate to remind them the next step in the operation, timely development of all stages work summary.

4.3.5.2 Methods and Steps

According to this design content, each group gives program design ideas, in accordance with the parameters and known conditions, put forward specific implementation steps shown in Fig. 1.

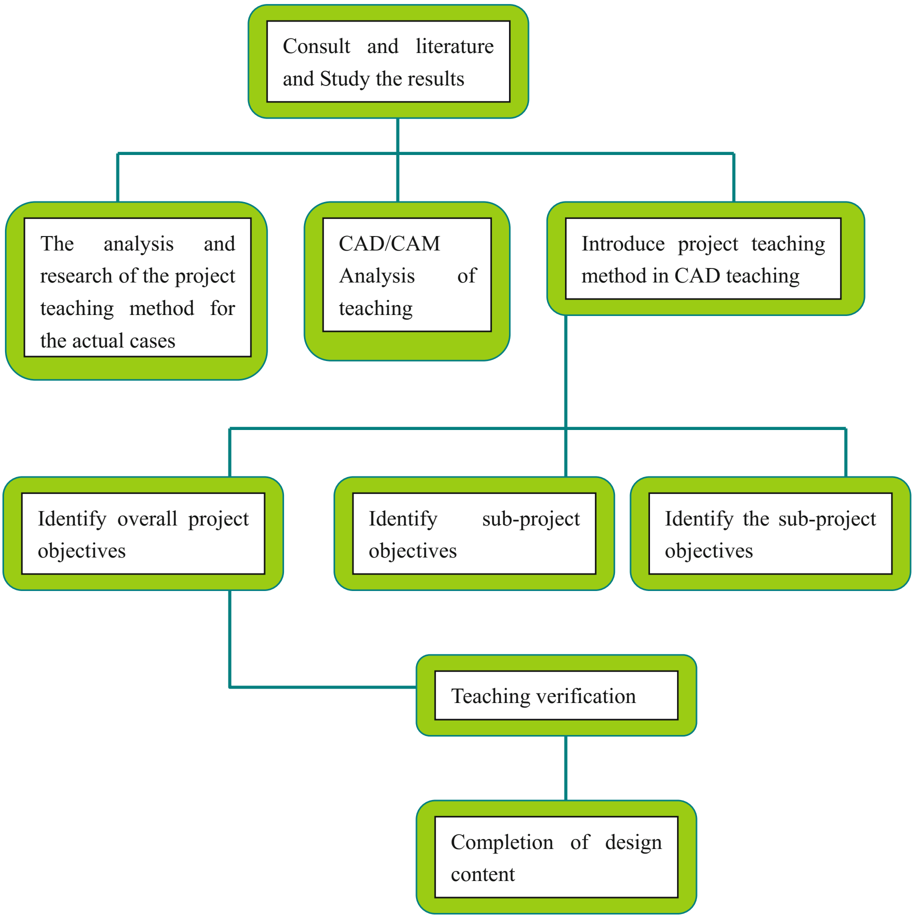

Fig. 1. Implementation steps

4.3.6 Results Show

According to the design plan, students design two-stage reducer three-dimensional map shown in Fig. 2.

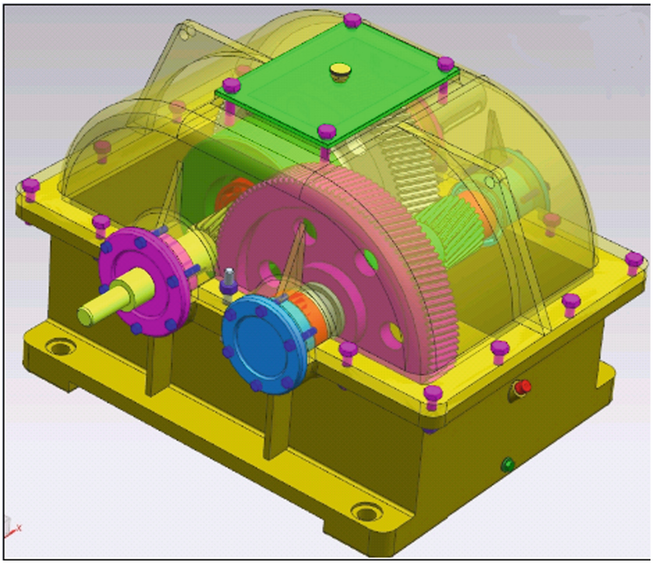

Fig. 2. Two-stage reducer three-dimensional map

4.4 Discussion

Through the analysis of the results, this time according to the project teaching method to complete the teaching design, to achieve the teaching purpose, and achieved good teaching results, all students enhanced teamwork ability, but the follow-up project teaching method should also be used in CAD/CAM teaching should consider a few points:

4.4.1 In CAD/CAM Teaching, the Project Plan Should be Determined According to the Professional Field of Students

In the selection of projects, professional requirements should be selected for the corresponding professional knowledge and teaching projects. Outstanding professional features closely linked to teaching syllabus and teaching objectives, the classroom teaching project design. As for the two reducers, CAD/CAM courses can be designed according to the shaft parts drawings, assembly drawings and other projects.

4.4.2 Choose the Project Should Choose the Items the Teacher Can Control

According to the teacher's own understanding of the project's environmental background, the familiarity of the project involved, and the analysis, judgment and response experience of the project involved issues. Choose a project that the teacher can control. Students according to their strengths division of labor, do not know how to discuss with each other and research, so as to find a solution to the problem.

4.4.3 Select the Project from Easy to Difficult, Step by Step

To combine the actual knowledge of students, we should pay attention to the arrangement of the contents of the project from easy to difficult, step by step, so that students can always continue to accumulate knowledge in a relaxed and pleasant learning atmosphere. For example, in the parts modeling project, the first line, then the surface, then the entity, from easy to difficult, then students are very easy to accept.

4.4.4 Should Pay Attention to the Right Medicine, Stratification

Teachers should be based on different teaching objects and professional requirements to select and design different projects. The difficulty of the project should also be based on different students based on CAD/CAM mastery, cognitive characteristics and acceptability of individual differences, different levels of students were designed for different projects of different gradient.

4.4.5 The Choice of the Project

The choice of the project to leave more space to play a good project with more space to play will certainly lead students to think more about the problem and provide more ways to solve the problem. Not only able to stimulate the student's desire for knowledge, but also conducive to the cultivation of students' innovative ability.

5 Conclusion

The use of project teaching, to better stimulate the creative potential of students to develop creative thinking and innovative ability in CAD/CAM teaching, teaching and practice using a combination of project teaching methods to enable students to learn CAD/CAM courses Easier, the teacher's curriculum advances more smoothly, then stimulate students interest in learning, improve the overall ability and professionalism of students.

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Research on Cultivation Mode of Innovative Talents in Colleges and Universities

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Abstract. As China has entered the ranks of an innovative country, it is necessary to raise the level of education for all and the level of training creative personnel. As an incubator of knowledge innovation and personnel training, colleges and universities must solve and realize the cultivation of innovative talents. This paper puts forward four training models for innovative talents in colleges and universities and fully demonstrates the mode of cultivating creative talents with examples. The goal is to provide practical and theoretical methods and realistic basis for solving the training problems of innovative talents in colleges and universities.

Keywords: Innovation ability · Higher education · Practice · Internet

1 Introduction

The development of our country depends on the progress of science and technology and the improvement of science and technology depends on the innovation of talents. Innovation is the soul of a nation's progress and an inexhaustible motive force for the development of a country. At present, the contribution of China's scientific and technological progress to economic growth has risen sharply and has entered the ranks of innovative countries. Therefore, the full implementation of quality education, deepen the comprehensive reform in education, focus on improving the quality of education, cultivate students' sense of social responsibility, innovation, practical ability is imminent. The development of a country relies heavily on the development of education. Only by cultivating innovative talents can we promote the improvement of economy and overall national strength so that the great motherland will stand in the forest of peoples of the world [1]. Therefore, countries need innovation, talent must follow up.

2 The Importance of Training Creative Personnel in Colleges and Universities

In today's world, with the ever-changing science and technology, the competition among various enterprises in the international market reaches the level of chalkiness and the competition is fiercer and fiercer. As an incubator of knowledge innovation and

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personnel training, colleges and universities should fully realize the importance of training creative talents.

(1) The Importance of Cultivating Innovative Talents in the Construction of Talent Team in China
The quality of our talented people is not high, weakened our ability to innovate, and our market awareness is poor. Second, the knowledge is relatively narrow, a large number of lack of compound talents; Third, the concept of lifelong education is relatively weak, the power and ability of system learning after leaving school is lacking; Fourth, combining learning, learning to use enough, practical ability is weak. Therefore, China's overall ability to innovate and research are not up to the level of developed countries [2]. The scientists and engineers engaged in research and development in every 10,000 laborers in our country are only equivalent to one-fifth of the medium-developed countries and one-ninth of the developed countries, while the average per capita number of patents and patents for science and technology is far less than that of the developed countries. Therefore, it is imperative for our country's innovative talents to cultivate that we can speed up the economic and civilized progress of the entire society and accelerate our country's attainment to the level of developed countries by accelerating the training of scientists and technicians and high-level innovative personnel.
(2) Innovative talent training in the international competition in the importance of talent
The development of an enterprise, can not be separated from the introduction of talent. In today's world, rapid advances in science and technology have led to faster and faster knowledge updates, shorter and shorter product replacement cycles, more and more types of talent needs and higher and higher levels. The shortage of qualified personnel has become a common problem faced by all countries in the world. Nowadays, many countries, especially the developed countries, are making policies and policies to train and attract talented people, especially high-level innovative talents. The United States regards education as the basic national policy of the country and constantly improves its education system according to the changes in the situation and increases its investment in education. At the same time, the use of education and financial advantages to attract foreign scholars and students for their effectiveness. Japan has actively strengthened the training of high-tech personnel and introduced and implemented a new type of education reform program. Promote transnational schooling mode and promote the flow of talents. Multi-party for the world's best talent. Both the French and German governments attach great importance to education and personnel training. In order to meet the requirements of the information age, they have made great efforts to develop the multimedia education industry and funded enterprises to organize training centers to strengthen personnel training. It can be seen that fostering more high-tech personnel through strengthening education and educational reform has become a trend set by the world and the established policy of most countries. Therefore, our choice can only be to meet the challenges and participate in the competition. We must take measures to control the brain drain

and actively seek the return of talents. We must also take effective measures to enhance the cultivation of innovative talents.

(3) Cultivation of innovative talents is the inevitable choice for the development of higher education

The fundamental task of higher education is to train qualified personnel. Talents trained by colleges and universities must realize the all-round development of people's quality with the emphasis on innovation and practical ability. Therefore, the cultivation of innovative talents is the inevitable choice for the development of higher education in the new era, which reflects the correct direction and development trend of higher education reform. The cultivation of innovative talents is an objective requirement to achieve the goal of higher education. Higher education should attach importance to cultivating university students' innovative ability, practical ability and entrepreneurial spirit.

To achieve the goal of higher education, we must actively implement quality education and innovative education, strive to cultivate students' ideological and moral qualities, scientific and cultural qualities, physical and mental qualities. In particular, we must fully develop and release the talents and innovative potential hidden in the educated, have a strong sense of innovation, cultivate innovative capabilities and innovative character. Therefore, the cultivation of innovative talents, that is, the objective requirement of higher education, is also the fundamental task of higher education.

3 The Contemporary College Students Innovative Personnel Training Mode

The cultivation of innovative talents for contemporary college students in colleges and universities can be considered as follows. On the basis of strengthening overall quality education of students, we must highlight the cultivation of students' innovative qualities. Including the sense of innovation, innovative thinking, innovative ability, innovative character and so on [3] (Fig. 1).

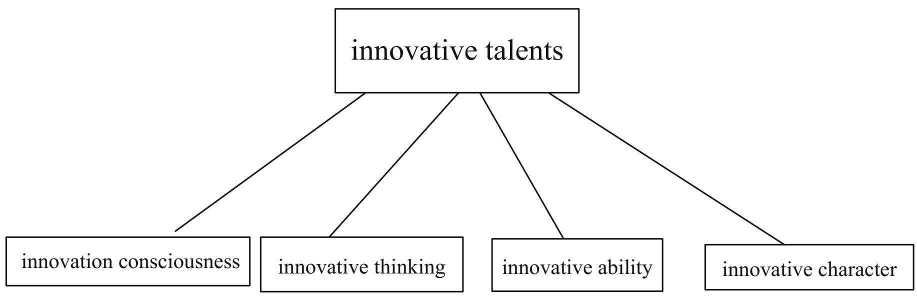

Fig. 1. Innovative talent quality structure

Colleges and universities can effectively use and optimize the allocation of various innovative resources, through knowledge innovation, technological innovation, the achievement of transformation and innovation, management innovation and other innovative activities, training high-quality innovative talents [4]. In this paper, how to cultivate the innovative quality of college students, enhance the creative ability of college students, combined with the advantages of colleges and universities, put forward four kinds of innovative mode of cultivation of college students to demonstrate the correctness and feasibility of training mode.

3.1 Internet Innovation Education Training Mode

There are many shortcomings and problems in the traditional mode of education: First, the teaching effect is poor, teaching methods are outdated; Second, students are not focused; Third, the lack of students can not keep up with the overall teaching schedule; Fourth, information technology has not been effective and rational use of teaching methods; Fifth, the effect of student learning is not ideal; Sixth, students are more passive learning, most of the students are in a passive environment, rather than take the initiative to participate in learning for interest; seven is after class time students and teachers can not communicate and interact in a timely manner. Eighth, students can not independently study the courses they are interested in, especially in other specialized courses. Nine is the university education curriculum system is relatively fixed and rigid closed, there is no strong content updates and flexible course selection mode. Due to the defects and problems of the traditional education mode, it has seriously hindered the cultivation of college students' innovative qualities [5].

Using the Internet innovation education training mode, can solve the problem well. The advantages of the Internet, combined with traditional education, can fully enhance the creative awareness of students and innovative thinking, improve the creative ability of college students [6]. First, the Internet updates knowledge faster. In the ever-changing science and technology today, only through the Internet, we can understand the level of development of some technologies at home and abroad, research status and other information. Second, the Internet has enabled domestic and foreign university students to exchange ideas and learn from each other, open up the horizons of college students, improve the level of scientific research, innovative awareness and innovative thinking of university students, and cultivate the innovative character of undergraduates. Third, the Internet is an indispensable tool for college students to innovate and start their own business. With Internet technology, university students can quickly access information and grasp information at any time and place, which is conducive to the development of innovative thinking of college students. Fourthly, using the online education of college majors and setting up the curriculum platform, the university strongly supports the traditional education mode and arouse the enthusiasm and creativity of students. Students can pass the lesson platform for course preparation, learning knowledge [7]. Through the teacher pre-recorded a good lesson short video learning point of knowledge. If you have any questions, you can share and ask questions in the physical class online. You can also exchange information with teachers online at any time to complete the homework assignments online and complete the exam online. More importantly, students through the Internet online education platform, to achieve a free learning model, to stimulate student enthusiasm for learning. Free learning frees students from the traditional learning paradigm and chooses the ones they like and are willing to learn across disciplines. But also fully meet the purpose of learning and training, which will play an active role in the cultivation of innovative ability of college students [8].

For example, Inner Mongolia University for Nationalities, where I live, through the establishment of online education platform so that students can choose any course on the platform to communicate with teachers on the platform. Teachers upload the course video to an online platform for students to study autonomously. Students use the online platform to improve their academic performance. And students can be connected to the school network through the campus network, free communication with the outside world. You can log CNKI, Wanfang database and some other academic platforms free access to a large number of scientific papers. The open online teaching environment enhances students' research ability and creativity. The creativity of students has been improved, which has led many students to achieve excellent results in the National University Science and Technology Competition. Visible, the introduction of the Internet education model to promote the cultivation of innovative ability of college students, to achieve the improvement of college students' innovative quality.

3.2 Science and Technology Activities as the Guide to Innovative Education Model

For engineering innovation professionals, we can adopt the education mode guided by science and technology activities and social practice. Science and technology activities in various forms, such as participation in domestic and international scientific and technological competitions, science and technology exchange, or regularly organize overseas study tours to well-known foreign universities for exchange and study. Through science and technology competition, science and technology exchange is conducive to the cultivation and promotion of college students' innovative quality. Therefore, colleges and universities should support and encourage college students to participate in all kinds of science and technology competitions. They should fully support university teachers in their financial and technical efforts to guide student competitions, and support teachers to lead students to universities in other parts of the world for study tours and academic exchanges and learning [9]. Here are two examples of my school:

(1) Under the guidance of the instructor, the students from the Robotics Research Institute of Inner Mongolia University for Nationalities participated in various national robot science and technology competitions and trained a batch of applied talents in the robot technology field. Many of the students trained by the institute not only gain full honor by participating in the competition, but also get the attention and employment opportunities of many enterprises after graduation. Some students have become the technical backbone of enterprises.

(2) Inner Mongolia University for Nationalities Institute of Mechanical Engineering, School of Economics and Management, College of Life Sciences, etc. have conducted academic exchanges and learning with overseas universities. For example, in 2017, the School of Mechanical Engineering took the summer vacation to lead students to Okayama University in Japan for Sino-Japanese university student exchange activities and achieved satisfactory results. Chinese

students learned about Japanese university education and Japanese culture through exchanges with Japanese university students and visited the laboratory of Okayama University. Okayama University professors made relevant professional academic reports for Chinese students. Through this academic exchange and interaction, students can learn about foreign cultures and education, open up students 'horizons and further enhance students' innovative qualities.

3.3 To Social Practice as the Guide to Innovative Education Model

Social practice refers to the cooperation between colleges and enterprises, the realization of school-enterprise joint education, the establishment of a joint school-enterprise training mechanism for students to practice their businesses and participate in various social activities of enterprises. Through the study and training in the enterprise, students are exposed to the knowledge they can not learn in the school, especially the corporate culture of some excellent enterprises. Through cooperation with enterprises running schools, so that students can study the learned expertise to solve the practical problems of enterprises and enhance students' innovative awareness and innovative thinking. Enhance students 'understanding of the profession, so that students no longer confused during school learning idle nothing, but targeted learning and research, improve students' ability to innovate. At the same time, contacts with enterprises have tempered students' ability to adapt to society, enabling students to quickly integrate into society and serve the community after they leave school.

For example, Inner Mongolia University of Nationalities Academy of Fine Arts and the Chinese occupation education giant education group within the cooperation of education, training art students. Starting from the real business enterprises, college students to accept the actual combat training before graduation to enhance the innovative ability and quality of college students. The computer college and the soft group cooperation in running schools, the students sent to the soft group internships, so that students get exercise and ability to upgrade. The Inner Mongolia University for Nationalities Institute of Mechanical Engineering and Changchun FAW, Tongliao Huo Coal Group, Tongliao new energy bus and other enterprises to cooperate, students regularly to the enterprise training internship, production practice. Some outstanding students also participated in the technical research and development of new energy buses. These school-enterprise cooperation modes dominated by social practice have tempered students' practical ability and improved their innovative quality.

3.4 Innovative Education Mode Guided by Practical Teaching Projects

Based on the practical teaching, the innovative education mode guided by practical teaching projects should break the limitations of the traditional basic courses and specialized courses in the curriculum system setup, and organize the corresponding curriculum practice content from the realization of the basic skills, to practice teaching projects based on the necessary teaching content optimization and integration. Course content can be college teachers scientific research projects or scientific research achievements into practical teaching projects. Because college teachers have the experience of hosting or participating in some research projects. Teachers do scientific research project process, but also on their own scientific research ability and teaching ability to improve the process. Teachers can transform their research projects or achievements into one or more student innovation projects to incorporate new theories and techniques into teaching.

Moreover, many colleges and universities are implementing mentoring system. Tutors are students' learning and living guidance teachers, and are generally based on full-time teachers [10]. Can be combined with the university tutor system, the use of research content of the mentor, design and planning a certain innovative practice projects to instruct mentors mentoring students for innovation and research group, the implementation of innovative practice projects. By participating in these activities that transform research projects into innovative practice projects, students have enhanced their knowledge level and achieved the goal of cultivating students' innovative qualities.

For example, for the mechanical engineering profession, breaking the traditional theory of mechanics, material mechanics, mechanical theory, mechanical design, engineering materials, mechanical manufacturing technology and computer-aided design and manufacture of CAD/CAM and other mechanical engineering basic courses and specialized courses of the boundaries, starting from the need of realizing the basic skills, organizing the corresponding course content learning, based on the practice teaching projects, to achieve the ability to cultivate students' mechanical system and structure model building, Mechanical system and structure of the comprehensive analysis capabilities, mechanical analysis and innovative design capabilities, basic components and structural design capabilities, computer-aided design and manufacturing capabilities, tolerances, manufacturing process capabilities, engineering project operational capacity. Taking a subject researched by a teacher as an example, we design a practical teaching program (Table 1).

Table 1. "Mechanical design and manufacture of integrated combat" innovative practice project

Ability training	Corresponding knowledge point	Mission name
Mechanical system and structure of the mechanical model building ability	1. According to design specifications and standards to determine the load 2. Mechanism movement diagram, degree of freedom calculation 3. Common constraint types, force analysis, rigid body motion analysis 4. Use kinetic equations to solve the problem	Mission object: castor harvester drive mechanism 1. Mechanism parameters mapping and exercise diagram drawing 2. Institutional movement analysis 3. Institutions dynamic static analysis
Mechanical systems and structures of mechanical comprehensive analysis capabilities	1. Mechanics, the establishment of three equations and three variables analysis 2. Engineering materials performance and selection 3. Strength theory and other design criteria	Mission: castor harvester mechanical structure 1. Statics analysis 2. Intensity check 3. Stiffness check

(*continued*)

Table 1. (*continued*)

Ability training	Corresponding knowledge point	Mission name
Structural analysis and innovative design capabilities	1. Agency selection method 2. Institutional innovation methods 3. Structural innovation	Mission: contrast of key structural design of castor harvester 1. Fruit picking mechanical structure design 2. Fruit transport hydraulic structure design 3. Workbench up and down adjustment mechanism design 4. Innovative structures and methods
Basic part design ability	1. Transmission structure design 2. Connector design 3. Axis system components design 4. Structure technology	Mission: castor harvester 1. Headstock parts design 2. Operating mechanism components design 3. Transmission parts design
Tolerance knowledge use ability	1. With the system, tolerance level, with the choice of nature 2. Geometric tolerances and the principle of tolerance selection 3. Surface roughness selection	Mission: castor harvester Shaft parts
Electro-hydraulic control ability to use knowledge	1. Control Engineering Foundation 2. Innovative application of modern control methods	Mission: castor harvester control system 1. Control program development 2. Component selection
Simulation ability	1. System dynamics simulation 2. System Control System Simulation	Mission: castor harvest machine 1. Mechanical structure 2. Electronic control structure
Hands-on ability	1. Experimental principle and experimental design 2. Test techniques	Mission: castor harvest machine Structural performance test, test performance
Engineering project operational capacity	1. Project organization and planning principles and methods based on customer needs 2. Product cost, profit model, marketing strategy 3. Trade secrets, intellectual property protection	Mission: castor harvester 1. Prototype promotion 2. Patent application 3. Market analysis

4 Summary

This article has carried on the theoretical research and the example demonstration to the innovative talents cultivation mode in colleges and universities, expounds the characteristics, the content and the realization methods of the four innovative talents cultivation modes. Innovative Talent Training runs through the university's entire four-year study life. In the university education which will be four modes of organic combination is more conducive to the cultivation of innovative talents to enhance the innovative ability of college students and lay a solid foundation for future employment and entrepreneurship of college students.

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Teaching Reform and Practice of the Course Mechanism Manufacture Technology Basis Based on CDIO Education Foundation

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Abstract. CDIO, established by MIT, is the advanced modern engineering education concept which had been used widely in the world. Aimed at the status and role of the course mechanism manufacture technology basis in the engineering personnel training and problems in teaching, this paper putted forward the model of curriculum reform thinking and practice of CDIO engineering education model in order to cultivate the ability of the innovative practice, comprehensive analysis and the team cooperation. Research and exploration of teaching reform had promoted on educational concept, training mode, organization and operation management and several aspects. The educational process in the specific context of the product/system life cycle, helped students to set up the engineering concept, occupation ethics, team spirit and success and share consciousness, which offered the reference and inspiration for the applied talents training mode innovation.

Keywords: CDIO · Machinery manufacturing technology · Training mode

1 Introduction

CDIO is a new engineering educational idea and implementation system, which is developed and proposed by Massachusetts Institute of Technology, together with three leading industry university Chalmers University of Technology, Linkoping University and the Royal Institute of Technology University. CDIO is the abbreviation of English word conceive, design, implement, operate. The "conceive" including analysis of customer needs, design of technology, business strategy and regulations, formulation of development idea, technical procedures and business plan; The "design" including projects plans, design of drawings and implementation program; The "implementation" refers specifically to the process to transform design into product, including confirmation of manufacture, decoding, test and design program; The "run" is assessment process for pre-program mainly through products putted into use, including the revision, improvement and withdrawals of the system [1, 2]. CDIO syllabus divides the ability of engineering graduates into four aspects: technical knowledge and reasoning, personal and professional skills, interpersonal interaction skills, adaption and adjustment to large-scale systems, requires to enable students to achieve the desired goals in

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these four aspects through a comprehensive approach. In the educational idea of CDIO, the culture of all-levels quality is integrated within the framework of the overall culture, comprehensively trained and developed which is based on team project. The establishment of part of the syllabuses in this mode directly corresponds to the engineering quality requirements, the framework of education is systematic and innovative in worldwide higher engineering education [3]. In order to achieve the goal of CDIO ability training, the existing professional training programs and professional fundamental course teaching model must be adjusted and reformed. Mechanical manufacturing technology foundation is a main technical foundation courses for the mechanical profession students, this course is streamlined from the original courses, such as tools and principles of metal-cutting, introduction of metal-cutting machine, machinery manufacturing crafts, machine fixtures. The main contents of this course include basic knowledge about common processing methods and equipment in machinery manufacturing process, metal-cutting theory, manufacturing process and fixtures of the parts. The broaden knowledge, rich content, good theory and practicality of the course make it play a very important role in training the ability to analyze and solve practical engineering problems, mechanical design ability, innovation ability of students and high-quality compound talents. But the traditional educational ideas, models and management tools are difficult to meet the requirements of present talents training, so exploring the advanced engineering educational idea and implementation system based on CDIO has great significance for the reform of mechanical manufacturing technology fundamental course.

2 Problems in Mechanical Manufacturing Technology Teaching

First, traditional educational idea pays attention to imparting knowledge while ignoring the training of self-learning ability and interpersonal communication skills, which makes students' learning ability, autonomy and creativity hard to full play, and students taught in this mode lack of suitability and competitiveness, the drawbacks of engineering innovation awareness and technological innovation ability training to talents are incompatible with present social requirements. Secondly, the design of course pays too much attention to engineering science instead of engineering systems, the course system is single, knowledge structure is antiquated, ignoring the systematic of engineering knowledge, which make it difficult to adapt to the rapid development of society. Thirdly, theory and practice are out of touch, practice opportunities for students are few, and it is difficult for students to have the opportunity to get involved in the actual project, then they are lack of initial capacity and quality to manage modern engineering projects. Lastly, there is a lack of scientific and effective teaching organization and evaluation mechanisms, which cannot give full play to initiative and enthusiasm for teachers and students, and seriously hampers the development of teaching reform. These are the major problems existing in higher education. It is an era of knowledge explosion, we should pay much attention to the training of self-learning ability, practical ability, innovative ability, self-control, teamwork and communication skills, not only the necessary knowledge.

3 Change of Educational Idea Based on CDIO

3.1 What's the Purpose of Education

The famous educator Whitehead said: "The reason for the existence of university is that university enables the integration of young and old, and makes imaginative exploration to scholarship, which can build bridges between knowledge and pursuit of life's passion, and impart knowledge in an imaginative way. This kind of imaginative exploration can produce exciting ambiance, and knowledge is full of vitality, which inspires our dreams like a poet, set goals like a designer, it is no longer the burden of memory. Of course, the imagination is unable to be divorced with reality, if the young full of imagination are able to be strengthen by exercise, the vitality full of imagination is likely to remain for long time, and the task of university is to combine the imagination with experience." American educator Hutchins pointed out: "What is education, education is to help students to learn to think independently, to make independent judgments, and to work as a responsible citizen." Freud believed that the purpose of education is to make young people healthy, capable, adapted to their environment, and successful from the concept of the society. However the present education is just the opposite, in the teaching of mechanical manufacturing technology course, more attention is payed to imparting knowledge, which leads to out of touch between theory and practice, and limits the ability of independent learning and imagination. In recent years, the industry come to realize that professional engineering college graduates are difficult to meet the requirements of industrial production in reality because of being seriously out of the practice, the university engineering education must actively adjust the training model to meet the requirements of industrial production fields [4]. Therefore, a significant characteristic of CDIO engineering education model is prone to focusing on manufacture practice based on continuing to strengthen the learning of basic theory.

3.2 Change the Role of Teacher Based on CDIO

The educational idea of CDIO requires that teacher should become a innovator, and center on the students. The role of them should be changed from the leader to guider in the learning of integration of students and teachers "The learning of integration" (students should not only learn the professional knowledge, but also pay attention to the culture of personal and professional skills, interpersonal skills, and for large systems and regulation and adaption ability for huge system in the engineering project reality), ensures every student to actively participate in engineering project and development of team project, and improves the ability for teamwork and project. The role of teachers should be changed from the imparter of scientific knowledge to the designer of engineering project, they will build learning environments, develop learning resources and provide learning services for students, trying to make students take practice and participate in project full of passion. Teachers should propose the course plans on which is beneficial to the improvement of students' ability, attitude and leaded by project, and arrange the teaching time and content reasonably based on the purpose of CDIO [5].

3.3 Requirements for Teachers' Ability Based on CDIO

The purpose of machinery manufacturing technology's teaching is to enable students to acknowledge and master the basic principles and methods of mechanical product manufacturing processes, lay solid theoretical foundation to professional courses learning, graduation project and the work of in mechanical product design, manufacturing and production management after graduation, mechanical manufacturing technology is largely based on the practice and application of the program. Teachers are the soul of teaching systems, and they directly determines the teaching quality. Standard 9 and 10 of CDIO put up some requirements for high-level teachers team. CDIO emphasizes the importance of teaching ability and CDIO skills of teachers. At present, the acknowledge of basic knowledge of many teachers are pretty good, disciplines relatively solid, but they are lack of engineering practice and experience in the business environment. Teachers should continue to enhance the knowledge and ability to reach the CDIO standards. CDIO faculty building is highly relative to engineering education reform, we must pay more attention to it, giving full play to the advantages of higher education in our country.

3.4 Talents Standard Based on CDIO

Under the great competitive pressure from the popularization of higher education, how to reflect the requirements for the students personalized training, and meet the different requirements for objectives and standard of talents is the problems faced by colleges and universities. We must emphasized that both imparting knowledge and education, theory and practice, learning and innovation are equally important. Standard of talents is not just the ability, loyalty, responsibility, gratitude, honesty, fairness, kindness and dedication are more important. The training of all-levels quality from CDIO educational idea is integrated into the overall training framework, and centered on team project. The training of the ability includes theoretical knowledge, personal and professional skills and professional ethics, interpersonal and project the conception, design, implementation, and operational abilities. We are trying to systematically improve the overall quality of students in a scientific training model, train those talents who are competitive internationally in the international education ideal to respond to the opportunities and challenges from globalization, and strive for Chinese dreams.

4 Establish the Training Mode Based on CDIO Educational Idea

4.1 Build the New Teaching System of Mechanical Manufacturing Technology Foundation

Mechanical Manufacturing Technology Foundation course has rich content, which is a combination of the original four major professional courses in accordance with the principles of more foundation, less hours, broader face, the newer knowledge. The course content is closely linked with the production practices and students can get much knowledge from the practical teaching. The course is a comprehensive, fundamental and practical course. During the teaching design process the educational idea and implementation system of CDIO should be learned and the Mechanical Manufacturing Technology course should be reformed and created new course content and system. Centered on the training of engineering ability, a hierarchical system of practice teaching should be built and technological innovation practice will be strengthened. As for the problem of lack of theoretical hours, the contradiction between the course content and hours can be solved by two methods "learning in doing" and "teaching and learning in the project". Thus, theoretical teaching and innovative practices can be well combined and the course system will be improved further while students' engineering awareness and ability are improved.

4.2 Build the Platform of "CDIO Environmental Background"

Basic knowledge of project management and engineering, a strong sense of innovation and initial capacity of developing and designing products are dependent on engineering practice. Engineer is creating the specific product by abstract knowledge to create abstract knowledge. Engineering education is providing a situation of accumulating and exploring knowledge to make engineers gradually master and use the link between the abstract knowledge and specific products. The concept of "situation" is the first standard of CDIO (CDIO environmental background) [6]. Training engineering capability emphasizes practice and requires students to have first-hand experience. In accordance with the CDIO standards, engineering training center should base on the requirements of Mechanical Manufacturing Technology course and build "CDIO environmental background" platform. Engineering training center provides such a knowledge-capability transformation channel that students can obtain the basic vocational skills and project quality in a real professional environment.

The design of "CDIO environmental background" platform enables students to actively learn creatively and practically and supports the entire lesson plans. The platform provides the conditions for engineering practice: sites of conception, design and implementation. In the conception sites, thinking about engineering practice sites enables students to think out a new product and understand user's needs and development concepts. The sites should include the individual and team practice sites for students to talk, listen and think in order to encourage the formation and optimization of concepts. In the design sites, students can design, analog design, share design and make interactions. Finally in the implementation and operation of engineering practice sites, students can obtain the corresponding feedback to improve the product system through the construction and operation of product systems. Of course, engineering training center can also simulate the outside plant normally in motion so that students in the school can directly accept practical and work on-site training.

4.3 Construct the Course Teaching Mode Combining "Case Teaching" and "Project-Based Learning,"

Mechanical Manufacturing Technology course requires teachers to integrate theory with practice in the teaching process. Therefore, teachers should explain procedure cases fully to allow students to understand some abstract concepts and theory so that students will not feel boring and improve learning enthusiasm. Meanwhile students can have the initial cognition on the industrial systems, train professional interest and establish innovation and engineering consciousness. Training cases should include the "cognition about typical equipment, tools and fixtures construction", "cognition about typical product line", "cognition about typical parts machining technology", "safe production and operation management" and so on. During the teaching process, students are familiar with planning, designing, implementing, operating about the main line of industrial products and form the CDIO consciousness. Case-based teaching methods will be the main means of education in the future, which has unparalleled advantages and should get high valued by whether teaching staff or teaching resource providers.

Mechanical Manufacturing Technology course is a comprehensive practical subject. It is necessary to apply the reform using "project-based learning" mode guided by constructivist theory. Teachers can design and organize teaching contents in the mode of project lead, task-driven, teaching and learning combination. The projects in teaching should have high technical content that include teaching knowledge and is close to the actual production. Teachers should make students become learning subjects and lead them to study in groups by solving problems. In groups students can learn actively through positive interaction with other team members, discussing, exchanging ideas, encouraging each other and communicating. After the new teaching mode is applied, students can improve their enthusiasm and initiative of learning and ability of solving the engineering problems, preparing for the future jobs fully.

5 Establish Quality Evaluation and Monitoring Mechanism About Course Teaching Based on CDIO

Teaching quality is the lifeline of higher education and improving teaching quality is the eternal theme in colleges and universities [7]. It appears very important that how to evaluate the quality of teachers and the ability of students. British educator Whitehead said, "it is very wrong to evaluate a teacher according to published works with his signature. In any group of teachers, you will find some outstanding teachers that don't belong to those who published monographs. Their creative ideas need to be presented in the direct communication with students through speech or individual discussion. These people have had a huge impact on human development, such as Socrates. "Teaching quality management should be the management and monitoring of teaching process. The teaching mode based on CDIO must strengthen the control and evaluation of the teaching process, make new standards following scientific, leading and practical principles and regularize teachers' "teaching" and students' "learning" behaviors. Teachers should be strengthened talent training consciousness and focus on quality education and engineering training. Meanwhile, they should actively participate in teaching quality monitoring and pay attention to students' ways of thinking, learning methods, operational ability and innovation ability. For students, they should be encouraged to learn actively and initiatively and gradually form a correct outlook on life, values, society, family and employment. Besides, the universities should create a good educational environment and academic atmosphere so that students can take diversified study according to their own interest. The management of a university faculty is different from the administration of a business organization. Teachers' opinions and common passion for the university's educational goals is the only effective guarantee for running a university well.

6 Conclusion

The educational reform of Machinery Manufacturing Technology Foundation course based on CDIO educational idea establish the "learning in doing" and "teaching and learning in the project" teaching mode. The mode provides students with teaching situations which combine theoretical knowledge and practice and a systematic cognitive framework. In the mode, teachers change their own role and have the right outlook on talents. For students, they can carry out integrative learning and master the skills of planning, designing, implementing and operating in the enterprises and social environment. This reformation makes education process exposure to the specific situations of product or system life cycle and helps students gradually establish engineering concepts, professional integrity, teamwork and success and share awareness. Also, it provides reference for innovating the teaching model of training applied talents.

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The Application of Hybrid Teaching Model in Electrotechnics Course

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Abstract. In view of the existing problems in the teaching of electrotechnics, from the perspective of cultivating innovative talents, this paper proposes a hybrid teaching model based on internet, introducing blended learning method into theory teaching and practice teaching so as to make the teaching process "offline" Teaching) and "on-line" (online teaching). The students on the line can learn independently and the teachers and students in the line deepen their interaction so that they can complement each other's strengths so as to cultivate students' interest in learning and autonomous learning and improve the teaching effect of electrotechnics.

Keywords: Electrical engineering · Teaching reform · Mixed type

1 Introduction

Electrotechnical engineering is a technical basic course required for the non-electrical engineering major in colleges and universities. It involves a wide range of contents and a large amount of information, and is of strong theoretical and practical nature [1, 2]. It will lay a solid foundation for follow - Fundamentals, the professional thinking ability of students, engineering application ability plays an important role [3–5].

2 Problems Existing in the Traditional Teaching Mode of Electrotechnics

As a teacher of electrical engineering, I deeply understand that there are many problems in the traditional teaching mode of electrotechnics, as follows:

2.1 More Content, Less Time

However, with the reform of higher education in China, the hours of basic courses in colleges and universities are generally reduced. Taking Inner Mongolia University for Nationalities as an example, a total of 40 h of electrotechnics courses, including Theoretical teaching 34 h, experimental teaching 6 h, this is the primary challenge

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facing electrotechnics courses, how to improve the quality and effectiveness of teaching within a limited time, only to change our traditional teaching mode, looking for a new teaching model that can adapt to the new situation.

2.2 Conceptual Abstraction, Difficult for Students to Understand, Lack of Interactivity

Electrotechnics contains multidisciplinary knowledge, but also involves some physical phenomena, laws of nature and methods of mathematical analysis. The content of the theory is abstracted so that students are less interested in practical content. The traditional electrotechnical teaching emphasizes on the "inculcating" teaching mode, the teacher's "teaching" and the students "learning" all focus on the contents of the textbook. The tedious theoretical knowledge is taught by teachers. Students can only be passively accepted. Students' interest and enthusiasm in learning are limited. Teachers and students have little interaction with each other. Teachers find it hard to teach and students have difficulty in learning.

2.3 Teaching Content and Life, Engineering Practice Out of Touch

The traditional teaching mode pays attention to the teaching of theoretical knowledge, the weakening of practice and applied teaching. The students will do the questions, will take the exams, master the theoretical knowledge, but do not know how to apply them to life and engineering practice. They can not understand the profoundness and accomplishment brought by practice, Can not understand the advanced and practical electrical engineering courses.

In view of the above problems, we introduce the network mixed teaching model into the teaching of electrotechnics [6, 7], highlighting the main value of students in learning activities, and strive to build a multi-teaching method is conducive to students to improve their own learning Ability teaching mode to improve the teaching effect of electrotechnics course [8, 9].

3 Web-Based Hybrid Teaching Model

Based on the network of hybrid teaching is the teacher in the curriculum design and knowledge transfer, the classroom teaching and information technology integration, the teaching process of "offline" (classroom teaching) and "online" (online teaching) organic Combination of online students to learn independently, offline teachers and students in-depth interaction, so as to achieve efficient classroom. The specific process of hybrid teaching mode is shown in Fig. 1.

Through online learning platform, the online and offline teaching can be effectively combined. Students can learn by themselves through the "online" self-study before class and through the teacher's guidance. Develop students' ability to think and learn independently. Exploratory learning with active awareness maximizes human potential and acquires knowledge. The hybrid teaching model can improve students' interest in learning and learning, improve the difficulty of the course, and thus help to improve teaching quality and achieve better teaching results.

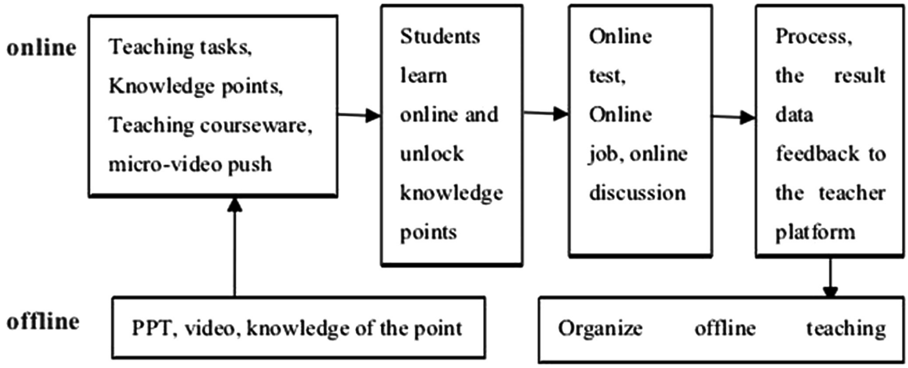

Fig. 1. Electrotechnical mixed teaching mode

3.1 Electrotechnics Mixed Teaching Process

The specific electrotechnics mixed teaching process shown in Fig. 2.

Before Class: Teachers in the online teaching platform to publish teaching tasks, teaching courseware, micro-video and other guidance resources and content resources, students access to the platform through the smart phone or computer course resources, especially through the study of multimedia courseware, micro-video for autonomous learning, Organize the content that is difficult to understand, record the doubts, feedback to the teachers through the online interactive communication platform, obtain the relevant information from the teachers, and focus on the common problems of the students in the classroom.

During Class: Groups-teaching is a common teaching and learning organization in the hybrid teaching of electrotechnics. The class students are divided into several learning groups of 4–5 people each. The group-based learning activities are carried out to achieve mutual aid among students. In the classroom teaching, students should first report the contents of the preview according to the teaching task book first, and the teachers should make overall comments according to the report situation, and discuss the difficult problems in the group or the discussion among the groups. During the discussion and exchange, teachers learned about the students' learning situation in real time, pointed out the commonly questioned content and combined the pre-test questions published on the platform to consolidate the heavy and difficult content.

After Class: Teachers conduct comprehensive assessment, discuss the extension and effect follow-up; students access to multimedia courseware, micro-video and other resources for review and consolidation; online exchange platform as a medium for students, teachers and students to interact. Through the online exam bank, students can complete the usual homework, testing and other assessment tasks, and use the knowledge learned to expand exercises.

Different types of students can make progress according to their own learning habits. Teachers are more responsible for teaching them how to learn and build knowledge so as to make classroom education more inspiring and pioneering. The hybrid teaching

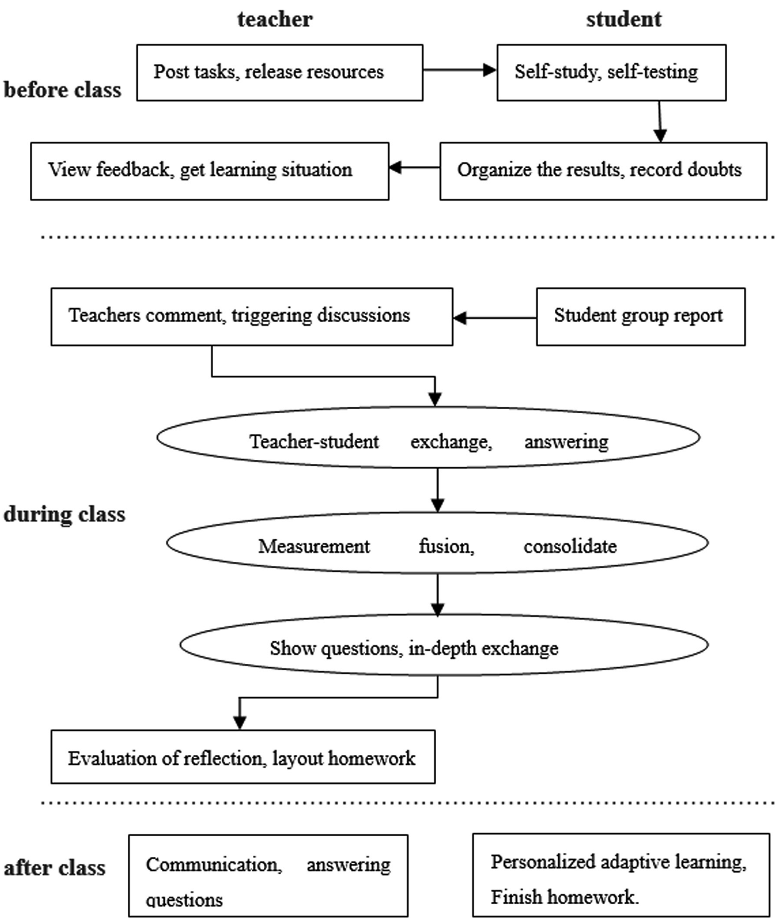

Fig. 2. Electrotechnics mixed teaching process

formed by using information technology adds an extra time for "online" self-preparation in traditional classrooms. For students who have slow understanding, there is a "time difference" that can make up for and absorb digestion knowledge through the Internet.

Practice teaching is an important part of the course of electrotechnics. We also carry out the hybrid teaching reform of practice teaching, redesign the course of electrotechnics experiment, and take the network teaching platform as the carrier, the traditional experiment teaching is divided into online learning and experiment. The actual operation of the two modules, the specific process can be seen in Fig. 3, that is, in the experimental class, the teacher released the contents of the experiment and classroom learning related resources, including teaching micro-video, teaching courseware and related knowledge links to expand the website, Intelligent mobile terminals at any time, any place to obtain learning materials, which greatly improved the efficiency of student learning.

3.2 Assessment of the Reform

Electrotechnics course hybrid teaching model reform also attaches great importance to the curriculum assessment reform. Evaluation of student achievement is a comprehensive assessment of various assessment results, including weekday results, process scores and final grade. Usually the results of the main visit students daily attendance, homework, notes and other content; process scores accounted for a high proportion, including the online platform for each class before the task book, all kinds of tests, homework, answering questions, discuss the completion of the situation, that each Teaching projects should have an assessment, the average score of all teaching projects as a process score; closed book exam results as the final grade. To strengthen the process of student assessment, and urge students to participate in the usual peacetime learning to avoid the students one or two weeks before the final exam surprise examination can pass the examination of the phenomenon, so that students pay attention to normal learning, pay more attention to the cultivation of learning ability and quality, Forming a good style of study and test.

4 Evaluation

In the first semester of the 2017–2018 academic year, a hybrid teaching was conducted on the electrotechnics course. The research group selected 23 students of the Mechanical Engineering Institute 16 (experimental class) as the experimental subjects and conducted a mixed teaching mode. In addition, 58 students as a control class, the implementation of the traditional teaching model. After a semester of study, the average grade of the blended teaching mode class reached 77.78 points, while that of the control group with the traditional teaching mode was 69.54 points, as shown in Fig. 2.

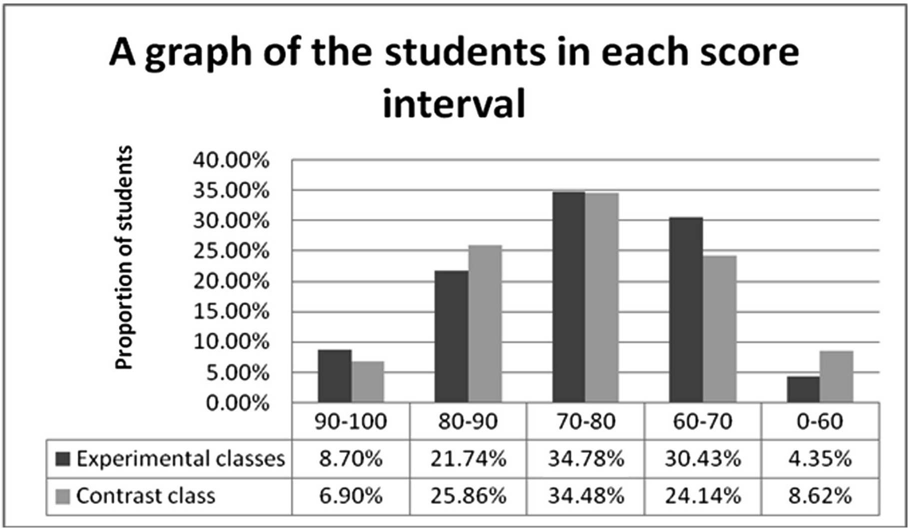

Fig. 3. Student score comparison chart

A questionnaire survey was conducted on 23 students from 14 mechanisms (experimental class), of whom 3 were very interested in the teaching method, 7 were more interested, 9 were generally interested, and 4 were not interested. The result shows that the teaching effect of mixed teaching mode is better than the traditional teaching mode. Students in the experimental class generally believe that the high degree of freedom for blended learning can be freely arranged online learning time, be free to develop their own learning plans, and in the classroom can not solve the problem, you can use the platform rich learning resources independent thinking and Solve the problem.

5 Conclusion

Practice shows that the hybrid teaching mode applied to the theory and experiment teaching of electrotechnics can solve the problems existing in the teaching of electrotechnics to a certain extent and has good adaptability and promotion to the teaching reform of electrotechnics. In the future teaching practice, it is necessary to continue to carry out continuous reform and exploration. From time to students as the main body, the modern educational technology into the teaching of electrical engineering, hoping to achieve better teaching effectiveness and cultivate students' engineering practice ability and innovation ability.

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Research on the Construction of Teachers' Team in Higher Vocational Education in the New Epoch

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Abstract. The quality of teachers could not only reflect the level of college, but also directly affect the overall quality of the students. Under the current development of Chinese economy and technology, the higher vocational education in new era requires teachers not only meet the traditional requirements, but also be international, professional and lifelong. It is pointed out that there are some problems in current higher vocational education, such as the imbalance of teachers' structure, the lack of professionalism, and the lack of broad international vision. To build a more powerful faculty and to train more high-quality students for Higher Vocational Education, it is proposed that the moral and human-oriented education be taken, the training mechanism of teachers should be improved, the structure of teachers team should be optimized, a stable teaching team should be established to ensure the continuous development of teaching reform in new epoch in China.

Keywords: Teachers' team · Higher vocational education · New epoch

1 Introduction

Vocational education is an important component of the national education system. It's the important foundation for promoting upgrading of the industrial structure and economic restructure. It is also an important measure index of the comprehensive strength and human resources of the country. At present, the economy of China has entered into a new normal state. The better quantity and quality of skilled personnel are demanded from the "Internet +", "Industry 4.0" and "China manufacturing 2025". In the report of the 19th National Congress, we must strive to develop vocational education. During the "13th Five-Year" period, higher vocational education in China will shift from the extension of scale expansion to the connotation development based on quality promotion. A modern vocational education system with Chinese characteristics and world level is forming initially. Teachers are the main body of college. To strengthen the construction of teachers is the key to improve the quality of teaching and the quality of school running. Therefore, it is particularly important to structure the new era of a high level of professional teachers who have high ethics, outstanding professional ability and reasonable structure [1, 2].

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2 Requirements to Teachers in Higher Vocational Education

In the new era, higher vocational education requires teachers to meet not only vocational education, higher education and industry, but also to be international, professional, life-long, have strong psychology, and dedicatory in the new epoch [3]. Figure 1 shows the qualities that teachers in higher vocational education should have.

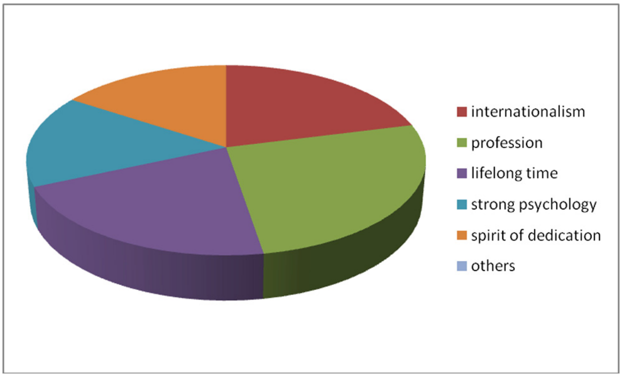

Fig. 1. Qualities of teachers in higher vocational education

2.1 Teachers Should be International

By 2020, a group of world-class vocational colleges and key majors will be built up in our country. The internationally competitive talent cultivation area will be formed. As a higher vocational education institution that cultivates skilled personnel, the vocational colleges can exert their own advantages and serve the national "Belt and Road" initiative. To build teachers team in a modern vocational education system with world-class Chinese characteristics, the experience of building a good international faculty for vocational education should be studied and used for reference. And the cohesion process of "localization" and "internationalization" in higher vocational colleges should be speeded up. We should develop international vision and improve the level of international exchange and cooperation of teachers. At the same time, it is also an inherent requirement to promote the internationalization and foresight of the training of teachers in higher vocational colleges.

2.2 Teachers Should be Professional

Higher vocational education is a type of education with coherence between higher education and vocational education. Teachers in higher vocational colleges should meet the demand of industrial development, occupy the peak of knowledge and technology, and master the forefront dynamic of industry and enterprise information, master strong professional skills. Therefore, the higher vocational teachers, especially the professional teachers should be "double-qualified teachers", which means that teachers' team should includes both theoretical course teachers and practical training instructor. Especially teachers for professional core courses, are required to have "double qualities", which means that they should master both professional theoretical knowledge and the skills and working experience in company.

2.3 Teachers Should be Lifelong

Modern vocational education system is in accordance with the concept of lifelong education, focusing on the lifelong integration of vocational education, so that workers can receive flexible vocational education at different stages of career development through multiple choices. Learners should learn for career development, and the vocational education should bring the sustainable development to all of workers [4]. So in this situation, teachers should keep on learning with the development of society, and be lifelong teachers.

2.4 Teachers Should Have Strongly Psychological Quality

Higher vocational teachers need to have good psychological quality. Teachers in higher vocational colleges should improve their own qualities. Good psychological quality and psychological endurance are the prerequisites and guarantee for us to drive students to study at ease. So teachers should be trained and practiced in psychology intensively to face kinds of students and various teaching environments.

2.5 Teachers Should Have the Spirit of Dedication

Teachers should have noble spirit of dedication, not only to devote their time and energy to their teaching work, but also to give their love, patience and responsibility to students, to give care to students as much as they can. The spirit of devoting is a highly noble spirit and quality for teachers.

3 Current Situation and Problems of Teachers' Team

With the progress of the times and the development of colleges and universities, the existing teachers can't meet the needs of the development of higher vocational colleges. At present, most of the higher vocational colleges have some problems, such as the imbalance of teachers' structure, the lack of professionalism, and the lack of broad international vision.

3.1 Imbalance of Teachers' Structure

Because of the unscientific age structure of the teachers, the disproportions of professional titles and the unreasonable proportion of part-time teachers, teacher in higher vocational teachers is hard to adapt to the transformation from scale development to connotation development, from high-speed development to high quality development, which restricts the development of vocational education.

3.2 Lack of Professionalism

The key problem of China's vocational education faculty construction is that most teachers do not have the working experience from the front line of teaching profession. This problem is more and more obvious along with the change of vocational education mode and the deepening of curriculum reform. There are several causes of the problems. First, most of the new teachers in vocational education are directly graduated from universities. Although they could teach professional theory knowledge, they are lack of skills at some degree in vocational education. Second, due to lack of cooperation between universities and enterprises, lack of long-term mechanism for a teacher to learn in enterprise, the enterprise is not willing to accept the teachers' to train. And most of training is only in a mere formality and it is difficult for teachers to get real exercise. Teachers are not able to fully understand the requirements of enterprise production and the latest trends in the development of technology to meet the teaching requirements [5, 6].

3.3 Lack of Broad International Vision

With the adjustment and upgrading of technological progress, economic structure and industrial structure, the teaching and learning of teachers and students in various vocational schools are gradually facing the connection between universities and enterprises at home and abroad. The teachers' quality is so important for the international connection that the internationalism of teachers' team is a key factor to the quality and sustainable development of vocational education [7].

4 Suggestions on the Construction of Teachers Team

4.1 Moral and Human-Oriented Education Should be Strengthened

At the National Conference on ideological and political work in universities and colleges, Xi Jinping pointed out that moral and human-oriented education is the foundation of the education in universities and colleges [8]. Only the universities in which the first-class talents are trained can be the first class universities in the world. Moral and human-oriented education should be a central link, and teachers should integrate morality into behaviors, teaching and learning to improve the ability of cultivated students who would have both ability and political integrity.

4.2 Improving the Training Mechanism of Teachers and Optimizing the Structure of Teachers' Team [9]

A group of young outstanding teachers with a broad academic vision and strong teaching and scientific research ability should be cultivated, who would be encouraged to be trained professionally, practice in enterprise, education promotion, study abroad, classified training through policy support. A "double-qualified" teachers' team should be built up with new education concept, strong sense of innovation, knowledge, skills, noble morality, strong teaching ability and practical ability. Schools should strengthen exploration and attempt in personnel training, strengthen ties and cooperation between schools and enterprises, combine production, teaching and research, and gradually establish diversified training system and teachers' lifelong learning system. Referring to the German vocational education system, teachers should be trained so strictly that they could undertake teaching task independently and be good at teamwork to complete the research work.

To form a professional and high quality teachers' team, a disciplinary talent team should be constructed by attracting talents. Part-time teachers should be developed reasonably, and the mechanism of talent flow should be standardized.

4.3 Establish a Stable Teaching Team to Ensure the Continuous Development of Teaching Reform

The quality of the teachers' team in a university or a college is the most fundamental factor on deciding a university's level. A stable teaching team is the guarantee for the continuous development and improvement of teaching. So a person of ability should stay for long time on the work of teaching and researching to ensure the continuous development of teaching reform. Thus, the quality of teachers' team can only be higher, and the goal of cultivating "all-around" students could be achieved.

Anyway, the quality of teachers is closely linked with the pulse of the development of the times. In the new era, teachers in higher vocational colleges are shouldering the glorious duty of training a good generation of new generation, who would have good moral quality, personality quality, cultural quality, scientific quality, psychological quality, creative quality, skill quality and physical quality, and would shoulder heavy responsibilities. Every higher vocational teacher should be constantly pressed, forge ahead, and explore courage to be good at innovation and self perfection. Teachers in new era should truly become high-quality vocational teachers with educational ethics, noble foundation, wide learning tolerance, broad mindedness and selfless love.

5 Conclusions

In short, in the development of new era, teachers' quality should be enhanced through various effective measures, such as strengthening moral and human-oriented education, improving the training mechanism of teachers and optimizing the structure of teachers' team, establishing a stable teaching team to ensure the continuous development of teaching reform. The measures should be implemented to make teachers more international, more professional, more strongly psychological, more dedicated and lifelong. Thus, the overall quality of students could be ensured to make more contributions for society.

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Application of WINDLX Simulator in Teaching Practice to Solve the Data-Related in the Pipeline

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Abstract. Data-related in the pipeline of Computer Architecture courses is hard to be understood by students in actual teaching. In this paper, with WINDLX simulation platform tools, through the Windows operating system graphical, interactive WINDLX simulator, to achieve the above theoretical content of the dynamic reproduction, so that students can personally feel the real-time operation of the computer in the instruction flow links. This simulator not only can demonstrate the working principle of DLX instruction in the pipeline machine, but also can provide the statistic of program status. The powerful function of WINDLX simulator has played a positive role in promoting.

Keywords: WINDLX · Computer architecture · Data-related · Instruction set

1 Introduction

Computer architecture as an important computer science pyramid course basic course, which is based on the external features of computer systems to study the basic structure of computer systems. The goal we hope to achieve in teaching is that after studying this specialized subject, students not only improve their research on the overall structure and systematic analysis level, but also to grasp the basic knowledge of all aspects of the computer architecture, such as computer architecture design methods. However, there are many problems in the actual teaching, for example: this course is theoretically strong, involving a large number of knowledge points, it is very abstract for students to learn, they can not profoundly understand the theoretical knowledge of classroom learning, the interest in this course greatly reduced often feel boring, empty, elusive, the interest in this course greatly reduced. In this paper, we use DLX simulator to the actual teaching, solve the data-related in the pipeline to make it easy for students to understand.

2 DLX Instruction Set Structure

2.1 DLX Register

The DLX includes 32 general purpose registers (GPRs) named R0, R1, R2, … R31, the value of R0 is always 0. Based on this feature, this register can be used to synthesize a

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set of useful operations from a simple instruction set. The DLX also contains a set of floating point registers (FPRs) that can be used as either 32 32-bit single-precision floating-point registers, can also be used to store double-precision floating-point numbers, that is, F0 and F1 form a 64-bit double-precision floating-point register, and F2 and F3 form a 64-bit double-precision floating-point register, and so on. These 64-bit floating-point registers are named F0, F2, … , F28, F30. In this way, DLX provides 32 32-bit single-precision floating-point registers or 16 64-bit double-precision floating-point registers. This design of DLX is more efficient. You can extended single precision to double precision to deal with.

2.2 DLX Addressing Method

Using the characteristics of the R0 register is always zero, DLX with very little hardware cost, provides five addressing modes. They are: register addressing; immediate addressing (immediate range is 16 bits), displacement addressing (a register plus the offset to form the address of the operand), register indirect addressing the amount of displacement in the address mode is equal to 0), direct addressing mode (R0 in the register in displacement addressing mode).

The DLX memory is addressed by the byte-first format of the 32-bit address. Because it is a Load-Store instruction set structure, all memory accesses must be done through memory or GPR or load or store operations between memory and FPR. The address for accessing a single word must be in the form of xx00B, the address for accessing the half word must be in the form of xxx0B, the address of the access byte is arbitrary.

3 WINDLX Simulator Introduction

WINDLX platform includes six navigation functions, located at the top of the WINDLX platform interface are: File, Window, Execute, Memory, Configuration, Breakpoints as can be seen from Fig. 1. Click the File option in the navigation bar to see the drop-down menu has four function keys, which are reset WINDLX environment, load the program into the platform and exit the platform. The other five navigation bar corresponding WINDLX platform provides other features that can be set according to user needs.

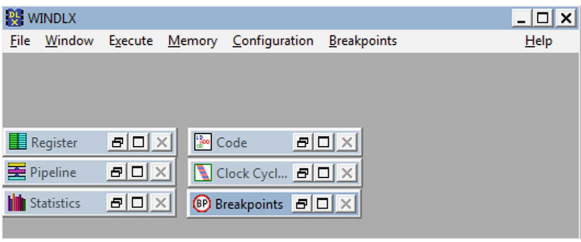

Fig. 1. WINDLX simulator

The Pipeline shows the five functional stages through which an instruction executes. The execution section of the DLX pipeline is divided into four units: intEX unit (integer operation), faddEX unit (floating point addition and subtraction), fmulEX (floating point multiplication), fdivEX (floating point division). We can modify its settings. Clock Cycle Diagram shows the instructions in the pipeline overlap, the different colors of this window pipeline and the Pipeline window color correspond, as shown in Fig. 2.

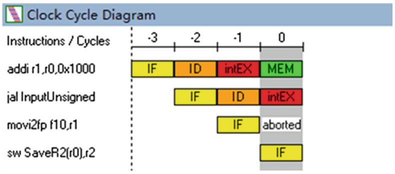

Fig. 2. Clock Cycle Diagram sub-window

The Statistics displays statistics that include the total number of clock cycles required for program execution. Breakpoints show the details of the breakpoint set. Using these subwindows, you can analyze and complete representative data-related, structurerelated and control-related processing experiments and clearly visualize the results of the experimental process.

4 Data Related and Processing Methods

During the execution of an instruction, if the instructions, operands and index offsets used are just the result of executing the previous instructions, you must wait for the completion of the previous instruction execution, and write the result to the main memory or general register, the current instruction to start execution. that is, different instructions on the main memory operand or register there is a "first read and write" association, this correlation is called data-related. Since the data-related impact is only a handful of instructions in the vicinity of this instruction, it is considered to be partially relevant.

In the absence of WINDLX simulator applied to the practice of teaching, for the time being only teachers in theory can first define the data-related text description, then lists two or more instructions in the process of overlapping is how to generate data-related processes, to run a bubbling sort, for example, first double-click WINDLX executable program, open the platform, we will load the data-related programs to the platform. Then in the experimental platform in the navigation bar above the window to find the Configuration option, click the Configuration option, in the drop-down menu to find Enable Forwarding function keys, click on it to make sure that the check mark in front of it disappears, showing that no redirect technology was used, as shown in Fig. 3.

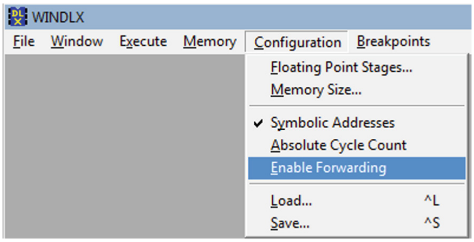

Fig. 3. Cancel redirect technology

After completing this step, we start running the program pre-loaded into the platform, also in the navigation bar above to find the Execute option, click and select the Run function key and click on it. After the program execution is completed, we open the Statistics window under the platform (Fig. 4).

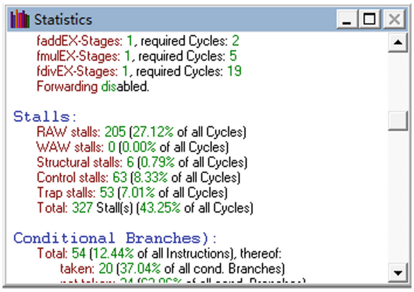

Fig. 4. Related statistical results window

As described earlier, the Statistics window provides information on all aspects, including the reasons for suspension and one of them. Then we can clearly see through the statistics sub-window after the completion of the program execution data related to the number of 205, here to program somewhere in the data-related. For example, as shown in Fig. 5. R-Stall data-related, seqi r5, r3, 0xa in the decoding phase need r3 data, but lbu r3, 0x0(r2) still in the implementation stage, The data in r3 has not been written back yet, so we need to wait for the data to happen.

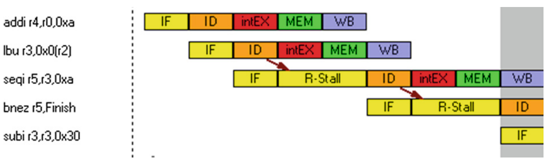

Fig. 5. Generates data-related part of the space-time map

Reduce data-related method is to redirect technology, reset the platform, reload the previous program into the platform. After the loading is successful, select the Configuration option in the navigation bar above the platform and click the Enable Forwarding softkey in the drop-down menu to make sure that the check mark in front of it is displayed. This shows that the redirection technique is successfully used, as shown in Fig. 6.

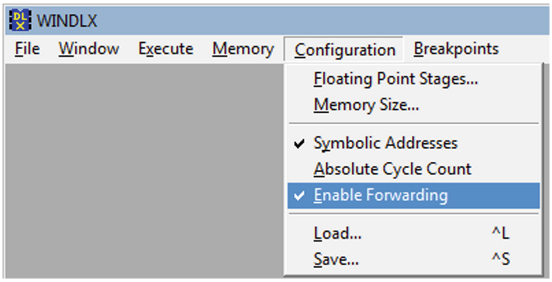

Fig. 6. Using redirection technology

After these steps are successfully completed, the data can be passed on to the next piece of data using the virtual wires provided by the WINDLX platform. Re-enter the data. After the execution of the program is completed, we also open the Statistics window below the platform. As shown in Fig. 7.

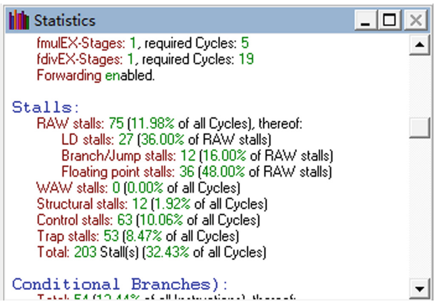

Fig. 7. Using the redirect technology related statistics

Using redirect technology, we found that the number of data-related reduction from the original 205 to 75, the total number of program clock cycles also reduced.

Compared to the theory of teaching, such a teaching method to introduce the simulator is a good way to generate relevant data from all aspects of reduced to a vivid display in the form of graphic students. Similarly, the structure-related and control-related will also be described through the platform.

5 Conclusion

With such information being abundant, we have contributed to the constant melody under the theme of "innovation". Compared to the traditional theory of teaching, WINDLX simulator's powerful features give us an intuitive visual experience, can be clearly in-depth details of the work inside the processor, truly the theoretical teaching and experimental teaching organic combination. Application windlx simulator for students to learn the data-related in the pipeline has an important supporting role.

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Evaluation of Undergraduate Teaching Quality in Local Colleges and Universities Based on the Discreteness of Postgraduate Entrance Examination Results

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Abstract. The results of analysis not only can be used as a means of teaching quality evaluation, but also is an important basis for teaching research. Based on the examination results analysis of the use of feedback mechanism, will help to improve the quality of education and teaching. In order to study the evaluation of undergraduate education in basic courses and professional courses and teaching quality, this paper use the principle and methods of educational statistics to apply for graduate students, from the entrance exam of this perspective, through a school for nearly three years, the entrance examination sample for statistical processing and discrete analysis, discusses the reform of undergraduate teaching effect, different problems and basic courses and professional courses, and draw conclusions and suggestions with reference value and practical significance.

Keywords: Graduate entrance examination results · Discreteness
Local colleges and universities · Quality of undergraduate teaching

1 Introduction

China higher education has been basically the transition from elite education to mass education stage, also is in the transition from scale expansion to quality period of. The national Ministry of education and the Ministry of Finance issued on “12th Five-Year” during the implementation of undergraduate teaching quality and teaching reform project opinions in 2011, and in Colleges and universities across the country to carry out undergraduate teaching quality audit, which fully shows that the undergraduate teaching quality problems have aroused the attention of the country [1].

This paper studies the master of a local college entrance exam scores of students, through the discrete analysis of the graduate entrance examination scores, main problems of undergraduate teaching quality in the teaching of basic courses, different professional courses and teaching and how to improve the teaching quality of undergraduate education [2–4].

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2 The Application of Average and Standard Deviation in the Analysis of Performance

2.1 The Theory of Mean Value and Standard Deviation

The overall situation of a collective test should include two aspects: one is the average of the sample and the other is the standard deviation of the sample [5].

The average of the sample:

$$\bar{x} = \frac{1}{N} = \sum_{i=1}^{N} x_i. \tag{1}$$

The standard deviation of the sample:

$$\sigma = \sqrt{\frac{1}{N}\sum_{\mathrm{i}=1}^{N}(x_i - x)^2}. \tag{2}$$

Where N is number of samples.

The average value of the data is described from statistics, the standard deviation is the description of the data dispersion statistic average value equal to standard deviation of different groups, there are obvious differences in the distribution of students marks, only the mean and standard deviation of two statistics to that of a set of data in the picture [6]. The value of standard deviation that shows the extent of discrete data is larger, more uneven distribution of data, more broadly, that individual role is significant, the overall quality of teaching need to be examined. Therefore to discuss the main problems of undergraduate teaching quality in the teaching of basic courses teaching and different professional courses, to graduate students in the statistical analysis of the mean and variance of test results is an important channel [7].

2.2 Sample Mean and Standard Deviation

How to evaluate the quality of undergraduate teaching, distribution of graduate entrance examination scores may bring some inspiration. The following respectively from 2014, 2015 and 2016 at a local university students to participate in the unified national graduate entrance examination scores overall, random sample of 30 samples were analyzed. For statistical analysis, the specialized courses and specialized courses for two of the mean and standard deviation is the list of original score conversion.

As can be seen from the data in Table 1:

$$\bar{x}_{Political\ 14} = 59.87, \bar{x}_{English\ 14} = 45.93, \bar{x}_{Business\ 1\ 14} = 51.16$$
$$\bar{x}_{Business\ 2\ 14} = 78.23, \bar{x}_{Total\ grade\ 14} = 299.87$$
$$\sigma_{Political\ 14} = 9.00, \sigma_{English\ 14} = 12.24, \sigma_{Business\ 1\ 14} = 22.83$$
$$\sigma_{Business\ 2\ 14} = 19.05, \sigma_{Total\ grade\ 14} = 61.73$$

Table 1. Random sample of local university students to participate in the unified national graduate entrance examination in 2014

Sample	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Political	58	61	48	65	58	72	70	66	53	64	59	63	38	48	71
English	35	24	31	50	53	43	61	21	47	53	41	50	54	53	32
Business 1	110	137	22	113	120	123	126	126	22	92	88	71	35	45	23
Business 2	124	102	108	120	126	109	127	90	108	133	119	139	61	118	139
Total grade	327	324	209	348	357	347	384	303	230	342	307	323	188	264	265
Sample	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Political	67	53	53	59	67	58	56	65	59	58	56	70	67	45	74
English	72	55	28	64	53	43	51	57	42	36	35	55	44	38	61
Business 1	92	83	28	100	51	76	82	111	60	37	52	83	81	49	70
Business 2	138	142	138	132	121	116	113	131	140	119	134	126	134	65	150
Total grade	369	333	247	355	292	293	302	364	301	250	277	334	326	197	355

Table 2. Random sample of local university students to participate in the unified national graduate entrance examination in 2015

Sample	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Political	49	49	27	47	47	75	75	66	74	56	71	43	63	77	54
English	30	21	24	28	45	61	53	48	72	14	56	51	55	55	57
Business 1	61	17	36	79	124	127	107	105	130	54	112	65	124	133	132
Business 2	73	17	142	40	120	102	127	131	128	23	131	40	109	122	132
Total grade	213	104	229	194	336	365	362	350	404	147	370	199	351	387	375
Sample	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Political	76	52	70	64	66	67	64	55	53	44	63	56	40	69	60
English	66	49	47	41	66	58	63	55	40	30	57	66	27	44	68
Business 1	133	99	115	108	137	122	130	93	48	59	45	77	25	83	129
Business 2	141	111	128	119	121	120	108	99	75	118	123	148	52	132	145
Total grade	416	311	360	332	390	367	365	302	216	251	288	347	144	328	402

As can be seen from the data in Table 2:

$$\bar{x}_{Political\ 15} = 59.07, \bar{x}_{English\ 15} = 48.23, \bar{x}_{Business\ 1\ 15} = 62.45,$$
$$\bar{x}_{Business\ 2\ 15} = 78.64, \bar{x}_{Total\ grade\ 15} = 306.83$$
$$\sigma_{Political\ 15} = 12.19, \sigma_{English\ 15} = 10.21, \sigma_{Business\ 1\ 15} = 24.07,$$
$$\sigma_{Business\ 2\ 15} = 24.32, \sigma_{Total\ grade\ 15} = 58.67$$

Table 3. Random sample of local university students to participate in the unified national graduate entrance examination in 2016

Sample	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Political	74	59	46	70	65	51	48	76	52	61	62	55	52	59	62
English	41	44	55	49	44	58	41	45	36	33	58	39	39	36	57
Business 1	103	105	45	118	124	133	111	147	92	71	93	111	36	42	71
Business 2	108	106	63	121	137	143	59	144	48	140	67	106	59	140	137
Total grade	326	314	209	358	370	385	259	412	228	305	280	311	186	277	327
Sample	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Political	65	47	69	65	67	55	54	54	58	52	66	66	36	59	64
English	47	43	43	59	52	46	39	35	38	50	49	30	27	38	39
Business 1	77	28	35	83	107	47	51	24	56	53	64	81	22	87	71
Business 2	145	124	121	129	144	87	101	95	139	129	95	118	50	130	132
Total grade	334	242	268	336	370	235	245	208	291	284	274	295	135	314	306

As can be seen from the data in Table 3:

$$\begin{aligned}
&\bar{x}_{Political\ 16} = 58.97, \bar{x}_{English\ 15} = 48.67, \bar{x}_{Business\ 1\ 15} = 53.98, \\
&\bar{x}_{Business\ 2\ 15} = 78.86, \bar{x}_{Total\ grade\ 15} = 307.80 \\
&\sigma_{Political\ \ 5} = 8.77, \sigma_{English\ 15} = 8.32, \sigma_{Business\ 1\ 15} = 20.38, \\
&\sigma_{Business\ 2\ 15} = 15.04, \sigma_{Total\ grade\ 15} = 52.43
\end{aligned}$$

2.3 The Discrete-Time Analysis of Graduate Entrance Examination Results

In 2015, the local university held a school since one of the largest teaching work conference, the unity of thinking, adhere to the "four priority", namely the work on priority funding priority investment, resource allocation policy priority, priority support, earnestly implement the central position of undergraduate teaching, and the "three a satisfied with" teaching satisfaction, teacher satisfaction and student satisfaction as a measure of the standard of work departments at all levels. In specific work, by the Ministry of education for the implementation of the "quality project" of the east wind, carried out a series of undergraduate teaching reform. How to reform from the past three years school students to participate in the national postgraduate entrance exams for discrete analysis this point. According to the above 2014–2016 years of school students to participate in the national postgraduate entrance examination scores sampling statistics:

$$\bar{x}_{Total\ grade\ 14} < \bar{x}_{Total\ grade\ 15} < \bar{x}_{Total\ grade\ 16}$$

$$\sigma_{Total\ grade\ 14} > \sigma_{Total\ grade\ 15} > \sigma_{Total\ grade\ 16}$$

the sample average increases, and the sample standard deviation is decreased, the overall performance of students in grades improve, dispersion significantly reduced, indicating that the overall effect of undergraduate teaching in improving the teaching effect, tended to be concentrated. Sample mean and standard courses of political theory and foreign language achievement scores difference Changes are like Table 4.

Table 4. Sample mean and standard courses of political theory and foreign language achievement scores table

Year	2014	2015	2016
$\bar{x}_{Political}$	59.87	59.07	58.97
$\bar{x}_{English}$	45.93	48.23	48.67
$\sigma_{Political}$	9.00	10.19	8.77
$\sigma_{English}$	12.24	12.21	8.32

As can be seen from the data in Table 4, the sample mean volatility is not political theory courses from 2014–2016 for 3 years, the corresponding standard deviation is basically similar to that of the school students' political theory education is relatively stable, the overall political literacy of students better. English scores of the sample mean increases the corresponding the standard deviation is gradually decreased, indicating that the teaching effect of the school English class has risen, the discreteness of student achievement in the reduced teaching effect tends to focus on the overall performance of the students, to improve English achievement, but the mean is small, that the English teaching is still the school base. There is still much room for improvement in the quality of English teaching. The further improvement of the quality of English teaching can not only effectively promote the overall teaching level of the school, but also further improve the proportion of the students taking the postgraduate's further education.

Changes in sample mean and standard deviation of business class one and business class two, such as Table 5.

Table 5. sample mean and standard deviation of business class one and business class two table

Year	2014	2015	2016
$\bar{x}_{Business\ 1}$	51.16	62.45	53.98
$\bar{x}_{Business\ 2}$	78.23	78.64	78.86
$\sigma_{Business\ 1}$	22.83	24.07	20.38
$\sigma_{Business\ 2}$	19.05	24.32	15.04

As can be seen from the data in Table 5, the results of sample mean in 2015 two a business class and business class have increased significantly, but the standard deviation is suddenly increased, the overall student grades have improved, but also increase the differentiation of students from 2014–2016 for 3 years, schools with the actual analysis, the possible reason is the school of undergraduate teaching at the beginning of reform deepening educational reform work, eager to seize the key points, which led to the students to see the results of polarization, such as grading teaching measures of schools take is perhaps one of the reasons leading to polarization; after the timely adjustment and improvement to a business class in 2016 and business class two grade sample mean increased, especially the standard deviation was also decreased, indicating the teaching effect tends to focus on the reform of undergraduate teaching, and achieved remarkable results; statistical data from two business class, 2014–2016 standard deviation is large, the relevant examination and subject difference, different difficulty and other factors, but the sample mean is relatively high, indicating that the professional teaching and the students are better. From 2014–2016 of the sample mean, business class two was significantly higher than that of the business class, the school in the teaching of solid foundation, students' learning and application ability. But the theoretical foundation is relatively weak, and the school has a greater promotion space in basic theory education.

3 Conclusions and Suggestions

The national postgraduate entrance examination is a unified standard, authoritative examination has high evaluation level, by the students of a local university in discrete analysis of the national graduate admission test scores, school evaluation based on the results of statistical analysis to the quality of undergraduate teaching, summed up the three aspects of the following conclusions can be drawn:

(1) The central position of undergraduate teaching has been strengthened and the effect of teaching has been greatly improved.
(2) The quality of the professional course is relatively stable and the teaching effect is ideal. It shows that the quality of the school is stable in the training of professional teaching and professional talents.
(3) Basic course teaching has greatly improved space, teaching methods, teaching methods and teachers to be further strengthened, reflects the basic quality of students is not high school, basic research and basic ability is not strong enough, also influence the school students graduate enrollment.

According to the statistical analysis of the situation, as the foundation to enhance the ability of local undergraduate teaching quality and students, teaching and Research on the basic theory of strengthening is recommended. First of all, should attach importance to cultivate the basic theory and the ability of correcting "training theory and the ability of investment, quick slow wrong thinking", to medium thick foundation, heavy ability of undergraduate talents; secondly, investment should tilt to the foundation of teaching, increase the basic laboratory construction, improve the weight based teaching in the teaching evaluation index system of the basic theory, the introduction of high-level leading talent, through the education effect of teacher driven basic theory teaching in the whole body level; moreover, strengthen guidance and education for students, let the students understand the basic ability is the foundation and guarantee of professional competence, professional and academic field to the road to go farther, must have a solid foundation of theory; finally, we should give play to the talents cultivation advantages, explore the basic theory of new ideas into teaching more in theory teaching, make relatively dry with professional practice fusion and more energetic.

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Optimization of Courses System for Mining Engineering Guided by Engineering Education Accreditation

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Abstract. Engineering Education Accreditation is an important part of the implementation of quality projects by the Ministry of Education. The necessity and significance of Engineering Education Accreditation were analyzed. Based on the Engineering Education Accreditation standards, and combined with training objectives, set the mining professional courses system. In order to strengthen engineering education for engineering practice, it is necessary to set up some courses that reflect the situation of mining industry and the technology of mining geological conditions of mine seams in the service area of graduates to improve the quality of professional education in mining, cultivate students' adaptability to the development of mining industry and promote professional international Mutual recognition, and promoting the transnational movement of mining professionals have a realistic meaning.

Keywords: Engineering Education Accreditation · Mining engineering
Quality control · Courses system

1 Introduction

Economic globalization has promoted the globalization of engineering and technical occupations and the transnational flow of engineering professionals, correspondingly, promoted the higher engineering education to adapt to the trend of globalization [1]. Due to the different system and conditions of engineering education in different countries and regions, how to define and evaluate the management level, the quality of personnel training, the implementation of national engineering education professional comparability and the equivalent of the Engineering Education Accreditation, is the common concern of engineering education and engineering problems [2]. This article combined with the Engineering Education Accreditation to explore how to set up Engineering Education Accreditation, the professional courses system of mining engineering, mining to improve the professional quality of education and cultivate students' development of the mining industry to promote the professional adapt ability and Industry international mutual recognition and enhance the professional international competitiveness [3].

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2 The Necessity and Significance of Engineering Education Accreditation

Until 2016, there are more than 5 million undergraduate students enrolled in higher engineering education in China. Nearly all universities opened the engineering profession and the scale of the first in the world. However, the reality is that China is a large country of engineering education rather than a strong country in engineering education. There are still many problems in China's engineering education. The root cause is that there are too few engineering and technical education in engineering education in China. In order to improve the level of engineering and technical education that is geared to engineering practice and to go along with international education, the Ministry of Education has conducted many explorations. In 2006, the Ministry of Education jointly with China Association for Science and Technology, and hired engineering education and business experts to form a China Professional Committee of Engineering Education Experts, set the goal of engineering education Engineering Education Accreditation is to further improve the quality of engineering education. In January 2007, the Ministry of Education and the Ministry of Finance jointly issued a document calling for "actively exploring the reform of the professional assessment system, focusing on the pilot project of Engineering Education Accreditation in engineering, medicine and other fields, and gradually establishing a Engineering Education Accreditation system that meets the needs of the vocational system". In June 2007, the Ministry of Education issued "Several Opinions on Strengthening Undergraduate Teaching Work in Higher Institutions and Improving Teaching Quality", requiring "to establish an internal evaluation and certification mechanism for employing teaching units by employers, teachers and students" and again put forward Engineering Education Accreditation-oriented teaching quality monitoring [4]. The economic globalization will inevitably lead to the internationalization of engineering education. Engineering Education Accreditation is a special occupation of Engineering Education Accreditation: certification of professional specialized occupation education from Engineering Education Accreditation institutions for higher education institutions to offer implementation, together by special occupation Association in the field of education workers, provide quality assurance for the relevant personnel to enter the special occupation industry practitioners of preparatory education. The United States is the country that started Engineering Education Accreditation earlier. American Engineering Technology authentication (Accreditation Board for Engineering and Technology) is the most authoritative certification body of the engineering education. For the American public, only certified professionals certified by a reliable certification body are recognized professionals. For the profession, the certification is actually related to the living conditions of the profession or even the school, because only certified professional can attract students and attract investment; for students, if the professional did not pass the certification, obtain funding, scholarships, credits Other universities admit that they will encounter difficulties in accepting their degrees through other countries [5]. Therefore, in order to improve the quality of engineering education in China and cultivate the qualified talents recognized by both domestic and foreign countries, engineering education requires not only Engineering Education Accreditation but also relevant international certification agreements to promote Chinese engineering education to participate in international exchanges and achieve mutual recognition. At present, there are four agreements on mutual recognition of academic degree in engineering education such as "Washington Agreement", "Sydney Agreement", "Dublin Agreement" and "Seoul Agreement." The "Washington Accord" is generally considered to be the most authoritative and international the highest degree of education system, a relatively complete system of mutual recognition agreement. The Washington Accord is an internationally recognized agreement on a bachelor's degree in engineering. At the beginning of the contract in 1989, the agreement covers six countries on three continents: the United States, Canada, the United Kingdom, Ireland, Australia and New Zealand. At present, the Washington Accord has enjoyed a worldwide reputation and attracted the consortium of engineering consultants of the European Union covering 27 countries to negotiate the accession issue. China participated as an observer of the Washington Protocol System in 2005, 2007 and 2009, and at the International Union of Construction Project Conference held in Seoul, South Korea in November 2013, the "Washington Accord" plenum unanimously passed by accepting China as a signatory to the agreement and China became The agreement to organize the twenty-first member, which to some extent, shows that the scale of China's engineering education achieved rapid development, ranking first in the world at the same time, the quality has also been recognized by the international community. In November 2007, mining engineering was certified at Central South University and China University of Mining respectively and passed, which shows that the training quality of the mining major in these two schools has reached the international standards of peers and at the same time indicates that the Chinese mining professional on the new course of integration with international education [6].

3 Engineering Education Accreditation Standards

The certification standard is divided into two parts: general standard [7] and professional supplementary standard. The general standard is the basic requirement for every engineering education major. The professional supplementary standard is the specific requirement based on the general standard and according to the characteristics of this specialty.

3.1 General Standard

The general standard contains seven aspects:

(1) Students, including majors to attract excellent students, student guidance, students' performance tracking and evaluation, transfer to professional, transfer and other systems.
(2) Training objectives, including graduation requirements, training objectives revised.
(3) Graduation requirements, including professional knowledge, basic knowledge, professional ethics, human science literacy, innovation and team spirit, international vision, lifelong learning and so on.

(4) Continuous improvement, including teaching process quality monitoring mechanism, graduates tracking feedback mechanism, social evaluation mechanism.
(5) Curriculum system, including mathematics and natural science, engineering foundation, professional foundation, professional course, engineering practice, graduation design (Thesis), humanities and Social Sciences, etc.
(6) Teachers, including the number of teachers, teacher structure, business or industry experts as part-time teachers, teacher engineering background, teacher teaching time.
(7) Supportive conditions, including classroom, laboratory and equipment training base, computer and network, and library resources, teaching expenses, construction of teaching staff, teaching management and service standards.

In the above general standards, the content of curriculum system is very vague. It only gives what courses for engineering education majors should be offered, and there is no specific course name.

3.2 Professional Supplementary Standards

Profession must meet the corresponding professional supplement standards. Professional supplement standard provides the corresponding professional in the courses system, teaching staff and support conditions of the special requirements. Mining professional supplement standards include three aspects. Mining professional courses system, divided into theoretical courses, practice and graduation design (Thesis).

- Theoretical courses, including:

  (1) Mathematics and physics courses, including mathematical calculus should include calculus, space analytic geometry, ordinary differential equations, linear algebra, probability theory and mathematical statistics and other basic knowledge. Physical courses should include knowledge of mechanics, vibration, fluctuation, optics, molecular physics and thermodynamics, electromagnetics, mechanics of special relativity, and quantum physics fundamentals.
  (2) The optimized talent training program, the graduates of mining engineering should have the following knowledge and ability.
  Engineering basic courses, including elasticity, engineering mechanics, fluid mechanics, engineering drawing, electrical and electronic technology, computer and information technology foundation.
  (3) Professional foundation courses, teaching content: Geology, mining machinery, rock mechanics and engineering, mining systems engineering, environmental protection and safety of mining.
  (4) Professional Courses are divided into core and non-coal professional courses. Apart from the core knowledge of mine extraction, mine ventilation and safety, and roadway engineering, other courses of coal and non-coal specialties are allowed to have their own characteristics emphasis. The core content of coal must also hold should include mining pressure and strata control, slope stability and so on; the core content of non coal class students must master should also include drilling and blasting engineering.

- Practice links, including:

  (1) Experimental courses: rock mechanics, mine pressure and rock control, blasting engineering, mine ventilation and safety, slope stability experiment selected at least three experiments.
  (2) Curriculum design: the design of open-pit and underground mining, the basic course design of mechanical design, and the selection of at least two in the design of mine ventilation safety.
  (3) Field practice: cognition practice, production practice and graduation practice, and establish a relatively stable practice base, and closely cooperate with industry, University and Research Institute, so that students can understand and participate in production practice.
  (4) Science and technology innovation and other forms of practical activities.

In the graduation project (thesis) a requirement that topics should be consistent with the professional training objectives and engineering design-based. It needs a clear application background.

Teachers team, there are two requirements. First, the teachers engaged in the teaching of the main course of the major must have a master's degree and a doctorate in engineering, majoring in mining engineering. Some teachers have relevant professional learning experiences. The second is for professional teachers with engineering background, which is engaged in the professional teaching (including experiment teaching) above 80% teachers should have at least 6 months experience in mining enterprises or engineering practice.

Support conditions, including professional information, experimental conditions and practice base.

First, professional information requires a variety of high-quality (including the latest), adequate textbooks, reference books and related Chinese and foreign books, periodicals, tool manuals, electronic resources and other information, including the typical mining design at home and abroad Case.

The second is the experimental conditions, one is required to complete the experimental equipment, adequate, excellent performance, to meet the needs of various types of teaching experiment, and the laboratory layout is reasonable and safe, and second, require a sufficient number of experimental technicians to guide students in rock mechanics, mining Pressure and rock control, ventilation and safety, mining methods, slope stability and other experiments.

Third, the practice base, need to have an in-school and internship base, production and research cooperation base and outside the school-based mining practice base. It can be seen from the above-mentioned common standards and supplementary standards for mining professionals that the courses system is the basis for training objectives and that the teaching staff is a teaching quality monitoring system and guarantee system that can guarantee the realization of the curriculum objectives. The supporting conditions are the supporting systems for the teaching of courses, To promote the training objectives, faculty building and other aspects. Therefore, to achieve the goal of training students to graduate, the most basic is to strengthen the courses system.

4 Courses System Construction

Jiangxi University of Science and Technology is located in the old revolutionary base areas in China, is to cultivate China's non-ferrous metal industry and steel industry typical characteristics of colleges and universities, the mining engineering course system in China's mining universities have a certain representation. The following course system construction content with its 2016 version of talent training programs as an example.

4.1 To Train the Target for the Refinement of Standards, the Courses System

Training Objectives for Mining Engineering: To cultivate the all-round development of moral, physical and mental development and to master the basic theories and methods of metal mining, and to be engaged in mineral resources exploration, development, planning, design, consulting, management, environmental protection and other institutions and research institutes Development planning, mine design, mine safety technology, mine engineering supervision, production technology management and scientific research. About 5 years after graduation, it can independently solve the practical problems of mine engineering, with strong innovation consciousness, innovative ability and international perspective Of the composite application personnel.

Mining Engineering Training Standards: The major students mainly learn the basic theories and basic techniques of foreign languages, mathematics, mechanics, computer applications, mining geology, surveying, blasting engineering, mining engineering and mine safety, and accept the basic training of mining engineers.

Graduates should acquire the following knowledge, ability and quality:

(1) Have good humanities and social science literacy, strong sense of social responsibility and good engineering professional ethics.
(2) Have engaged in engineering work required for the relevant mathematics, natural science knowledge, master the economic and management knowledge of mining enterprises.
(3) Master the basic theoretical knowledge and professional core knowledge related to the exploitation of metal deposits, have systematic experience in engineering practice and understand the current situation and trend of the forefront of the development of the profession.
(4) Have engaged in mining engineering design and related engineering experiment capabilities, and be able to analyze the experimental results.
(5) With innovative awareness and advanced concepts, with the initial ability to carry out technological innovation and new technology, new technology research, with the ability to design systems and processes using a combination of theoretical and technical means, the design process can take into account economic, environmental, law, safety, Health, ethics and other constraints.
(6) Have the basic ability of computer application, master the basic methods of document retrieval, data inquiry and use of modern information technology to obtain relevant information.

(7) Understand the principles, policies, laws and regulations related to the design, production, safety, research and development, environmental protection and sustainable development of mining engineering, and correctly understand the impact of Engineering on the objective world and society.
(8) Have certain production organization and technical management skills, with good expression skills and interpersonal skills and good teamwork skills.
(9) Have a correct understanding of lifelong learning, with the ability to continuously learn and adapt to development.
(10) With international perspective and cross-cultural exchange, competition and cooperation ability.

4.2 Based on Engineering Education Accreditation Standards, the Course System Settings

An important part of Engineering Education Accreditation is to emphasize students' practice. In response to this requirement, it is necessary to strengthen engineering and technical education that is "oriented toward engineering practice", and can set up various kinds of curriculum design and internships to train students' hands-on and practical skills. Therefore, in addition to the theoretical courses system, practical courses should also be set up, such as geological internship, mine cognition internship, mine production internship, mine graduation practice, mining area curriculum design, ventilation safety course design, roadway engineering course design and such as rock mechanics, Mine pressure and rock control, blasting engineering, mine ventilation and safety aspects of the experimental class. In addition, in the conditions of mines, construction of a number of production and research base for the practice of class to provide a practical venue.

A notable feature of Engineering Education Accreditation is that enterprises or industry experts are required to participate in teaching students as part-time teachers. Teachers from the field feedback to the industry the situation and needs of the development so that students learned can really solve the needs of the scene. Therefore, some courses reflecting the industry situation can be set up as elective courses such as mine digital mapping, special mining, soft rock roadway support, engineering inspection and monitoring as elective courses for students to learn.

In addition, mining is a subject of engineering, in addition to some such as the introduction of some basic concepts such as Marxism, Mao Zedong Thought and the theory of socialism with Chinese characteristics, modern Chinese history outline, ideological and moral training and legal basis, mental health education and guidance of university students must Humanities and social science courses outside. It is also necessary to set up basic mathematics, mechanics and informational basic courses in accordance with the General Standards for Engineering Accreditation and the Supplementary Standards for Mining Professionals such as Higher Mathematics, Linear Algebra, Mathematical Statistics and Probability, College Physics, Theoretical Mechanics, Materials Mechanics, Elastic Mechanics, Fluid mechanics, electrical and electronic technology, computer and information technology foundation.

4.3 Graduates Serve the Regional Industry Features, the Courses System Settings

The basic idea of Engineering Education Accreditation reflects the basic conditions and basic requirements, is the lowest standard of the same type of professional training objectives and specifications to achieve the lowest threshold of professional construction quality. Professional and characteristic construction is to encourage the development of professional personality, reflect the diversity of professional construction, strengthen the characteristics, highlight the ability to explore the needs of different types of talents in the community personnel training model for the community to provide high-quality specialized personnel.

The following Table 1 is in accordance with the above three aspects of the curriculum to achieve the realization of the matrix profile.

Table 1. Realize matrix introduction (Part)

Professional standard	Knowledge and ability requirements	Curriculum and teaching
Has a good humanities and social science literacy, a strong sense of social responsibility and good professional ethics	Cultivate a correct world outlook, understand the theory of socialism with Chinese characteristics, cultivate students to establish a correct outlook on life and the legal system	Introduction to the Basic Principles of Marxism, Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics, Ideological and Moral Cultivation and Legal Basis
	Understand the modern history of China and the current situation and policies at home and abroad	Outline of Modern Chinese History, Situation and Policy, Military Skill Training
	Develop strict discipline and hard-working spirit, understand the theory of national defense and military affairs, enhance personal physique and master the correct physical training methods	Military Theory, Physical Education, Celebrities and Experts Patriotic
	Understand the modern college students should have the humanities, social, economic and other comprehensive quality, understanding as a modern college students and engineering and technical personnel should have a sense of social responsibility and professional ethics	Safe Education, Career Guidance for College Students, Introduction to New Students and Career Planning
Have engaged in the engineering work required by the relevant mathematics, natural science knowledge, grasp the economic management of mining enterprises, knowledge	Have the mathematical, physical knowledge necessary to solve most engineering problems	Higher Mathematics, Linear Algebra, Probability and Mathematical Statistics, College Physics, Experiment of College Physics
		Materials Mechanics, Fluid Mechanics

(*continued*)

Table 1. (*continued*)

Professional standard	Knowledge and ability requirements	Curriculum and teaching
	To master the relevant professional applied mechanics and natural science knowledge	Elasticity Mechanics, Electrotechnics
	Master the basic economic analysis techniques and systems engineering professional analysis methods	Mine Design Principles, Mining Engineering, Mining Economics
	Have a certain degree of modern enterprise management quality, mine safety and other environmental safety standards and management system	Security Analysis and Management of Tailing pond, Mine Managing Production, Mine Environmental Protection and Reclamation
Master the basic theoretical knowledge and professional core knowledge related to the exploitation of metal deposits, have systematic experience in engineering practice, understand the current situation and trend of the forefront of the professional development	Grasp the basic theoretical knowledge of metal mining	Mining Geology, Rock Mechanics, Rock Drilling and Blasting Engineering
	Master the professional core knowledge related to mining	Tunnel Project, Underground Mining
		Open Pit Mining, Mine Ventilation and Safety
	Possess the ability to solve practical engineering problems with professional basic theory and professional core knowledge	Professional Comprehensive Practice, Design for Graduation, Rock Drilling and Blasting Engineering, Tunnel Project
		Open Pit Mining, Mine Ventilation and Safety
	Experience with mining companies practice learning	Professional Comprehensive Practice, Design for Graduation, Rock Drilling and Blasting Engineering, Tunnel Project
	Can understand the research status and development trend of mining science	Underground Mining, Open Pit Mining, Mine Ventilation and Safety
Have engaged in mining engineering design and related engineering experiment capabilities, and be able to analyze the experimental results	Master the basic knowledge of design engineering experiment	Observation in Workshop, Production Training, Graduation Practice
	To understand the basic methods of scientific experiments, master the principles, methods and skills of related geotechnical experiments and consolidate the knowledge they have learned. To train students to master the principle, method and technical implementation of rock slope stability test of mine slope, mine underground roadway and stope.	Department of New Mining Technology, Graduation Practice, Digital Mine

(*continued*)

Table 1. (*continued*)

Professional standard	Knowledge and ability requirements	Curriculum and teaching
	Verify the theory, consolidate the knowledge and deepen understanding, and improve students' ability to analyze and predict the stability of mine rock mass	
	Through the course experiment to enable students to master the basic process and implementation process of roadway construction, engineering blasting initiation network connection, the determination of blasting equipment parameters, to master the measurement method of meteorological parameters in the mine and the correct use of equipment	Drilling and Blasting Engineering Course Experiment, Mine Ventilation Course Experiment, Tunnel project Course Experiment
	Deepen students' understanding of theoretical knowledge, enable students to master the basic theoretical knowledge of metal mining more intuitively, explore the basic skills related to mining design, and general techniques of mine production management, and enhance their practical ability and ability to solve practical production problems	Underground Mining Course Deposit Experiment, Filling Theory Course Experiment, Open Pit Mining Experiment
	Master the basic knowledge of engineering drawing and methods, in the process of solving professional problems, be proficient in using modern computer information processing technology, with a certain degree of programming and computer graphics capabilities	Machinery Drawing, Programming in Computer Language, Mining Engineering CAD, College Computer Foundation, Mining Machinery

5 Conclusion

Engineering Education Accreditation is an important part of the implementation of quality engineering by the Ministry of Education. Through Engineering Education Accreditation, it is of great importance to improve the quality of China's higher engineering education, promote engineering education and international standards, and cultivate the qualifications recognized at home and abroad. To Engineering Education

Accreditation-oriented, from the training objectives of the mining profession, the Engineering Education Accreditation standards for the courses system and graduate service area of the mining industry, the three aspects of the courses system set up to improve the quality of mining professional education and training students in the mining industry development Adaptability, promote professional international mutual recognition, to enhance the international competitiveness of mining talent is not only realistic but also Engineering Education Accreditation-oriented teaching quality monitoring needs.

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Optimization and Practice of Talent Cultivation Scheme of "Regression Project" in Mining Engineering Specialty

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Abstract. In view of the problems that the training system of domestic mining engineering specialty is prevalent in the past for a long period of time, there are many problems such as lack of talent cultivation, lack of academic tendency, lack of teacher engineering and weak practice. Jiangxi University of Science and Technology learn from the domestic industry in the field of top institutions of high-end disciplines development concept and application-oriented undergraduate, vocational education orientation of personnel training ideas, through the construction of "school-based-the participation of the mine" and the "theoretical study - engineering practice - innovation and development" of the integrated curriculum platform, including the curriculum system, teaching content, practice, teaching operation, teaching materials, teacher training and management mechanisms All-round reform, carried out a diversified, cross-scale practice of exploration and innovation, formed a set of more complete and the implementation of the effect of improving the mining project compound talent training program. The effect of the implementation in recent years shows that the smooth implementation of the scheme can help the mining engineering graduates to complete the rapid transformation of the mining technology compound talents under the new situation and help to realize the training objectives of the outstanding engineers.

Keywords: Mining engineering · Talent training program
Excellent engineer training program · Engineering education certification
Innovation practice

1 Introduction

In recent years, with the continuous improvement of production technology and equipment level, safety and environmental protection requirements in the mining field, the employers' requirements for the quality of mining engineering technical personnel training are also rising. Mining engineering professional culture in foreign universities has greatly changed a lot over the past decade, the teaching content of the mining engineering design is in close contact with the demand of mining industry, emphasizes that mining enterprises participate in the university education [1, 2], the design of each course is formed by the unofficial contact between school teachers and mining colleagues. In the process of training, foreign universities attach great importance to the

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cultivation of students' engineering practice ability [3], and take the mining enterprises participating in higher education as important means to improve the comprehensive ability of graduates of mining engineering. However, in the domestic mining engineering training system there has been prevalent problems including single talent training mode, lack of industry adaptability and serious academic tendency, engineering deficiency of teaching staff and weak practice link for a long period of time in the past, which is difficult to adapt to the demand of mining enterprises for mining engineering and technical personnel in the new situation [4–6].

Jiangxi University of Science and Technology mining engineering was established in 1958, after steeling itself for more than half a century gradually it has established national specialties with certain influence in the industry and geographical advantages, it passed the first batch National Accreditation of engineering education among the mining industry, was approved the "excellent engineer training program". As for how to develop and improve program of mining engineering in the new situation, how to improve the necessary supplement during undergraduate teaching process according to the needs of the construction industry talent market professional knowledge system and comprehensive quality training module, Jiangxi University of Science and Technology explore the practice and innovation of diversification and cross scale, it absorbed the high-end development idea from top universities in the industry including China University of Mining and Technology, Northeastern University and other universities, at the same time it referred to application type undergraduate with distinctive characteristics in this industry, discipline development of the concept of high-end, training idea of vocational college oriented talents [7], it has formed a set of training program of compound talents which was complete and of which the implementation effect has been improved obviously.

2 Goal and Significance

2.1 Overall Goal

Adopt the means of 'three the same time' including the enterprise experts participate in the talent training program revision at the same time, participating in the theory and practice of teaching at the same time and participate in the mechanism of target evaluation management at the same time, through revising the training plan, innovating training model, optimizing the curriculum, updating the curriculum system, refining teaching contents and methods, strengthening practice, strengthening enterprise participation, realize the goal of making return project as the core, enhancing mining engineering majors' practice and manipulative ability, cultivating innovative and creative ability adopt the means of 'three the same time' including the enterprise experts participate in the talent training program revision at the same time, participating in the theory and practice of teaching at the same time and participate in the mechanism of target evaluation management at the same time, through revising the training plan, innovating training model, optimizing the curriculum, updating the curriculum system, refining teaching contents and methods, strengthening practice, strengthening enterprise participation,

realize the goal of making return project as the core, enhancing mining engineering majors' practice and manipulative ability, cultivating innovative and creative ability.

2.2 Implementation Significance

Optimization of professional training in Jiangxi University of Science and Technology mining engineering is based on a series of national teaching guidelines including the national engineering education accreditation, outstanding engineers training program, training plan and based on a practical exploration of training mechanism to change their educational ideas and innovating talents training mechanism. The smooth implementation of the scheme will help solve the mining engineering majors' problem of gap between basic theory study and industry application practice, and effectively improve the students' ability of engineering practice and innovative ability, enable them to be familiar with geological background of the working area, technical links including ore types, metallogenic mechanism, investment and development of mining, mining enterprises construction, mining process, quickly access to the enterprise technical personnel role, help mining engineering graduates to transform into compound mining engineering technology talents in the new situation.

3 Optimizing Contents of Talent Training Scheme

3.1 The Professional Training Goal

With the engineering education concept of 'face engineering, face the world, face the future', guided by the national economy and mining demand, cultivate mining engineering professional engineering and technical personnel with good humanistic moral quality, have the strong team cooperation ability, master mining engineering related basic theory, able to analyze professional theory and use knowledge to deal with practical problems, have ability of mining engineering project construction and operation practice, have strong innovation ability, good ability of interpersonal communication and organization, international competition ability, social service consciousness and entrepreneurial acumen.

3.2 Achievement Index of Personnel Training

Implement the optimized talent training program, the graduates of mining engineering should have the following knowledge and ability:

(1) Have higher quality of Humanities and Social Sciences, sense of social responsibility and professional ethics of mining engineering;
(2) Master the relevant basic knowledge of natural science and rich knowledge of economic management in mining engineering;
(3) Have the basic theory knowledge of mining engineering basic knowledge and mining engineering basic theories, master mining geology, mechanical mine, safe mining related basic theory and basic methods in the design of nonferrous metal mines and know the development status and trend of mining engineering;

(4) Have the basic ability of flexible application of professional theoretical knowledge and technical means to analyze and deal with practical problems in mining engineering;
(5) Familiar with the basic methods of literature retrieval, information retrieval and use of modern information technology to obtain professional knowledge;
(6) Have the ability to develop, research and design new technology, new technique and new equipment for mining engineering, and have a strong sense of innovation and entrepreneurship;
(7) Be familiar with laws and regulations covering design, production, operation and research of the mining engineering related fields, understand the general and specific policy of national and regional environmental protection, green mining and sustainable development, able to scientifically understand mining engineering field's position in the global economic and social development;
(8) Have strong interpersonal skill, language ability, organizational management ability and certain potential to be core backbone of the team;
(9) Have the correct attitude and career planning ability of lifelong learning and self sustainable development;
(10) Have a certain international vision and multi-cultural communication and cooperation ability.

4 Personnel Training Scheme

The basic idea of optimizing the mode of talent training: with national development, market demand as the goal, cultivating students' ability as the basis, combine highlighting scientific research with teaching, strengthen the link of practice teaching, carry out integrated teaching combined by 'produce, study and research'.

4.1 Training Mode

Use "three plus one" training mode for modular teaching which means learn the school public basic courses and professional basic courses for three years, learn and practice in the cooperative practice base or mining enterprise for one year. The technical and managerial personnel of mining enterprise fully penetrate the training process of students, collective sixth semesters and eighth semesters arranged are one academic year in total. During this period, students must participate with plan in the planning, design, construction, management, acceptance and all production links of the mining enterprise' process of project, and collect relevant technical data to complete the graduation project. The main practice links designed and independently set up by every core course 'base + professional + innovation' (practice inside and outside school are included) are in accordance with the 'Curriculum Guide + project driven' training mode, which means to choose the typical project cases suitable for teaching in mining enterprise cooperated and teachers' scientific research project. Use laboratory equipments which are similar to the engineering design, keep the teaching content and field engineering remain basically the same, enable students to quickly adapt to the identity of mining engineering technician, so as to shorten the probationary period, help to realize the goal of cultivating outstanding mining engineers.

4.2 Culture Method

Based on the ‘three plus one’ talent training mode, schools, mining enterprise continue to improve according to the dynamic demand of talents in the industry and the development trend of industry front end irregular personnel training program. In order to fully exercise the students’ fieldwork and application ability, cultivate students’ innovation consciousness and design ideas, the first two weeks during the summer of the fourth semester was for the cognitive visiting practice in the mining enterprise, enable the students to understand the nature of this profession, arouse the enthusiasm of students. And require the students to complete credit of the relevant curriculum modules prescribed by the training program in Jiangxi University of Science and Technology and mining enterprise the first seven semesters, in the last semester study and practice in the mining enterprise, and complete the graduation project.

The last term is set as the enterprise learning stage, implement double tutor system, each student is assigned a school instructor and business practice instructor, both of them are responsible for the whole process of the students training in the eighth semester, students learn specific enterprise training plan is set by two instructors after discussing, two teachers guide the students to complete the double coordination of graduation design.

According to the characteristics of mining engineering and the actual situation of mining enterprises, the whole practice module carries out teaching through the combination of centralization and decentralization. Enterprise learning stage mainly covers three aspects of learning content:

(1) Enterprise training. Contains the history and culture of mining enterprises, safety rules and regulations of education, mining and production process, the stope and practice work team, this part is mainly handled by mine human resources departments and enterprises mentor, school tutor participate in assessment and stage effect evaluation;
(2) Experiment and practice of specialized courses. This part of content is usually jointly implemented by the school teachers and the mining enterprise technical personnel, the purpose is to make part of the classroom practice content reproduce in the project site, deepen the understanding of students;
(3) Professional practice training. Including production practice, course design, graduation practice and graduation design, this part is mainly implemented by tutor of mining enterprise, the school instructor is responsible for tracking management and participate in the evaluation of final effect. Professional practice training is systematic learning of the related professional knowledge needed by specific mine production, and through the curriculum design, practice report and graduation design report and other assessment methods, train students to comprehensively use the knowledge they have learnt to solve practical problems in mining engineering, lay a good foundation for the subsequent occupation career development.

5 Implementation Effect

The experiment and practice teaching system in this training program makes training practical and innovative talents as its goal, closely combines theoretical teaching, experimental teaching and practice teaching, attaches great importance to the cultivation of students' innovation and practical ability. Emphasize overall planning and coordination arrangement of theory teaching and practice teaching, give full play to the advantages of experimental and practical feature of professional teaching, and comprehensively improve the level and quality of experimental and practical teaching, perform multi-level experiments and teaching and practice, construct experimental and practical teaching system built by the basic experimental platform, engineering practice and research platform, innovation platform (Fig. 1).

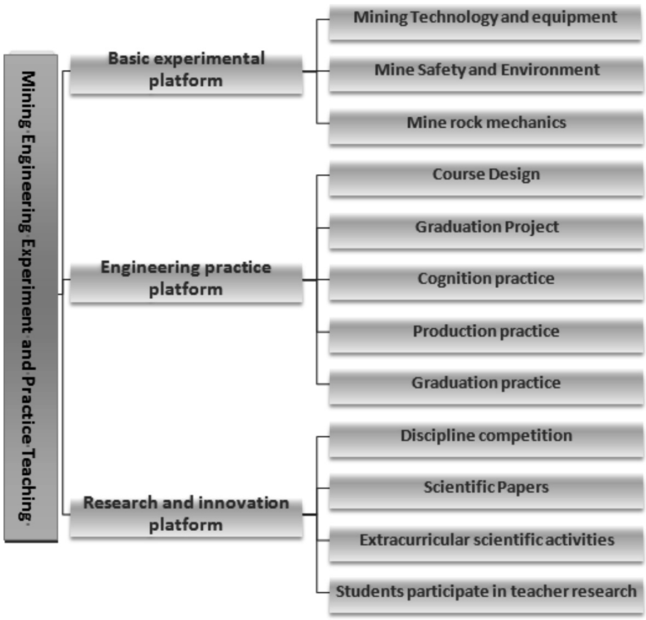

Fig. 1. Mining engineer experiment and practical teaching system

Professional personnel training program of mining engineering includes three major types of experimental and practical projects and integrate the experimental and practical teaching with scientific research. The implementation of projects such as "undergraduate tutorial system", "innovation and entrepreneurship training program for college students", "extracurricular science and technology competition for college students", "Research assistant program for college students" enable it possible to closely link the undergraduate experiments and practical teaching with scientific research. The program established experimental and practice project type of three levels of basic experiment (including demonstration experiment, verification experiment), engineering practice and research innovation, which emphasizes the proportion of fundamental, designing and innovative experimental practice.

In recent years, the application of mining engineering disciplines has led to achievements in scientific research, improvements in scientific research and experimental level of practical teaching as well as the introduction of advanced scientific research into experimental and practical teaching. For example, the self-developed "airflow meter correction instrument" is used for the mine ventilation, various types of airflow meter calibration in dust test courses, "The multi-point displacement meter of the surrounding rock" is used for the experiments in geotechnical engineering courses, "continuous monitoring instrument of intelligent acoustic emission " is used for the experiments of rock and soil stability monitoring in the laboratory, all these help to achieve a good experimental and practical teaching effect. The experimental teaching equipment is connected with the research equipment and scientific research equipment is accessible to undergraduate students, thus, the experimental teaching can be conducted in a smooth way and students can broaden their horizons. Through the implementation of projects of "undergraduate tutorial system", "extracurricular science and technology competition for college students" and other projects, students are encouraged to participate in scientific research projects, and their creative thinking and practical ability will be improved.

Mining engineering follows the development concept of "the interaction between school and business", actively make cooperation in running schools with large and medium-sized enterprises of high technological level and advanced equipment, and establish a long-term cooperative relations with Jiangxi Copper industry. In addition, it also built the long-term stable internship base. Mining engineering turns the problems after being handled and sublimated in the engineering practice into practical teaching project. It employs technical staff with practical experience as part-time teachers from the enterprise to explain the solutions of practical problems, to help widen students thought and improve their interests in learning. It combines the professional designed experiments and innovative special subject experiments with the actual production and technological innovation of the enterprises.

Mining engineering tries to set up a comprehensive professional practice courses to improve students' practical ability and innovative consciousness. The implementation goal of training plan for the excellent engineer fully considers the cultivation of the students' practice and innovation ability. The course of one credit is arranged at the end of the 6th semester. After completing the main course, the rest of courses is mainly student-oriented and provides special practice venues, the assessment method is submit their innovative practice works, the course requires the participation of all professional teachers, students are divided into 20 innovative practice groups with one instructor and five or six students in each group. Students are asked to submit practical works within one week. The contents of works are as follows:

Physical works: According to a mine, building the whole or part of the physical model (such as the development systems, ventilation systems, lifting systems, filling systems, water supply and drainage systems, mining methods, mining equipment, etc.) The specification of physical model should be submitted.

Digital works: Building a whole or a part of the digital model through the application of computer software, digital documents, brochures and paper printing materials should be provided.

Learning works: DV works of mining, mining animation, learning courseware, websites and other works. CD-ROM materials are required to be submitted.

By the end of the course, the professional assessment team will make evaluation and classification for students' entries, the evaluation level is divided into four categories excellent, good, qualified and unqualified. Then the assessment team shall recommend excellent works to participate in the professional practice contest national mining engineering.

6 Conclusion

The optimization of personnel training program of "returning project" is different from the previous personnel training model, teaching system and management mechanism. It is not just a simple three-year theory study at school and a year of practice of mining enterprise engineering, but according to national teaching reform of engineering education certification and excellent engineer education and training programs to grasp the overall construction goals. The program requires not only spending more time in the mining engineering practice, more importantly, integrate the concept of engineering education into the teaching system in mining engineering of undergraduate and carry it out in every aspect and process of professional teaching. Through the construction integrated curriculum platform joint personnel training mechanism of "school-based-with mine' participation" and "theoretical study-engineering practice-innovation and development", conducting all-round reforms including the curriculum system, teaching content, practice, teaching operation, teaching materials building, teachers training and management mechanism and nurturing the complex, applied talents with team spirit, innovation awareness and engineering capacity.

Cultivating graduates that meets the engineering and industry needs according to the optimized talent training program serves not only the nonferrous metals industry but also the local economic development. Personnel training actively adapts to the development needs of local industry, cultivate the quality of graduates that towards the grass-roots level, the practice and the project line and develop talents who are of solid foundation, practical and honest attitude. These talents are not only widely favored and put into an important position. Many of them has become executives and business backbone of enterprises. According to incomplete statistics, in recent five years, the proportion of graduates who chose to work in the local economic construction and non-ferrous industry as their first job has reached 94% in average. At least 10% of graduates have become middle-level cadres within five years.

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The Research of the Effect of Applying AR Technology in the Teaching of Higher Vocational Training Courses

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Abstract. Augmented reality is a kind of virtual reality technology. It can superpose the virtual view and the real view, enhance some objects in the real view, and make people have a more intuitive and realistic sensory experience. This paper first introduces the technical characteristics of augmented reality and the relationship between augmented reality technology and education, and then introduces the application of augmented reality in current education of 0–6 years old, K12 and other stages. The next we focuses on the training course of higher vocational education, Several experiments in the augmented reality-assisted training class were conducted. The feasibility of using augmented reality in training courses was discussed. The effectiveness of teaching was also analyzed. The advantages of using the augmented reality of learning aids to assist in practical training were analyzed. The article concludes with a conclusion that affirms the potential of augmented reality in education.

Keywords: Augmented reality · Education · Learning aids
Higher vocational education · Training course

1 Introduction

With the development of information technology, more and more new technologies are applied in education. With the help of information technology, people have made many breakthroughs in education. Augmented reality is a kind of virtual reality technology. Augmented reality is based on computer graphics and other disciplines. By calculating the user's current direction and position, adding the virtual information to the user's view of the real world in real time, augmented reality technology can be used to enhance some objects in the real view so as to enable the user to surpass the reality Sensory experience. By strengthening the practical teaching, the transmission loss of knowledge details in traditional education can be reduced and the quality of teaching improved.

Ivan Sutherland developed the first augmented reality system in 1966 [1] Sword of Damocles. The word augmented reality was first used by Tom Caudell and David Mizell in 1992 in the paper [2] Augmented reality: an application of heads-up display technology to manual manufacturing processes. Burdea G and Coiffet P in their book

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Virtual Reality Systems and Applications proposed virtual reality "3I" features [3], namely Interactivity, Immersion and Imagination.

The New Media Alliance [4, 5] has listed augmented reality as a new technology that has a significant impact on education in the Horizon Report since 2011 and has introduced the trend of influence of augmented reality technology to education in every horizon report in recent years. In addition, the change from "augmented reality" to "augmented reality" in the horizon report shows that more sophisticated augmented reality technologies have been applied to some aspects of education.

2 Relate Work

The earliest application of virtual reality technology to teaching was Billinghurst [6], which produced a "Magic Book," and the reader took a special glasses to see virtual 3D characters, objects and animations on the Magic Book. This practice enriched the contents of the book, and increased the fun of reading.

Hornecker and Dünserc designed an AR book [7] that allows children to interact with avatars in books through physical paddles, focusing on analyzing how children acquire knowledge and skills from the virtual world through an interactive process. Children were found to have performed better with the help of the digital virtual world.

Education researchers such as Cai and Zhang proposed the concept of an augmented reality learning environment [8, 9] in 2010, and published The Book of the Future, in which the pendulum and Newton's law in physics experimental production are selected into AR books and participated in the 17th Beijing International Book Fair in 2010. Cai S et al. through the production of convex lens imaging AR demonstration experiments and water molecules, diamond molecular composition demonstration experiments and applied them to physics and chemistry classes for eighth graders to prove that students' use of AR-assisted experimental learning is easier to grasp Knowledge points in the experiment.

In the mobile learning can be used for some unconventional teaching environment, outdoor, etc., users can use mobile phones and other mobile devices to interact with the external environment to complete the learning task. Furió et al. in 2013, they developed a series of augmented reality games for learning knowledge of tourist attractions [10], helping students to more easily remember scene details and stories of scenic spots.

In practical training, Bacca and Baldiris have developed a tag-based mobile AR application called Paint-CAR [11] to support the repair of automotive lacquer in automotive maintenance training courses, a training session of teaching, and through the use of the program's teaching results, cross-sectional assessment of the teaching and research had be developed. Chen Xiangdong, Qiao Chen designed a circuit based on augmented reality appliances, students learn the manual by reading, you can operate their own instruments, through the learning camera to shoot a specific circuit board, you can display the school's display On the display of 3D AR teaching animation, training teaching practice more secure and flexible. BMW also independently developed a teaching system in 2014, "BMW Repair Glasses" [12], which can guide the maintenance staff to interact with the teaching system through sound. In the process of BMW assembly teaching, the glasses superimpose the virtual animation on the images of real car parts. In this demonstration, maintenance personnel can intuitively understand each assembly step and complete the assembly according to the demonstration.

3 Design and Development

The target we show in this paper is to show the effect of Applying AR Technology in Teaching, so we Designed and Developed some AR-learning aids to assist it.

Unity3d is a cross-platform engine for creating games and applications developed by UnityTechnologies.Vuforia is an augmented reality SDK from PTC Inc. Using Vuforia + Unity, you can develop a variety of augmented reality applications based on the Android, IOS, Web, ARWear and other platforms.

The authors based on Unity and Vuforia developed a mobile application that describes the formation of an industrial Ethernet network, as shown in Fig. 1. The user can install the application on the phone, and use the phone's camera to shoot a specific training manual, then learn the industrial Ethernet networking process, and according to the requirements of the experimental operation. The application first takes advantage of the phone camera to capture the real scene in the camera and then Vuforia spatially registers the place where the virtual information is presented with a special marker with a feature point (pictorial on the training manual) and will eventually be made in Unity 3D virtual model is superimposed on the scene, the application of the working principle shown in Fig. 2.

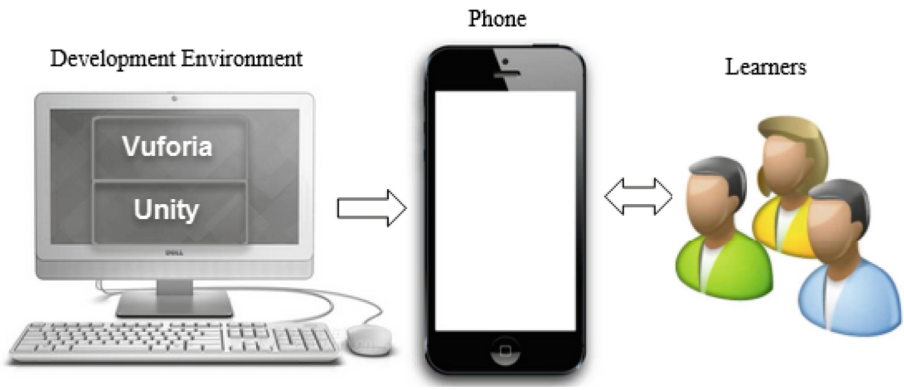

Fig. 1. The development process

In the same way, the author developed a mobile application that can be used in the teaching of computer network training course and made it into a set of training aids system according to the real-world training environment by using AR glasses of RealMaker's RealSeer DK1. As shown in Fig. 3. Users can wear RearSeer DK1 glasses through real training tools in real training environment to practice, the training system will identify training tools, and will use the operation of the tool in 3D animation superimposed on the appropriate position on the tool to guide the user training operation.

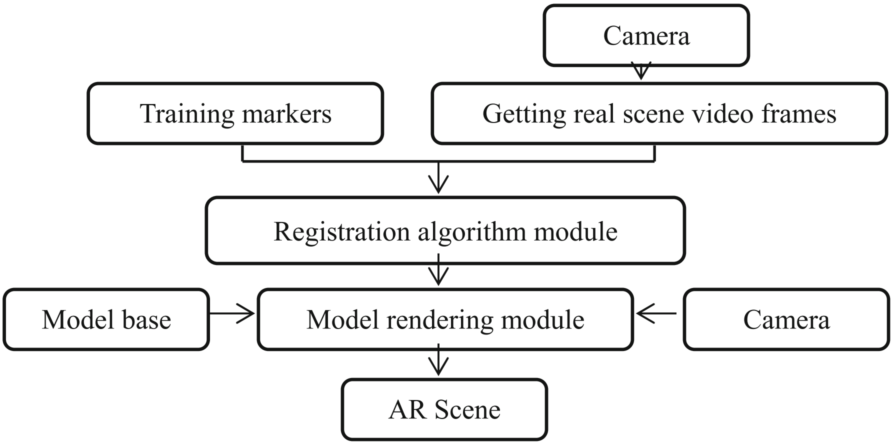

Fig. 2. Principle of the application

Fig. 3. RearSeer AR training teaching system

4 Test with Students

Due to the esoteric nature of the course "Building Industrial Ethernet", the process of building an Ethernet network is complicated and the safety requirements are high. Therefore, students need to be familiar with the principles and operating points before they can acquire the skills through simulated exercises. Using the AR mobile app, students used engineering to test students in higher education. Students first used the mobile phone to view the training manual in the training room and then reviewed the course principles and operating points through the AR 3D animation displayed in the mobile phone, as shown in Fig. 4 As shown. Finally, through the phone in the AR operation game perform simulation exercises, as shown in Fig. 5.

The author applies RealSeer dk1 glasses-based training aids system to the training course of "Computer Network Technology" course. During the test, students first wear RearSeer glasses and adjust the lens to the proper position, and then hold the operation tool and put it move to the field of vision glasses, teaching aids to identify tools, the 3D

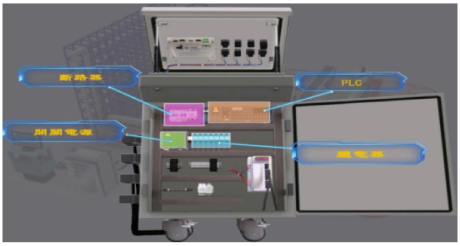

Fig. 4. AR technology shows the principle of building ethernet

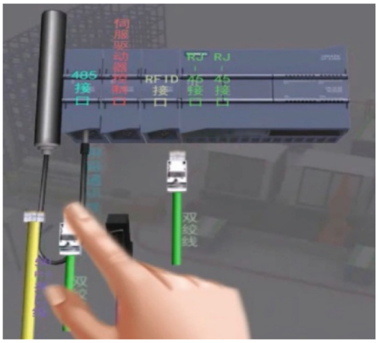

Fig. 5. Simulating exercises with AR games

teaching animation after distortion displayed on the lenses of RearSeer glasses. There is a yellow “sight” on the lens view, the students turn the head, the control of the yellow sight to virtual button to select which animation to play, as shown in Figs. 6 and 7. Finally, after viewing the teaching animation, students can push the lenses on the RealSeer glasses and perform the actual operation as shown in Fig. 8.

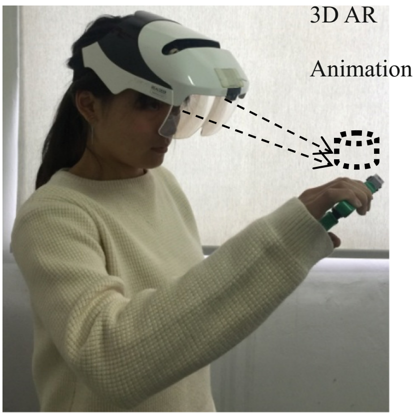

Fig. 6. AR view on tools

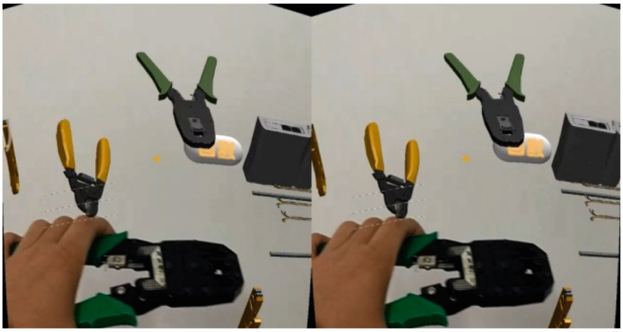

Fig. 7. The distorted AR view in RealSeer glasses

Fig. 8. Real operation practice

5 Results

Two experiments were conducted using the comparative method, the students were divided into two groups, one group using the traditional way of teaching, the other group using AR technology to assist teaching, after the end of the teaching on-site examinations, the results shown in Tables 1 and 2 Show.

Table 1. The result of "industrial ethernet construction" experiment

Group number	Test method	Passing rate	Remarks
1	paper	95.2%	Use AR-assisted instruction
2	paper	89.7%	Unused AR-assisted instruction

Table 2. The result of "computer network training" experiment

Group number	Test method	Passing rate	Remarks
1	actual operation	87.8%	Use AR-assisted instruction
2	Actual operation	82.1%	Unused AR-assisted instruction

The questionnaires were issued after the test in both experiments. 103 valid questionnaires were collected and the effective recovery rate was 98%. The survey results show that the teaching methods using AR technology are highly satisfied.

6 Conclusion

The AR technology is still in its early stage of development, it still needs special equipment and specific environment to assist the teaching process. At present, there are not many interactions that can be achieved during the teaching process [13]. However, according to the above example, AR technology in education has been involved in all stages of 0–6 years old, K12, higher education, involving many aspects of theory, practice teaching, the potential for application is huge, and with the development of AR technology, will continue to education zone To continuous, lasting changes in the future AR technology can also be combined with artificial intelligence, things and other technologies to design better teaching cases.

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Html5 Web Design Course Teaching Research

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Abstract. Html 5 network technology has become the mainstream of today's era of open front-end network platform technology, vocational colleges to adapt to today's new forms of network technology, a new era of requirements, the study of teaching related courses is very necessary, this article Html 5 Network Course. In the teaching of the role of doing an important exposition, a reasonable arrangement of the course from the relevant teaching methods is the top task of the relevant professional teachers.

Keywords: Html 5 · Browser · B/S structure

1 Introduction

Microsoft MIX2010 conference in March 2010, Microsoft engineers introduced Internet Explorer 9 browser at the same time, also made the future will enter the era of Html 5. He explores the development of the Internet from a development perspective into three phases [1]. The forthcoming Html 5 is the third phase - rich graphics content and rich media content phase, and website development is about to usher in a new era. Therefore, colleges and universities on the network development courses to adapt to the new era of new environment requirements, Web-based Html 5 teaching design is very necessary.

2 Web Design Course Professional Goal

Html's goal is to be able to create a more simple Web development process, code writing more concise and more efficient, compared to the previous Html version, Html 5 provides more attributes more elements, greatly expanded the Html function itself. In the current Internet B/S structure era, Html 5 rich Internet applications can improve the user experience, is the first choice for Web design and development, and is also the first choice for college Web design-related courses.

3 In the Past Related Issues of Professional Courses

3.1 The Course Content and the Development of Real Technology are Seriously Out of Line

In today's era of IT industry in every direction of the development are by leaps and bounds, web development, especially in the development of the previous paragraph

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also experienced too many Html version, and web-based browser is also very diverse types, commonly used include Internet Explore, Google, Firefox, Safari, Opera, etc. Web browser [2]. Developers in the process of developing the corresponding web page program, not only to learn the relevant knowledge of Html, but also to understand whether the relevant code can adapt to commonly used browser. The previous course is mainly to explain the theoretical knowledge-based, related technologies in the network adaptability and scalability and did not spend too much space to introduce the students in the past after learning the lessons, in their own independent preparation of the application when found, many of the attributes and elements of the previous study no longer apply, the commonly used browser is no longer supported by the learning content, resulting in greatly reduced interest in curriculum learning [3].

3.2 Knowledge Points are Too Loose

Previous web design courses because of the Html version of a large number of grammatical inconsistencies between the compatibility of the site leading developers to learn knowledge points are too scattered. Teachers in the process of explaining the course will appear knowledge fault, students also encountered in the learning process cannot connect the relevant knowledge problems, the learning effect of the course is very low.

4 Html 5 Course Advantage

4.1 Adapt to the Requirements of the Times

Html 5 course in Internet-related knowledge, especially the Internet common standards will have a uniform standard, this is also an urgent requirement of the times, before the course of light to explain the compatibility of Web browser before wasting a lot of time, Html 5 course Students will be introduced to a mature web application platform where video, audio, image, animation, and computer interaction are standardized and teachers do not need to spend too much time explaining non-standardization issues, Knowledge point construction is very clear.

4.2 Improve the Lack of Previous Courses

Html 5 is not a new course,it does not require teachers to prepare a new teaching plan, but based on the original curriculum to make up for the past because of platform, browser compatibility bug caused [4]. The previous version of the syntax can still be used on the Html 5 platform, and Html 5 adds a lot of brand new structure-related elements, not only that, but also incorporates a variety of peripheral technologies including micro formats, barrier-free applications, Improve the lack of grammar in the past, improve the readability of grammar.

4.3 Good Interface with Other Core Courses

Before college web design courses are based on the PC platform, but the use of mobile phone platforms in today's society has become the mainstream, so mobile phone-based development courses are also popular courses in colleges and universities, and Html 5 curriculum developed web program, Not only introduced the development knowledge of PC platform, also introduced the relevant knowledge of mobile platform. Teachers introduce relevant knowledge of this course as well as other knowledge points in other directions. After learning this course, the relevant knowledge points can be generalized when students learn other core courses, such as mobile APP development course.

5 The Overall Framework of the Html5 Course

As shown in Fig. 1, Html 5 has a complete structural framework [5]. Relevant web design courses offered by colleges and universities include the current knowledge of network openness, including the new tags included in css, svg, and Animation, etc. Element is the key content of the course, in order to adapt to the new era, new environment teaching requirements [6].

Fig. 1. The overall structure of the Html5 framework map

6 Html 5 Courses May Face Problems

Although Html 5 is the hottest web front-end development tool for the present and in the future, its role is not perfect [7]. There are some problems that teachers and students may encounter. The topics include the following:

6.1 Browser Compatibility Issues

It is well known that the compatibility of Web browsers is very low. Developed web programs can run on one browser, but not necessarily on the other browser [8]. The problem is that the previous specifications are not uniform, or no standardization caused. Html 5 appears to solve this problem, but in view of the current development trend, the problem still exists [9]. If we want to solve this problem fundamentally, there is still a long way to go.

6.2 Grammar Documentation is Not Rigorous

Html 5 version before Html 5, the structure of the document is not clear, such as the <div> element, too much use of the element will cause the program cannot distinguish between the text and title [10], that cannot see the document structure. Html 5 is a good solution to this problem, but it is also compatible with the syntax of the previous version of the reason, the new syntax and the old syntax can be used, coupled with the high degree of freedom of grammar [11], if not in accordance with a uniform standard is very easy to write Cause the program readability is low, non-developers cannot understand the situation [12].

7 Conclusion

Although the current development of Html 5 is still far from the expected goal, it is an indisputable core course for the university's current network-related direction. Teachers in colleges and universities cultivate students' interest in Html 5 online courses and enrich their own networks Knowledge, and targeted education of students related to the network of professional skills, improve students' ability to network development, training a group of professionals with computer application talents to meet the needs of employment [13].

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The Application Research of SPOC Mode in Mobile Terminal Application Development Course Teaching

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Abstract. SPOC, “MOOC + CLASSROOM”, is a kind of teaching solution that uses MOOC resources for small-scale and specific groups. It can combine the advantage of face-to-face classroom teaching in traditional class with the advantage of on-line communication. Taking APP Inventor programming teaching reform as an example, the teaching mode of SPOC was constructed from four aspects of pre-class analysis, resources design, learning environment and activities design on SPOC platform. It can be seen that SPOC platform has changed the traditional teaching mode and teaching method, integrated the network video resources, realized the online and offline teaching.

Keywords: SPOC · Online · Teaching mode · Teaching method
Courses resources

1 Introduction

With the development of a new generation of information technology represented by mobile Internet, Internet of things and cloud computing, huge changes of teaching philosophy, teaching objectives, teaching objects, teaching mode, teaching methods, teaching process, teaching media, etc. in college education have taken place in many ways under the impetus of information technology. Traditional classroom teaching can’t meet the needs of students’ teaching. SPOC is an innovative teaching theory in the information environment, which subverts the traditional teaching process.

2 SPOC

SPOC (small private online course), “MOOC + CLASSROOM”, is a kind of teaching solution that uses MOOC resources for small-scale and specific groups [1]. The basic form of SPOC is to use MOOC lecture video or on-line evaluation to assist classroom teaching in traditional campus classes, which uses mixed teaching to combine MOOC and traditional campus classroom teaching. The core philosophy of SPOC is that to tell me, I will forget; to show me, I may remember; to involve me, I can understand. SPOC applies MOOC’s teaching resources online to students on a small scale, making up for

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the shortcomings of MOOC effectively, such as videos, materials, quizzes, online assignments, forums, etc. [2]. As you can see, SPOC is the blended learning, combining On-line learning and offline-line learning.

3 The Characteristics of Mobile Terminal Application Development Course

Mobile terminal application development courses include JAVA programming, Android applications and development, mobile terminal system development, APP Inventor programming courses. It has the following characteristics: the more content, the less time, the abstract theories, the strong practicality. The traditional teaching focuses on explaining the theory, unifying teaching content, the uniforming teaching method, the light practice. The student has the low enthusiasm and the poor practical ability. When SPOC is applied in the teaching of mobile terminal application development, students can self-learn before class, discuss with teachers and classmates in class and after class, or discuss online according to their own actual situation. Thus students' initiative and practical ability, creativity are improved greatly.

4 The Application Research of SPOC Mode in Mobile Terminal Application Development Course Teaching

(1) *Pre-class preview*

Pre-class video learning is the basis of SPOC teaching mode. Video knowledge provides the basic knowledge for classroom teaching, and the quality of learning impacts on classroom training directly. First of all, according to the characteristics of this course, teaching objectives and knowledge, the teacher arranges teaching activities, designs each class of basic theoretical knowledge points and training exercises.

Then, the teacher makes the theoretical knowledge into a streamlined video and uploads it to the cloud computing network teaching platform, arranges the students to watch the teaching videos and complete the training and quiz of the knowledge points. in accordance with the teacher's learning tasks, combining with individual needs, the student can learn selfly [3]. Good foundation students can speed up learning, poor foundation students can slow down or watch video learning repeatedly.

(2) *Classroom teaching*

In SPOC teaching design, the leading and the organization is the teacher, the main is the student. Teachers should guide students to think about the problem divergently, and participate in class discussions and learning activities actively. In teaching, teachers should pre-arranged learning activities to guide students and complete their learning tasks actively. In the process, teachers should add some interesting learning activities, divergent problems, and teamwork learning activities. Through group discussions, group competitions, debating competitions, brainstorming and other forms, the learners learn knowledge in practical activities and cultivate team spirit.

(3) *Consolidating after-school*
Strengthen exercises after-class are a continuation of classroom teaching. The students mainly complete homework assignments after the traditional teaching. However, after-classroom teaching methods based on the SPOC platform have various means to increase the interaction between teachers and students, and among students [4]. For example, when students can't understand the knowledge point after learning a knowledge unit, you can watch the video repeatedly. Online testing after-class can consolidate the knowledge learned, and have played a very good effect on consolidating knowledge.

5 Taking 《APP Inventor Programming》 as an Example to Design a Case

This research takes the mobile communication specialty of a university in Wuhu as an example. It applies the SPOC mode under the mixed learning environment. There are 60 students in this major. the teaching time of 《APP Inventor programming》 is 16

Table 1. 《Designing the User Interface.》 course learning activity design form

Credit hours	Learning content	Learning target	Activity form	Learning activities design	Main body	Activity level	Activity evaluation
6 h, a total of 270 min	Chapter III: Designing the User Interface. There are seven sections of this chapter: Declarative Design, Create Startup Interface, Use alternative resources, Implement dialogs, Apply themes, Add menus, Add settings	(1) To master the various steps of the user interface design (2) To master the use of log messages debugger (3) To master the use of debugger to debug programs (4) Students report, exercise their expression skills and teaching ability	Pre-class: E-learning platform and activities after class	The students browse the video resources on the learning platform and the expand ing information to complete the test questions	The students	To understand; To apply	The students design the user interface, report team performance, and complete testing online
			Classing: Teachers teach and organize group work in multimedia classrooms	The teachers use examples to explain declarative design, create startup interfaces, use alternative resources, implement dialogs, apply topics, add menus, and add settings. Students practice operation, discuss in group	The teachers and the students	To understand; To apply; To Evaluate To anti-think	
			After class: online learning platform	The students complete unit test online, discuss the difficult points in the ion area online	The students	To understand; To apply; To anti-think	

weeks. This study selected the third chapter "design user interface" for teaching design is shown in Table 1.

(1) *Pre-class analysis*
The students are in the next semester, with the basic skills of computer. The students also have greater interest and confidence in learning online. Before the class, The students browse the video platform and expanding resources pre-class to complete the relevant tasks. In class, the teacher will explain and organize reports in group.

(2) *Learning Resources*
The online learning resources include MOOC videos, 《the APP Inventor Programming》 video course produced by the faculty team from xuetang X and electronic materials.

(3) *Learning environment*
The course is conducted in a multi-purpose classroom, while students have computers, notebook PC and mobile phones to complete the operation.

(4) *Learning activities design*
The third chapter of this course is mainly conducted in the form of works submitted by students. The students design different interface contains what he learned in group, and then report the class works. And finally, the teacher comment, sum up and explain the emphases and difficulties. After class the students complete the test online. Teachers complete the evaluation of students based on platform information.

6 Summary

The main body of the classroom has changed. In traditional classrooms, the teachers are the disseminators of knowledge, and students are often in a position of passive acceptance. In SPOC classroom teaching, the teacher's role is transformed into a "director" of teaching activities and a "coach" of students, and the role of students is transformed into a proactive participant in teaching activities.

Teaching methods have changed. Traditional higher education teaching method is mainly teaching law, focusing on explaining, reading, and talking and discussing teaching method is very few, such as self-learning method is rarely used [5]. This teaching model leaves many students feeling dull and thus losing their interest. This kind of interactive learning by SPOC not only enables to explain students' incomprehensible knowledge, promotes the exchange of teachers and students, but also improves students' learning efficiency.

Teaching resources have changed. The traditional teaching resources are mainly teaching materials and teaching references, while SPOC is mainly based on the short and pithy teaching videos. Teaching videos are usually targeted at a specific topic, which the time is 5–10 min [6]. Through the media player, you can pause, playback and other functions, to facilitate students to take notes in the learning process and thinking, which is beneficial for student to self-learn, review and consolidate. When problems arise, students can also communicate with teachers and peers for help online.

Teaching environment has changed. The traditional classroom teaching is based in classroom, and the SPOC classroom is a combination of online and offline. The interaction in the classroom can be expanded to cyberspace [7]. The time and effect of interaction between teachers and students are greatly increased.

In general, the flipping classroom teaching mode based on SPOC not only has the successful place, providing the reference for the reform of the university curriculum, but also it has deficiencies, stimulating the researchers to explore in depth and improve the teaching mode of the university further.

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Teaching Experience for Non-computer Major App Inventor Program Design Course

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Abstract. APP Inventor is a visual programming software developed by MIT that can quickly develop android APP without code writing. In the traditional non-computer professional C programming language courses, students generally poor acceptance, teaching is not good. Now cultivate students' computational thinking by piloting in the non-computer major with APP Inventor as their first computer language course for students. At the same time, students in the learning process generally feel easy to learn, interesting, high degree of acceptance, and achieved good teaching results.

Keywords: APP Inventor · Computational · Thinking programming Interest UI

1 Introduction

1.1 Introduction of College

In higher vocational colleges, students have a low starting point and face many difficulties in programming courses. In the previous syllabus, the non-computer major in our college was mainly C in the course of programming, which was generally accepted by the students with unsatisfactory results [1]. Especially in professional animation, because the enrollment of students from art and cultural studies, weak, learning C is particularly difficult, and, due to the operation result C is under the DOS interface, student interest is not strong, emotional weariness heavier.

We design the application interface design as the main training direction in our professional animation department, so for students to master the necessary programming ideas is very important. UI designers with programming ideas can communicate better with the background programmers in the development team, but the UI designers themselves do not have to be expert in the details of developing the programs themselves, so long as they know the process of running them, so we use App Inventor as a programming language for teaching in the 2011 animation professional.

1.2 Introduction of App Inventor

App Inventor is a simple, code-free, rapid-developing, visual mobile application programming tool that inspires sand trains young students in computational thinking. Particularly, it is suitable for low grade non-computer major students in programming entry practice teaching.

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Animation students in the course of the learning process, you can quickly and easily develop Android applications, and it plays a role in promoting that interface design combined with the Android system to initially check the students make their own interface effects on professional courses [2].

2 Teaching Reformation of App Inventor Programming Design

Throughout the teaching process, we insist on "mission-oriented" various practical operations of the course content in a task-driven manner. In the process of teaching, we followed the order of tasks to realize to make it easier for students to more easily grasp the teaching content. In the teaching methods, we explain profound theories in simple language, do more experiments, stimulate students interest in learning, develop students programming ability [3].

In the course of teaching reform, we have done the following:

(1) Teaching and experiment synchronization
We think all teaching methods and teaching methods should be used around the purpose of improving students' abilities and qualities.
According to the characteristics of App Inventor, we developed a teaching syllabus, and wrote the experimental book "App Inventor Programming". Studying effort is better when students develop programs at class by teaching content and the experimental book real-time. Resource of this course is shown as Table 1.

Table 1. Resource of the course.

Course's title	Curriculum module	Cases	Key point
Quick development technology of App Inventor	Introduction	Structure of develop environment	Develop environment
		Cat-Man	Develop processing
			Basic component
	Basic components	Angle and radian	Textbox component
		A simple music player	Layout introduction
			Variables and strings
			expressions
			Selective structure
	Program flow	Finger-guessing game	Program flow
			Interface of game
			Naming rules; resource loading
			Design of the game

(*continued*)

Table 1. (*continued*)

Course's title	Curriculum module	Cases	Key point
	Computer digital image design	Drawing board	Interface design of drawing board
			Draw lines and circles
			Clock and random coordinates
			Finger painting
	Multi-screen control	Virtual Beijing	Multiple screens in the interface
			Table layout
			Horizontal list box
			How to start multiple screens
			Implementation of listpicker component

(2) Reform the examination method
Flexible and diverse assessment methods are used to present the evaluation results quantitatively. Such as daily attendance, homework, class notes, on-board experiments and other comprehensive assessment, no longer organize exams in the form of papers, students ultimately need to submit the work by way of grading, learning and application of innovative students to encourage and add grades [4].
According to the traditional programming courses, the students' scores mainly depend on the written test results. After carrying out the assessment reform, if the student work has been submitted to the Android software store, we will give scores based on downloads work. Creativity and innovation are important parts of the overall evaluation system. The level of student achievement depends on the applicability of his work.

(3) Combination of professional courses, reflecting the professional characteristics
According to the characteristics of animation professional, the interface layout, icons, animation, color matching, fonts and other aspects of strengthening requirements, emphasizing the beauty of the application software interface.
According to the works I received, I compared the procedures submitted by computer other related professional students. The advantages of animation majors are very obvious both in layout and in interface colors and texts.

(4) Develop student programming interest and accomplishment
App Inventor is easy to learn and easy to implement, allowing students to turn ideas into reality as they learn. In previous professional animation creation of C language programming courses, students generally react learning difficulty, they do not know what the role of learning C, poor experimental results. After opening

an App Inventor course, students have a high level of interest and accomplishment as 90% of students complete the experiment on the spot and run smoothly on their mobile phone. Throughout the teaching process, students enthusiastic questions and have a strong reaction. Some students have also developed a creative work.

3 Teaching Experience of Course "App Inventor Programming" for Student with Non-computer Major

In response to the teaching of App Inventor in animation major, we got the following experience:

(1) For non-computer professional programming courses, mainly to cultivate programming thinking.
(2) We should be combined with professional characteristics, choose to reflect the characteristics of professional language, so as to better serve the professional goals, and the willingness of students to accept more intense.
(3) The programming language should be chosen to avoid too much difficulty and too much depth to avoid causing students' fear and excitement and to make students feel tired of learning when they are exposed to programming.
(4) In the teaching process, we must be distinguished from the computer class lectures.
(5) The advantage of App Inventor programming is that it is simple, fast and convenient, and the students have a high degree of acceptance and the interest is strong. The disadvantage is that by way of building block programming, students do not have enough understanding of programming ideas, especially when writing circular structures or conditions, they often encounter difficulties, the overall concept is not strong.

In response to App Inventor's teaching experience, the School Affairs Department will have a planned App Inventor elective for all non-computer professionals this year. We will also make some improvements based on this lesson experience.

(1) Case of continuity and expansion. In these years of teaching, we has accumulated some curriculum resources and materials. The version of APP Inventor is also in a state of rapid update. The old case needs to be improved and expanded to accommodate the new version, and new cases need to be developed to reflect the new application.
(2) Due to APP Inventor server problems, sometimes there will be unable to log in, in response to this problem, we will be set up servers in schools to solve platform problems.
(3) In the teaching process, we will also emphasize the integrity of programming ideas. Through an explanation of each example, try hard to explain the goal, sample design idea, design steps and reasons for doing so in order to prevent students from going through the teacher's diagram to do the work one by one, but they does not know how to start the situation when they meet a new assignment.

(4) For different professional students, we write teaching syllabus and curriculum resources that accord with their own professional characteristics, make APP Inventor not only beneficial to student's program thinking, but also to students' professional courses.

4 Conclusion

The characteristics of higher vocational education determines our training mode, that is, learning to use, for non-computer programming courses, without too much difficulty, as long as simple enough to be able to achieve the teaching objectives. Allow students to learn in the interest, to play, feel the joy of programming, which reached the purpose of our App Inventor this course.

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Promoting the Hands-on Skills of Engineering Students by Blending Practice Teaching Method

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Abstract. Modern university has been from elite education to mass education, how to implement the quality education and cultivate students' practice ability and innovation ability are always a question that needs the constant research by universities and colleges. Taking the mining engineering as an example, the existing shortcomings in practice training were analyzed, on this basis, a blending practice teaching method combining modern computer technology and traditional experimental means was proposed, and then, the possible application directions in mining engineering were pointed out, and issues required attention were discussed. The conclusions show that new blending practice teaching method not only can make up for the deficiencies of the traditional laboratory method, but also can train more students at the same time and improve better hands-on skills of students. So, it is a effective teaching means conforming to modern education philosophy.

Keywords: Blending practice teaching · Manipulative ability
Numerical simulation · Mining engineering

1 Introduction

With the continuous development of social economy, higher education in our country has also achieved the transformation from elitism to popularization, which has led to the dream of universities among thousands of families and students, and it is of great significance to comprehensively improve the overall quality of China and improve the overall competitiveness of our country. However, disturbingly, a large number of students have the phenomenon of strong theoretical calculation ability, weak practice ability, and strong imitation ability, weak innovation ability, resulting in the trust of the enterprise on education is continuously decreasing, which is more common in engineering colleges or engineering majors. The author believes that the reason for the above situation is the lack of practice teaching. In fact, the purpose of engineering major is to cultivate the senior engineering technical personnel who have some practical application ability in the corresponding engineering field, but practice teaching is often restricted by funds, venues, professional factors, safety and so on, which made the practice cannot

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meet the training requirements [1, 2]. With the continuous development of computer hardware and software technology, the computer simulation methods or numerical simulation techniques have been increasingly spreading in all fields of society, and research teaching is no exception [3]. Therefore, introducing the numerical simulation technique can make up for the inadequacy and shortcomings of practical teaching in some degree and has a great practical significance in teaching of engineering major.

2 Inadequacy of the Practical Teaching in Mining Engineering

For mining engineering, its research object is engineering geology with complex uncertainties. In order to improve practice and problem-solving abilities of students, achieve the requirement of students' engineering skills and abilities to innovate, it is important to take a definite proportion practical teaching courses. However, in the context of the rapid expansion of undergraduate students and the increasing security awareness, there are some following problems during the practical teaching courses arrangement:

(1) Indoor experiment is watch more and operate less. Take the course of rock mechanics as an example, rock Mechanics is a compulsory course for the mining engineering students. The basic experiments of compression tests, tension tests and direct shear tests are important and basic teaching content, and which are required to use rock cutting machine, core drilling machine, grinder, for the reasons of safety and quantity of equipment, in general, students are forbidden to process the rock samples independently. So above experiments process have become demonstration experiments from operational test, students often watch more but do less and eventually they get limited knowledge.

(2) Mining practice is in the form. Cognition practice, production practice and graduation practice are required practice training to undergraduate students of mining engineering, which is an important part of cultivating students ability to operate, analyze and solve problems. However, due to the particularity of mining engineering and fearing of the occurrence of security incidents, many mining companies just arrange students to visit the mining facilities and processes symbolically, the result is more form than content, and it is impossible to make students master the specific production technology and parameters [4]. Based on this, it is not strange for many engineering students to have the strong faculty of theoretical calculation and the poor practical ability.

3 Application of Blending Practical Teaching Method

3.1 Blending Teaching

As a new teaching method, by combining the electronic and networked technology with traditional teaching, blending teaching can guide, enlighten and monitor the teacher's teaching process and fully reflect the students' initiative, enthusiasm and creativity as the center in learning [5].

3.2 Blending Practical Teaching Method Based on Modern Computer Technology

Blending practical teaching mainly refers to the combination of modern computer technology and traditional practice methods, which can avoid the deficiency of traditional laboratory and internship, and make the students achieve the goal of using every moment in class and outside to learn professional knowledge independently.

Nowadays, there are many subjects have their own modern computing simulation teaching software, for example, electronic power subject has electronic simulation software and Multisim 13.0 software and so on, the logistics system has three-dimensional logistics simulation software called AUTOMOD, and the finance and economics subject has simulated stock exchange, simulated futures trading and so on [1]. With continue develop of computer technology, the simulation software will be updated continuously, which will become more intelligent and realistic. As for mining engineering, numerical simulation can adapt to various teaching content.

(1) cognize of mining system

As is known to all, mining engineering is a very large and certain dangerous systems engineering, if you want to know the development, production, promotion and transportation of the whole underground mining, it is necessary to do a long workshop practice in the mine. However, at present the mines belong to dangerous industries in that accidents often occur, therefore, the Practice time is often not guaranteed because of the enterprise's safety management needs, and which reduced the cognitive ability of the students to mine system.

The metal mine simulation system is a set of visual teaching software based on actual mine development. It includes the main parts from development to production to transportation, which can meet the students' basic understanding to the whole mine system and can be completed indoors [6]. On this basis, combining with a certain amount of workshop practice, it will make the whole mining practice achieve better results.

(2) rock fracture process

As stated in the previous article, research on the rock mechanical properties under pressure, pull or shear situation by indoor experiment are although visualized, but it's impossible to get all involved and capture rock failure process, in this case, the simulation can be solved by using rock real fracture process analysis software. When using this software for simulating conventional rock mechanics experiment, the rock sample size, loading paths, experimental steps are all consistent with the laboratory test, but the superiority is the process of cutting and machining to rock can be omitted, furthermore, the failure process and fracture development of rock samples can be observed in detail, which are not done in a conventional laboratory test. So, the simulation method is not only reduces the workload but also ensures experimental safety, and it also achieves the purpose of teaching [7, 8].

(3) slope stability
It is very important for safety production and economic benefits of open-pit mine to ensure the stability of slope, once the slope is unstable, it will bring immeasurable losses to the mining enterprise. In order to exactly understand the degree of slope stability and master the possible scope, instability mechanism and effective prevention and control measures of the landslide, carrying out the similarity simulation experiment is one of the effective ways [9]. However, similar simulation experiments are time-consuming and laborious, and difficult to be exactly similar to the actual situation. Using numerical simulation software will solve this problem, and more importantly, by changing engineering excavation steps and material parameters, a variety of different calculation schemes can be analyzed lightly, and the results are more image and intuitive, which are not comparable to indoor similar experiments. There are many softwares in this field, including Lizheng, geo-slope, FLAC2D/3D, 3DEC, etc.

(4) underground pressure disaster
In the process of underground mining, because natural equilibrium of rock mass is broken, so a series of ground pressure phenomena appeared constantly, and then resulting in mine disasters occurred one after another, such as: roof falling, rock strata movement and surface subsidence. The point is that these disasters are irreversible and losses caused by the disaster cannot be recovery, therefore, it is not realistic to conduct local industrial experiments without research. Numerical simulation can make up for these deficiencies by precomputed analysis, softwares like UDEC, 3DEC, FLAC2D/3D, 3D-sigma, ANSYS, etc. are all having above function [10].

3.3 Considerations for Using Numerical Simulation Teaching

Using numerical simulation to assist practical teaching, while playing the powerful functions of modern electronic technology, there are other issues to be concerned about.

(1) Although the numerical simulation can well simulate the all kinds of conditions to finish different experimental contents, but the whole test processes are completed by computer after all, and students have no real sense of operation. In addition, due to a low cost of error by computer technology, it is easy for students to develop a careless habits.
(2) Students need to be actively involved. The combination of numerical techniques and traditional teaching methods can stimulate students' interest in learning, lead students from passive learning to active learning and enhance comprehensive ability of the students.
(3) Numerical simulation is only a teaching method, mastering the core content of the course is still the first element of the student.

4 Conclusion

Apart from teaching basic knowledge and basic theory, the cultivation of practical ability and innovation ability is also an important content of education. But, the achievement of innovative ability requires repeated practice, blending practice teaching method can complete different experiments safely and conveniently, and practice exercises are not limited by time, space and equipment conditions. Therefore, blending practical teaching method based on modern computer technology is an advanced teaching method and should be strongly advocated.

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Reform of Practical Teaching System for Metallurgical Engineering Undergraduate Course Under New Engineering Background

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Abstract. Reform of practical teaching system for Metallurgical engineering undergraduate course under new engineering background emphasize on the construction of practical teaching. The practical teaching system in the process of knowledge foundation, application and innovation was realized by specialized experiment teaching, the construction of enterprise internship base and practical teaching platform of innovation education, which cultivate the specialized comprehensive quality, ability of practical application and innovation spirit of students better. It will cultivate high-quality specialized engineering human resource and eventually enhance the competence of Metallurgical engineering students in our university.

Keywords: New engineering · Reform · Practical teaching

1 Introduction

It is not only a period that economy and society have developed rapidly but also a period that high education and scientific research have developed rapidly in recent ten years. Internationally, undergraduate education development has become the strategic choice of many countries to drive the innovation development and enhance the international competence. The model of undergraduate education in our country hasn't adapt to the diversified requirement of the development of economy and society, students are scare of innovation and practice ability especially which hinder the promotion of cultivating students.

At present, the undergraduate educational model of metallurgical engineering in our school pay much attention to teach specialized knowledge inherited form early thoughts, emphasizing on the learning and promotion of theoretical knowledge but the abilities of innovation and practice are neglected. As a result, the undergraduate education model which connect tightly with cultivating the abilities of profession developing. At present, the undergraduate education of metallurgical engineering in our university is evaluated mainly based on the specific performance such as the academic performance during at school and research output of students and so on, it neglects the elements such as engineering ability, development potential, specialized adaptability and innovation and entrepreneurship ability and so on.

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As the reform of undergraduate education in our university is deepening, the cultivation system of metallurgic engineering innovation human resource is urgently needed to promote the specialized quality and engineering ability and cultivate the innovation ability. Hence, the teaching system of metallurgical engineering must be transformed to practical teaching which plays an important part in the cultivation of practical human resource and practical operation ability, problem solved ability and innovation spirit of students, it can't be replaced by theoretical education [1].

2 The Existing Problems in Practical Teaching and the Necessity of Reform

The foresting program emphasize on the practical teaching to cultivate the specialized comprehensive qualities, practical application ability and innovation spirit of students [2]. But as the expansion of university, the number of students have increased rapidly, the primary practical teaching system has no longer adapted to the current situation [3] because of the development of metallurgical technology. At present, the main problems in the process of practical teaching: (1) the construction of laboratory is neglected, it can't satisfy the demand of major basic experiment; (2) it's difficult to construct internship base, the demand of production practice and graduation practice can't be satisfied; (3) it is scare of innovation education which make the cultivation of comprehensive quality meet the bottleneck [4, 5]. Hence, the metallurgical engineering practical teaching system must be reformed and optimized.

3 The Construction and Optimization of Practical Teaching System

The metallurgical engineering practical teaching includes experiments (curriculum basic experiment and specialized experiment), design (curriculum design and graduation design), paper and discussion (classroom discussion, seminar and paper) and so on. According to the character of practical teaching, the practical teaching has been modular to cultivate corresponding abilities and construct and optimize the practical teaching system. The first section is specialized basic practical teaching which cultivate the practice ability of students includes experiments (curriculum basic experiment and specialized experiment) and design (curriculum design and graduation design); the second section is specialized knowledge applied practical teaching which cultivate the practical ability of students includes internship (metalworking practice, perceptual practice and production practice) and new additional specialized investigation; the third section is the development of qualities for metallurgical engineering and practical teaching of comprehensive quality for promotion, that is innovation education which cultivate the innovation spirit of students includes paper and discussion (classroom discussion, seminar and paper) and new additional research practice (scientific paper writing) and so on. The practical teaching in the progressive process of specialized experiment, factory practice, and innovation education was presented to cultivate the operation ability, practical ability and innovation spirit of students, and to promote the comprehensive quality of students. Optimized practical teaching system as shown in Fig. 1.

Lab teaching platform, construction of internship base and innovation education platform are the key points of practical teaching system, but the neglect on construction of lab, shortage of internship base and innovation education have become the prominent contradiction of the practical teaching process. Hence, the construction of practical teaching should be taken as an important part of the establishment and optimize of practical teaching system. First, the level of experiment teaching should be promoted to cultivate the operation ability through teaching process such as curriculum experiment, intensive experiment, curriculum design and so on. And then the construction of internship base should be enhanced to cultivate the practical ability of students through factory practice such as metalworking practice perceptual practice and production practice and so on. And the innovation spirit of students is eventually cultivated through independently thinking and researching activity which is conducting special lecture face to students, scientific writing and scientific practice and so on.

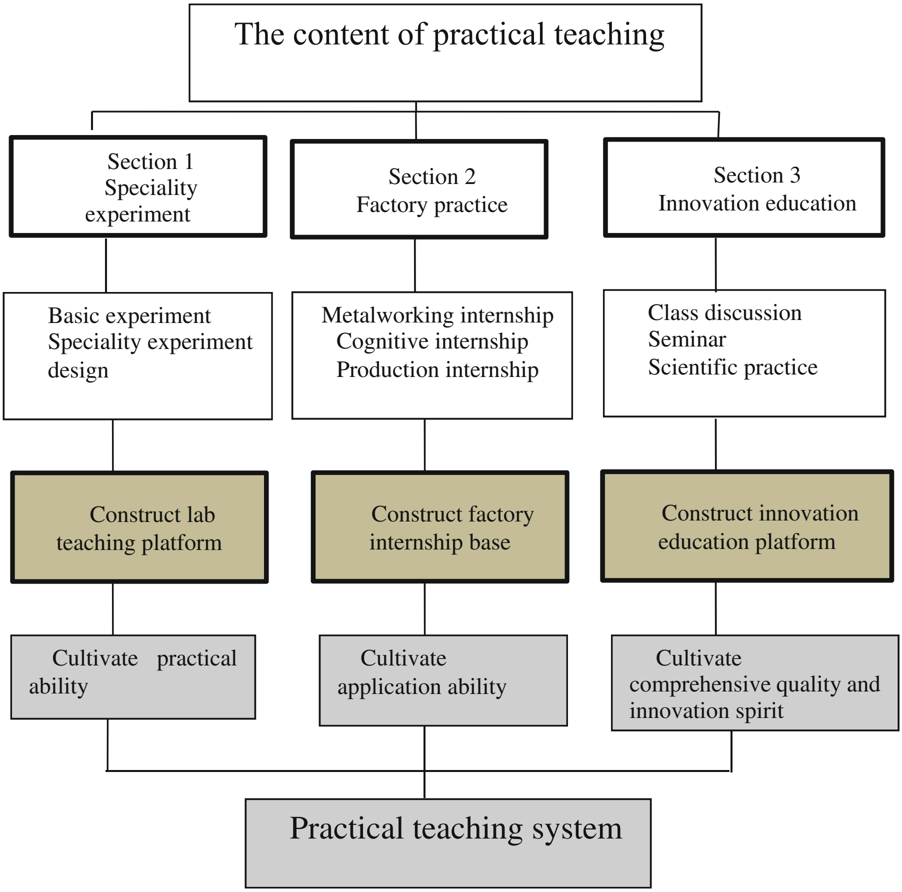

Fig. 1. The basic framework of metallurgical engineering practical teaching system

4 The Measures and Implements for Reforming Practical Teaching System

4.1 Enhance the Construction of Practical Lab Teaching Platform

Most of the experiment course are replication experiment based on classroom teaching (basic course, specialized basic course, specialized course), which is important teaching methodology of promoting basic specialized experiment skills. The goal of practicing of basic specialized experiment skills is to make students master the basic theory and basic experiment skills, the most important part of teaching is the application of instruments, the standardization of basic operation and the comprehension of basic experiment phenomenons [6, 7]. It can be concluded that the construction of metallurgical engineering experiment teaching must be enhanced on three parts as follows:

(1) The input into the construction of specialized lab should be increased. Our university focus on constructing the specialized lab of metallurgical engineering, our university have finished the input and construction of "nonferrous metallurgy lab of metallurgical engineering", "physical and chemistry metallurgy lab of metallurgical engineering" and "steel metallurgy lab of metallurgical engineering" one after another since 2006. Large stock of experimental apparatus and analytical instruments were bought, the lab instruments of metallurgical engineering were advanced and the demand of students conducting experiments was satisfied. In the meantime, major in metallurgical engineering has received financial support from "the major investment projects of local university specialized lab" of state minister of finance, constructed the "basic experiment lab of metallurgical engineering" which satisfies the beginning of experiment course of basic experimental skills of metallurgical engineering. The lab and experimental apparatus fully satisfied the demand of students in conducting experiment. Because of the improvement of experimental condition, the undergraduate experimental teaching of metallurgical has obtained good results.

(2) The construction of teaching staff. From appointed person do the appointed job to make expertise do the job. College attaches great importance to the construction of laboratory teachers, but also optimize the teaching staff of experimental teaching. The original laboratory appointed teachers are responsible for experimental teaching, due to the number of appointed teachers in the laboratory much less than the number of students, it can't achieve the desired expectation when the appointed teachers have heavy tasks. College take full advantage of teaching staff of metallurgical engineering department, the specialized teacher is responsible for the experimental teaching together, due to that, the staff-student ratio raised three times. And because of that specialized teachers undertake the experimental task that they are good at, so the teaching result improved greatly, the degree of satisfaction of student reached 100%. In the meantime, our university conducted "the internship and practice of young teachers in factories" training activities in winter and summer vacation every year. Most of the newly introduced teaching staff have PHD degree, almost 50% of the teachers have the experience of working in production line, which guarantee an excellent teaching staff for cultivating engineering and technological human resource.

(3) The management of experimental instruments. Make sure the apparatus and instruments work and being shared normally, emphasize on maximizing the service efficiency of apparatus. Due to that the key point of teaching is the application of instruments, the standardization of basic operation and the comprehension of basic experiment phenomenon. The normal conducting of specialized experiment is guaranteed by the management of apparatus and instruments. Specific specialized teacher is responsible for the management of apparatus and instruments, especially the large-scale apparatus and instruments are managed by appointed person in special project, the teachers are responsible for the normally working of large-scale apparatus and instruments and that students use them properly. When students take part in research activities, the teachers conduct students to use the apparatus and instruments according to the research needs. The less the apparatus and instruments breakdown, the higher service efficiency we can get.

The experimental teaching plays an important part on teaching activities of colleges and universities and an important path for the colleges and universities to implement education for all-around quality developing. The cultivation of practice ability under theoretical conduction is an important part of cultivating basic qualities, and the practice ability is achieved by experimental teaching in lab. The students experienced the process from cognitive to verification through the specialized experimental teaching which is the foundation of practical teaching system.

4.2 Enhance the Construction of Internship Base Platform

It can offer more perceptual knowledge of production apparatus and production technological process, and provide the example of combination of theory and practice which will develop the cognitive ability of students and inspire the learning interest. The practical ability of students in metallurgical engineering must be valued, especially the ability of analyzing and solving problems on production line. Our university pay attention to the internship in enterprise, internship as the important process of practice deepen the knowledge learned in classroom, and the students can have a good idea of technological process, equipment, project and technical operation of modern metallurgical enterprise. It cultivates the ability of observing, analyzing and solving problems of students, and in favor of students learning experience of enterprise management and the spirit of working hard. In order to promote the engineering practical ability of students in our university, the connection with metallurgical enterprise should be enhanced, the construction of internship base should be attached importance to and the production practice knowledge of engineer should be taken advantage of. Constructing the enterprise internship base, taking full advantage of enterprise human resource and teaching the student knowledge of production which is complementary with the theory teaching in the classroom.

(1) The construction of internship base was enhanced. The construction of metallurgical enterprise internship has been enhanced since 2005. The Jianxi Copper Company, Fujian Sanming Steel Company, Zhuzhou Metallurgy Company, Jiangxi Xinyu Steel Company, Jiangxi Pongxiang Steel Company, Aluminum

Corporation of China Limited in Shanxi, Aluminum Corporation of east of China Limited which all have full metallurgy technological process have become the internship of our university. For example, the perceptual internship in Fujian Sanming Steel Company is to be familiar with the whole production process of metallurgy which includes stock yard, sintering, coking, iron-making, converter, electric furnace and steel rolling. The internship in Xinyu and Pingxiang Steel Company require the students to have deep learning in posts include blast furnace, converter and electric furnace to combine the theory with practical operation.

(2) The construction of teaching staff of enterprise internship base was enhanced. Our university take full advantage of enterprise human resource to teach the knowledge of production which is the complementary of specialized theory teaching in the classroom. All the enterprise internship bases are state-owned or local large-scale pillar industries of metallurgy enterprise which have integrated staff training system and its platform is enterprise staff training center. The staff training center is transformed by primary enterprise technical school and stand for the enterprise to arrange the practice activities which have the experience of management and teaching have improved the teaching results. In the meantime, the enterprise engineers are hired to teach the production process and introduce the production apparatus which half the work with double results.

(3) The enterprise internship safety management was enhanced. Practice safely which has been put into the first priority is the basic guarantee of internship. The safety consciousness was enhanced through the safe product management system of enterprise to ensure the success of internship. For example, the first thing of practicing in Sanming Steel Company is safety education in which the headquarters is responsible for the safety consciousness, the branches are responsible for the safety measures and the plants conduct the safe practice and safety management.

The construction of enterprise internship base has ensured the success of engineering practice activities which give full play to students' proactive and enhance students' engineering awareness and engineering practice and cultivate the abilities of comprehensive apply learned knowledge of students. The students have learned the enterprise production technology and relevant regulations of management through enterprise internship which is the process from "cognitive" to "practice" of students and the deepen reform of practice teaching system.

4.3 The Construction of Innovation Education Platform

The students experienced the process of cognitive, verification through the specialized experiments which is the foundation of practical teaching system. The enterprise internship is the practical process from "cognitive" to "practice" of students and the deepen reform of practical teaching system. The innovation education is the process from "practice" to "innovation" and the sublimation of practical teaching system. The two fundamental point of practical teaching system are the specialized experiments and factory practice which also satisfied the basic requirement of cultivating engineering technical human resource. Then the innovation education is the quality development education according to the talent and learning demands of students and the features of the major which satisfied the personality development and the aspiration of advantage promotion of students. The nature of innovation education is not to teach students how to exactly innovate, but to forest the awareness, spirit and abilities of innovation of students. And eventually inspire the desire of exploration and innovation of students. There are rules for specialized experiments and the construction of teaching platform of factory practice, but there isn't uniform way for the construction of innovation education platform which provide a proper conditions to help students develop the personality and promote personal advantage during the whole learning time in university [8, 9].

The innovation education is diversified and plentiful. According to the character of metallurgical engineering and tradition of our university, the characteristic quality development activities are conducted based on the foundation of learning demand of students which create a good learning atmosphere. The "undergraduate tutorial system" has been carry out which aim at the students have demand of promoting specialized knowledge in which students choose teachers in metallurgy department on their own and attend the research projects of teachers to investigate, work on a project, research and write papers independently. The "research activities of metallurgical enterprise" which is supported by university and lead by teachers has been carry out. The themes of investigation are chosen by students themselves, and the production technology, product sales market, new production and new technology are investigated by students going in the metallurgical enterprise. The reinforce of communicating and acquainting with metallurgical enterprise help the students to establish right employment view. The "technology activities of undergraduate" are carry out which are organized by students themselves. Excellent achievement has been obtained by encouraging students to attend the National College Challenge Cup. The "activities of metallurgical technology of undergraduate" are carry out which are lectured by experienced professor in metallurgical department and external experts and enterprise manager or plant manager. The students can take full advantage of the resource of provincial and ministerial engineering technology center in our university and social resource such as metallurgical enterprise. These activities have been carry out to satisfy the learning demand of students and to make students learn consciously which create an excellent atmosphere to realize the innovation education.

5 Conclusion

The construction of practical teaching platform as the important part of reform for practical teaching of metallurgical engineering of Jiangxi University of Science and Technology which have realized the practical teaching system in the progressive process of knowledge foundation, application and innovation through the construction of specialized lab, enterprise internship base and innovation education platform. The reform has promoted the ability of cultivating high quality engineering technology human resource who have excellent comprehensive quality, ability of practice and innovation spirit.

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E-Learning Data Mining

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Abstract. In order to effectively analyze a large number of original data, the concept of large data is proposed. Big data era has brought a new change for education. With the rapid development of education information especially digital campus network and the growing popularity of higher education, education in the field of the deployment of many of the software systems, software systems in these stores massive educational data. E-Learning produced a large number of educational data in a variety of forms. E-Learning has achieved a certain effect on the scale effect, but the support for the individual of the learners is still seriously inadequate. The new technology, represented by large data and social networks, provides a new possibility for personalized learning.

Keywords: Big data · E-Learning · Digital campus · Data mining

1 Overview

The general feature of today's IT technologies is the cloud-based infrastructure that supports big data processing and applications, shifting from "compute-centric" to "data-centric." For the current big data processing is the cloud compute itself, both of which are the combination of large-scale data aggregation and customized distribution. Large-scale data aggregation and customized distribution for information sharing, information collaboration and learning to create a completely new environment. In the past 10 years, with the rapid development of education information, especially the massive practice of digitized campus and network higher education, a large number of software systems have been deployed in the field of education, and massive educational data are stored in these software systems.

2 E-Learning's Development

Learning was formally proposed dating back to 2000 and has been for more than a decade now, but has made great strides in areas such as enterprise training, basic education, higher education and lifelong education. However, E-Learning has been placed great hope.

Through the overall investigation of the development of E-Learning in different periods, E-Learning is divided into the following three stages from the aspects of technology maturity, teaching idea and method, resources construction [1–5].

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1. The smart terminal has entered the period of popularity and started to be widely used in the field of education. With the proliferation of educational applications based on the store model, e-textbooks and their distribution channels have entered a period of rapid growth worldwide. Learners begin to really have the opportunity to conduct learning activities electronically and to provide a foundation for the acquisition of big data. The ubiquitous learning model has emerged.
2. The learning platform began to appear centralized, and a unified learning platform began to emerge globally. Based on the cloud platform unified data center, a unified resource center began to form.
3. The arrival of big data era. The popularity of learning terminals and a well-established unified data storage center provide the possibility for large-scale data storage for learners. Learner learning trajectory and its related features can be well documented. Learning analytics becomes an important support tool. The advent of the big data era has provided the possibility for learning analytic refinement. For the first time, E-Learning has the potential to find a convergence between a large education coverage and a personalized learning experience.

The development of E-Learning has witnessed the holistic transformation of education from the paradigm of education to the paradigm of learning. To some extent, it can be said that e-Learning promotes the transformation of education paradigm. Educational reform itself also requires technical Full support. In summary, the development of E-Learning shows the following trends (see Table 1):

Table 1. E-Learning stage of development and its characteristics

	Teaching mode	Main construction content	Theoretical basis	Application areas	Terminal	Characteristic	Iconic event
Preparation period Before 2000	There is no fixed teaching mode, mostly electronic traditional education	Multimedia courseware, prototype and so on	Mainly on traditional model of behavioristic teaching	The embryonic stage of Various types of educational application	PC-based	The supplement of traditional teaching system	Network popularity, vitality than to achieve a higher level
Exploring period 2000–2009	A variety of mode exploration, such as mixed learning, inquiry learning and so on	Sakai, Moodle, Integrated Learning Systems, Open Courses and Boutique Courses, Various Teaching Resources, Standardized Business Training Courses	Mainly on constructivism	Enterprise E-Learning, basic education model exploration, lifelong learning began to take shape	PC, smart phone, PDA began to appear	A variety of innovative application exploration and effect of the application are also based on simple transfer of resources	MIT's OCW program, Sakai, Moodle applications
Relative maturity period After 2010	A mixed learning mode as the core of flipping the classroom	MOOCs, Video Open Courses, Unified Data Center and Learning Archives, Generative Educational Resources	Mainly on constructivism and situation awareness	Higher education and basiceducation beganto be in-depth application, lifelong learning appearing and the enterprise field into the integration period	The popularity of PC and smart terminal	E-Learning began to integrate into the traditional education process and innovative teaching model	Khan Academy, MOOCs, ebook and ebook package

- From economies of scale to quality requirements;
- From pushing simple resources to innovating learning mode;
- From the Educational Metaphor of Knowledge Transfer to the Educational Metaphor of Knowledge Construction in Situations;
- From independent application to systematic application;
- From technology-centered to learning-centered;
- From staged learning to lifelong learning;
- From pre-established resources to productive resources.

3 The Building of E-Learning Data Mining Mode

E-Learning data mining mode is built to complete a specific mining tasks. From the previous analysis of mining tasks, there are many elements of E-Learning. We can mine elements such as students, teachers, learning contents and learning activities one by one, but lack a logical main line to organize these scattered mining topics. In the following, the author uses the grid frame method in grammar to mark the semantic grid with "E-Learning" as the central predicate. Common semantic grid includes the agent case, the tool case, the object case, making case, the locative case, the guest case and so on. The result is shown in Fig. 1.

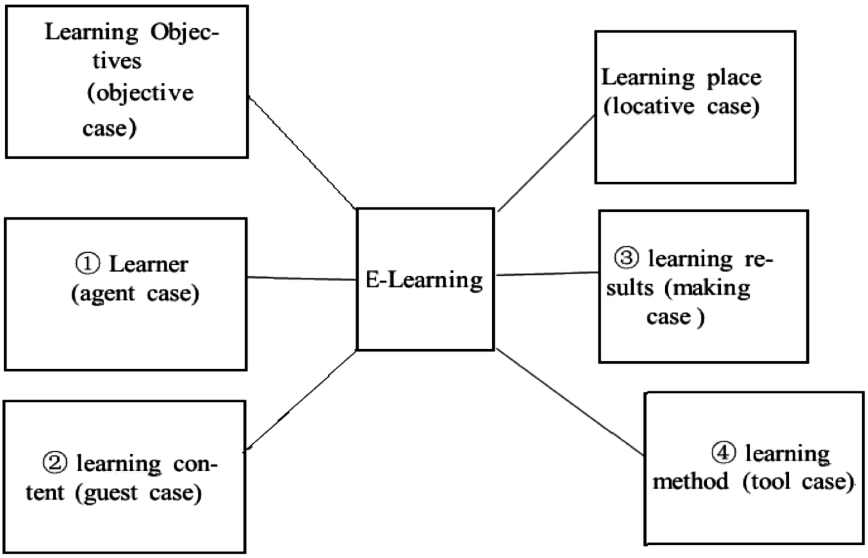

Fig. 1. E-Learning grid framework

As shown in Fig. 1, the author uses digital numbers to mark the four semantic grids that need to be focused on. The corresponding content of the four semantic grids has data records in the teaching platform or educational administration system and can form a clear logical main line. That the main line of "Who learns, what to learn, how to learn and learning effect" is the main line, using the data mining method to excavate and analyze the four semantic lattices, will make the central predicate "E-Learning" more clear, resulting in a more complete understanding of the current state of E-Learning.

Around this logical main line, three mining task scenarios can be generated, namely, learner feature mining for answering "who is learning", learning process mining for answering "what to learn and the results of mining for answering "learning effect", which builds three kinds of data mining patterns for others to complete similar mining tasks provide a reference.

3.1 E-Learning Data Mining Mode Components

E-Learning data mining mode consists of three elements: "data mining work", "tools and algorithms" and "data", "tools and algorithms" supports "data mining work" and produce the corresponding "data". The expansion of these three elements in time will respectively form the data mining workflow, tool and algorithm flow, and data flow. Data mining is in line with the general process of data mining, including data collection, data preprocessing, data mining, evaluation and application of model interpretation and other aspects. According to different mission situations, each part of "data mining work" has its own characteristics.

Tools and algorithms refer to the various tools and algorithms used in data mining workflows. The algorithms used in this paper cover the classical algorithms of data mining, including decision tree algorithm, timing algorithm, clustering analysis algorithm, sequential analysis and clustering analysis algorithm, association rules algorithm, linear regression algorithm and statistics and visualization methods. Data is the type of data that results from the use of tools and algorithms, including all kinds of knowledge gained from mining, such as visualizations, frequent itemsets, rules, sequence patterns, network diagrams, and so on.

3.2 Learner Characteristic Data Mining Mode

3.2.1 Training Algorithm

Backpropagation (BP) algorithm is the most popular type. This is a gradient descent search algorithm. It tries to update depending on the difference between the network output and the available data includes two passes: forward transmission (error calculation) and a backward pass (parameter tuning). In the forward pass, the effect applied to the input neuron's activity pattern propagates through the network layer by layer, producing the output of the network. The connection weights are assigned randomly at the beginning, so the input value is mapped to the output, but meaningless mode. The outputs are then compared to what is expected and the following error signal is generated (Fig. 2).

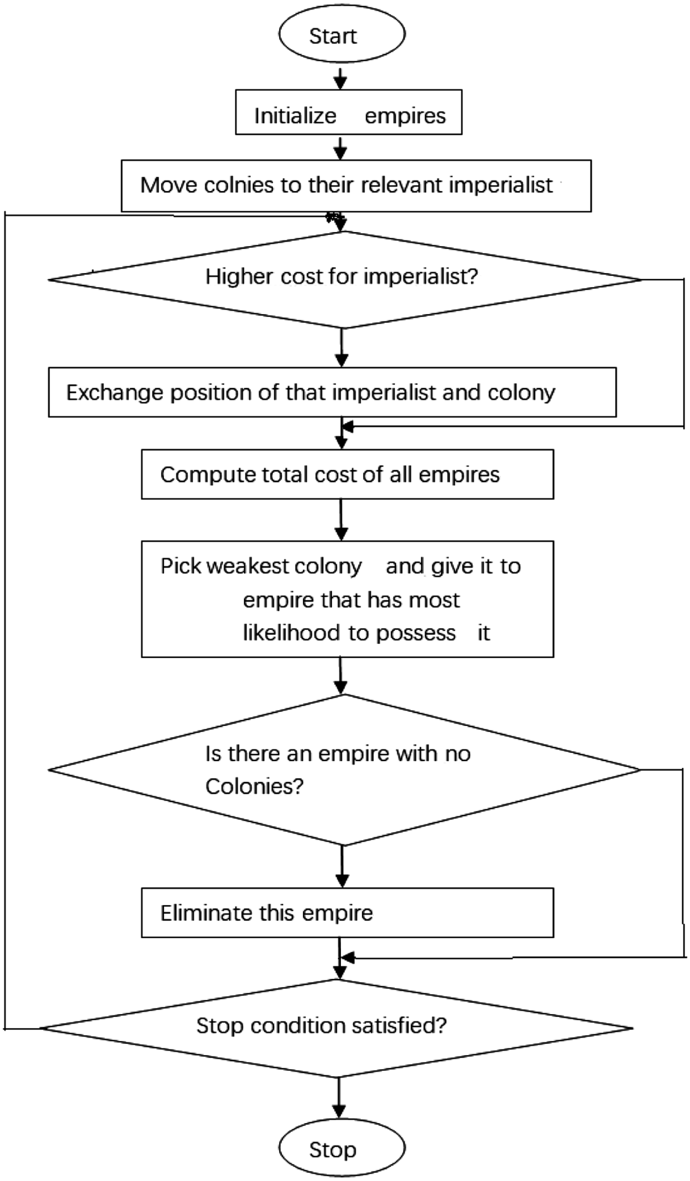

Fig. 2. ICA algorithm flow chart

4 Researchers Co-network Analysis

4.1 Researchers

According to the authors of the collected literature, there are a few researchers who can conduct in-depth research on education data mining field during 2008–2016. There are mainly 4 scholars who published more than 6 research papers.

4.2 Research Team

187 author indexes in the bibliographic information of 187 bibliographies were extracted, and the researchers conducted a quantitative analysis through the artificial intelligence network structure to calculate the overall network density of 0.0367. The connectivity between the network nodes (this refers to the researchers) is not high, is a sparse network, indicating that the degree of cooperation between researchers is relatively low, most of them are one or two researchers co-authored (Table 2).

Table 2. Quantitative statistics

Researchers	Chen 1	Ma 2	Niu 3	Chen 4	Wang 5	Li 6
Number of articles	8	5	9	8	4	8

5 Conclusion

Personalized Learning Appeal has A new way to achieve in Big Data Era - Big data analysis based on large-scale knowledge dissemination offers the possibility for learners and learners to analyze their content. A fusion of learning based on learner needs is taking shape. The difference between blended learning and traditional blended teaching is:

(1) The core concept: mixed teaching is mix of teaching methods at the core of the teaching behavior, The fusion learning mode is based on data analysis and is a holistic design method and technical analysis framework.

(2) Application areas: The traditional hybrid learning model is mainly to solve the problem of the choice of space-time education, and did not improve the core of learning itself, so its application areas are concentrated in relatively simple enterprise areas. Convergent learning is a learning model that focuses on learning internal mechanisms and is well used throughout the learning area, such as basic education, higher education, and lifelong learning.

(3) Fusion learning emphasizes learner's development and practical problem solving. The learning power of learners requires that learners have sufficient choices, including the choice of learning content, learning styles and learning process autonomy; learning process is a continuum of small-grained learning activities; E-learning is a continuous teaching system, which should be fully integrated into the overall education system, not just the supplement of the traditional teaching mode. Learning may take place at any time and place. Schools, social places,

workplaces and families will play different roles. E-learning completes the support and perfection of individual lifelong learning; the learning technology framework should be an open and scalable social learning support system; any individual is the designer and the consumer of the learning system, and the productive resources become the mainstream.

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Construction of Engineering Graduate Education System Based on Cultivation of Innovation and Entrepreneurial Ability

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Abstract. Implementing vigorously innovation and entrepreneurship of postgraduate is our country's main strategy position in relying on science and education to rejuvenate the nation and making China an innovative nation. Firstly, the paper based on the idea of "interest-guided and project-oriented", which structures the training system of ability of innovation and entrepreneurship, relying on research projects and science and technology contests, breaking down the barriers, going to make it more open, practice training, advocating autonomous learning under the guidance of "tutors and seniors". Secondly, building practice education system based on uniting the university, government and corporations, making the needs of enterprise's scientific and technological become preliminary research for postgraduates to research, they can improve abilities of practical, self-study, innovation and entrepreneurship in scientific practice. Finally, strengthening process management and supervision to ensure that all kinds of well-designed and continuously improved mechanisms, policies and systems can be implemented. Researching project can create a good academic atmosphere, optimize the training mechanism, improve the teaching quality and enhance self-learning ability, practical ability and innovation and entrepreneurship ability of graduate students.

Keywords: Innovation · Entrepreneurship · Quality education Graduate students

1 Introduction

With the 21st century coming, the scale of graduate education in China has made great progress. After the quantity growth, how to improve the quality of postgraduate training has become a hot issue of attention from all walks of life. While the Strengthening construction of hardware and ensuring basic training conditions, how to enhance the ability of graduate students in innovation and entrepreneurship, as well as training innovative talents, receive more attention. On the other hand, the cores of the current international competition are knowledgement and talents. The postgraduate education plays the irreplaceable role in training innovative talents and the research of technology. Striving to develop postgraduate education is an important measure for

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relying on science and education to rejuvenate the nation and making an innovative nation which has great strategic meanings.

2 Research Status

Modern postgraduate education originated in Germany in the first half of the 19th century. Postgraduate education in Germany was in the leading position in world higher education from then on until a very long period in the early 20th century.

While inheriting the concept of German higher education, the United States developed and innovate d according to its own national conditions. The United States has reformed the scientific research pursuit of "pure science" in higher education in Germany and closely integrated scientific research with the political and economic development of society. While focusing on basic research, the United States has made great efforts to develop applied research so that it can make good achievements in innovation and entrepreneurship development, Harvard University, Stanford University, University of Pennsylvania, Georgia Institute of Technology, University of California, Berkeley and other American engineering elite in the field of innovation and entrepreneurship education in the forefront of the world, training Zuckerberg, Musk, Jerry Yang and a large number of internationally renowned entrepreneur. Massachusetts Institute of Technology alumni founded company, even reached a total annual revenue of more than 2 trillion US dollars surprising volume, as an independent economy who ranked 11th in the world. A large number of leading international companies such as General Motors, Hewlett-Packard, Intel, McDonnell Douglas, Texas Instruments and Gillette were founded by MIT alumni (Fig. 1).

Fig. 1. Scene of U.S. students participating in a technology competition

My country started late in the field of higher education, but it developed rapidly. In order to meet the needs of the development of the times, the Ministry of Education promulgated “Opinions on Vigorously Promoting Innovation and Entrepreneurship Education in Colleges and Universities and Undertaking Entrepreneurship by Students” as early as May 2010, and proposed to vigorously promote innovation and entrepreneurship education in colleges and universities and to strengthen the building of entrepreneurship bases. Since the 18th CPC National Congress, the party Central Committee with Comrade Xi Jinping as the core has even put forward the national strategy of “making the masses popular and innovating in a large number of ways.” The Opinions of the State Council on Several Policies and Measures for Vigorously Promoting Innovation in Mass Creation and Entrepreneurship promulgated in June 2015 has provided policy support and guidance for innovation and entrepreneurship in the whole society. This year’s report on the work of the government has also proposed that a new batch of “double-found bases” should be set up to encourage large enterprises, research institutes and universities to set up specialization in creating more space.

China has also emerged a large number of entrepreneurship entrepreneurs represented by Huawei companies Ren Zhengfei, Alibaba Jack Ma, Jingdong Liu Qiangdong, Baidu Robin Li, Tencent Ma Huateng, millet technology Lei Jun, and DJI-Innovations Wang Tao (Fig. 2).

Fig. 2. Typical representatives of China’s science and technology innovation and entrepreneurship - Ren Zhengfei (Huawei) and Wang Tao (DJI)

3 Construction of Culture System

The talent training model is the sum of educational theory, training target, curriculum system, management system, evaluation method and so on. Whether colleges and universities can cultivate satisfactory talents is largely determined by the scientific nature of the talent training model. Take the ability as a main line of innovative quality education road can inject vitality mode for university talent training, the concept of university education and training mode to innovation ability and scientific literacy cultivation of graduate students as the center, to cultivate talents to meet the social demands of innovation and entrepreneurship, bring vitality for higher education (Fig. 3).

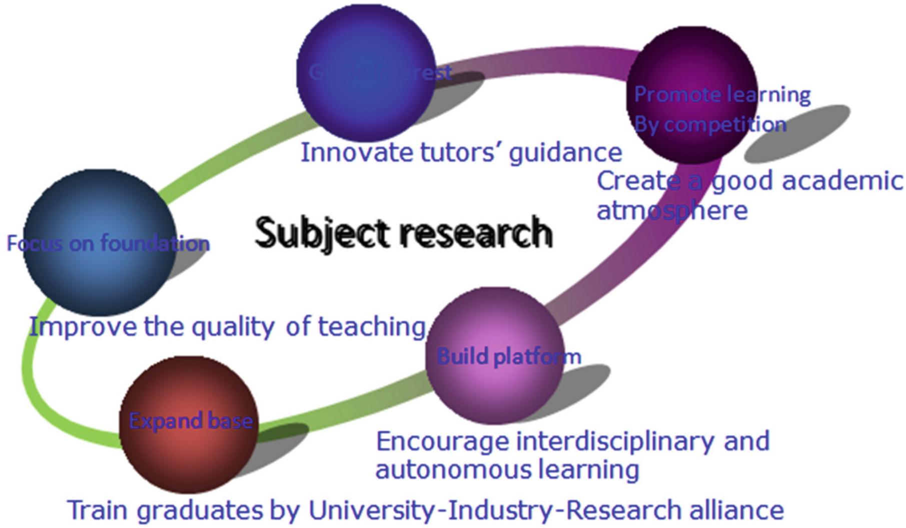

Fig. 3. The main measures taken in this article

3.1 Interest Guidance, Innovation of Tutor Guidance

Interest is the best teacher. The research training mode driven by the engineering project and the science and technology competition can stimulate the students' desire for knowledge. For example, robotics, which involves knowledge in mechanical, control, computer programming, AI, multi-agent theory and technology, is a typical interdisciplinary research platform. It not only has the basic theory, but also has the application of engineering technology, as well as the exploration of academic frontier. It is very suitable for graduate students to carry out innovative research. Learning, researching, designing and even making works for interested objects can enable students to actively build and improve knowledge system and cultivate scientific literacy in practical activities.

The so-called 'the teachers' ability and emphasis are different and varied', which leads to the strong limitations of the traditional "private ownership" direction. This project aims to break the traditional ways of guidance to the team as a unit, barriers, take individual guidance, guidance and senior fellow with the collective combination of "tutor group" collective guidance system. The implementation of the guiding process is determined according to the specific characteristics of graduate students, including their professional characteristics, training objectives, research directions, basic literacy and their research tasks. The members of the tutorial group have different professional background and broad knowledge base. The members of the group, in the whole training process of graduate students, have a reasonable division of labor, complement each other and cooperate with each other to ensure that all training links of graduate students can always get a higher level of guidance.

A group of academic activities consisting of postgraduates, tutors, steering group teachers and undergraduate students was set up to organize flexible and diverse academic salons regularly. The graduate students who choose their own interests to take turns doing academic reports. The guidance group makes specific comments on the performance of the students, points out the shortcomings and the direction of future efforts. And the group also gives a scientific assessment of the scientific nature of the academic report, the ability of speech and the preparation of the report. Academic Salon activities can not only guide graduate students to master broad theoretical knowledge and latest academic trends, but also foster the ability of postgraduates to express their language. At the same time, Academic Salon is a technological edification for undergraduates. It has an early involvement in the quality of postgraduate enrollment, and plays a good role in promoting and ensuring its quality.

3.2 Face to Engineering and Create a Good Academic Atmosphere

As for junior class postgraduates, it leads students to gradually remove the layers of the veil of engineering problems and to find the point to analyze and solve problem by the opportunities and platforms of science and technology competitions and simple scientific research. During several years of observation, the research group finds it is easier for high level science and technology competition to stimulate students' desire to attract the interest, which can guide the students to get a quick introduction and carry out basic scientific research and training. At the same time, winning of scientific and technological competitions have a good display degree, which can effectively promote enrollment, employment and platform construction.

Since Tsinghua University organized and hosted the first "Challenge Cup" in 1989, the positive effect of high-level science and technology competition on student training has been widely recognized by the society, the high-level science and technology competition every year has attracted tens of thousands of students from major universities in China, which involves Robotics Competition, Graduate Electronics Design Competition, "Internet +" Innovation and Entrepreneurship Competition, Sharing Cup Science and Technology Resource Sharing and Service Innovation Practice Contest, Smart City Technology and Creative Design Contest, Mathematical Modeling Contest, IOT (Internet of Things) Design Competition, Big Data and Intelligent Computing Competition, Smart Motor Competition, Smart Manufacturing (Industry 4.0) Innovation and Entrepreneurship Competition, Siemens Cup China Smart Manufacturing Challenge Competition and so on. To varying degrees, these projects have reached many frontier areas. Some of them require considerable engineering capabilities and theoretical depth, they are suitable for graduate students' research training and even thesis topics.

In recent years, our school has achieved great success in robotics contest, mathematical modeling contest and challenge cup. More importantly, postgraduates showed great interest in these projects. They conducted a great deal of meaningful research and exploration on the competition, united with each other and made progress together, and created a strong academic atmosphere with common goals.

3.3 Focus on the Foundation, Improve the Quality of Teaching

Curriculum learning plays a very important role in the whole process of postgraduate training. It is not only an effective way for students to master the basic knowledge and professional knowledge of the system, but also an important foundation for training innovation ability. Firstly, teaching content and curriculum system should be reorganize, it is in the face of the rapid expansion of knowledge and exchange, science and technology and the integrated development of science that engineering postgraduates curriculum system should follow the principle of to the principle of 'rebuilding the foundation, highlighting the modern, reflecting the frontiers, and integrating comprehensively and open more human courses, interdisciplinary courses and cutting-edge courses to promote contact of discipline and curriculum.

Secondly, to improve teaching methods and teaching management system, to improve teachers' teaching methods and teaching methods such as using more heuristic and research style teaching and increasing class discussion to fully mobilize the initiative and consciousness of postgraduates. Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime. The instructors should change their teaching method so long as they raise questions and guide students to think about problems. The key point of teaching should be the ability and character related to creative activities, and a series of norms, standards, values and attitudes of creating the activity which include the consciousness of creation, the value of creation, the method of thinking and method of creating activity. We should carry out heuristic, research style teaching and more academic discussions in teaching that gives graduate students a full imagination space, guides graduate students brave to explore, dare to innovate and develops their ability to detect problems, analyze problems and solve problems.

3.4 Building a Platform, Encourage Interdisciplinary and Autonomous Learning

Based on the existing platform, equipment and site conditions, we should discard the concept of self enclosed development, break the barrier between organizations and take an open road of development. we should also promote interdisciplinary research with multidisciplinary, multi-level and multi-faceted efforts under the team spirit to create an atmosphere of interdisciplinary education and research. Graduate students are an important part of an interdisciplinary research team. We formulate curriculum plans and management systems that are suitable for interdisciplinary and autonomous learning. So as to students can learn to study, scientific research, cooperating and learn to use different disciplines to analyze and solve problems.

Take scientific research projects and various science and technology competitions as links, take full advantage of existing research conditions and teachers, and actively organize graduate students. Especially the lower grades of graduate students who can be stationed in relevant laboratories, participate in the design, production, commissioning and other work, and to assist and guidance undergraduates to form a good platform. Take scientific research projects and science and technology competition as a carrier, achieve the seamless connection between theory and practice and train students in interdisciplinary knowledge system.

3.5 Expand the Base, Train Graduate Students by Alliance of Government-Industry

University-Research

By the construction of a platform for school-enterprise cooperation, we should expand alliance of Government-Industry-University-Research and establish graduate students training bases and mobile workstations. We should establish a system and mechanism for pre-graduate research on the participation of postgraduates in enterprise science and technology, and cooperate with effective guidance and supervision mechanisms to enable graduate students to grow rapidly in practice.

Training plan for graduate students should be revised properly, curriculum arrangement and teaching time also should be adjusted. Especially for the professional graduate, focusing on interest guidance and hands-on training, a certain number of graduate students (mainly part-time tutor-led graduate students) can enter the workstations set up by the enterprises in the second grade and participate engineering training under the joint guidance of both tutors. When it comes to the ripe condition, the graduate students equipped with much engineering training abilities, who can take the pre-research by enterprise as the research subject and take the guide by enterprise's tutor as the main direction to start the subject research. By the end of research, they can take the guide by the tutors in school as the mainstay to summarize, to refine and to improve the research of subject, and then they can write the dissertation.

4 Conclusion and Outlook

4.1 Conclusion

This article aims at the training of engineering graduate students' ability to innovate and start a business, and builds the training system of engineering postgraduates based on the guidance of interest and the cooperation of industry, university and research. After years of unremitting efforts, our school in practice base construction and alliances with production and research has Baosteel Group, the new steel group, China Ruilin, Tyco Group, Hangzhou Iron and Steel Group, Nanjing Iron and Steel Group, Jiangxi Copper Group, China Aluminum Industry, Tongling Group, Jiang Tungsten Group and other large enterprises to establish a long-term and stable relations of cooperation and the establishment of a number of teaching practice base and talent employment base, and Guangzhou ZLG MCU Development Co., Ltd. jointly established a "3 + 1" Innovative Education Experiment Class, and Tyco Group jointly established the "Tyhao class", and Shanghai Ying Lun Information Technology Co., Ltd. jointly established the "British class." Among them, the "3 + 1" innovation education experimental class was named the national level teaching reform demonstration area, personnel training mode innovation experimental area and the national engineering practice education center.

Innovation and entrepreneurship training system based on the concept of "interest-oriented and engineering-oriented": based on scientific research projects and science and technology competitions, based on the school's existing platform conditions, equipment conditions and site conditions, we can break the barriers between organizations and take the open development Road, practical training for graduate students, advocate "guidance group + seniors" under the guidance of autonomous learning. The graduate students form a complete knowledge system in the research and design, improve the knowledge structure in the production, debugging and optimization, and cultivate the ability to analyze and solve problems and the brave breakthrough in innovation.

Based on the practical education system of cooperation between government, industry and research institutes, this paper starts from the cultivation of innovation and entrepreneurship ability, and conducts an in-depth research on the reform and improvement of postgraduate education system. Advocate the cooperation between government, academic and research institutes, expand the practical teaching base and postgraduate mobile workstations, and establish the research needs of enterprises in science and technology as pre-research projects. Research by postgraduates enables postgraduates to stimulate their interest in learning in science and technology, to activate academic atmosphere and improve academic standards, Strengthen hands-on ability, cultivate innovation consciousness.

Strengthen Process Management: Strengthen supervision and resolutely put an end to the vacuum that may emerge in postgraduate management so that students can really move on. To ensure that all kinds of well-designed and continuously improved mechanisms, policies and systems can be implemented in an effort to reduce the gap between post-graduate education and social needs.

4.2 Outlook

In response to the advent of the era of knowledge economy, international higher engineering education is constantly reform and innovation. From the long-term development trend, with the further development of economic globalization, the connotation of engineering education has expanded from engineering science, technology and management to the integration with natural sciences and social sciences. In the future, we will increase the compatibility of training system, enhance liquidity, promote practicality and strengthen interaction from the perspective of "return to engineering".

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Research on Blended Learning Activity and Application

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Abstract. With the rapid development of information age, it produces a series of new ideas, new methods, new technology and new means. These appearance promote the reform of education to new steps. Modern education activities gradually emphasize autonomy, personalized and diversified. The role of the teacher also taught by a single person into the organizers of the learning resources, the designers of the learning process and learning behavior to guide and estimate learning results. In order to adapt to the modern education to cultivate talents for the target demand, educators are trying to seek a new way of teaching to adapt to the social development.

Keywords: Blended learning · Learning activities · The traditional teaching Online learning

1 The Widely Application on Blended Learning

The rapid development of information technology has greatly changed our life, especially the way we work, earn and entertainment. At the same time, blended learning has been widely used in education. E-learning, what we usually refer to as online learning or network learning, mainly refers to a new way of learning which through the computer network. Compared with the traditional learning, blended learning has many advantages, such as providing a wealth of network resources and multimedia learning resources which break the limitations of time and space. Also, blended learning enables independent learning to become a reality. What's more, blended learning changes the traditional teaching relationship between teachers and students. Students play the dominant position which is good at achieving their personalized learning. In view of the above advantages, blended learning has swept the world since the end of the last century. Some scholars even proposed that blended learning will replace traditional classroom learning. Although it has been found through practice that blended learning can not completely replace the traditional classroom teaching, it will greatly change the purpose and function of classroom teaching. With the rapid development of education information, people begin to

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reflect on blended learning and think that both traditional classroom teaching and blended learning have their own advantages. As a result, blended learning is widely recognized. It combines the advantages of online learning and traditional classroom learning while it makes up for the shortcomings of both. Its goal is to provide students with better conditions to improve students' information literacy and comprehensive quality and ability. Cooperates and online education institutes have also begun to adopt a hybrid learning approach to training and education [1–3].

2 The Basic Theory of Blended Learning

2.1 The Connotation of Blended Learning

Professor HE Ke-kang from Beijing Normal University introduced blended learning for the first time at the 7th Conference on Global Chinese Computer Education Applications in Nanjing. Professor He Ke kang believes that the blended learning is to combine the advantages of traditional learning methods with the advantages of e-learning. That is to say that it is necessary for teachers to play the leading role in guiding, enlightening and monitoring the teaching process. In the meanwhile, blended learning needs students show their initiative, enthusiasm and creativity on study. At present, the consensus of the international educational technology community is that only by combining the both strengths, can achieve the best learning effect.

However, many people consider the hybrid learning mode as the combination of traditional classroom teaching and online teaching. Such simple one plus one mode probably is only a description of the surface features. Singh & Reed, a foreign scholar, suggests that blended learning is achieved at the "appropriate" time by "appropriate" learning techniques and "appropriate" learning styles, delivering "appropriate" abilities to "appropriate" learners to optimize the learning effect.

2.2 The Fundamental of Blended Learning

The basic principle of blended learning is to improve and enhance learning through "optimization" that may be found. To understand the basic principles of blended learning. It is a must to understand what is learning first. There are two kinds of learning: one is "shallow learning", characterized by memory; the other is "deep learning", its characteristics is to grasp the new knowledge, that is, to understand and verify the existing knowledge of the fit, and then integrate knowledge into the existing knowledge structure. Shallow learning only focuses on the memory of information, which can only be a kind of inefficient learning. Deep learning, on the other hand, contains the learner's comprehension process and is a problem-solving learning. Clearly, blended learning expectations can help deep learning.

Therefore, as argues, the rationale for blended learning, is that blended learning is a combination of Web-based technologies such as virtual classroom live, collaborative learning and streaming media in order to implement a teaching goal; It is the combination of various teaching methods (such as constructivism, behaviorism and cognitivism) and teaching techniques (or non-teaching techniques) to achieve the best teaching results. In other words, blended learning is like a kind of optimal fusion, emphasizing on the teaching elements (teachers, students, teaching content, media) through organic integration of mutual interaction between the teaching methods in order to achieve specific teaching objectives [4–6].

2.3 The Components of Blended Learning

Blended learning includes two parts: face-to-face teaching and online learning. These two parts are not single. Teachers should combine the two parts effectively in practical teaching. Clark divided the blended learning into two parts: offline learning and online learning. Based on this, I made a few minor changes and added the virtual learning environment to online learning as shown in Fig. 1.

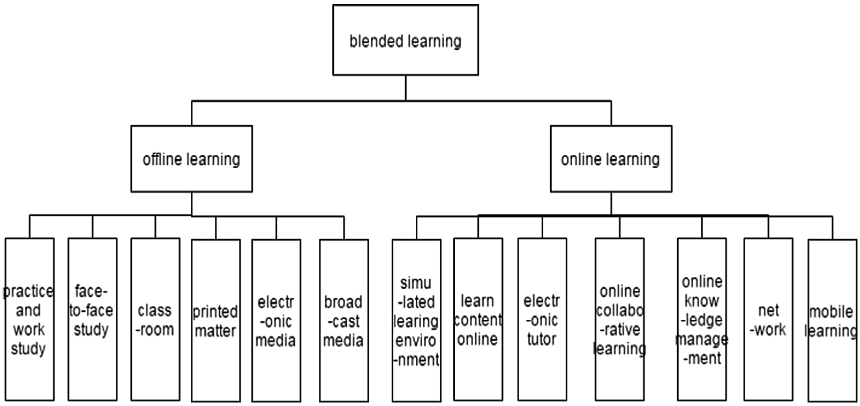

Fig. 1. The virtual learning environment to online learning

3 Learning Evaluation Design

As blended learning integrates a variety of teaching (learning) activities, its diversity and complexity make the learning process more specific and meticulous, then the evaluation for it is even more important. For the various learning forms in blended learning, there are some limitations in the traditional teaching evaluation and network evaluation methods, which requires the integration of teaching evaluation based on blended learning.

The methods of evaluation include the following. Firstly, blended learning file evaluation has a tracking record of the learning process. Students in the system platform for all activities will be recorded in detail. The record of these learning processes is equivalent to an electronic file, as a new evaluation for student learning. Secondly, formation evaluation and summary evaluation. While the test mode of traditional course simply uses paper, the final grade of the course is decided by the usual participation calculated by the system, the experimental results and the final examination results which according to the proportion of 4:3:3. Thirdly, the combination of self-assessment and peer-review enable students to fully understand their own strengths and weaknesses in order to develop their own self-awareness while peer review allows students to find their own advantages and disadvantages of learning. In this course, there was a heated discussion in “The Sense of Excellent Work” in the discussion area of “Sense of Homework”. Many students are deeply touched. And through the observation and study of excellent homework, these students have realized the gap between themselves and others, and then, they find the direction of ascension. Fourthly, that is personal evaluation and team evaluation. The evaluation of individuals in group collaborative learning tasks depends not only on the group’s performance, but also on the individual’s contribution to the group activity and the evaluation of the group members. In fact, evaluation activities are also a part of learning activities, which embodies the teaching concept of centering on learners.

4 Feedback

Feedback is the final stage of curriculum design framework of the blended learning. we must be soberly aware that blended learning curriculum design is an open and dynamic process. The various elements such as teacher, student, information, media, the environment and so on are changing. Therefore, after the end of the course design, we must summarize the course as a whole and form a summary report about the feedback on each stage before so that the course can be modified in time.

5 Problems and Deficiencies

The advent of blended learning undoubtedly diversifies people’s learning styles and changes the teaching forms in every corner of the world. This way of learning is achieved through the “mixing” and “integration” of other learning styles. It offers the possibility of superiority and distinctiveness over other single learning styles because it can combine different elements during study. Through a semester of follow-up surveys and interviews, I found that there are still some problems in the blended teaching process.

First of all, online learning has many external disturbances which is much easier to be disturbed by the outside world. Students with poor self-control may not be able to withstand the influence of external networks. Most students are in the state of shallow learning rather than deep learning.

Second, the evaluation method is challenged. The evaluation methods of blended learning are diversified, among which e-file is the core evaluation method. However, through deep interviews, it was found that some of the students appeared the problem of grandstanding. In order to cope with the teachers, these students formally login to the platform, they did not integrate into the designed activities and just used the platform for downloading resources. What’s more, some students will log into two accounts at once to help other students finish their homework. At present, the evaluation methods of electronic files are subject to some challenges. How to ensure the quality and fairness of evaluation methods is a serious question which is worth thinking.

Finally, online learning is not well attended. Reasons are also very complex. For example, learners have a sense of loneliness online or lack of information literacy or did not develop online learning habits. Students' online engagement has become one of the most important factors affecting online learning. Although there are some deficiencies in the blended learning model, these deficiencies are both common. Through traditional teaching, these deficiencies can be remedied and this model will be more optimized and systematic.

6 Suggestions and Improvements-Three Modules in Teaching

The learning process can be divided into three modules according to the teaching process: Pre-class to guide and study, While - class to explain the discussion and Post - class to tutor. Now take the lesson called "Disasters" in the new version of college English listening and speaking course as an example to show how to embody the concept of mixed teaching in English listening teaching.

6.1 Pre-class Teaching

During the Pre - class process, the teacher determines the teaching plan according to the syllabus, puts forward a clear guide program and provides various media resources. Under the guidance of the teacher, the students carry out the autonomous learning under the network environment of autonomous learning center.

In Pre - class guidance stage, teachers can ask students to preview the text, grasp the new words and phrases and get to know the subject of the text. To enable students to understand the meaning of the text more deeply, teachers can choose some suitable listening comprehension website for students to supplement the contents of the class, such as listening and speaking materials site like "Randall's online ESL listening laboratory". The listening materials provided by this site range from easy to difficult, and some have video recordings. The English - to - go website offers free news reading. This site is novel in material and covers a wide range of areas. The arrangement of practicing is very scientific. There are also many activities associated with the text which is suitable for self-study.

In addition, the teacher can design some questions on Pre - class modules for text content, such as: what are natural disasters? And what are man - made disasters? What damage can they cause? How can we reduce the damage caused by such natural disasters as Tornado and tsunami? What can we do to prevent man - made disasters? Teachers can distribute these questions to students via Blog, BBS or e-mail and ask them to answer the questions after they have studied. During the course of preview, if students encounter difficulties, they can communicate with teachers through Blog, BBS or e-mail. For non-difficult questions, teachers should mainly adopt the method of instruction and guidance. For example, teachers can group the keywords or questions related to the text sections into several groups and post them on the blog. Each student can post their own answers on the blog. Then, the difficult content or the common problems will be as the focus of while - class teaching to be explained by teachers.

6.2 While-Class Teaching

While - class teaching has fully demonstrated that "teaching" is serving students' "learning". Teachers are no longer to listen to the answer first, but adopt individualized teaching methods. Through a variety of teaching methods, teachers solve the problem of students in listening comprehension of the language which can not be understood. Students are no longer blind, passive, but listening to the teacher with questions. If the student still has questions after the teacher explains the question already, or when some questions are raised, the teacher can help the students to seek the correct answer by the way of group discussion and other forms.

After the language barrier having been basically eliminated, on the basis of students understanding the content of the text generally, students can watch relevant films and video materials to enhance their understanding. When students watching the movie, they are not only asked to pay attention to the language of the characters used by the actors, but also pay attention to the actors' body language. After watching, the teacher asked the student to summarize the unit in a study group and ask the group representative to make a report in class. At the same time, teachers can open a time column in the classroom for listening strategy training.

6.3 Post-class Teaching

Post - class teaching session is an indispensable and important part of the teaching process. It is the continuation and extension of classroom teaching. Q & A after class is a feedback on learner's learning level and learning effect. It is helpful for teachers to adjust the teaching content timely according to the actual situation and instruct teachers to arrange the next part of teaching activities. After the end of the two courses above, if students still have questions on the language phenomenon or the text of the lesson, they can conduct interactive learning online and participate in the discussion, then find the answer. Also, they can seek help from the teachers through a variety of media means. For example, the Chat-room, E-Mail BBS and so on. Then the teachers targeted specific questions to answer. For the universal problems, teachers can published the answers in the Blog or BBS, or as the context of the next lesson, then give the guidance.

7 Conclusion

After theoretical research and practical exploration, we can conclude that the blended learning in the virtual learning environment has been fully affirmed by teachers and students in our teaching practice. In blended learning, the enthusiasm and initiative of students have been mobilized to the maximum extent. Students' abilities of applying information technology to analyze and comprehensively solve the problem have greatly improved. In short, from the traditional classroom teaching to online teaching and then to "blended learning" teaching, it is not a simple application of information technology and a simple change of teaching forms, but a change of teaching philosophy and teaching mode. Its purpose is to apply information technology more effectively in teaching so as to enhance students' learning ability and optimize the education and teaching process.

Combining the background of education information and the education system with Chinese characteristics, the design of blended learning curriculum has great advantages in the teaching reform in colleges and universities. However, how to carry out the blended learning better under the circumstances of virtual learning in colleges and universities needs us to work together to explore a better way.

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Construction of Teaching Quality Assurance System in the Context of Engineering Education Certification

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Abstract. The teaching quality assurance system involves all aspects of personnel training. It effectively monitors, analyzes and improves all the processes and factors that affect the quality of personnel training, which is the key to ensuring and continuously improving the teaching quality. Taking Computer Engineering College of Harbin Engineering University as an example, this paper summarizes a set of effective teaching quality assurance system through undergraduate teaching reform and practice. This article introduces the overall situation of the construction of college teaching quality assurance system, sorts out the main monitoring points in the teaching quality assurance system, and expounds the evaluation mechanism of teachers' teaching level. After a year of teaching practice, this teaching guarantee system has achieved good results.

Keywords: Engineering Education Certification · Quality control
Teaching evaluation · Monitoring point · Continuous improvement

Engineering Education Certification [1] is the qualified level of certification aiming at the engineering education to regulate engineering education specialty in higher education in China, construct higher vocational education quality control system and improve engineering teaching quality. In the process of teaching practice, quality assurance work of teaching is gradually normalized in accordance with the relevant norms of professional certification [2], following the OBE education concept. In all aspects of teaching, in accordance with professional quality certification standards, the formation of closed-loop feedback mechanism and continuous improvement to continuously improve the quality of education and teaching.

1 Education and Teaching Quality Assurance System Architecture

The teaching quality goal system includes a series of standards such as school orientation, training goal, quality standard; The quality assurance system of

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teaching resources management includes the construction and management of teaching staff [3], management of teaching expenses, facilities construction and management, teaching infrastructure management, teaching reform and research management [4]; The quality assurance system of teaching process management includes the enrollment plan and quality of students, the formulation (revision) of personnel training plan and the implementation of talent training programs; The teaching quality monitoring system runs through all aspects to provide feedback and improvement measures for all aspects. The main monitoring points and quality standards involved are as Tables 1, 2, 3 and 4 shows:

2 Teaching Evaluation Mechanism

The teacher teaching evaluation [5] conduct on five dimensions, as shown in Table 5. The evaluation system from the three perspectives are the curriculum system, graduation requirements, training objectives. The system regularly evaluates whether teachers can achieve the goal of the curriculum, whether the construction of the curriculum supports the training objectives and whether the graduating students meet the competency requirements.

Applying this evaluation system as the core, a top-down professional construction as Fig. 1 and improvement has been achieved. From the in-depth study of social needs and the connotation of subject development, a reasonable training goal and a graduation requirement for supporting training objectives have been identified. According to the graduation requirements, the curriculum system are set up and the teaching objectives of the curriculum are clarified to build and maintain a faculty and supportive environment which can support to reach the goals. Then through the bottom-up assessment and feedback, whether the syllabus (curriculum objectives) test are reached from the most basic course teaching papers, curriculum analysis, the achievement of graduation requirements are tested from the achievement of the goal of the curriculum, whether the training goal is reached are tested from the graduation requirements, and finally whether the community is satisfied with the training of personnel are tested from the training objectives and the development of the work of students, which end up test and correct the personnel training objectives and the concept of running a school. Closed-loop process formed by top-down design and bottom-up feedback reflects the professional construction of continuous improvement mechanism connotation.

3 Implementation Effect of Teaching Quality Assurance System

Since 2016, the system of professional leaders, as well as teachers' self-evaluation mechanism, professional evaluation, student evaluation, external evaluation, joint evaluation of departments and departments has been implemented as "five dimensions", which lead college teaching into good condition by running more than a year.

Table 1. Monitoring points: training objectives

Quality standard	Evaluation method	Evaluation cycle	Executive body of evaluation	Feedback improvement measures
Graduates recognize their own training objectives	Questionnaire for new graduates and 5 years graduates			Evaluation results are fed back to the teaching and advisory committee. If not appropriate, the organization will revise the training objectives. If the training objectives are not met, find out the reasons and improve the curriculum system setting and teaching
Admission of employers to graduates achieves the training objectives	Conduct a questionnaire to employers who hires new and 5 years graduates			
Training objectives in line with national and social needs	Investigate and analyze whether the national and social needs are consistent with the objectives of this major	Once a year	Training program revision team	
The employment rate is higher than the average school level	Figure up employment rate			

1. Professional system leader is implemented, and the professional leaders which hold a concurrent post by grassroots academic leaders is the first person in charge of professional construction. Responsible teachers for each course is set, who is responsible for the specific implementation of the curriculum and curriculum construction. Since the autumn semester of 2016, the system

Table 2. Monitoring point: training requirements

Quality standard	Evaluation method	Evaluation cycle	Executive body of evaluation	Feedback improvement measures
Meet the training requirements of knowledge, ability and quality	Check the student comprehensive evaluation file	Once prior to each student's graduation	Training program revision team	The evaluation results are fed back to the teaching and advisory committee, and adjust to the problem or regulate the corresponding teaching activities

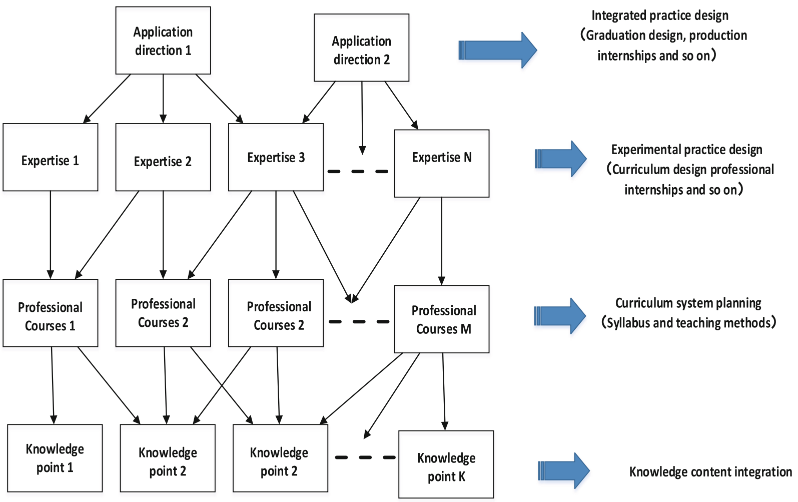

Fig. 1. Top-down professional construction

of talking between professional principals and responsible teachers has been implemented. The outline is as follows:

– Understand the professional training objectives and graduation requirements, and timely explain to students;
– Understand and know the supporting role of this course in training objectives and graduation requirements, and explain to students the teaching contents and objectives of this course;
– Problems in the Course Implementation and Improvement Measures (Syllabus, Course Assessment, Teaching Methods, Feedback from Students, etc.);

Table 3. Monitoring point: courses teaching

Quality standard	Evaluation method	Evaluation cycle	Executive body of evaluation	Feedback improvement measures
The teaching content covers the relevant knowledge areas and knowledge points which is consistent with the curriculum syllabus	See if the lesson plans meet the course requirements	One semester ahead of schedule	Course responsibilities teachers, inspectors	The evaluation results are fed back to the person in charge of the course, and the teaching content, teaching methods and examination methods are adjusted according to the result
Course assessment requirements and content can support areas of expertise	Whether courses meet the request of the training objectives	Held once a semester for each course	Specialty in-charge	
Theoretical and experimental teaching can complete the teaching work according to teaching plan	See if teacher teaching meets the curriculum goal	No fixed term	Students, inspectors, faculty leaders	
The distribution of test scores, as well as the status of the review, proposition	Check the papers, laboratory reports, papers, check whether students meet the curriculum requirements	Once a semester	Specialty in-charge	

– Course leaders need to organize teachers for teaching preparation, fill in the meeting records and report to the college for the record;
– Curriculum construction (including IMOOC class construction, textbook construction, teaching and research, etc.) and the problems to be solved.

Since the implementation of this system, teachers have made clearer view of the training objectives for this course who can timely grasp the feedback from students, supervisors and other parties to adjust timely in the course of teaching and pay more attention to the teaching mode, teaching construction

Table 4. Monitoring point: conditions guarantee

Quality standard	Evaluation method	Evaluation cycle	Executive body of evaluation	Feedback improvement measures
Training programs can be recognized by more than 90% of students and most of teachers and supervisors	Analyze the feedback of students and teachers from different grades of various curriculum, supervisors and college leader	Once a semester	Specialty in-charge	Form a semester research report, leaving the personnel training revision to reference
According to year and teaching links and processes, clearly define standards and accurate access to relevant documents	For all aspects of teaching, teaching and operating order file was established	Long term	Talent development office	Standardize the teaching operation process
Experimental teaching environment and platform support the smooth opening of experimental courses which meet the needs of students in class and extracurricular innovation	Whether teaching experiment environment and software and hardware platform meet the needs of course teaching and students' scientific and technological innovation	Once a semester	Specialty in-charge	Form a teaching condition construction plan as well as add and update hardware and software equipment to meet the practical and theoretical teaching needs
Meet the company's skills requirements for junior staff and basic standards of corporate employees	Whether school-enterprise joint training meet the training objectives and requirements	Once a year	Student counselor and business mentor	Formed a school-enterprise training annual report, and conduct focused analysis for students in and out of enterprises

Table 5. Five dimensions of the evaluation method

Evaluation measures	Executive body	Measures	Frequency of execution
Teacher self-assessment	The teacher	Qualification evaluation, benchmarking evaluation, papers analysis	Every term
Student assessment	Students at school	Questionnaire	Every term
Professional evaluation	Specialties in-charge	Talk system at the beginning of the course, teaching files	Every term
External evaluation	External enterprises, teaching supervision and so on	Governor attend class, enterprise research X and so on	Every term
College joint evaluation	College leaders, personnel training offices, teaching and so on	Check basic teaching information, ethics, education advisory committees and teaching level, teaching rules and so on	Every term

and assessment methods or other teaching reform. 19 courses including artificial intelligence, introduction to internet of things engineering, emperor new brain, system design and analysis, software engineering project practice conducted a teaching reform, the use of research-based, seminar-based teaching mode has been praised by students. At the same time, pay more attention to the process of assessment methods teachers get more and more recognition, and widely used in the teaching process. Assessment methods which focus on the process get the recognition from teachers.

2. The implementation of teaching information system. Each class in college set up a teaching information officer, who is responsible for the timely feedback of teaching information. Since the implementation of this system, the college has collected and summarized nearly one hundred feedback on the teaching, feedbacking by professional person in-charge to teachers, and teachers' targeted rectification has greatly improved the teaching effectiveness.

3. Regular inspection of teaching files system. Every semester, the college organizes a comprehensive examination of the curriculum papers, the experiment report, the internship summary and the graduation project, and focuses on the rectification of the test paper analysis so that the teachers can find out the shortcomings in teaching and put forward the improvement measures which is of great importance to the continuous improvement of teaching effectiveness significance.
4. Improve the teaching evaluation mechanism. College teachers teaching evaluation adhere to basic requirements of the ethics first, scientific research as the basis, the development of foundation to develop a teaching status assessment program. Assessment content:
   - education and teaching level (leadership listen to lectures, Grassroots academic leaders listen to lectures, supervision lectures, evaluation of professional leaders, check scores through teaching files);
   - ethics evaluation of teachers (academic misconduct, student evaluation of teachers, evaluation of academic instructors, graduation design and experimental practice teaching);
   - education and teaching ability (contribution to the construction of professional, curriculum construction contribution, commitment to the core curriculum, contribution to college teaching specialized work);
   - rules of education and teaching (teaching performance, consummation of assigned tasks from college and grass-roots academic organizations, situation of the participation in the education and teaching activities, course transfer, proctoring and proposition).

   In addition, through the continuous introduction of high-level teachers, the strict implementation of mechanism for Professor annual teaching undergraduates, teaching level and enhancement of students' understanding of professional knowledge has been continuously improved.
5. Add the Students' learning status to Teacher Teaching Evaluation System.
   - After the examination of the curriculum, according to the students' evaluation results, the degree of the course is analyzed, and the lower level of the curriculum shows the lack of support for training goals and graduation requirements. Analysis of the existing problems, targeted courses teaching content, teaching methods, assessment methods, or replacement of teachers and other aspects of the adjustment.
   - The student's classroom learning status is added to the classroom teaching evaluation link, which is reflected in the lecture of the school leadership, supervision, teaching and advisory committee.
   - Comprehensive implementation of undergraduate students' academic guidance system. Each semester is evaluated by the student working office to the student's academic achievement and participate in various competitions and so on, and according to this data to the academic teacher to evaluate.

4 Conclusion

By implementing the teaching quality guarantee system, the college teaching is further standardized, and the students' degree of satisfaction has improved significantly, and the development of connotation construction and extension construction. To improve the overall teaching level of the college, it has laid a good foundation for further innovative talent training mode, improving the quality of education teaching, and carrying out the professional certification of engineering education.

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Taking Students as the Center, Discussing Some Thoughts on the Certification of Engineering Education Major

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Abstract. This article from the audit evaluation and professional certification two aspects of engineering education professional certification conducted a series of studies. In accordance with the "five in one" evaluation system proposed by the state to improve professional quality, "students" "learning effectiveness" as the center to achieve the goal of personnel training, develop students' ability to learn for life, training students' positivist and logical thinking. It is an inevitable trend to innovate the model of school-enterprise cooperation and education, promote the combination of teaching and research, and make clear that the evaluation orientation of "taking output as the mainstay" is the construction of engineering education. Finally, deepen the development of higher education informatization through innovation.

Keywords: Students · Audit assessment · Professional certification Engineering education

At the end of September 2017, our college will usher in the entrance examination work certificated by the information security professional engineering education [1], which is also a new certification major after two consecutive passes of computer science and technology certification [2], and also the first batch of information security majors to be certified in the country. In the meantime, in October 2017, our school will also welcome the review and assessment organized by the Ministry of Education.

In order to improve the quality of teaching in higher education, our country has put forward a "five-in-one" evaluation system, namely "self-assessment", "college assessment", "professional certification and assessment", "international assessment" and "normal monitoring of the teaching basic state data". It should be said that audit evaluation is the inheritance and development of level evaluation [3], and it is a mode for college evaluation. Professional certification is a quality assurance action for the majors to meet the quality standards.

1 Efficient Response, Consistent Pace

The main evaluation criteria for undergraduate teaching review and assessment are what we commonly refer to as "five degrees": the coincidence of school run-

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ning orientation and social needs; the supportiveness for school running orientation produced by the four functions of colleges; the conformity of all aspects of personnel training; the guarantee degree of teaching resources to the training of talents; the satisfaction of students, society and government with the quality of personnel training. The top-level design of five degrees is “to answer what people to train”, that is, personnel training objectives [4].

Engineering education accreditation should focus on seven aspects. That is, around the identified talents training objectives, we should evaluate ourselves in seven aspects: student development, training objectives, graduation requirements, continuous improvement, curriculum system [5], teaching staff and support conditions.

If we try to analyze the relationship between “five degrees” and “seven aspects”: from the aspects of curriculum system, teaching staff and supportive conditions, we can review the guarantee degree of teaching resources to the training of talents; from the aspects of student development and graduation requirements, we can review the satisfaction of students, society and government with the quality of personnel training; from the aspect of continuous improvement, we can review the conformity of all aspects of personnel training; from the aspect of training objectives, we can review the coincidence of school running orientation and from the aspects of continuous improvement, teaching staff and support conditions, we can review the supportiveness for school running orientation produced by the four functions of colleges.

The “five degrees” of review and assessment directly affect the overall level of the school. The “seven aspects” of professional certification is the best starting point to sort out the running system, the “five degrees” and the “seven aspects” should be integrated with each other to ensure the quality of personnel training from different perspectives.

2 Take Advantage of the Situation, Grasp the Core

The PISA (Project of International Student Assessment) and the TIMMS (Comparative Programs of Mathematics and Science Achievements of the International Association for the Evaluation of Educational Achievement) conducted by the end of the 20th century have fully demonstrated that “output-oriented” evaluation orientation is the inevitable trend of engineering education major construction.

Combined with the general standard of engineering education accreditation, it is easy to see that there are three core concepts: the first is that the learning effect of students is the focus of attention; the second is that student learning results is orientation; the third is to promote the continuous improvement of teaching quality.

Based on the goal of school personnel training, we should form a professional training target to conform to the school orientation, adapt to the needs of the community and industry development, construct a scientific and reasonable curriculum system that supports the graduation target, rely on the leaders of the grass-roots academic organizations and the course leaders, and continue to improve the teaching quality monitoring system.

3 Clear Concept, Enhance the Overall

To cultivate credible successors of socialism is the fundamental part of university education, cultivating the ability of lifelong learning and laying a solid foundation for the development of students. The personnel training in colleges and universities includes the four elements of literacy (humanistic heritage, healthy life, scientific spirit), knowledge (autonomous learning), innovation ability (practice innovation) and responsibility. In the 12 years from elementary education to higher education, students gradually gained the initial training of empirical thinking and logical thinking. However, how to flexibly apply the positive thinking and logical thinking, especially computational thinking, to solve complex engineering problems needs to be strengthened urgently.

For this reason, professional construction needs to pay attention to the following questions:

1. Innovate the mode of school-enterprise cooperation and education, and promote "the research on the mode of enterprise resource participating in personnel training". Delivery the enterprise needs of personnel to colleges and universities timely, bring high-quality corporate resources into all aspects of personnel training colleges and universities, which is a useful complement to personnel training environment.
2. Promote the combination of teaching and research, research is used in teaching, research in the process of teaching. In his autobiography "How to Get the Nobel Prize", Michael Bishop, winner of the 1989 Nobel Prize in Physiology or Medicine, said: "It is boring to engage in academic research but not to teach, and modern scholars engaged in scientific research and teaching, their lofty mission is to combine scientific discovery with teaching in the same individual."
3. New technologies and new knowledge are disseminated, promoting new technologies such as cloud computing, big data and artificial intelligence, the concept of educating people driven by "innovation-driven and talent-oriented" is constantly deepened.
4. In the post-industrial era, we should promote the reform of the way of running a school through education informatization and deepen the informatization development of higher education.

4 Close Four Rings, Focus on Quality

It has always been concerned with the two assumptions of teaching: "Everything that runs counter to the law of human development will fail." "All teaching reforms that are free of students will fail".

Therefore, we must grasp the "fixed point" of continuous improvement of teaching quality. From the supporting degree of the teaching process to the curriculum objectives and the graduation requirements index point, the course carries on the comprehensive examination; According to the reasonable evaluation of the course, the degree of graduation requirement is calculated; To examine the training target, the achievement degree of the training goal is calculated; Through the feedback of the social and employing units, alumni, teachers and students, the school orientation and professional characteristics are combined, continuously improving the training goals.

5 Conclusion

With the opportunity of evaluation and professional certification, the college has put forward the teaching principle of "quality first, carry out power and responsibility, pay attention to the core", reached four major development strategies that include "cultivating all kinds of computer major, certifying all professional projects and integrating the curriculum system with international standards", and put forward four programs to enhance the program content which are constructing course context with the ability to solve complex engineering-based problem; proposing training strategy new ideas for curriculum integration and promoting the integration of school-enterprise innovation; promoting the clarity of curriculum orientation and the implementation of grassroots academic teaching responsibility; Carrying out the Trinity of certification, appraisal, and professional construction. Finally, These strategies form four validating ways:

1. Emphasize the output guidance, content updating and simultaneous reform of teaching methods and assessment methods;
2. Multi-source course quality assurance system centering on "students" "learning outcomes";
3. Comment and construction synchronizes, choose excellent teachers, and build a comprehensive teaching environment.
4. Audit evaluation and professional certification, as an important starting point for personnel training, is "one of the two wings, dual-wheel of the drive" of the education development.

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Regarding Engineering Education Professional Certification as a Starting Point, Do a Good Job of Audit Assessment

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Abstract. With the gradual implementation and deepening of engineering education in colleges and universities. Student-centered, guided by training objectives and graduation requirements. The teaching evaluation system aiming at improving students' learning ability and ability tends to be more accurate, comprehensive and scientific. The development of intelligent talents with student development as the core. Clear new professional development trend of "Computational Complexity of System, Technology-Driven Innovation Driven and Entrepreneurial Driven, and Promotion of Interdisciplinary Formation". Improving the students' ability to solve complex problems and the normal monitoring of basic state data have become the important means of teaching quality assurance.

Keywords: Computational complexity of system
Technology-driven innovation driven
Technology-entrepreneurial driven
Promotion of interdisciplinary formation

For a long time, our university education follows the Marxist theory of man's all-round development and established that the core of university work is to promote the all-round development of students through education. Guided by the education idea of "cultivating students' lifelong learning ability" [1], the level of professional construction has a direct impact on the talent cultivation effect of universities. Our college will focus on the certification of engineering education [2], the college audit assessment done.

1 Evaluation of the Working Principle

Computer Science and Technology, as the first engineering major in our school to pass the engineering education certification, has made a positive attempt and exploration for the school and college's strategy of engineering major. On this basis, in September 2017, information security major was the first batch

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to receive inspection of engineering education certification specialists; at the same time, software engineering major formally submitted engineering education certification applications. In October 2017, our school will also usher in the review and appraisal organized by the Ministry of Education. For this reason, the college established the working guideline of "Regarding the certification of engineering education [3] as the starting point and doing a good job in the examination and assessment of the college":

– Developed an internationalized and research-oriented training program [4] to improve the conformity degree between professional education and social needs;
– Implement professional construction and curriculum construction responsibilities and enhance the support of grassroots academic organizations [5] for specialized education;
– Improve the teaching quality monitoring system of "Five-Dimensional and Four-Ring" so as to improve the coincidence degree of all aspects of talent cultivation;
– Constructing various kinds of teaching service and management platforms to enhance the protection of teaching resources for talent cultivation;
– Introduction of university-enterprise cooperation mode, formulate a short-term visit plan, carry out CSP competency certification, and enhance the satisfaction of students, society, government and families on the quality of talent cultivation.

In September 2016, for the first time, the college put forward the goal, "The cultivation system of smart talents with the core of student development". In nearly three months, the college conducted international comparison of teaching objectives and investigated the objective and curriculum system of talent cultivation in many foreign universities, such as Stanford and MIT, especially cultivate the education characteristics of "solving complex engineering problems", and clearly defined the new professional development trend of "complexity of computing systems is enhanced, technology-driven towards innovation-driven and entrepreneurial-driven, and promote the formation of interdisciplinary" and so on. In April 2017, following the ACM/IEEE2013 international standards and OBE project certification standards, the institute formulated a program of elite-type talent cultivation that divides into four levels: general thinking cultivation, basic ability training, professional ability training and knowledge/vision expansion. The content of many courses is condensed into thinking courses, which are opened in the lower grades, emphasizing the continuity; senior courses are based on the design and structure, emphasizing the systematic and in-depth understanding of complex systems and knowledge.

2 Courses Are a Vehicle to Improve Students' Ability

As a carrier to solve the problem of cultivating the ability to solve complex engineering problems, the curriculums must have a clear system and context. First,

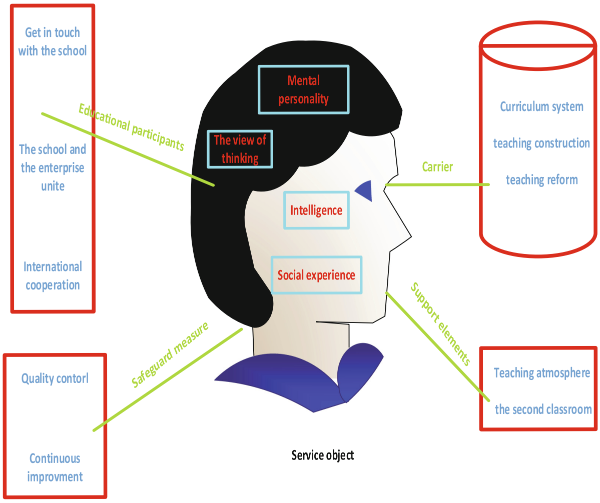

Fig. 1. The cultivation system of smart talents with the core of student development

the integration of new ideas to promote the course content innovation; Second, clear positioning, the implementation of the construction responsibility; Third, the coordination of output to ensure synchronous reform of teaching methods and assessment methods and other aspects. In order to ensure the success of the above objectives, the college has set up a Teaching and Advisory Committee to clarify the major teaching decision-making system and implemented a number of job responsibilities such as graduation design, professional internships, international exchange, quality engineering, teaching materials construction and so on, the college hired professional leader and course responsibility professor (responsible teacher), who answered "Who revised the curriculum system, who revised the syllabus, where does feedback data come from..." and many other issues. Through the above measures, teachers have published a number of national, provincial and ministerial planning textbooks, have built a number of excellent courses and moocs. The number of lectures by teachers drop by 30%, while the number of students' weekly drop by 15%, and the number of courses from more than 160 is integrated into more than 70 (Fig. 1).

In order to verify the effectiveness of teaching construction and reform, the college has introduced a multi-source course quality assurance system and a program for teachers' teaching status evaluation centering on "students" and "learning outcomes". The so-called "five-dimensional" refers to the responsible professors' assessment, student' assessment, external evaluation, professional evaluation and college internal review. The so-called "four-ring" refers to the evaluation of the rationality of the curriculum, the evaluation of the graduation requirements, the continuous evaluation of the profession and the evaluation of social satisfaction. However, the teaching responsibility is passed to the teachers through loosely quantitative state evaluation data, including four indicators: teaching attitude, teaching methods, teaching spirit and teaching effect.

In order to improve the efficiency of running a school, the college has also adjusted the elective course system and developed a procedural/accumulative assessment platform. The electronic internship notes are implemented so that students can keep record at any time and teacher, enterprise can evaluate Interactively. The graduation design management and blind review system have been piloted, and the full cycle quality monitoring is strictly regulated. At the same time, the college is actively involved in multi-resources to carry out the development work of professional education big data platform.

A variety of education teaching construction and reform measures make the school's overall educational efficiency and talent cultivation level of the college significantly improved. Professor William Webster, a former vice president of the University of California, Berkeley and a fellow of the American Academy of Engineering, is a part-time professor of our university. He once said: "Talent cultivation will often follow the traditional model because all risks are low and there is no need to think about it, thus all reform and try appear more meaningful, because it is easier to succeed," for us, engineering education professional certification is both an attempt and a necessary one.

3 Conclusion

To adhere to the engineering education certification as the starting point. Promote and improve the quality assurance system established by the university itself. Enhance engineering education of human wealth and industrial adaptability. At the same time, it is also promoting the further extension of scientific evaluation, standardization, marketization and socialization. Engineering Education Professional Certification brings about personnel training mode, teaching reform and management reform. Talent cultivation transforms from the past knowledge into ability. From Ability to Whole Person Education for Healthy Personality and Individuality. At the same time, it also profoundly affects the transformation of educational philosophy. Education is not only a means of obtaining living skills, but also a way of enhancing human spirits.

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Research on the Related Teaching Method of Computer Operating System Course

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Abstract. Computer operating system (OS) is one of the most important course of computer science. According to the difficult situation in the teaching of computer operating system course, the article analyses the reasons of main problems in the teaching process, and puts forward a new related teaching method based on association. Firstly, the method regards the computer system as a complete social system, and strengthen the crossing and connection with other courses. Secondly, strengthen the specific association and correspondence between experiments and theoretic. Finally, specific examples are given and explained.

Keywords: Operating system (OS) · Related teaching method
Cross learning · Educational reform

1 Background

Computer OS is an important and indispensable part of the computer system. It is the first extension of the computer hardware function, and the computer system is no use without it. The Operating System Principle (OS) course is a foundation course and a core course of computer and related subjects. It is an important software course which related to much hardware knowledge in computer system courses. In curriculum settings of the computer software and hardware courses, it plays a connecting role. The OS implements the overall management of computer system resources, which is the only interface between all other software and computer hardware. Therefore, all users need to use the computer on the OS, and the services provided by the OS are required. The mastery of OS course affects the professional level and development direction of computer learners. By the studying of this course, student can learn the basic concepts and main functions of the OS. In addition, student can master the use and general management methods of common OS (such as windows, UNIX, Linux), understand how it is organized and operated. And then, the knowledge of OS lay a solid foundation for students' future study and work.

Constantly, the usage, analysis, design and development of the OS is always the important subjects and tasks of computer science. In order to learn the course well, it

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not only requires students to have a certain knowledge of computer hardware, but also requires students to have the knowledge of software technology. Thus, the purpose of this course is to make students to understand and master the basic working principle design techniques and design methods of computer OS. The content of OS course is the composition structure, design idea, design method and theory synthesis of all kinds of OS. Because of the multiple knowledge points, with conceptual and abstract strong, it is different for many learners to understand and master.

2 Main Problems in the Teaching Process of OS Course

Many students raises the question after class as if by prior agreement: What is the principle of computer operating system? What is the relationship with other courses? How does the knowledge links up between chapters? Why is the experiment difficult to correspond with the theoretic? Many teachers are also studying how to improve the teaching methods of this course [1–5], or try to improve the experimental content and facilities [6–8]. These articles analyze the shortcomings of the traditional teaching model from various aspects.

After getting rid of the extrinsic factors such as the less change of teachers' teaching methods and obsolete computers, the course itself should be analyzed on its characteristics and difficulties.

2.1 Curriculum and Experiment Are More Difficult

There are many concepts, strong principles, high degree of abstraction in the OS course, so it is difficult to understand for learners. The theoretical knowledge accounts for a large proportion, in especial, the key knowledge points are dispersed, and the intrinsic logic relationship between concepts is hard to find. Moreover, operating system itself is a complex programming set, for that reasons both experimental comprehension and design are difficult.

2.2 The Teaching Content and Experiments Cannot Be Effectively Related

The choices and arrangements of experimental contents are of great concern. There are many experimental settings unreasonable, special details as follows:

(1) Few experiments is set about memory management and device management.
(2) Most of the experiments are of replication experiments and the number of designed experiments is few and difficult.
(3) Curriculum content is generality OS theory, while the OS experiments must be corresponding to a specific OS(such as windows), so, experiments cannot be one-to-one correspondence to OS theory.
(4) The operating system is closely related to hardware, but the experiment is often not associated with hardware or difficult to achieve.

2.3 The Student's Knowledge Reserve Is not Enough

The setting of previous courses is unreasonable, so that the development experience and hardware related knowledge of the student is weak. In addition, some courses are closely related to the content of the OS course, the same content will be appear in different ways or different angles. However, students do not associate and utilize other courses in their study.

2.4 The Examination and Application Are Relatively Divorced

Examinations focus on concepts and principles, and often divorces from the actual application. It was this issue which led to the deviation of students' learning focus. Many students think that the mastery of knowledge is nothing but rote learning.

To sum up, the difficulty of operating system course cannot be overcome. Not only good teaching materials can play a role in teaching process, but also continuous accumulation of teachers teaching experience is needed. Therefore, it is particularly important to adopt reasonable teaching methods. In this paper, the related teaching method is put forward to the teaching of operating system. This method can mobilize the enthusiasm of the students to the greatest extent, guide students to learn independently, and then improve their learning ability.

3 The Related Teaching Method of the OS Teaching

A good teaching method will not only allow students to understand the principles and internal mechanisms of the operating system, but also enable them to master the key-skills of software engineering. In the related teaching method, teachers will impart knowledge by association and analogy. Students are required to learn the operating system in the developer's mind, and to think of all the parts of the OS as a whole. In the traditional way of teaching, we often divided the course content based on OS function into several modules which is further divided into smaller modules.

Because of the dispersive characteristic of OS, we should pay more attention on how to strengthen the contact of knowledge points rather than split them. Therefore, the aim of related teaching method is to change the relationship of knowledge modules from high cohesion and low coupling into high cohesion and high coupling.

According to the differences of knowledge points, different correlation and correlation range, the basic association of knowledge can be divided into tree structure, cluster structure, ring structure, and mesh structure.

The key points of related teaching method is shown in Fig. 1. New methods and concepts in each chapter will be studied associating with other related subjects and things in life. By this means, learners can get the knowledge more easily and concretely. Knowledge is especially associated with experiments, and then main knowledge is deepen understanding by programming. We also link up the knowledge and experiments between chapters.

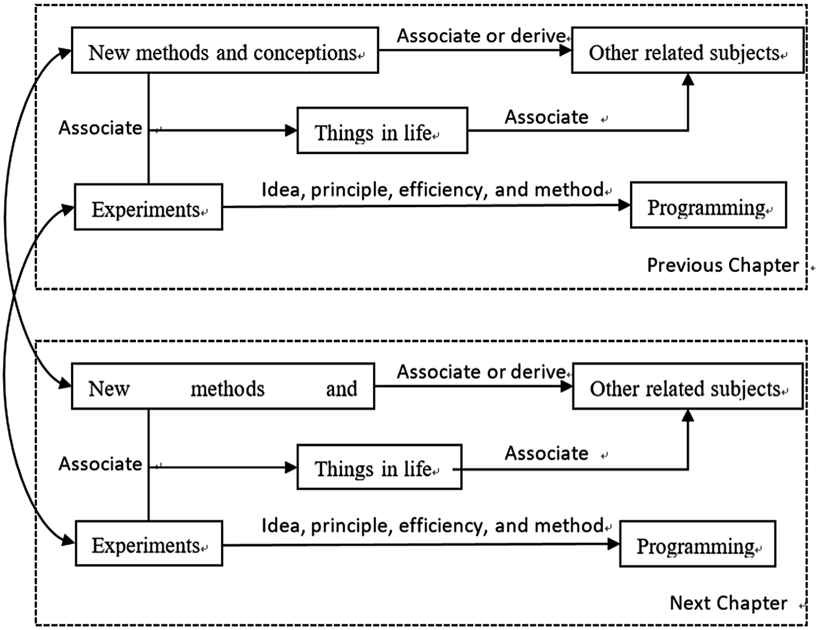

Fig. 1. Key points of the related teaching method. New methods and concepts in each chapter will be studied associating with other related subjects and things in life, especially associated with experiments.

Based on years of teaching, 8 methods of OS teaching need to be done.

(1) Pay attention to the training of students' associated mode of thinking.
(2) As an OS learner, transposition should be thinking more different stand point of view the problem, such as developers, users, and managers.
(3) Provide Linux, windows, Android, or simplified experimental platform of operating system, in order to corresponding the general functions and the specific applications.
(4) Change the process of teaching. Questions should be spotted by learners themselves, instead of being asked by teachers.
(5) Pay attention to the association of experiments and programming. Computer programming is an important way to understand OS principle. It is suggested that teacher should provide the system programming subjects, the simulation experiment platform of OS, the teaching OS, the kernel development of business OS and so on.
(6) Pay attention to the search and association of reference material. Make sure learners have the ability to retrieve reference materials. For example, Memory management and other hardware knowledge can refer to Principles of Computer Organization, and some algorithms for process scheduling can refer to algorithms in Data Structure.

(7) Pay attention to the association of the knowledge points in previous chapter and next chapter by contracting, contacting, and simulating.
(8) Strengthen the connection if hardware and software. The OS is mainly used for managing hardware. If a mainline can be used to put the operating system principle into a large computer system, the mainline is the composition of each part of the computer.

4 Examples of the Related Thinking

A better way to learn the OS is to understand each knowledge from the point of view of an OS kernel developer.

(1) Concepts and algorithms is associated with the things in life. For example, CPU is considered as a decision maker, and OS is considered as a manager of the computer hardware and software. The computer system is a multi-layer social system. The software can be related to transportation scheduling, transportation, functional departments, social structure, social classification system, etc. In contact, the hardware is related to roads, houses, warehouses, land, vehicles, etc.
(2) Associate with software development and software engineering. The common problem of the allocation and sharing of limited resources is the compromise and the improvement of efficiency. In programming, there is a programming think that time changing space and space changing time. In control theory, there are suboptimal control and cost control. It is a balance of resources both in programming and control theory. Therefore, we should first guide students to learn from the perspective of developers and designers, clarify the premise of limited resources, and make clear that the operation system programming is the principle of reasonable management of limited resources. For example, the application of variable in program development, memory dynamic application is closely related to the memory management in the operating system. Furthermore, the operating system program itself is in line with the development and design concept of software engineering, and the idea of software engineering can be verified here.
(3) Associate with the concept of cross points between subjects. Different subjects have different formulations and different teaching angles. If teachers can explain from different angles at the time of teaching, they will be of great help to the integration of all courses. For example, when students use the windows OS for application management, it will involve many concepts of file system, such as partition, formatting, sector, cluster, etc.; The discrete management mode of learning memory management involves hardware knowledge and computer composition principles with the same content but different expressions.
(4) The lesson will be connected closely to the experiments. Specific operation such as commands, calls, and processes should be associated with the knowledge points of the textbook.
(5) The connection between CPU execution and hardware support. Who is the working people (i.e. program), and where to place things (memory, memory, register).

(6) The connection between the windows setting and the interface of the hardware and the OS. It is necessary to identify which is a graphical interface, which is a program interface, and a command interface.
(7) Garbage collection system is associated with equipment recovery and resource recovery. This is similar to programming resource recovery.

5 Conclusion

The article give a vivid teaching method of OS course. By the method, chapters are closely related to each other, and the whole course content is easily studied. The core of this method is to enhance students' thinking skills training. Through classroom practice, this teaching method can effectively overcome the objective constraints brought by teaching materials and experimental equipment. It also maximizes the enthusiasm of the students and guides the students to study independently. Thereby, improve the learning and understanding abilities of the students, and then make students have the ability of understanding the rest of other courses.

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Build Up Peer Instruction Based Flipped Classroom with Social Network

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Abstract. Nowadays, the rapid development of information technology provides a great support for Flipped classroom. We introduce the features of Peer Instruction (PI) and a social network APP which is named Wechat and its public platform. We introduce how to apply Wechat into classroom teaching by building a mixed Flipped classroom teaching mode based on PI with Wechat public platform. We take Computer Network Experiment course of Taizhou University as an example to illustrate the practice process. The feedback and investigation result indicate that this new Flipped classroom teaching mode can improve students' participation in the classroom activities and arouse students' interest in study. Students have thought highly of this new teaching mode.

Keywords: Peer Instruction · Flipped classroom · Teaching mode
Social network · App · Wechat public platform

1 Introduction

Flipped classroom, also known as reverse classroom, is a new teaching mode, which exchanges the order of teaching and learning in conventional class and at the same time reallocates the class time [1]. To be specific, students are required to watch videos before taking the class and internalize what they have learned from the video, so the new mode of teaching has changed the role of teacher and students in conventional class in this regard. Flipped class redefines the order, focus and mode of teaching, from conventional "teaching and learning" to "learning and teaching" and from "learning results focus" to "learning process focus", and from "teaching leading to learning" to "learning leading to teaching" [2]. Flipped class enables student to learn individually based on their own interests and level. Personalized learning is exactly what the teachers in the conventional class have been devoting to, but remains unsolved problem.

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With wide application of the Internet, college students are highly dependent on the Internet, and it has been an important part of their lives and their studies. Nowadays, most college students own a smart phone (using Android or IOS operating system) and a great number of them have their own laptops and tablets. Besides, campus networks, especial campus wireless networks and networks provided by network providers are covering the entire campus, which enables students to study with their mobile devices connecting to the Internet on campus. On the other side, social networks have already been students' day-to-day communication tool. Being new technology and latest fashion pursuers, students are willing to pursue new inventions and use new products and technologies. At present, nearly all the Chinese college students' cellphones are loaded with Wechat - a social network app like Facebook. They visit and refresh their Moments often even in the class or voice-talk with long-distance friends on Wechat.

As spreads of the teaching philosophy of "use video to reinvent education" proposed by Khan (founder of Khan Academy) in his famous talk [3], Flipped classroom quickly attracts attention all over the world. Therefore, it is of great significance to build Flipped classroom on the basis of Wechat platform, taking advantage of Massive Open Online Courses [4] to put study into students' real-time network lives. On one hand, it can improve student's self-learning awareness and make the Internet assisted learning much easier than before; On the other hand, it explores the possibility to unify modern in-class learning and post-class assisted learning, which is of practical significance.

2 Related Work

2.1 Peer Instruction Teaching Strategy

Peer Instruction is a kind of student-oriented mutual support teaching strategy. It can be used to examine the level of mastery of learners and their peers. In the case of the team learning, every student can teach the team members from teachers' perspectives. At the same time, they can receive guidance and help from the companions. It will greatly enhance the enthusiasm of learning, broaden the thinking dimension, depth understanding of knowledge, and improve the ability to innovate and so on [5, 6]. The learners themselves to improve the efficiency of learning at the same time to overcome the basic ability of different courses difficult, inadequate teaching resources and other issues, which reduce the burden of teachers in the experimental course.

2.2 Flipped Classroom Based on Wireless Terminal

The wide use of smart devices gives a great support for the second classroom. Many educational researchers start to explore building and practicing the Flipped classroom based on wireless terminal [7–9].

At present in China, the teaching mode based on wireless terminal mainly use QQ (a social network software) or Wechat to assist teaching. QQ assisted teaching mode divides the whole class into several groups and lets the student and the teacher of the same group discuss and exchange learning materials. The advantages of Wechat are:

firstly, the teacher can upload the learning materials to the ‘Wechat cloud’ permanently, and students can read the material or watch the video on Wechat platform without downloading them; secondly, Wechat has functions of group chatting, video transferring, voice-texting, photos and emoji transferring, so the teacher can have one-to-one or one-to-group lecturing on Wechat; thirdly, as the most popular App in China, Wechat is welcomed by teachers and students.

In summary, Wechat assisted teaching has more competitive edges than others. So, the Flipped classroom based on Wechat platform greatly benefits the classroom teaching reform.

2.3 Wechat Public Platform

Wechat public platform was released by Tencent®, offering services to group subscribers, once known as ‘official platform’ or ‘media platform’, and finally named as ‘public platform’ officially. Through Wechat public platform, users can receive customized services like notification sending, brand spreading, QR (Quick Response) code, etc. Wechat public platform is free to the public. Users can get their own Wechat public account by registering with email, and it provides many functions such as text messaging, hold-to-talk voice messaging, broadcast (one-to-many) messaging, sharing of photographs and videos, etc. It is easy to use for any beginners. Moreover, it provides real-time interactions and sends accurate notifications. QR code has been widely used by media, websites, shops, etc. It also meets the college students’ life style and communication habits. Due to above advantages, almost every college student’s smart phone is installed with Wechat. In addition, the college teachers are willing to try use new inventions, which makes the Flipped classroom possible based on Wechat public platform.

3 Flipped Classroom Mode Building and Practice

3.1 The Building of Flipped Classroom Based on Wechat

The conventional class is the place where teachers give lectures to students, whereas Flipped classroom is the place for question raising, discussion and problems solving. After reviewing the literature on Flipped classroom [10–14], combining the advantage of Flipped classroom and Wechat platform, this paper presents a new Flipped classroom mode based on the mode [15] initiated by Robert Talbert from Franklin School in America. We take Computer Network Experiment as an example, and show it in Fig. 1.

This mode includes three steps, namely pre-class knowledge transfer, in-class knowledge internalization and post-class knowledge enhancement. With students focused, this mode uses the Wechat function of one-to-one and one-to-group to facilitate effective communication between students and teacher, which enables the teacher to play the role of organizer and students the role of participators. (1) Pre-class knowledge transfer. The teacher takes students’ level into consideration and make appropriate teaching videos and materials to help students review what they have learned previously and preview what they are about to learn. Students are asked to learn

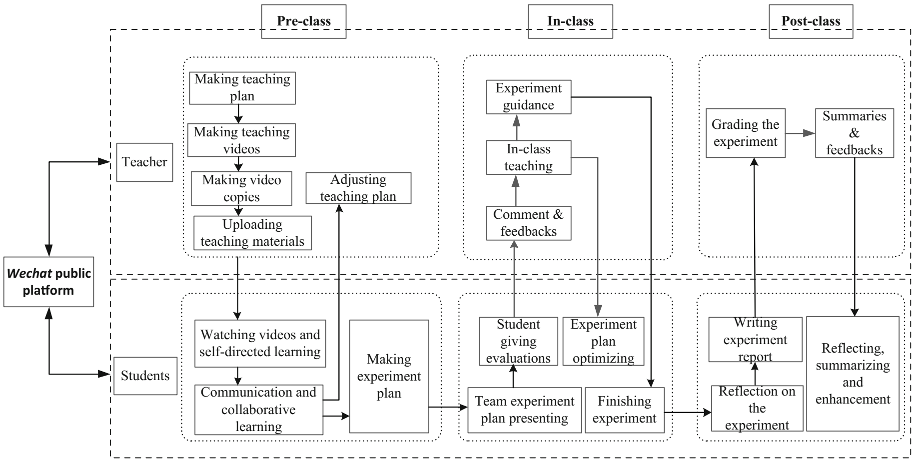

Fig. 1. The flipped classroom mode for Computer Network Experiment course based on Wechat public platform

those materials by themselves and later have discussions with their classmates on Wechat. (2) In-class knowledge internalization. The in-class knowledge is passed on from teacher to students should follow the rule of "attention-interest-exploring-action-sharing". In other words, learning contents should first arouse students' interests and then make them explore further and master them in the end. The last step is that they share their ideas with classmates and teacher. (3) Post-class knowledge enhancement. Students upload the problems they could not solve on Wechat public platform, and the teacher organizes discussions with focus on key points and difficulties, leading students to summarize and reflect on what they have learned, which gradually improves their capability of solving problems.

3.2 The Effects

The trial has been taking for a semester, and students have a better master of the experiment contents, explore further than previous students and are more involved in the study. Secondly, teachers and students have more communications and get more closed than before, which encourage students to have more participation in the study. Thirdly, students' communication skills have been practiced greatly and critical thinking has been cultivated.

As indicated in the "users analysis" released by Wechat platform data statistics, students give much attention to Wechat platform of Taizhou University Network Laboratory. There are 4 classes totaled 108 students taking the course of Computer Network Experiment last semester. All of them have followed Wechat platform of Taizhou University Network Laboratory. As shown in Fig. 2, the following rate reaches 100%.

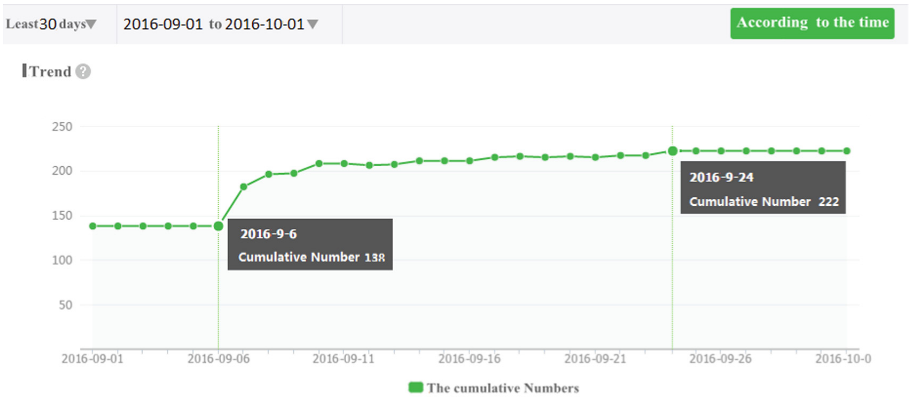

Fig. 2. The number of followers of Wechat public platform ‘Taizhou University Network Laboratory’

Also, we take the final scores of the latest four semesters and previous three semesters for comparison. In the latest four semesters, we adopted the Flipped classroom approach. The final score was composed of experiment operations 30%, presentations 30% and experiment reports 40%, while in the traditional approach, the final score was composed of experiment operations 50% and experiment reports 50%, see in Table 1.

Table 1. Students’ scores comparison

Semester	Student number	Experiment operating (average score, 30%)	Experiment report (average score, 40%)	Presentation (average score, 30%)	Final score (100%)
Spring, 2017	92	93	88	90	90.1
Fall, 2016	119	92	86	90	89
Spring, 2016	59	91	86	88	88.1
Fall, 2015	84	92	84	85	86.7

Semester	Student number	Experiment operating (average score, 50%)	Experiment report (average score, 50%)	Final score (100%)
Spring, 2015	56	75	82	78.5
Fall, 2014	103	81	85	83
Spring, 2014	58	77	82	79.5

From the data in Table 1, there exists a gap among the students' scores. In the Flipped classroom approach students watching videos and making presentation before taking the experiment get a higher score in 'experiment operations'. Traditional approach merely focused on 'operations and reports'. In the Flipped classroom approach, students achieve a unified goal in presentations. The latter makes the results comparable and improves the overall level due to their mutual encouragement. Meanwhile, the rule that the presentation score marked before the experiment enable the evaluation of final scores more fair and objective.

4 Conclusions

Building and practicing the Flipped classroom based on Wechat platform not only brings the advantages of the Flipped classroom into full play, but also improves students self-learning awareness. It focuses on personalized study and realizes the goal of stratify teaching. Meanwhile, it can strengthen the communications between teachers and students and make them get closer than before. It combines students' network life and study. It also greatly inspires their motivation.

The Flipped classroom based on Wechat platform has proved that the teaching quality has been raised greatly and the college students have been inspired to work harder on study. However, this mode requires much more for college teachers. Teachers need to spend more time and put more efforts on their teaching notions, teaching methodology and teaching skills in order to keep abreast of the modern age of teaching.

Much work has to be done as to the experimentation in adopting the Flipped classroom in our teaching. Further suggestions and comments are most welcome.

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The Empirical Study on English Teaching Mode of Higher Vocational Colleges Focused on Professional English Ability Training

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Abstract. Vocational college English teaching shall focus on professional English ability training so as to comprehensively promote students' language skills, subject accomplishment and innovation ability. It is found through questionnaire made under the guidance of professional English ability contents, survey on the professional English ability of our graduates in different work posts and independent sample T test by software spss 11.0 (The software name originally stood for Statistical Package for the Social Sciences, reflecting the original market, although the software is now popular in other fields as well, including the health sciences and marketing. SPSS is a widely used program for statistical analysis in social science. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners, and others.). There is no significant differences in professional English ability for gender and profession, while graduates from different majors show significant differences in professional English ability for being class leaders or not, internship experience and industries they work in. Our graduates are not confident enough on their professional English ability, not good at oral expression and they all believe professional English ability directly affect the development of their future career. Therefore, in English teaching of higher vocational colleges based on professional English ability training, we need to bring vocational education theory throughout the whole teaching process and learning content, pay attention to students' differences, improve teachers' informatization capacity and teaching effectiveness in class, adopt flexible and multiple assessment methods and create a teaching system where English could well integrate with other fields.

Keywords: Professional English · Vocational ability · Teaching mode Empirical study

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With China's implementation of "The Belt and Road", domestic enterprises, related countries, regions as well as the whole world has been highly connected, and English has become the major media for international affairs and communications. Vocational education holds the important mission of serving the regional economic development, therefore, vocational English teaching mode featured in "taking employment as the orientation, ability as the standard and having vocational characteristics" has been the inevitable requirement for the international political, economic and social development. It will be the core part for vocational colleges' talents cultivation to comprehensively promote students' language skills, subject achievement and innovation ability and foster graduates with higher vocational English ability. English teaching of higher vocational colleges focused on professional English ability training will improve the employment competitiveness of vocational college graduates and meet the increasingly internationalized post requirement. Scientific guidance is provided for the vocational English teaching reform in our college though the empirical studies on professional English ability of graduates from different majors.

1 Connotation of Professional English Ability

The connotation of professional English ability is derived from vocational ability. Both behavioristic psychology and cognitive psychology have given the explanations to professional ability, where the former emphasizes solely on the students' ability of finishing specific, operable and measurable tasks while ignoring other ability related to vocational activities that can be tested yet invisible (Ye et al. 1996); and the latter ignores the practical requirement of vocational ability that knowledge does not simply equal to ability. Some scholars hold the view that "ability includes talent, method and cognition that people shall learn and use the whole life". The vocational ability discussed now is comprehensive ability, no longer limited to work post. Ability could be classified according to the content as the following three kinds: (i) professional ability, which is professional skills and the ability the practitioner needs to fit the work post. It needs professional post knowledge, practical operating ability and the ability to use and promote new materials, processes, techniques and equipment; (ii) methodological ability, which includes the ability to collect, process and sort materials, ability of writing communication and summary, ability to make plans and organize activities as well as the reverse and conversion thinking ability; (iii) social ability (Reschly & Gresham), which needs to be summarized from others, individual and task. Jiang Dayuan, Chinese scholar, believes that vocational ability consists of the ability of profession, strategy and social contact. Ability of profession refer to the relevant professional skill, theoretical system and related skills; while ability of strategy refer to the skills of handling businesses and the attitude of drawing experience during work, and ability of social contact refer to the communication skills of participating in relevant business occasions and the combination with the public during work (Jiang 2008).

To sum up, vocational ability includes professional skills and related skills apart from professional skills. The former includes stable and unique technical ability related to major and future career, while the latter refers to all other ability for the career apart from those skills mentioned above, which include self-learning ability, language communication skills, social communication skills, collective responsibilities and so on. Therefore, vocational English ability of vocational students include professional accomplishment skill, language ability, technical skill and innovation ability, that is to say students need to have good language skills, technical skills as well as rich professional accomplishment and could use language to solve professional problems and master technical skills.

2 The Empirical Investigation of Our Graduates' Job Market Based on Professional English Ability

2.1 Objects, Methods and Contents

This study made sampling questionnaire survey of the graduates of 2014, 2015 and 2016 from departments of Civil Air Transportation, Tourism and Hotel, Marine Engineering and Electromechanical Engineering of our college, with the connotation of professional English ability as the survey content. The questionnaires were given to the graduation and collected for analysis through spss 11.0. 260 valid questionnaires have been collected, on which the individual information include gender, class leader or not, internship experience or not, major, industry and so on. We had a preliminary understanding of the objects by data sorting to ensure the samples are highly representative, which could reflect the actual English teaching condition of our students so as to provide references to the English teaching reform of our college.

According to the investigated data, 39.6% of the objects are male, while 60.4% are female. The number of students who are class leaders takes up about half of the objects, which is 50.8%. 93.8% of the objects are with internship experience, which takes up the largest percentage. Besides, 109 of all investigators are majoring in Civil Air Transportation, taking up 41.9% of the whole objects, while 46.5% are majoring in Tourism and Hotel, 1.2% are majoring in Electromechanical Engineering and 10.4% are others. Judging from industries we can see that 36.9% investigators work on civil air transportation, followed by those work on tourism and hotel and other industries, which takes up 36.2% and 16.5% respectively; but those work on electromechanical engineering only take up 4%. From the frequency distribution table of personal information of those investigators we can see that the samples are quite representative since they have covered classes leaders or not, internship or not, all majors and all industries.

2.2 Index Difference Analysis

Gender Difference: After comparing the professional English ability difference of male and female and making independent sample T test, the results are as in Table 1 shows that the P value of the significance testing in the first line is 0.007, less than 0.05, therefore, the variance is non-homogeneous. And the corresponding P value of t test is 0.364, above 0.05, which tells that there is no significant difference between male and female in professional English ability.

Table 1. Independent sample test of gender difference

	Variance Levene test		T-test of mean variance						
	F	Sig	t	df	Sig	Mean difference value	Standard error value	95 confidence interval of finite difference	
								Lower limit	Upper limit
Assumed equal variances assumed unequal variances	7.432	0.007	−0.956 −0.910	258 181.851	0.340 0.364	−1.698 −1.698	1.776 1.866	−5.196 −5.380	1.800 1.984

Class leaders or not: After comparing the professional English ability difference of those who are class leaders and those who are not and making independent sample T test, the results are as in Table 2: Table 2 shows that the P value of the significance testing in the first line is 0.353, above 0.05, therefore, the variance is homogeneous. And the corresponding P value of t test is 0.001, less than 0.05, which shows that there is significant difference between those who are class leaders and those are not in terms of professional English ability.

Table 2. Independent sample test

	Variance Levene test		T-test of mean variance						
	F	Sig	t	df	Sig	Mean difference value	Standard error value	95 confidence interval of finite difference	
								Lower limit	Upper limit
Assumed equal variances assumed unequal variances	0.864	0.353	3.363 3.369	0.258 256.643	0.001 0.001	5.731 5.731	1.704 1.701	2.376 2.381	9.066 9.081

Internship experience or not After comparing the professional English ability difference of those who have internship experience and those who have not and making independent sample T test, the results are showed as in Table 3: From Table 3 we can see that the P value of the significance testing in the first line is 0.539, above 0.05, therefore, the variance is homogeneous. And the corresponding P value of t test is 0.038, less than 0.05, which tells that there is significant difference between those who have internship experience and those have not in terms of professional English ability.

Table 3. Independent sample test

	Variance Levene test		T-test of mean variance						
	F	Sig	t	df	Sig	Mean difference value	Standard error value	95 confidence interval of finite difference	
								Lower limit	Upper limit
Assumed equal variances assumed unequal variances	0.379	0.539	2.090 1.931	258 16.686	0.038 0.071	7.504 7.504	3.591 3.887	0.432 −0.708	14.576 15.716

Major difference: Table 4 gives the N, Mean, Std Deviation, Std. Error, 95% confidence interval, Minimum value and Maximum value of all majors in professional Englishability.

Table 4. Description of mean

	N	Mean	Std. Deviation	Std. Error	95% confidence interval of mean		Minimum value	Maximum value
					Lower limit	Upper limit		
Civil air transportation	109	43.46	13.986	1.340	40.80	46.11	15	70
Tourism and hotel	121	47.00	13.589	1.235	44.55	49.25	15	75
Marine engineering	3	38.33	17.954	10.366	−6.27	82.93	18	52
Electromechanical engineering	0	0	0	0	0	0	0	0
Others	27	50.63	14.289	2.750	44.98	56.28	15	75
Total	260	45.79	14.006	0.869	44.08	47.50	15	75

Table 5 is the result of homogeneity test of variance. From the aspect of significance rate we can see that $p > 0.05$, showing the variances of each group have no significant difference at the level of $a = 0.05$, which mean the variance has homogeneity.

Table 5. Compared homogeneity test of variance

Levene statistics	df1	df2	saliency
0.357	3	256	.784

Table 6 is the analysis of variance, where the corresponding probability value of F value under the assumption of HO shows there is no significant difference for mean values between groups (i.e. there is no difference of professional English ability in majors). While after calculation, F value is 2.719, and the corresponding probability value is 0.045, less than 0.05, rejecting the original assumption, which shows there is significant difference of professional English ability for different majors.

Table 6. Analysis of variance

	Quadratic sum	df	Mean square	F	Saliency
Between groups	1566.757	3	522.919	2.719	0.045
Within group	49238.027	256	192.336		
Total	50806.785	259			

The descriptive of Table 7 gives the N, Mean, Std Deviation, Std. Error, 95% confidence interval, Minimum value and Maximum value of professional English ability in different industries.

Table 7. Description of mean

	N	Mean	Standard Deviation	SE	95% confidence interval of mean		Minimum value	Maximum value
					Lower limit	Upper limit		
Civil air transportation	96	45.79	13.161	1.343	43.12	48.46	15	73
Tourism and hotel	94	46.11	12.519	1.231	43.54	48.67	15	75
Marine engineering	1	18.00					18	18
Others	69	45.77	16.713	2.012	41.75	49.78	15	75
Total	260	45.79	14.006	0.869	44.08	47.50	15	75

Table 8 is the result of homogeneity test of variance. From the aspect of significance rate we can see that $p > 0.05$, showing the variances of each group have no significant difference at the level of $a = 0.05$, which mean the variance has homogeneity.

Table 8. Compared homogeneity test of variance

Levene statistics	df1	df2	Saliency
4.624	2	256	.054

Table 9 is the analysis of variance, where the corresponding probability value of F value under the assumption of HO shows there is significant difference for mean values between groups (i.e. there is difference of professional English ability in different industries). While after calculation, F value is 1.333, and the corresponding probability value is 0.264, above 0.05, echoing the original assumption, which shows there is significant difference of professional English ability for different industries.

Table 9. Difference analysis

	Quadratic sum	df	Mean square	F	Saliency
Between group	781.725	3	260.575	1.333	0.264
Within group	50025.059	256	195.410		
Total	50806.785	259			

2.3 Frequency Analysis of Key Issues

We made a survey on the issues of "chances of using English" and "situation of being rejected for poor English" during graduates' work and the results are as follows (Table 10):

Table 10. Statistics of issues

Statistics of issues	Frequency	Statistics of issues	Frequency
Chances of using English		Be rejected for poor English	
Very frequent	25 (9.6%)	Often	31 (11.9%)
Comparatively frequent	71 (27.3%)	Occasionally	87 (33.5)
Less frequent	116 (44.6%)	Non	100 (38.5%)
Almost not use	48 (18.5%)	No idea	42 (16.2%)

The table shows that the number of graduates using English very frequently during work takes up 9.6%, and of those almost not using English takes up 18.5%, which means that more than 80% of the graduates would use English for communication during work. The number of graduates often being rejected for poor English takes up 11.9%, and of those who are never confronted with this situation takes up 38.5%. According to the employment feedback, the graduates from our college mainly take the grass-root posts, while the work involving advanced English is often charged by those higher-lever personnel, so there is few chances left for our graduates.

We also made a survey on questions such as "overall evaluation of your own English ability", "What aspect do you think you are lack of the most during English learning?" and "How does English influence your future employment or career"? And the results are as follows (Table 11):

In terms of "self-evaluation of English ability", the number of graduates that are very confident only takes up 3.1%, while of those that are very unconfident takes up 14.2%, which shows a large gap. Besides, 45.4% of the graduates think oral

Table 11. Statistics of questions

Statistics of questions	Frequency	Statistics of questions	Frequency	Statistics of questions	Frequency
Self-evaluation of English ability		The most needing aspect		The influence of English for career	
Very confident	8 (3.1%)	Listening competence	40 (15.4%)	Great	166 (63.8%)
Comparatively confident	71 (27.3%)	Oral competence	118 (45.4%)	Average	53 (20.4%)
Uncertain	64 (24.6%)	Reading competence	23 (8.8%)	Not sure	34 (13.1%)
Comparatively unconfident	80 (30.8%)	Writing competence	41 (15.8%)	Non	7 (2.7%)
Very unconfident	37 (14.2%)	Translation competence	38 (14.6%)		

competence is what they lack the most, followed by writing competence, listening competence, translation competence and reading competence. So, being unconfident about their English ability is the leading factor that they cannot speak English; in addition, most of their work just needs basic oral communication instead of advanced translation and reading. As for "the influence English has for career", 63.8% of the graduates believe English has great impact for the development of their future career, while those who think English has no influence for career just takes up 2.7%, which shows that with the increasing number of international enterprises, more and more graduates begin to aware the great influence English has for career development and they begin to have the sense of occupational crisis.

2.4 Cultivation of Graduates' Professional English Ability

It is found through investing and interviewing the actual work situation of the sample graduates that the major problem of English learning the vocational college students are now facing is that they are weak in basic English knowledge and lost studying interest and confidence, then, they have les chances to practice English so their language communication ability cannot be improved. The most important part of college English teaching is to strengthen students' oral training, make plans to improve student' daily English communication skills, consolidate their language foundation and cultivate their constant English leaning ability and autonomous learning ability. The most effective approach to promote college students' professional English ability is to reform teaching system, which need to increase the proportion of practical training such as English practice class, set ability training as the objective of running school, conduct occupational career planning of college students designedly and establish industry-college alliance and set up training base with enterprises.

3 Conclusion

The design of this questionnaire survey includes four dimensions which are professional accomplishment skill, language ability, technical skill and innovation ability to study whether graduates from our college could use English to complete post communication, and use vocational English ability mastered to constantly improve their English therefore to expand their career planning. The data of using software spss 11.0 for independent sample T test on graduates from all majors and employment fields shows that there is no significant difference of professional English ability between male and female and among graduates from different majors; however, the professional English ability are quite different for those graduates with and without class leader experience and internship experience as well as their employment fields. More importantly, our graduates are not confident enough on their professional English ability. Besides, with low English using frequency in work, most of them believe they are not good at oral expression but they are convinced that professional English ability directly affect the development of their future career. Therefore, in order to improve their professional English ability, students are highly suggested to strengthen oral English during their study in college, while teachers need to update teaching methods and approaches to create more chances for students to practice English and the college shall cooperate with enterprises to speed up the building of practical teaching base.

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A Survey on College Education Using Internet

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Abstract. With the rapid development of network technology, the vast amounts of applications on internet bring big impact to traditional methods on teaching and researching. To understand the status of network applications on teaching and researching, the author of this article carried out a survey to higher vocational college teachers and students, combining face to face and internet survey, to make a start for future valuable research and provide help to network technology application on teaching and researching.

Keywords: Network technology · Teaching · Research · Survey report

1 Introduction

With the rapid development of network technology, various applications based on the internet have brought great impact to the traditional teaching and research method, which has caused the revolution of education method to adapt to the internet technology. This is unstoppable trend. How the relationship between the teacher and student will change? How the teaching method as well as the way to study will change? And what changes have taken place in the attitude and ways of students' learning? When the internet technology affected the education and study process, how the teacher and student adapt to it, what kind of support they required? Based on these considerations, this research used survey and face to face interview, to understand the status on how the network technologies are used in vocational school teaching.

2 Survey and Sampling

This Survey consists of two parts, one for students on how the network technology impacts your study? One for teachers on 'Network technology impact your teaching and study'. It designs to understand how the teacher is aware of the network technology and how frequent to use them, to understand how they use them in teaching, to understand if they get any support from school and education bureau (Is there any good

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hardware and training system?), to understand if the student is good to use them, and if they like the way of teaching.

This Survey was issued via internet, mainly to college teachers and college students; we received 65 effective feedbacks from the teachers and 165 copies from the students. Majority of the questionnaires are subjective type questions, and all in anomalous to maintain the integrity of the study.

To further understand how the teachers and students welcome the network environment teaching, after the survey we conducted comprehensive face to face interview to some college teachers and students majoring in computer science. These materials were sorted and analyzed for this article.

3 Survey Result and Analysis

Regarding how the education management departments support the network technology teaching, refer to Fig. 1, most of them continue to invest on hardware, such as school website, multimedia classroom, computer lab, training lab, electronic reading room etc. However we notice they are slightly short of training to the teacher on how to use these information technologies, as well as on the development of the network teaching platform. In additional, based on the on-site visiting, mainland vocational school made better progress, they developed network teaching platform earlier, CAT made good results, it is a major part of the teaching and becomes the second classroom now. While in Hainan province, the vocational schools need a lot of improvement.

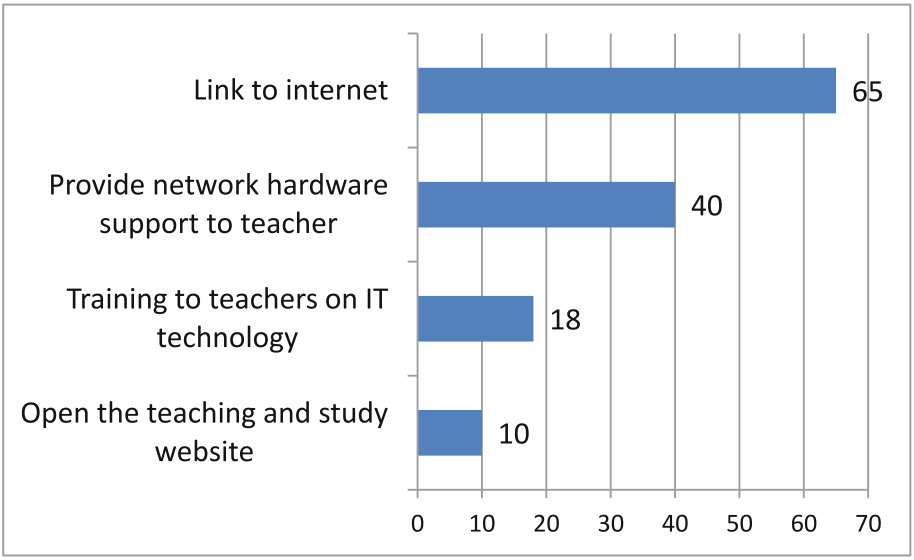

Fig. 1. Network technology support from college to teachers for teaching and study

How familiar and how frequent the teacher use network technology? All teachers agree it is better to teach using network technology, also they are aware of the ways to use network technology on teaching, majority of the teachers are familiar with network technology such as multimedia, resource sharing, mobile internet etc., 90% teachers are familiar with multimedia technology, while only 20% are aware of cloud service and remote teaching. Refer to Fig. 2, teachers who send back the survey use network technology more frequently in pre-class and after-class tutoring sessions.

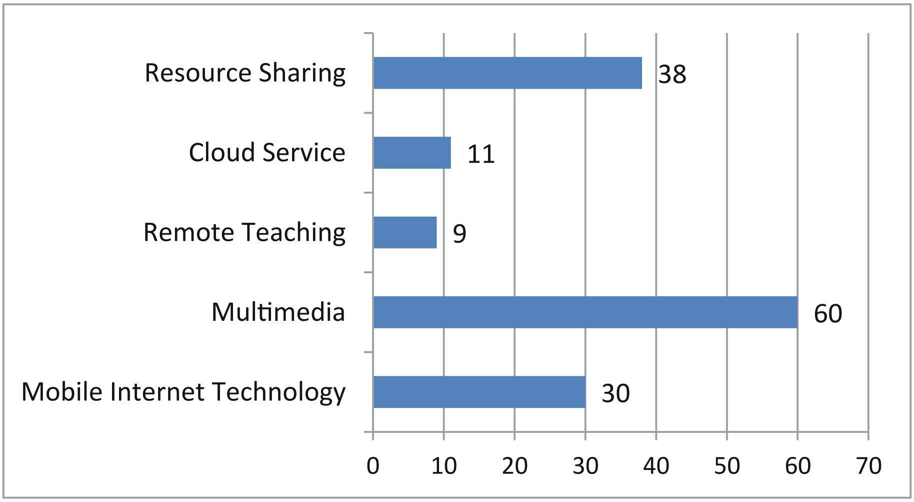

Fig. 2. Teacher uses network technology during instruction

Status of teachers using network technology in teaching and the depth to use them. Currently most of teachers only use the network technology in per-class preparation session, majority are to use internet to search information. Only 50% use network technology during class and after class instruction. Very few use network technology to create the learning environment, or use multimedia in class. Very few write specified teaching software. They did not make use of the network's multi-directional, rich and convenient features. At the same time, teachers are lack of knowledge to guide the students to use the network technology. Teachers do not improve students' capability to use the information resource efficiently to resolve the problem. More than 90% teachers think they need training to improve their network technology (Table 1).

Table 1. Feedback from the teacher if their current network technology needs improvement and training

Altitude	Quantity	Percentage
Not unnecessary	1	1.54%
Very necessarily	59	90.77%
In between	5	7.69%

Status of students to support network style teaching.
Students almost use internet every day, More than 65% students use the network for games, chatting and shopping, refer to Fig. 3. Within the 165 students provided feedback, more than 70% think they need improve their network technology and need training, refer to Table 2.

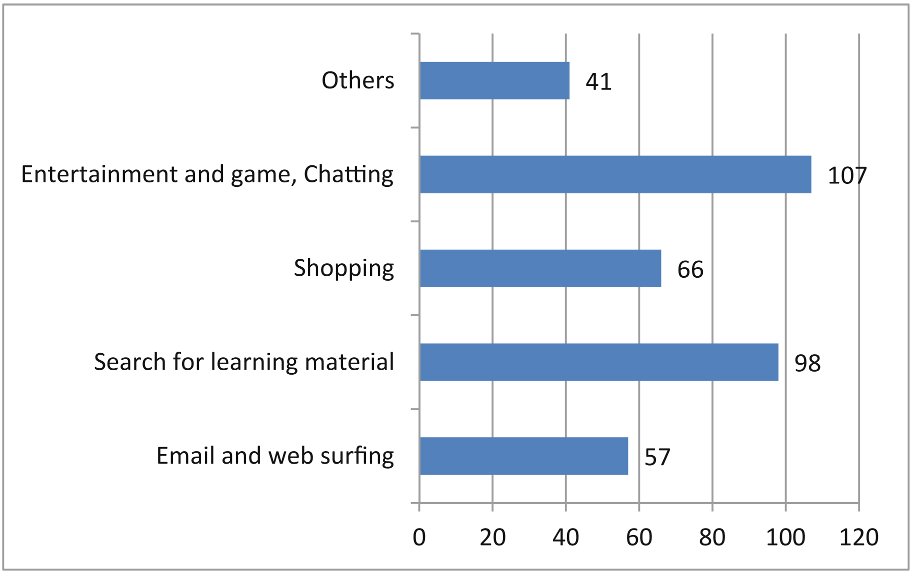

Fig. 3. Activities for students to use the internet

Table 2. Feedback from students if their network skills need to be improved

Feedback	Quantity	Percentage
Unnecessary	2	1.21%
Very necessary	122	73.94%
In between	41	24.85%

Feedback on the acceptance to network style teaching from the students.
More than 67% think network style teaching is better than traditional instruction. They think it is more effective, refer to Table 3. Almost all students who joined the survey think network technology adapted classes are more alive and agile, it can encourage students to study more actively, and teachers should provide network technology support. Feedback from 65 teachers, 68.86% teachers think the students can learn more effectively, only 21.31% teachers think there is not much difference comparing with traditional teaching, only 9.84% teachers think network technology style can bring distraction, which impacts the efficiency of study.

Table 3. Feedback on network technology adapted class and traditional class

	Quantity	Percentage
Network technology style class is more effective	111	67.27%
Traditional class is more effective	30	18.18%
Not much difference	24	14.55%

4 Problem Finding During Survey

During the face to face interview with students and teachers, and the feedback from on-line survey, we found following problems.

Teachers use very simple network technology, which need to be improved. Many teachers only assess basic level of network technologies such as electronic black board, electronic PPT, using network course material etc. [1]. Classroom is still based on intranet environment to use multimedia. They do not use virtue lab, intellectual class room. Teachers do not have enough skill to deeply link the teaching with information technology; Teacher can not use network technology to innovate the teaching process.

During the teaching process, teachers do not provide enough guidance to help students to utilize network technology, majority will ask the students to find learning material from internet, check email, group chat etc., they do not lead the students to improve the capability of problem analyzing or resolution. Network and multimedia technology are only aided tool for teacher to do demonstration; it does not evolve into the tooling to guide the learning and communication, or as a tooling to improve students' interest [2].

Most of students' network technology application skills need to be improved. Students use the network frequently, but majority are chatting or shopping. Only small part of students use it for self-study. IM (Instant Message) and searching engine are the majority ways for students to adapt to network study, very basic level study such as Baidu searching and IM chatting to solve the problem, lack of depth self-study.

Colleges do not pay attention to invest school network resource library. Most of college do not have independent teaching and study website. Some college may have significant amounts of network course resources, but lack of high quality and attractive digital teaching resources; they do not use it very frequently, and do not bring much benefit [3]. In addition, colleges do not provide much training to teachers on how to use network technology to teach and study, many teachers can only use it to combine PPT, and need to improve skills to produce high quality interactive teaching materials.

5 Conclusion

Through the field face to face investigation and questionnaire survey, we can see most colleges already invested a lot. Majority colleges have high performance and multi-functional school network. Classroom and training lab are installed with multimedia projectors. Some schools even have their own network course platform. Majority Colleges and teachers believe network technology application is future trend; they all start to pay attention. However, we also notice there are a lot of shortage to use network technology to teach and study in these colleges, such as teachers are lack of skill, they need training to improve. Students do not use network tooling to study initiatively which need guidance from teachers. Also lack of investment on course resources, they do not have much high quality digital course material etc. To solve these problems, the education bureau, colleges and teachers all need work hard, using multimedia and new network technologies, to optimize the class teaching, improve the class efficiency and teaching quality.

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The Construction and Practice of E-Teaching and Learning Innovative Mode for the Design History Course

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Abstract. In the course system of art design specialty in Chinese universities, the design history course occupies a certain proportion, but teaching results are less effective. The foremost reason is that the students of design majors in Chinese universities emphasize more on practice and less on theories and they have less interest in learning the design history course. In order to change the phenomenon, the researchers carry out an exploratory research where the course of *Modern Design History*, set up by China and United States universities' cooperative specialty, is regarded as a pilot of reform. They creatively build diversified E-teaching and learning innovative mode for design history course and launch empirical research by adopting current international prevailing network teaching resources and methods. Through practical application, the teaching effect is found outstanding.

Keywords: Design majors · History courses · E-teaching and learning Innovative mode · Practice

1 Introduction

Mostly initiated in the 1980s and 1990s, the design specialty in Chinese universities has a short history and weak theoretical research and teaching. According to researchers' years of design history teaching experience and extensive investigation and communication, students of the major are less attached to design theory course, and they are less interested in learning. "In modern designing art, as for many people, theoretical education about art design is even insignificant for art design education" [1]. Moreover, "on account of single teaching method and antique teaching contents, the actual teaching effect is not as ideal as expected" [2].

The course, *Modern Design History*, regarded as a basic course in curriculum system of art design specialty of Chinese universities, plays an important role in theory teaching. Hence, researchers select *Modern Design History* as a trial spot, which belongs to the course of Visual Communication Design major, established by Anhui Polytechnic University and University of Bridgeport. Fully relying on Sino-foreign educational resources and advantages, they develop E-Teaching and learning

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innovative mode. That is establishing the network virtual environment where all learning styles of the teaching module and function and the application of learning system can be developed by means of radio, television, computer, Internet and mobile phone, which is aimed at taking the promotion of the quality-oriented education as core and the elevation of teaching quality as basis. Focusing on changing the traditional teaching mode, this innovative mode is tending to make students overcome learning habit of relying on teachers and cultivate the independence of mind and the autonomy of learning with the help of flipped classroom. Additionally, the mode can change boring theory teaching into interesting interactive and flipped teaching as well as create a digital online teaching platform and teaching environment, which will contribute to improving the students' ability and efficiency of E-learning, stimulating learning enthusiasm, giving full play to personality and promoting individualized learning.

2 Traditional Teaching Mode Resources of the Design History Course

The principals in two universities particularly discuss the educational teaching plans and the talent training programs of the design major, a Sino-foreign cooperative major. (Visual Communication Design major in China is called Graphic Design major in the US). "The teaching of design theory holds a large portion of the teaching system of design majors in universities on the basis of well-studied design theory in the US. Just take Graphic Design major for instance, design history courses usually take up 20%–30% of compulsory courses in the major." [3] Therefore, in the teaching plans of the major, Modern Design History, a basic course in design major appointed by US University, starts in the third semester with a total of 3 credits for 48 teaching hours. Furthermore, other relevant courses such as *Art History I, Art History II* and *History of Graphic Design* have contributed to the systematized learning of design theory system. According to the need of establishing the course, comprehensive learning of design history courses including Modern Design History will not only help students criticize the role of design cultural field from the perspectives of culture and history but also learn from history. What's more, based on theoretical guidance in practice, developing the historical review of design practice will improve students' abilities of thinking and innovation in design.

Since the establishment of Visual Communication Design major in September, 2014, teachers in the major has adopted a bilingual teaching and other new teaching methods. However, owing to these factors like defective teaching equipment, big class size and the traditional face-to-face teaching environment, teachers' teaching potential fails in digging deeply and developing fully. At the same time, students' learning autonomy and interest can't be stimulated effectively. Therefore, as we can see from Table 1, the current teaching resource is not suitable for the new mode of E-teaching and learning reform.

Table 1. The initial opening situation of visual communication design major and teaching resource list in September, 2015

Name	Name	Name	Name	Name	Name
Number of teachers	1	Teaching courseware	10	Thesis and teaching achievements	7
Number of students selecting course	39	All kinds of exercises	39	Test bank	2
Multimedia devices	1	Online teaching resources	0	Teaching video	12
Teaching practical base	3	Number of computers	1	Classroom (traditional pattern)	1

3 The Construction and Practice of E-Teaching and Learning Platform

In view of the limited online teaching resources in existing curriculum resources, so it is regarded as the breakthrough point and key point of curriculum reform. In order to lay a solid foundation and an effective protection for the application and practice of the mode, researchers apply current new and relatively mature online education resources and learning interface in the international educational circles into the teaching of Modern Design History studied by sophomores of the major in September, 2016.

3.1 The Construction of Teaching Facilities

Above all, specialized infrastructure and hardware devices are needed for the construction and practice of E-Teaching and learning innovative mode. Therefore, based on the investigation of building programs and beneficial experiences from the flipped classroom of some universities in the UK, Singapore and Taiwan, managers and teachers not only choose suitable classrooms to rebuild except for some existing multimedia devices, new wireless networks, LCD and audio and video devices but also establish some specialized tutoring classrooms for group discussion. Additionally, in order to build information based teaching environment, researchers also deploy network computer rooms and audio classrooms with the aim to take advantage of online teaching platform in diversified forms.

3.2 The Communication and Feedback upon E-Survey

Survey feedback mechanism itself belongs to one of teaching modules and online learning and communication. With the periodic publication of online survey on Surveymonkey, an international famous online survey platform, researchers find that students can be encouraged to use network and to interact with teachers online more frequently in online teaching, which will be beneficial for the dynamic adjustment of teaching (Fig. 1).

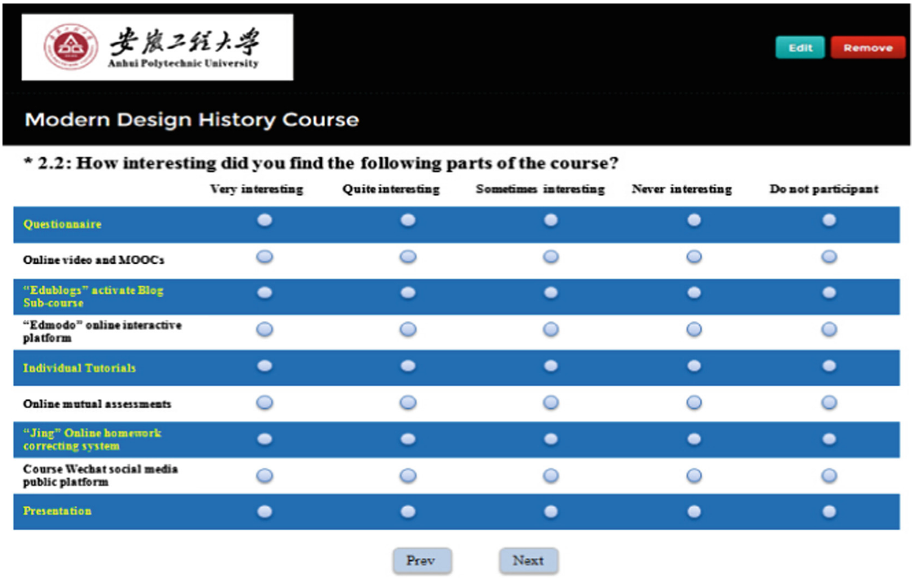

Fig. 1. The content interface of E-survey

3.2.1 The Pre-class Survey of Applying Flipped Classroom Mode and the Discussion of Learning Task List

Since the initial establishment of the flipped classroom in 2007, it has become a hot issue in the global educational field, the biggest feature of which is that the roles of teachers and students have changed in the teaching process. Besides, it also renovates the organization and linear process. What's more, flipped classroom is a specific type of blended learning design which changes the traditional teaching method with the help of technology and introduces the concept of practice by conducting a series of learning activities as well. As a result, flipped classroom teaching method is adopted in the E-Teaching and learning innovative mode. In order to make students better understand and adapt to this new teaching mode, researchers ask students to take part in an online questionnaire before start the course. Based on introducing flipped classroom, on the one hand, the questionnaire gives an initial assessment of the students' perception and interest to the mode. On the other hand, on the basis of knowing about students' learning abilities and learning status, it also provides an occasion where teachers can discuss with students about teaching tasks in different periods, point out those important knowledge points or teaching difficulties for students and collect their suggestions in order to conform to the flipped classroom.

There are two parts including 45 questions in the questionnaire, the first five questions of which are basic questions for students. In the first part, 20 questions are offered after the succinct statement of the concept, purpose, form and mode of the flipped classroom. More concretely, the first three questions are set up for asking students whether they know flipped classroom. The next five ones are asking students' attitudes towards flipped classroom mode in the teaching of *Modern Design History*.

Question from the tenth to the fifteenth discuss about the form of online teaching platform while questions from the sixteenth to twentieth talk about the potential problems and reasons for the students learning process. In the second part, first of all, the learning goals and teaching tasks about the course are briefly presented in a list and another 20 questions are also offered here. The initial four questions involve students' awareness towards the course while the next six questions are about students' understanding and assessment to learning tasks set by teachers. Questions from the eleventh to the sixteenth are designed for asking students what they want to learn, adjust and suggest. In the last four questions, students are asked to answer their expectation and interest according to their personal situation.

3.2.2 The Questionnaire About Teachers' Guidance in Class and Students' Learning Effect Investigation

In the mid-term examination stage in the course, researchers survey students' feeling towards flipped classroom in the form of questionnaire. After survey, they provide targeted guidance for each student upon feedback. The questionnaire includes thirty three questions, the first six questions of which are about students' feelings. Questions from the seventh to the twelfth discuss the problems and the reasons for those troubles students meet in learning. From the thirteenth to the nineteenth, students need to make assessments about the current online resources. The next five questions are about students' expectations. While the last six questions talk about students' learning interest, contents and methods in second half course study.

3.2.3 The Questionnaire About Teaching Assessment

After finishing all teaching tasks, there is a questionnaire including thirty-five questions for students to make teaching evaluation. The whole questions are divided into eight aspects which are the effectiveness of flipped classroom mode, the operation of online teaching platform, the applicability of online learning resources, teacher's mastery of flipped classroom, the result of communication between teachers and students, the suggestions about the mode and platform, the effect of new assessment method, and self-assessment of students which is to evaluate self expression during course learning.

3.2.4 The Network Testing System

The question bank module's design function of Surveymonkey can easily set various text types, like single choice, multiple choice, filling the blanks, answering questions and even drawing, which therefore, can be regarded as network examination system. At the end of the course, the teachers can ask students to have an online test in class to convert the traditional way of examination.

3.3 The Design Application of E-Interaction

Researchers and teachers have tried to apply a new teaching method into class that is to reserve the traditional face-to-face teaching on the one hand and to finish other teaching modules through building an E-interactive platform of course on the other hand. To illustrate, the integral network transplantation and online working of question answering, presentation, discussion and students' valuation and other teaching procedures have reached the creative combination of off-line classes and virtual classes, which not only includes the active atmosphere of classroom teaching, but also involves the technology of the latest network teaching. The specific executing processes are as follows: First, teachers import the teaching tasks, teaching courseware, audio and video material, relevant websites or questions into the online interactive system, with combining the knowledge to be taught in class. That is to say, teaching on the spot means that teachers will give the lesson by pointing out the learning task and the core knowledge of the lesson for students. Then, students should log into the online interactive system to learn autonomously and finish the task assigned by teachers in class. While teachers will answer students' specific questions in the whole process one to one. Furthermore, teachers will also ask every student to selectively evaluate the performance of other students after finishing their own studying task, which can not only helps students to have real-time communication and discussion, but also helps students to find out other students' unique understanding and thinking when analyzing problems in class.

The online interactive platform of course is supported by the global educational content sharing platform and the electronic network teaching platform, Edmodo (Fig. 2). First, the teacher should create a class group of the course with all students joining. Then, the classroom should be equipped with network and computers. Due to the large number of 35 students in one class, students will be taught in two groups separately and each group will be taught for three teaching hours per time to ensure teacher's tutoring quantity and teaching quality and to advance the course's exploration, speculation, interaction and practice to a new height.

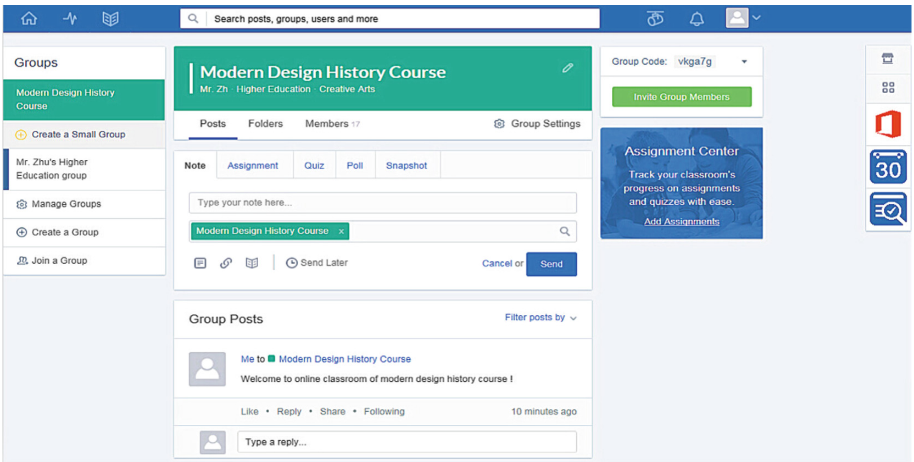

Fig. 2. The online interactive interface of the course on Edmodo

3.4 The Online Operation of Homework Checking

Jing® is popular video capture software and its features are used by researchers to create an online homework checking system and a video sharing platform. It is unique in that not only students can submit jobs on line and teachers can correct the homework and give feedbacks on line through implanting the homework checking into the network, but also teachers can check students' homework in audio and video form rather than in the traditional writing form. On account of that the audio can deliver much more information than the several written commenting sentences, so teachers can stress the key mistakes and extend the relevant knowledge or even give an example to illustrate in the audio or video checking. At the same time, teachers can also make careful and clear homework valuation, which will effectively avoid the students' incomplete understanding for teachers' comments or suggestions that often happen in the traditional checking. Thus, the comprehensive and profound homework checking can be achieved. Besides, in this way, students will know about the whole process of teachers' checking and find the teachers' thinking perspectives, thinking ways of solving problems or design thinking from it in a more accessible form, like communicating with teachers face to face instead of just seeing some emotionless comments.

The creative application of Jing's online homework checking system (Fig. 3) has evoked strong responses among students and all of them have a highly opinion of the system when giving suggestions and feedback about it. Meanwhile, Jing brings novelty of learning to students and arouses their learning interest, making them love or even expect teachers' homework checking. As a result, watching the comments in media form has become one of their learning hobbies. "The homework online submitting and the checking is one link of attracting students" [4]. Apart from applying Jing's online homework checking system into practice, in terms of these students who want to pass the TOTEL in Sino-US cooperative class, teachers should promote them to practice writing regularly and recommend them to use Checker software or other free net resources to correct mistakes and improve the writing by themselves.

Fig. 3. The online homework checking interface

3.5 The Introduction of MOOCs

As a very convenient online distance education platform, MOOC is widely used in nowadays. Besides, MOOCs in English and other globally diverse learning channels without limit on time and space have the relatively real foreign learning environment, the new teaching modules and the broaden international vision, which comes to a unique advantage to those students in Sino-US cooperative majors. Most importantly, the relevant online courses on MOOCs not only involve the rich teaching experiences, refined knowledge system and particular teaching methods from famous teachers, but also include the display of combining the historical design and the latest design, which can provide *Modern Design History*, a boring course most students think before, with continuous fresh and high-quality learning resources and greatly enhance students' learning interest, self-learning consciousness and their design innovative thinking abilities.

To this issue, according to the major characteristics of Sino-US visual communication and the course characters and contents of *Modern Design History*, researchers investigate students' familiarity with MOOCs. On the one hand, they specially open the introductory lectures about MOOCs, resource library and how to choose and enter to the MOOCs for students before classes. On the other hand, with many professional teachers together, they also pick out 24 excellent courses, more highly related with *Modern Design History*, from the abundant resources on MOOCs. There 24 courses are divided into four categories with 6 courses in one category for students' reference.

3.6 Establish a WeChat Public Platform and Analyze the Data Online

With the aim to expand and use the online platform completely, researchers establish the public platform of the course on WeChat, the most popular social media on China Mobile's network, sharing course resources and learning experiences on it. Students in the course are required to upload the information of their learning materials, elected according to their hobbies, and share the learning experience in time. Meanwhile, the platform will be promoted to those students from other majors or even to the outside society to obtain the largest-scale follows, taking the outside learning resources and helpful experience. After setting up and expending the database for learner's self-studying, on the one hand, researchers will offer a dynamic analysis for all kinds of online learning information and relevant data, mainly including 3 aspects. The first is the analysis of the properties of the following users, like gender, age, major, educational structure, school or the types of company, city or province and so on. The second aspect is the analysis of course resources and their properties, including the types and quantity of the resource, the topics and the relevancy of the followed information, the learning heat, focus point and keywords analysis. The third is the statistics about the information's usage and reading with 4 indexes that is the number of users and times of browsing, discussion or commenting, the sharing, collecting or transmitting, and clicking the link to the original text.

Moreover, by collecting all autonomous learning information and resources data uploaded by students, researchers plan to carry out the measuring analysis of students' learning activities, the real-time assessment of learning content, learning target and learning expectation and the directive leading with threes objectives. First, according to the online data of WeChat public platform and the feedbacks among students, researchers will collect and classify the learning contents, interesting points and learning expectations of students, from which students' learning activities and thinking patterns will be analyzed, simulated and located and their deep or potential learning expectations can also be searched by analyzing data. Second, on the basis of republishing students' learning activities on the Internet and analyzing their learning contents, the targeted and orientated evaluations can be carried out differently for all students of the course, all professional teachers in the universities opening the course and the social groups on the public platform by taking the advantage of the function setting of these micro activities and the feedback mechanisms on the WeChat public platform. Third, based on the data of assessment feedbacks and further analyzing, refining and matching, the directive feedbacks and the targeted suggestions will be offered to personal students or the same learning groups to help them to choose the most suitable learning contents and learning activities through publishing directive information on the WeChat public platform.

4 Conclusion

The E-teaching and learning innovative mode for design history course and digital learning environment make the historical knowledge alive in the modern network teaching space. The online interaction and other new teaching methods, network media and unlimited space not only improve students' digital learning abilities, but also make their characteristics and specialties completely played, which can allow students to carry out various personalized studies more freely and autonomously without any time and space limits. According to the feedback of questionnaires among students and for private tutoring and the analyzing results of public platform online data, students' learning interest, learning activeness and learning efficiency have been advanced greatly and the teaching effect is obvious as well.

By means of the flipped classroom, combining design history with its practice or application and changing boring theory teaching to colorful interactive teaching or flipped teaching will make students think independently, learn autonomously, explore the knowledge and apply the design history creatively. It not only reach and surpass the learning subjective set for the course, but also reach the International level in new educational resources and teaching modes, which totally conform to the aim of developing international innovative talents of Sino-foreign cooperative design major.

Combining the E-teaching platform, teaching activities have been changed and they will adapt, help and service learning from the traditional class to the virtual class, from the traditional teaching mode to the flipped classroom teaching mode, which also advances the teaching and researching level of teachers.

The deep-rooted learning habits of depending on teachers, coming into being in China long-time traditional education, have been removed, which facilitates the nurturing of new learning habits and learning motivation. Moreover, the traditional relationship between teachers and students has also converted to the new learning partnership.

The classes will be of high quality to cater to students' learning interest and meet their needs on the basis of establishing the E-teaching and learning innovative mode for Modern Design History and the integrative innovation and application of the teaching methods in the filliped classroom where students learn first before teaching. This teaching mode can absolutely be promoted and applied in the course of design history for design majors in Chinese universities.

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Flipped Classroom Based on E-Learning in Computer Science and Technology: A Case Study

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Abstract. Flipped classroom are widely adopted to improve students' learning, especially in deeper understanding and interactive learning. We designed and provided a flipped classroom combined with e-learning in a computer science and technology course to help students develop their computing and programming skills. We presented the course setting, process of flipped classroom and online material making. The flipped classroom is composed of before-class phase, in-class phase and after-class phase. All learning materials are provided by e-learning platform. Further, the detail analysis of results obtained was using to conclude that students are inclined to accept the new teaching model.

Keywords: Flipped classroom · e-learning · Computer science and technology Database course

1 Introduction

In recent years, flipped classroom have become very popular technique for delivery knowledge. The flipped classroom is different from traditional learning activities in which the teacher assigns introductory materials, such as instructional videos or basic assignment to be learned before class, so that class time can be spent with more advanced activities and higher thinking [1].

The flipped classroom adopts a student-centred approach and the teachers are no longer the transmitter of knowledge, in fact, the teachers can utilize class time more efficiently for group discussion and peer-to-peer interactions, or use more class time to look at specific examples and work them out. In a typical flipped classroom, the students will control the learning process in class, collaborating in small groups and solving the problems using basic knowledge they have acquired before class, and therefore increases their learning motivation, self-confidence and self-management. Thus, the students will be able to apply, analyze, evaluate, integrate, create and discuss, make a deeper understanding of knowledge in class than just remember it, and can improve their practical skills and collaborative learning skills [2].

According to learning analytics, flipped classroom is more efficient and scalable than traditional classroom in subjects like Mathematics, Health education, Science, Technology and English reading comprehension [3, 4]. Many students praised the

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flipped format, the course quality and enjoy the course [5]. The flipped classroom provides more flexibility and improves achievements for students' learning, and is widely used by universities all over the world [6].

The flipped classroom is greatly facilitated by making use of Information and Communication Technology (ICT), involving learning on computers outside the classroom, and interacting with peers in small group online [7]. ICT is used to promote connections: student-to-student communication and student-to-teacher communication.

With the rapid and continuous development of Internet and computer technology, the trend of adopting e-learning has been emerging and expanding in the field of education.

E-learning (or online learning) is an approach that use of digital devices such as computers, smartphones, iPads, the Web, and managed learning environments to organize or fulfill teaching and learning [8]. E-learning is a resource-based learning, which provides an educational environment where learners are able to access educational materials, at every time and at everywhere [9]. This approach is learner-centred, that is, it developed the individual and adaptive learning courses and taken on learners into the learning process, customized to the individual learner's needs and goals. Educational materials, which also known as learning objects (LOs) located in the Web environment or in the form of digital objects [10]. Many teachers think that e-learning is an important third-class platform of education. The Internet and e-learning has been the new classroom for learning and ubiquitous as a major form throughout China.

In this paper, we take a view on the integrated of flipped classroom and e-learning environment. In Sect. 2, we give an overall taxonomy of the approach. In Sect. 3, the course setting, and the teaching point of the class is discussed in detail based on a case study. In Sect. 4, a conclusion is made, and future research is proposed.

2 Integrated of Flipped Classroom with E-Learning

2.1 The Architecture of Learning System

The flipped classroom is composed of three phases of instruction that are before-class learning, in-class learning and after-class learning.

Figure 1 shows the overall taxonomy of our learning system.

In this taxonomy (Fig. 1) we show the associations among the levels of before-class learning, in-class learning and after-class learning. For each phase, the learning object will be discussed in detail. Subsequently, the e-learning platform provides material and context for the procedure. Accordingly, these processes are associated with the content adaptation and models. Moreover, the challenges in the course are considered.

The first phase of the flipped classroom is before-class learning phase. In this phase, students acquire basic knowledge by viewing on-line learning materials provided by e-learning platform, such as videos, power point presentations or documentations.

The second phase of the flipped classroom is in-class learning phase. In this phase, the time could be free for active learning. Students have student-centred interactive learning activities and could have more practice, such as lectures, problem solving, group discussion, peer-to-peer interactions, and higher order thinking. The in-class practice led students' learning into a more in-depth way.

The individual learning in the in-class phase is self-regulate their learning (SRL), focus on four dimensions of student self-management: planning, control, regulating and evaluation.

The team learning in the in-class phase is collaborative and cooperative forms of learning. Students should participate in discussions and interact with others by groups, so they must acquire a strong knowledge base in the before-class learning.

The third phase of the flipped classroom is after-class learning phase. In this phase, students should do some assignment to review the subject knowledge and technical skills. Homework can be followed review is carried out by students in online learning platform. There are section tests to check out the outcome of learning.

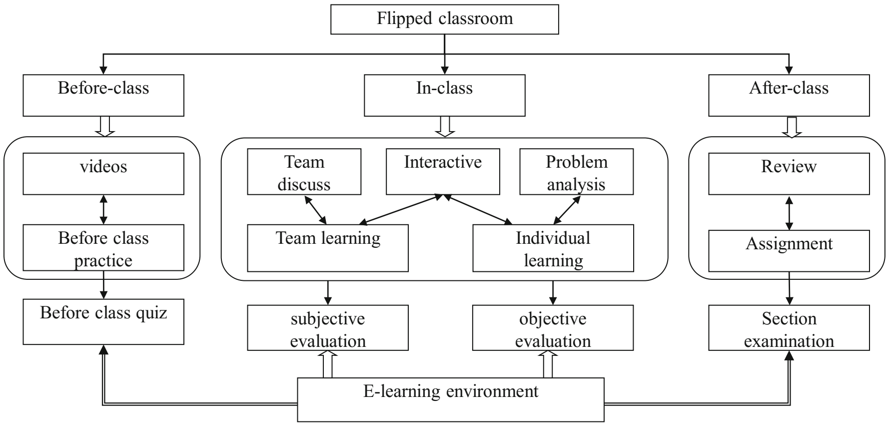

Fig. 1. Flipped classroom based on e-learning taxonomy

2.2 E-Learning Environment

The E-learning environment in the learning system or architecture is based on an online learning platform, which is composed of co-operative learning and question-answer system.

Online Co-operative Learning. The online cooperative learning helps the teaching and learning process in a number of useful ways. The students should use new learning technologies, such as online learning platforms and online discussion groups. Moreover, this method provides a means for group based learning, and the opportunities for teacher-student communication and student-student communication. The ICT in online cooperative learning is used to promote connections.

The online modules consist of power point presentations (PPTs), documentations, instructional videos and online question-answer following all the techniques that students will meet during the course. Students navigate the modules at their own pace, allowing flexibility and self-directed while meeting specific classroom deadlines and to reinforce teaching points. For example, students may learn structure query language (SQL) command program in the models, and in class the following day, work in group to do some exercise for complex SQL query.

Online Question-Answer. This module provides individualized online access to guidance, recommendations and assistance to promote student's learning and performance. Students can pose a question via Internet and need not be afraid of face-to-face interaction. In addition, students' questions can be feedback immediately, and they have instant support during this process. As online learning environments provide less threatening opportunities to seek help, students would prefer using this approach because it is easier and more efficient than traditional educational settings. For example, a student may ask a question about "the error of insufficient privilege", and the teacher can reply that "this problem can be solved using grant", furthermore, the teacher can give the student a screenshot using Print-Screen to demonstrate the solution. Moreover, the instructors are easy to identify which topics were difficult for students and pay more attention to these topics.

3 Case Study

3.1 Course Setting

The experiment of the flipped classroom combined with e-learning was conducted in a course entitled "Oracle Database Management System", which was a semester-long, 3 credit-hour course, targeting third year university students of Computer Science and Technology. The major focus of this course was to develop students' database basic concepts and principles, database management skills and database programming skills.

Below are descriptions of the content in some examples of the modules.

Database Setup and Configuration Videos. The videos are short instructional videos covering a variety of topics, including relational database management system software (RDBMS) installation and configuration, database network configuration, database creation, database startup and shutdown, etc. All the videos were developed at our institution using Screen-capture application.

SQL Programming PPTs. The PPTs covering the program of data definition language (DDL), data manipulate language (DML) and data control language (DCL). We made all the PPTs using Microsoft PowerPoint.

Assignments. Students submit their homework via Internet to promote their programming skills, for example, database management, database configuration, data query, data backup and restore.

Total Grade Calculating. Students want to achieve excellent total scores, exam performance is not the only to assess, they should do good at all the quizzes, actively participate in the classroom activities and discussions and assignments.

According to our experiences, preparing to initiate the flipped classroom model will consume more time than to initiate the traditional lecture-based instruction, because there are a lot of material should be prepared prior to the class. But the time was well spent for the materials, such as videos, PPTs and documentations can be used for future classes. Last but not least, when designing the learning material and activities, the instructors should think as students and should concern the students' feedback.

The setting of the course is listed in Table 1.

Table 1. Teaching points of database course

No.	Module of the course	Number of teaching points	Contents	Hours
1	Introduction	6	Database introduction, RDBMS architecture	2
2	Install, configuration and tools	18	Database installation under different OS, configuration and tools	4
3	Account and security	21	Creation of role, user and security management	2
4	Network and database management	4	Configuration of network, creation and management of database	2
5	Table	18	Create and update table, data type	6
6	Index and view	8	Management of index and view	4
7	Other schema object	5	Sequence, synonym and database link	6
8	Data manipulate language	5	Insert, delete, update and transaction control	4
9	Query and SQL function	11	Select, single line function, group function	4
10	PL/SQL	10	Program and instance of procedure, function, cursor, trigger and package	6

We have made PPTs, documentations, short videos, quiz questions, assignments and discussion topics. There are 96 videos were captured by a video-capture application, each of which is less than 10 min in length.

3.2 Classroom Sessions

The classroom sessions are interactive and collaborative activities for students to apply and make deeper understanding knowledge. The session is project-based, with explicit learning objectives, for example, to develop a human resource (HR) management system or an identity (ID) card management system. The final goals are divided into many topics, each with specific target, focusing on core teaching points, for example, database design, database create and configuration, user role and privilege, table and view, index and user interface.

All students in the class were divided into small teams of 4–5 members at the beginning of the semester, and a team leader was elected by all the members. As every student has a smartphone and laptop, each one in the study was assigned a userID of the e-learning system. Students were asked to submit their group discussions and problem solving to the course Web site before classroom session.

The flipped classroom format was examined in the 2015/16 academic year. There were 52 students registered on the course. The course is a third year undergraduate engineering course. The total number of hours for this course is 40, and the flipped approach consisted of 3 h class each week. In advance of the class time, teaching material (PPTs, documentations and videos) were uploaded onto the university's e-learning platform for students to study. The class time was spent on student-centred learning activities.

3.3 Challenges of the Course

The flipped classroom is a method that depends heavily on students preparing outside of class. The lack of students' preparation in before-class learning is a main trouble in the flipped classroom. If students show up no prepared, for example, come to class without doing the video lecture at home, they will get lost during in-class learning. The before class practice and quiz via Internet is used to ensure students have prepared prior to class. These quizzes are not difficult and should not cost students too much time. Moreover, the quizzes will bring the students in at a level of preparation, and the score will be calculated into the total grade.

Some students are not enjoy the active learning format is another trouble in the flipped classroom. These students are used to the traditional passive lecture learning format that the instructors explain all the subject knowledge. The teachers are difficult to know whether the students have acquired the knowledge, and the same group mark is awarded to each individual in the group despite their level of participation. So the in-class learning should be well-organized in instruction.

At last, students might not collaborate well or not contribute to the work of group in the in-class learning activities should be concerned. Some students may work on their own and with a low level of collaboration.

The learning feature of the e-learning platform allows the instructor to determine how many students are preparing for class.

Figure 2 is an example for detail analysis for some students of watching video. The video is 7.8 min long. The green bar indicates the completion of watching video. The deeper green of the bar means the better preparation before-class, on the contrary, the lighter green means the worse. The Repeating Ratio (%) indicates the repetition of the student for watch the video, it is calculated by Total Time for Watching Video divide the video length.

3.4 Course Evaluation

In order to evaluate the effect of course and improve future practice, an anonymous survey was conducted at the end of the semester. Student evaluation questionnaires (SEQs) are seen as a good means by reviewing what has come before [11]. We collected qualitative data, and display the questions and representative comments in Table 2.

From these data, we can conclude that students highlighted the overall course, and they give some useful suggestions in addition.

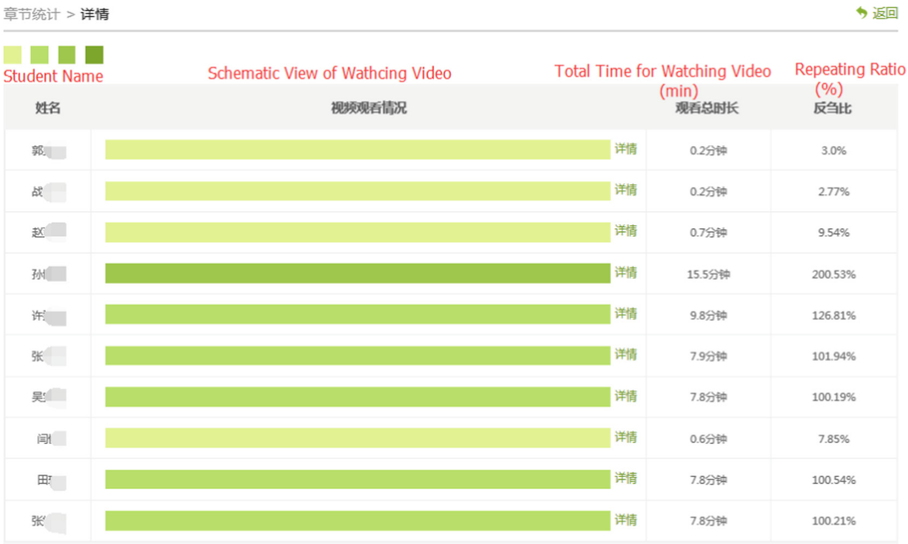

Fig. 2. Detail analysis of watching video by e-learning platform (the picture is a screenshot of the e-learning platform, so we translated the Chinese into English.) (Color figure online)

Table 2. Results from qualitative data

No.	Questions	Representative comments
1	What do you think of flipped classroom? (positive/negative)	Almost all participants chose “positive”
2	What do you think is the main advantage of the course?	“It’s more convenient to hand in homework” “I can review the content by myself, if I don’t understand it well in the class” “The flipped classroom can stimulate the students’ learning interests and thirst for knowledge” “There is a better learning effect in this course”
3	What do you think is the main weakness of the course?	“It’s a bit bother for using the e-learning platform” “There is no reminder of the deadline for the homework” “The curriculum is relatively scatter and requires higher self-management to the students”
4	What improvement suggestions do you have for the course?	“The e-learning platform should be improved” “More teacher’s online instruction are needed during the course”

4 Conclusion

Providing an interactive environment to the instructors’ and learners’ need is an important research area. Flipped classroom is the most popular teaching approach during the decade. The process of flipped classroom faces a wide problem such as delivery of materials, interaction of student-student and student-teacher. E-learning system rises as a natural platform to support flipped classroom.

In this research, we combined the flipped classroom with e-learning environment and provide a platform for teachers and students. The study gave an overall taxonomy of the learning system with structure, phases of learning and challenges.

A case study shows that the proposed learning system has good effects on the education modes and flipped classroom is an attractive method for providing seamless learning services.

In the future work, we are working on the design and implement of production of teaching materials and online answer and help system.

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Using Twitter to Enhance the Students' Skills: Motivation – A Disregarded Factor in Educational Design

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Abstract. While observing the context of formal learning, as far as the personal and general use of the network technologies to access information and the Social Networks (SNs) are concerned, it is inevitable to acknowledge the scarcity of cases where such technologies are used in support of teaching & learning activities. The potentialities of this type of technologies reside in the very creation of not only a bridge between formal and informal learning contexts, but also, and above all, of a very intense integration. This research paper explores the effectiveness of using Twitter to support a course titled "Sound Recording" in Music Technology. This tool allowed an increase of the motivation of all the students (in particular dyslexic students), getting them involved in team work, based on the Problem-Based-Learning principle. Results showed that students with dyslexia compensated for their processing deficits by relying on learning strategies and help seeking.

Keywords: Dyslexia · Learning · Motivation · Social Network Twitter

1 Introduction

Social Networks are increasingly taking root as habitual communication, expression and socializing tools [1]. Their capillary penetration into any context and at any time of everyday life requires an acknowledgment of the role that these technological resources already play and will ever more frequently play within a real sustainable didactic-educational innovation process.

In this respect, we must take into consideration that while students are comfortable with using the Web 2.0 technologies, teachers find it equally difficult to use them, being skeptical about the possibility to introduce them in a learning process [2].

It is not the simple introduction of technologies into the classroom that can create innovation in didactics: cultural change is needed in order to go beyond the concept of the classroom being the context within which knowledge is passed on, to the learning environment intentionally designed by the teacher, in which students use different technologies in an integrated manner, taking advantage of their potentialities and allowing the students to become protagonists in the knowledge building process [3].

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The Web technologies, therefore, are tools for education, yet the teacher must have an adequate knowledge of them so as to be able to assess which tools, how and in what contexts to use them. These choices may not disregard the "class" intended as a group of students having heterogeneous learning styles. The presence of dyslexic students imposes on the teacher certain didactic choices that help such students and that also turn out to be useful for **all** the other students (the non-dyslexic ones) in order to make didactic practice more efficient, the study method more conscious and the learning more long lasting and more profound [4].

The use of technologies is accompanied by an increase of the students' motivation, in general (be them dyslexic or not): they all grasp the important role it plays, but few of them actually know what they are and how to use them systematically [5]. Usually, "motivation" is considered a preliminary stage that must be dealt with upstream from the veritable educational stage [6]; however, motivation is never considered a central element of the actual educational process [7, 8].

This article will present a case study, based on blended learning and Problem-Based Learning (PBL), used in the Music High School, to convey information about the Sound Recording. The main aim of this project was to assist students to construct knowledge and develop skills in problem solving, communication, cooperation, negotiation, and decision making. Moreover, it was checked on and assessed the impact of the use of ICT in the students' learning process: increase the student's motivation in order to see if it corresponds to an improvement of his/her academic results. For this reason, it has been decided to introduce the use of Twitter in the classroom.

This paper is organized as follows.

Section 2 describes the Social Network. Section 3 explains the choice of Twitter. Section 4 shows the learning indicators for the *assessment* of the *Learning Process*. Section 5 shows an experimental test that illustrate the effectiveness of the proposed method. Finally, conclusions are drawn in Sect. 6.

2 The Social Network

The Social Networks may be considered a tool "for and of didactics" and the common feature of these environments is content sharing [9]. The social networks would, therefore, be characterized by [10]:

(1) uniquely identifiable profiles, made up of content supplied by the user, content supplied by other users and/or data provided at a system level;
(2) publicly structured connections that may be viewed and browsed by others;
(3) features that allow the users to consume, produce and/or interact with flows of content generated by the users that are supplied by the existing connections.

However, every Social Network has an intrinsic feature that distinguishes it from the others: on Facebook you can post photos and videos or see the ones shared by other users, or chat with your friends who have signed up; WhatsApp is a fast and easy alternative to the usual text messages (SMS) to "chat", because it can be used on the cell phone; to post the photos you need to use Instagram.

Certain conditions must be implemented [11, 12] for technologies to be used as a learning resource and not to be "neutralized" by a traditional use that subjects them to a transmissive didactics. First of all, real homework must be proposed to students, that should get them involved in resolving problems, in searching for information or in building artefacts (for instance relationships), thus giving more meaning to the needs of knowledge and of commitment. Technologies must help to open the class towards real interlocutors [13] (be them other students to collaborate with or experts to ask for advice), near or far, of different languages, culture or ages.

3 Why Twitter?

The name "Twitter" derives from the English verb to tweet. Tweet is the term used to identify a message.

Twitter is considered a Social Network characterized by an environment within which participants may share "what they are doing", by means of short messages (Tweets): a message may not exceed 140 characters and it may include an image as well. This characteristic makes Twitter similar to a microblog [14], where the interested people may participate (in a synchronous or an asynchronous fashion) in a "conversation" on certain topics. Every message may be made visible only to certain people or to everyone.

Therefore, Twitter permits: information sharing, information seeking and friendship-wide relationships [15]. Sharing information means sharing knowledge. What is important in Twitter is not this information sharing, but rather, the opportunity to be part of someone else's process by reading, commenting, discussing or simply enhancing it [16].

Twitter allows inserting a tag (hashtag) to a topic: this is non other than a word or a phrase (without spaces) preceded by the # symbol. It is enough to type a hashtag in Twitter's search box to immediately generate results that are focused on the topic.

Twitter may, therefore, be seen as an environment that allows the teacher to share and "converse" on certain topics (interests) with a large audience (community), using informal communication techniques. There is a dynamic nature within these audiences given the context of continually evolving participants in the Twitter environment. The teacher may design a learning process based on Problem Solving (Problem Based Learning) [17], inserting as discussion topic a query relevant to a certain set of problems to solve and taking advantage of the community to solve them.

This brief overview of Twitter is enough to understand its potentialities with respect to the "motivation" factor and it highlights certain relevant characteristics that may respond to the needs of a dyslexic student: characteristics that may help him/her to integrate spontaneously into the group work, rather than isolate himself/herself. The dyslexic student has intuition, the capacity to synthesize and the problem-solving capacity. The conciseness of the messages helps the students who have a hard time reading and it does not tire them when learning the content; the insertion of tags helps them in the text analysis; the possibility to write short messages helps them to develop the capacity to formulate a question or an answer (moreover, the automatic spell checker, already present in all devices allows them to avoid possible spelling errors); the possibility to intervene when they want helps the students to organize and manage their time.

4 The Role of Assessment in the (Ongoing) Learning Process

In this new context where students learn through the Social Network, the central role is played by the operations of monitoring and analysis. Without them the online environment will barely be able to emancipate from a perception that envisages it only in ancillary terms with respect to the education system and not, as it should be, as an element integrated into it and, actually, able to guarantee added value to it [18–20]: the monitoring and analysis of the learning processes assume an indispensable role for the development of quality processes. In this context emerge the necessity to ponder on the relationship that the technologies have with didactics so as to monitor both the changes in the learning habits and styles of the students [21, 22].

On the basis of the above considerations, in Table 1 there are some indicators that the teacher could consider to evaluate the (ongoing) learning process.

Table 1. Indicators to evaluate the (ongoing) learning process

Indicators referred to the internal process	• Construction of simple sentences for the message • Query formulation manner • Motivation to explore and search connections • Sustain a thesis on a problem, with a rich and complete variety of topics (connected to one another) • Use of the technical terms in simple sentences •Ability to cooperate with the group members •Take part in different dialogues • Reduction of the times needed to find the adequate solutions • Creation of a shared repertoire of technical terms • Express and compare knowledge levels within the work group
Indicators referred to the learning and growth process	• Number of messages • Number of days before a question receives an answer • Messages of people outside the classroom • Questions based on the problem • Choosing the adequate strategy to solve the problem • Quality of the formulated hypotheses (to solve the problem) • Acknowledgment of the set of problems as already solved in a preceding case • Number of ideas to solve a problem • Number of the resources found and shared related to the (similar) problem • Use knowledge of the order of procedures to carry out the problem

(*continued*)

Table 1. (*continued*)

	• Take different standpoints into account, compare them and seize the strengths and weaknesses and express an opinion on their validity • Number of tags proposed
Indicators referred to the user's perspective	• User satisfaction degree • Increase of the awareness of the group work • Activity sharing approach • Increase of the self-worth

5 Application and Analysis/Research Method

The objective of this research was to examine the educational potential of Twitter analysing his reflections on students' interest, participation and interaction. Twenty-seven students in a music technology course were involved; the samples were made up of 13 girls and 14 boys, of which 2 affected by dyslexia with difficulties in reading and writing.

The research was conducted for a time period of 5 months, from January 2017 to May 2017 (for a total of twenty weeks) and the goal of the project was to realize a sound effect based on the Granular Synthesis. Granular Synthesis is a method by which sounds are broken into tiny grains which are then redistributed and reorganised to form other sounds. To realize the project, students had to use an object-oriented visual programming environment: a software that permits to realize the sound effects by means of *patches* by arranging and connecting building-blocks of *objects* with virtual cables. These objects act as self-contained programs (in reality, they are dynamically-linked libraries), each of which may receive input (through one or more visual *inlets*), generate output (through visual *outlets*), or both. Objects pass messages from their outlets to the inlets of connected objects.

At the beginning of the period an entry test (identical for non-dyslexic and dyslexic students) was carried out in the classroom with the aim to gather information about the knowledge of specific technical terms and topics. On the base of the results, the teacher decided to organize two lessons to supply information about some terms so as to help the students to develop the project.

For the first two months the students participated in the lessons in the classroom listening to the teacher's explanations and taking notes in addition to the teacher's lecture notes. During this period the students were introduced to:

– the knowledge of electroacoustic music and digital sound synthesis techniques,
– the use of an object-oriented visual programming environment.

Simultaneously, Twitter was used with simple questions related to the topics explained in class, to analyse the presence of potential doubts and then try to exceed them by group work. This way we tried to make the students more familiar with this new didactic tool.

In order to ensure the necessary high standards of the results, the following three aspects were taken into consideration:

1. *Content:* the content of the message was checked to verify that it supplied the right information.
2. *Language:* the language of the message was checked in order to ensure clarity and correct use of technical terms. It is important that the message was clear, not only for the group of students, but especially for the dyslexic students.
3. *Format:* the format of the message was checked, in order to ensure that it summarized the stated concept.

In the last three months, during the in-class lessons, the students were introduced to practical application of the Granular Synthesis. Simultaneously, a didactic path was initiated on Twitter, where the teacher suggested a set of examples different than the ones analyzed in class and the students were asked to realize the Sound Effect (by means of Granular Synthesis), motivating and documenting their own choices and commenting on the messages of other students.

The most important problem emerged during this second period of the project, for all of the students, was the identification of the mathematical procedure useful to obtain the required result. Each example proposed by the teacher required a different approach to reach the result analysing the problem under a different point of view. This allowed the creation of a repository with information about technical terms, mathematical methods and objects and their connections. The students who encountered problems could refer to this repository to get information about similar situations or to solve some doubts. It was very easy for them to find an information thanks to the tags and this has enabled them to reduce the average time of their personal study.

At the end of the project, an examination, identical for non-dyslexic and dyslexic students. was carried out. Students had to realize a Sound Effect on the base of specific recommandations of the teacher. The dyslexic students were allowed to use the compensatory tools and the dispensatory measures, specified in the PDPs (Personalized Didactic Plans). The assessment were based not only on the completion of the task but even on the correct use of the appropriate objects and their connection.

The results were very sattisfactory. There was a positive mark within the classroom and, above all, for the dyslexic students.

Two main purposes emerged from the analysis of the tweets: instant communication and content sharing.

At the beginning of the course (first two months), students' participation on Twitter was very poor: in their opinion Twitter did not involve any advantage, but also any drawback. In the second period (last three months) students find the activity on Twitter more interesting, challenging and enjoyable, as well as it allows self-directed (see Fig. 1).

From an ex-post questionnaire submitted to the students it emerged that most of them agreed or strongly agreed to have drawn benefits from Twitter via interactive learning, instant communication and autonomous learning.

The project highlighted that the students who used Twitter to managed to master the contents of the discipline better than the students who experienced traditional teaching. They were able to define more precisely what they had learned and give detailed information.

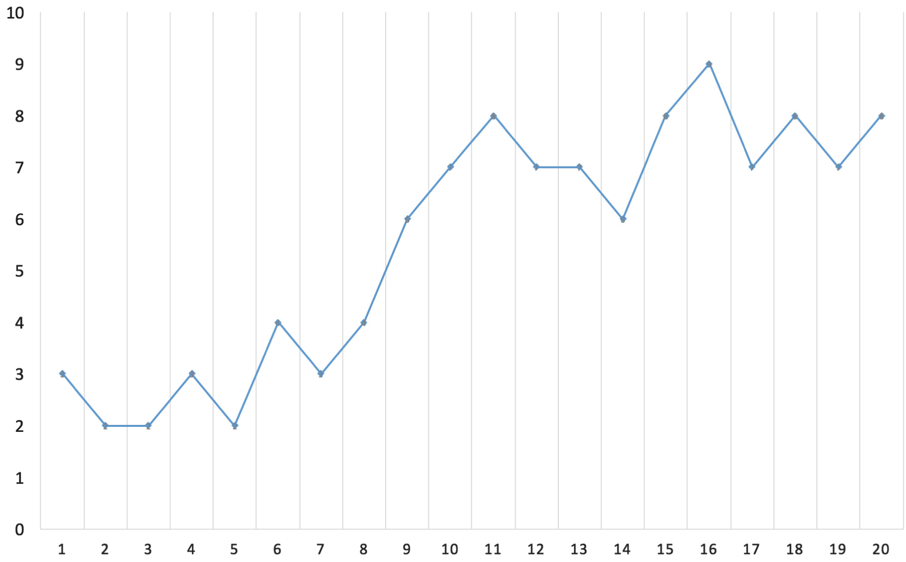

Fig. 1. Average of the students' messages for each week of the project.

Finaly, from the ex-post questionnaire emerged that there was a positive productive students' motivation which was expressed in their selection of more demanding tasks and in their perseverance in improving achievements.

6 Discussion and Conclusions

The communication through the Social Network (Twitter) was perceived positively by the students: the possibility to quickly obtain an answer to their own questions allowed them to dedicate more time to the assigned tasks, without becoming discouraged. This tool discouraged reciprocity (strength), enabling the passage from a dependence on the formal structures to the growth of the Social Network as a learning space. At the same time, the transmission of a 140 character-long message proved demanding generating a risk of leading to an over-simplification of complex debates (weakness). The fluency, the flexibility and the capacity to formulate or answer to a question are important consequences for the students and are a part of their learning process.

Finally, the possibility to formulate questions/answers in writing by assigning one or more tags (hashtags) enabled the creation of a sort of easily-retrievable "information archive" that could be used for future situations.

The insertion of "motivators" in a learning process, as Twitter for instance, yields positive behaviors of the students and generates in them an energy to be dispatched to the learning experiences. Thus, a learning environment may be transformed, from a place where the student is compelled to spend time into a place where students wish to do their best.

Every school might start to use Twitter as an important part of the learning process.

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Mechanism of Virtual Learning Environment System

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Abstract. Virtual learning environment refers to an artificial environment built with information technology to support student learning, which consists of the physical environment. The design of the virtual learning environment should be enhanced to make it self-monitoring and regulatory functions and to strengthen its anti-interference ability against external influences; Aiming at the performance problems such as the display delay and the stiff physical movement caused by the scene rendering of the existing three-dimensional virtual learning environment, the cloud computing is introduced into the construction of a three-dimensional virtual learning environment. The application and development of virtual reality technology in education have enriched the forms of teaching and learning in the existing education system.

Keywords: 3D virtual learning environment · Cloud computing
Virtual reality technology

1 Introduction

Virtual Learning Environments is a rapidly developing field of research in recent years. It refers to a computer-based standardized learning system that is mainly used to support the content delivery of online learning and promote the interaction between online teachers and students. It is an innovative model of information services, build knowledge base and provide professional users with a platform for information exchange through online learning resources. What's more, it not only play the leading role of teachers on guiding, enlightening and monitoring the teaching process, but also fully embody the initiative, enthusiasm and creativity of students as learning subjects by combining the advantages of traditional learning methods with the advantages of digital or networked learning. Virtual learning environment refers to an artificial environment built with information technology to support student learning, which consists of the physical environment, social environment and normative environment. This kind of learning method is learner-centered and provides learners with interactive real-time courses that meet individual needs and characteristics which are designed with learners' timely feedback and learning outcomes. This kind of information-based learning environment, which is supported by the network and can be used for teaching management and shared learning resources and various learning tools, is called virtual Learning Environments [1].

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2 Virtual Learning Environment

Virtual Learning is an online learning method based on constructivism learning theory and network and multimedia. Constructivism of learning theory hold the view that the experience of the environment is necessary for learners to build knowledge. Learning is the process of learner's actively construct internal psychological representation, which includes not only structural knowledge, but also includes a large number of unstructured experiences. Situational, collaborative, conversational and constructivist constructions are the four major elements of constructivist learning environment.

The aim of virtual learning environment is to support or manage all aspects of the network environment of teaching and learning, including all kinds of online interactions between learners and mentors (including online learning). There are also other people define it as: the virtual learning environment is a server-side software designed to manage all aspects of learning (delivering learning materials, student tracking, appraisal, student communications, etc.). VLE is a kind of virtual learning community that supports virtual learning. It can be generally understood as a virtual environment for reproducing the real world.

3 Definition of the Concept of Virtual Learning Environment

However, the learning environment is not a natural pile, it's systematically designed by designers, including teachers, students and other technologies (including hard and soft technologies). The crystallization of technical activities materialized form artifact, Learning environment is naturally "artifact". What is learning environment? The current concept of the learning environment has not been clearly defined. However, in terms of various definitions, there are mainly two explanations for it. One is to emphasize that learning environment is a static concept. This understanding holds that the learning environment is the material environment of individual learning. Another is that the learning environment is a dynamic concept, including the material and non-material conditions and conditions as well as its teaching mode and teaching strategies. Such as learning resources, learning atmosphere, learner characteristics and so on. In fact, we think that the learning environment is a dynamic concept, including all aspects of learning. This is not only because the environment is also related to the technical learning environment and the emotional learning environment [2], but also takes the wide range covered by "artifacts" in distributed cognitive theory into account. The learning environment is considered as a concrete concept of "artifact" should have the same category as "artifact". Therefore, the elements of the learning environment are not only material conditions, but also non-material conditions such as teaching modes and tactics [3].

4 Learning Model Framework

As shown in Fig. 1, the learning model framework is divided into four parts:

1. Learners. Individual learners acquire learning resources from a three-dimensional virtual learning environment by initiating learning activities and gain knowledge through the construction of meaning. In addition to these, multiple learners can also communicate with other learners. The way of communication is synchronized, coordinated and so on. The user interface provides technical support for learners' activities.
2. Teachers. Teachers are the providers of teaching resources and the organizers of curriculum design. They design teaching objectives and teaching content through the analysis of teaching tasks, and design a reasonable curriculum evaluation criteria based on the analysis of teaching objects. The curriculum design interface helps teachers design a three-dimensional learning environment in a visual way and interacts with teachers in real time to modify and refine the design of a three-dimensional learning environment. Learners and teachers form two major groups of users for learning.
3. Three-dimensional virtual learning environment. Three-dimensional virtual learning environment is a rich knowledge base, reflecting the teacher or curriculum ideas of textbook. Each environment is a three-dimensional space context learning environment, the relative relationship between the shape and the position of each teaching model is expressed in the form of a three-dimensional space vector to support real-time roaming and other functions. The environment provides a wealth of theoretical knowledge of learning and uses the actual teaching material design learning module unit for the object.

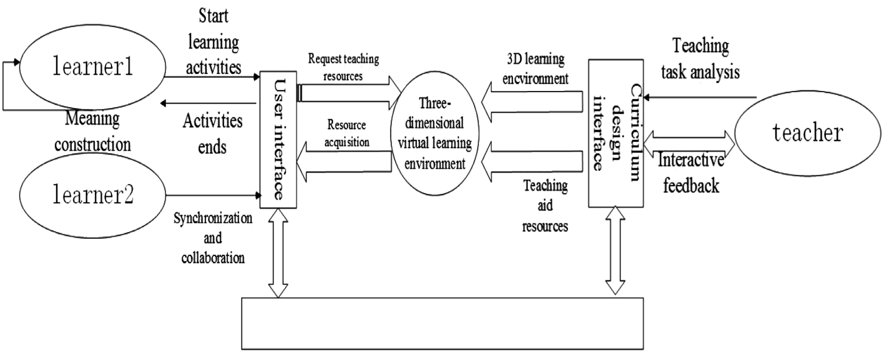

Fig. 1. Learning model framework

5 Interactive Teaching in Three-Dimensional Virtual Learning Environment

5.1 Teaching and Learning Supported by Virtual Reality Technology

Virtual Reality (VR) is a three-dimensional virtual environment gradually rises at the end of the 20th century and is computer-generated, but also a comprehensive information technology. It can leverage a variety of sensor devices to help users interact directly with the environment and "put" users into the virtual environment [4]. The application of virtual reality technology in teaching, the formation of the "virtual reality teaching environment" is an important part of the information-based teaching model in recent years. It is characterized by immersion, interest, convenience, richness, creativity and spanning time and space. In terms of teaching content presentation, teaching process, teaching and learning support and interaction, etc., it have played a positive role in promoting teaching effectiveness and teaching quality. For example, in a lifelike virtual history lesson, learners can be involved as part of a history, feeling important historical events and complex relationships with people. Teachers and designers can create unique cross-temporal teaching environment based on teaching strategies to make up for the defects that the real world situation changes less and time and space cannot be reversed(Such as reproduction of history, simulation of plant and animal growth process, show the structure of complex systems, vacuum physics experiments, etc.), greatly enhances the learning interest of learners in the learning process and provides strong support for teaching modes such as contextualization teaching, interactive teaching and cooperative learning.

5.2 Virtual Teacher Interaction in 3D Environment

Virtual Learning Environment is a tool that integrates all the features required for online learning. Virtual Learning Environment can be used as a basic tool for providing content and resources to school lD virtual learners, as well as for widely-distanced learners. The main components of a VLE include lesson planning (breaking down lessons into sections that can be assigned and evaluated), online support for teachers and learners, e-mailing (e-mail, discussion groups, chat rooms, web publishing) and Internet link to external course resources. In general, the user of the virtual learning environment has a teacher ID or learner ID. Teachers can see what learners see, but teachers have additional user rights such as creating or modifying contents of courses and tracking learner's performance. The design of ecological virtual learning environment mainly completes two tasks: First, it designs the virtual learning environment from a macro perspective, optimizes its overall function and realizes its self-organization; Second, it specifically design the various sub-environments from the microscopic point of view to optimize their internal structure and enhance learners' e-learning adaptability. And finally reach the goals of optimizing the virtual learning environment and improving learners' learning efficiency and effectiveness through these two aspects of design.

Overall, the ecological virtual learning environment should have the function of self-regulation, self-improvement and self-development. To realize its self-organization, a core monitoring and regulation mechanism needed. The establishment of this monitoring and regulation mechanism can be considered from two aspects of "technical support" and "human support": one is intelligent technical support for the virtual learning system and another is monitoring and regulation functions of aid scholars or student team. Combined with the basic composition and function of the ecological virtual learning environment and the analysis of the interaction between its constituent factors and factors, following the basic principles of ecology, we can design an ecological virtual learning environment structure and function model. As shown in Fig. 2.

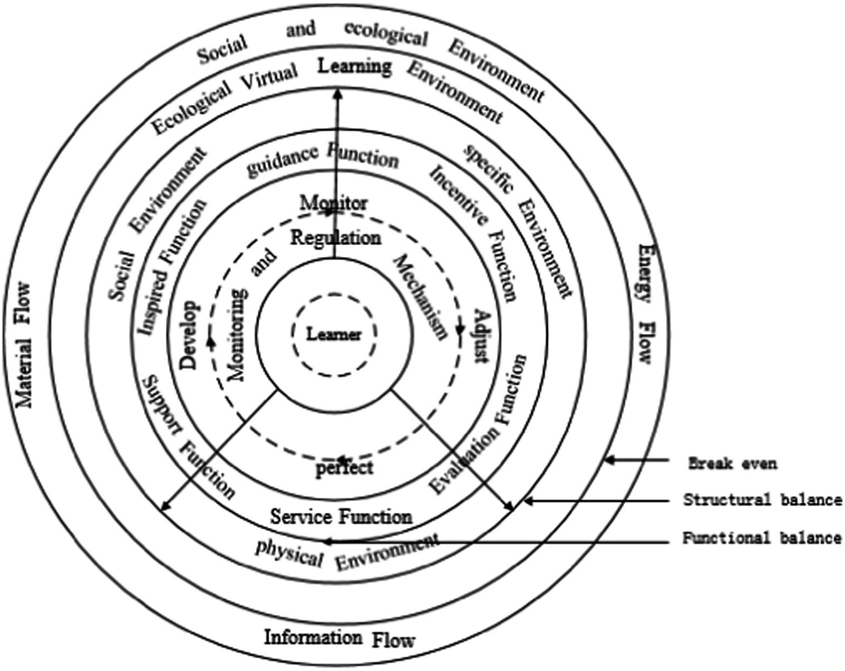

Fig. 2. Ecological virtual learning environment structure and function model

Ecological virtual learning environment is a subsystem of the social ecological environment, open to it and exchange material, energy and information with it constantly, and they keep balance between information, material and energy exchange. The physical environment, social environment and normative environment are interdependent and based on each other. The overall function of the virtual learning environment depends on the balance of the three types of environmental structures and the homogeneity of overall functions. Based on the integration of the three types of environment, the virtual learning environment should have the basic functions of supporting learning, service learning, guiding learning, enlightening learning, motivational learning, evaluation learning and should maintain the coordination of overall functions. The core mechanism of ensuring the self-organizing function is the learner-centered monitoring and regulation mechanism. Through this mechanism, the basic functions of the virtual learning environment can be effectively supervised and regulated, and the dynamic operation of “monitoring, regulation, perfection and development” can be realized. Timely identify problems and solve them, then improve and perfect the system, and ultimately achieve the continuous development of virtual learning environment.

6 Digital Cloud Data Library and Virtual Learning Environment Integration

The digital cloud information library covers different types of information resources in various disciplines, including online bibliographic databases, full - text electronic journals database, electronic books, audio and video materials, online CD - ROMs and various library related network information. The library provides teachers and students with a variety of academic information resources to support school education, learning and research and to provide them with quality service. The integration of digital cloud data library and virtual learning environment is conducive to the full exploitation and utilization of digital resources and carry out online teaching activities through the support of digital cloud data library’s strong technical. Modern university library bear the important task of information literacy education in addition to the traditional service functions. As the center of academic information resources, university libraries can not only provide simple information retrieval services, but also should actively integrate into teachers ‘teaching and students’ learning process to provide direct information resources services for teaching and research activities in schools. Information literacy education emphasizes the ability of students to efficiently acquire, use and properly evaluate information using computers and information technology. The integration of digital cloud data library and virtual learning environment provides an integrated open learning environment for information acquisition and utilization, which provides a way to realize the development of various learning methods and improvement of information literacy.

In the integration system of the digital cloud data library and the virtual learning environment, the digital resources in the library can support users to learn independently and meet the information needs of users’ information sharing, quick access and timely updating. Realizing the integration of library digital resources and services with VLE can play an active role in promoting teachers’ teaching. Students or teachers can log in to VLE only once, and they can easily access teaching resources and digital resources of libraries to achieve integrated learning. For example, in the virtual learning environment, curriculum teachers can preset part of the reference learning resources, students can not only use the fixed learning resources in the system, but can also click on the need to get the latest digital resources in the digital cloud information library (e-textbooks, e-journals, etc.) in the process of virtual learning. The final result of the consolidation is to build a fully integrated online learning environment that seamlessly links and interoperates with digital cloud data libraries and virtual learning environments and to provide personalized, flexible services through one-stop access. System integration diagram shown in Fig. 3:

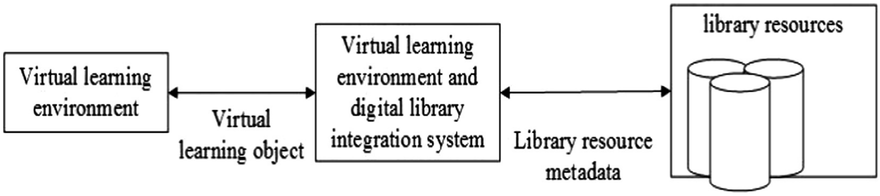

Fig. 3. System integration diagram

7 Conclusion

Virtual learning environment is an important place for the current and future students to learn. It is an effective way to design, develop and maintain the ecological development of virtual learning environment by analyzing the existing problems in the virtual learning environment from the perspective of ecology and exploring solutions to the problems based on the ideas, principles and methods of ecology. There is “ecological balance” in the ecological virtual learning environment, and also faces the “ecological crisis” triggered by human factors and external influences. If not promptly dealt with these issues it will affect the coordinated operation of the entire system and function. Therefore, on the one hand, the design of the virtual learning environment should be enhanced to make it self-monitoring and regulatory functions and to strengthen its anti-interference ability against external influences; on the other hand, the structure and function of various sub-environments should be optimized to make the internal sub-environment form a stable and unified system with the function of self-protection and defense, finally realize the ecological balance of the virtual learning environment and form a healthy virtual learning ecosystem.

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The Current Situation of Information Security and Prevention General Course in Universities and a Teaching Approach Based on Students Structure

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Abstract. This paper takes non-computer majors as the teaching object, analyzes the present situation of information security and prevention in today's society, as well as the existing security problems. And then, we design a set of Information Security and Prevention courses for non-computer major students. Finally, a teaching method based on students structure is introduced.

Keywords: Information security · Teaching methods
Experimental methods

1 Analysis of Information Security Present Situation and Existing Problems

In recent years, with the rapid development of computer network and E-commerce, information security and prevention have been paid more and more attention by relevant departments of the Country. Information security is a universal subject, and the improvement of national information security is related to China's political, economic, military and cultural aspects. The Communist Party of China in the fourth Plenary Session of the 16th CPC Central Committee has included information security and political security, economic security and cultural security into four important components of national security. Combined with the situation of China and the education level of the people, there are several problems in Chinese information security and prevention.

1.1 Weak Awareness of Personal Information Security

Security awareness means that by changing views of organizations or institutions, they are aware of the importance of security and the negative consequences of not ensuring security, as well as establishing training stages and reminding successors. According to the report of Beijing Gu An World Science and Technology Co., Ltd. in late 2012, they carried out the investigation of information security

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to Chinese employees, and the result show that the their information Security awareness still has a lot of room for improvement. Besides, the main reason for the large number of users data leakage at the beginning of 2012 is also because of the low consciousness of the personal information. According to Wang [8] survey that 83.7% of the people fully fill out their own registration data, compared with 78.2% in 2010. Therefore, in order to realize the information security of the whole nation, we must surround the security subject of people, care about the safety of peoples behavior, and to achieve people-oriented is critical. To realize the people-oriented information security management, the first step is to improve the peoples awareness of information security prevention.

1.2 Low Prevention Ability of Personal Information Security

The popularization of computer network, the application of electronic files, mobile terminals, mobile payment, all kinds of social media and the rapid development of logistics business are the main channels to disclose personal information. In recent years, the big data applications became hot-spots and provided more effective analytical data in some aspects and meanwhile brought great hidden danger to people's information security. Accordingly, in the community we live in, workplace, schools generally have no courses about the information security training or advertisements. Especially in China, many middle-aged and aged people as well as people from countryside, although always on the network and utilize many applications on mobile terminals; they are not enough understand and mastered the risks of them. Hence they are easy to be fishing, be attacked by Trojans and hackers. For these, many people have been stolen information or deceived but also have no awareness of this. Therefore, on the basis of raising peoples awareness of prevention, it is the most important to further improve the ability of people to guard against personal information.

1.3 The Surrounding Environment Is Heavily Trapped

People meet personal information disclosure or receiving telecommunications fraud, always because of social engineering means, mainly have the followings: 1. Attackers use or imitate trusted institutions or target stakeholders, such as banks, governments, to send forged e-mails or messages, to defraud or to grow Trojans. 2. Bait and cross-station phishing attacks: Make use of the latest movies, hot information or ultra-low discounts, which people pay high attentions, combined with the security vulnerabilities of application systems caused by crossing the sites to process phishing attacks. 3. Technical support Services: Attackers impersonate Technical Service Companys staff, and requires people to log in to an address or provide technical support through remote access. 4. The insiders of business platforms, logistics companies, hospitals, company human resources, leak or even trafficking users information. These bits of information, once they are integrated by big data technologies, expose a person completely.

1.4 Relevant Laws and Regulations Are Not Perfect

The quality and progress of legislation cannot meet the actual development needs of the information society. Firstly, legal norms are relatively weak and lagging behind; besides, it lacks of specific laws on privacy protection or personal information protection. Secondly, some legal concepts are not clear. To make a kind of behavior as crime, it must be the serious social harmfulness of the behavior, and the serious social harmfulness is the precondition and foundation of the crime. Thirdly, the legal punishment is not enough. Fourthly, the legislative process is slow. “The Cyber Security Act” was implemented on June 1, 2017 and General Secretary of China Jinping Xi proposed that without network security there will be no national security, cyberspace is the fifth territory after land, sea, air and outer space.

1.5 Lack of General Education

In recent years, China and even around the world often occur the events of personal information leakage, spam or phone messages, and even telecommunications fraud events. Colleges and universities are the main institutions for the training of masters, conveying a large number of graduates to the society every year. Since 2001, more than 20 colleges and universities have set up information security undergraduate courses, and more than 10 universities have established information security PhD-awarding branches. However, the proportion of professional students still is small. For other unprofessional students, especially students majoring in liberal arts, there are no courses on information security and prevention that are applicable to them in society or on campus. The unified computer Basic course and programming course in the whole school cannot effectively improve the students information security consciousness, and also cannot provide the safety precaution ability. Therefore, colleges and universities should pay more attention to and improve the information security and precaution consciousness of the unprofessional students while training professional talents, and teach some safety precaution techniques.

According to Lu and Xu [9] empirical analysis on information security education in eight universities in Shanghai, the probability that students of non-information security and computer majors can access information security education is almost zero. Related courses are similar to the “Computer Culture Foundation” and “The basic of computer applications”, such as operating system introduction and office software as the core of the teaching content. Even though there are some classes that include computer security and virus-related content, effect is generally not good because college freshman havent had time to get a thorough understanding of computer networks. In teaching materials, for information security or professional textbooks for computer professional students are quite many, but the popularization of technical textbooks and cultural textbooks are very few. This leads to the difficulty of understanding and mastering information security knowledge for people who are not professionally related.

2 Existing Solutions for Improving Personal Information Security Prevention Ability

2.1 Get Knowledge via Self-study

With the rapid development of computer network, people can learn the relevant knowledge on the network, for example, through watching and listening to the teaching video and audio, reading electronic literatures, have discussion or communication on the Internet forum to obtain the required technical knowledge. According to report, China has more than 500 million netizens; and the main group of the network learners is the city white-collars and university students. But for learners who are not computer, information or network professionals, it is difficult to master information security prevention ability via network learning. As a result, the number of people who are able to get information from the Internet to guard against the invasion is very small.

2.2 Students Can Get Relative Knowledge from the General Courses in School

Universities offer information security courses to teach students some information security prevention basic knowledges. However, most of the teaching is mainly based on the popularization of theoretical knowledge, ignoring the actual operation part. For students who are not computer majors, learn theoretical knowledge without any operation skills, difficult to master and easy to forget. In addition, the existing teaching materials are more professional and not very suitable for students who are not computer majors. Therefore, it is need to a better design in teaching method and textbooks as well as experimental teaching.

2.3 Companies and Government Departments Give Their Employees Information Security Training

Some enterprises and institutions or IT companies train their staffs of information security related knowledge. However, more of the content is related to their company and the organization, not suitable for outside and network use, and the number of people involved is less. In addition, there are some information security training institutions in the community, often at the expense of high tuition fees to provide learners with a certain degree of security measures and techniques.

3 The Contents Analysis of Information Security and Prevention Courses

3.1 The Requirements of Information Security and Preventive Courses for Teachers

This paper aims at the research and exploration of the teaching methods of information security and prevention course for non-computer related major students.

Information security is a new subject which is related to the whole nation, and there is no good teaching material for popularization at present. Therefore, the requirements for teachers in this course are as follows:

(1) Teacher allocation requirements: Firstly, the teacher has a good professional knowledge and has a certain degree of ability on information security precautions, detection and remediation. Secondly, the teacher fully understand the basic situation of students who select courses, such as the computer course that they had studied, mastery of the courses, the student proportion of science and liberal arts.
(2) Textbook needs to be well designed: At present, there is no suitable textbook about information security and prevention for the non-professional students. Therefore, after analyzing the present situation of the students, the teacher will edit a course of information security and prevention which is suitable for the students in the current period. Generally, the design of the course is flexible and varies according to the basic knowledge and professional circumstances of students that select the course for each year. For example, when liberal arts students more on the class, then the teaching content should be easier to understand and easy to operate experiments. When the science and engineering students takes a great proportion, teacher should design the lecture content to deepen some and teach more complex operation.
(3) It is the curriculum construction needs: The information security and prevention is a university general education course so that the types of student majors who select the course are various. According to experience, each year due to different major types of students, the degree of acceptance of this course and student personal ability is not the same. Therefore, in the teaching, teacher should adjust their content according to the students understanding, accumulated better teaching experience and methods, ultimately to enable students to get the higher level of information security and prevention knowledge.

3.2 Theoretical Knowledge of Information Security and Prevention Course

- Social engineering and awareness of information security prevention
- Operating system security
- Cryptography basics and digital authentication
- Computer viruses and malware
- Intrusion detection technology
- Firewall Technology
- VPN Technology
- Wireless network security
- E-commerce security.

3.3 Experiment Content of Information Security and Prevention Course

- Security settings of Windows operating system
- Web security
- Phishing attacks
- Social engineering and Cryptography Dictionary
- Intrusion detection
- Firewall settings
- Vulnerability scan and vulnerability scanner.

4 An Elective Course Teaching Method Based on Students Structure

4.1 Adjust the Teaching Content of the Course According to the Proportion of Liberal Arts and Science Students

As a university general course, Information security and prevention generally does not limit the majors of students who select the course. Because of the different curriculum arrangement of students majoring in Art and science, the basic knowledge they can learn is different. Therefore, a unified standard of teaching will be difficult or too simple for liberal arts or science. In addition, currently, professional textbooks are many, popularity textbooks are less. In view of these situations, we will combine students different professional types, arrange the reasonable course content, not confine to a certain teaching material or some widely applied specialized course, widely refer to the teaching experience and teaching content of common general courses in universities, as well as consult the information security education content of enterprises, government departments and the popular prevention techniques on the networks. We teach students to take the essence, step-by-step, from the introduction of the basic knowledge to have a better sense of prevention, eventually obtain daily preventive ability.

4.2 Adjust the Teaching Content According to the Ratio of High and Low Grade Students

Except the students major type, the levels of students grades are not required in this course. On the class, there are always some freshmen, as well as junior and senior students. This makes the basic knowledge of students and the social experiences they mastered are different. Freshman, just came out from high school, did not have an independent life, are full of curiosity to a lot of things, want to try, and lack of personal information protection awareness, always cannot identify and prevent the true and false. The junior and senior students live independently for two or three years, with a certain sense of self-protection and prevention awareness, in the face of problems have in certain ability to deal with or to know consulting with their parents and friends. Therefore, the teaching content of the information security course should be adjusted with the degree proportion of the students. That is, the content of the teaching to meet the accepting ability of the majority of students to, so that more students learn basic knowledge and grasp certain ability of information security prevention.

5 Evaluation of Teaching Effect

5.1 Student Evaluations

In the course of teaching, the students combine the information security events they have seen in daily life, take the questions to the class, or teacher organize class discussion, improve students learning interest and mastery of the knowledge. In addition, group analysis courses are arranged to enable students to analyze and explain principles, steps, and precautions of safety events in daily life, so as to strengthen students awareness of prevention and interest in obtaining relevant knowledge.

5.2 Teacher Evaluation

Teachers combine the teaching content of each class in teaching, give examples to explain relevant knowledge points, combine theory with practice, introduce and analyze latest information security cases, improve students sensitivity to information security and prevent consciousness. In addition, through experimental teaching, students can combine the theoretical knowledge and experimental teaching together to improve students ability of prevention.

6 Conclusion

Based on the research of colleges and universities, this paper analyzes the popularization and existing problems of information security teaching in colleges, and draws up a teaching content of information security and prevention which can be regarded as the curriculum of general education in colleges and universities, and gives an instructional method and its evaluation method according to the type of students of the course.

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Research on Shared Information Management in University College Reference Room

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Abstract. In the current university reference room, there are some problems such as backward system facilities, simplistic manual management, and limited funds, resulting in the repeated purchase of scientific books, non-transparent reference information as well as the waste of funds, which reduced the staffs work effectiveness and decreased references circulation. Taking Inner Mongolia University for example, we designed and developed a shared information management system for reference rooms. This system uses web service and three-tier architecture to simplify the workflow of reference room administrators, changes the previous lack of manual processing mode, achieve the resource sharing for research funding books and so that it can save money, meanwhile, it provides a quick and convenient query service for teachers and students.

Keywords: Reference room · Shared information management
Web service

1 Introduction

University college reference room is one of the important sources of information for teachers and postgraduates. Due to the shortage of staff, the backward system facilities and the limited funds, the management of the most universities college reference rooms is still handled manual. Such backward treatment not only increases the workload of the staff and reduces the efficiency, but also takes inconvenience to the borrower's checking and borrowing, so that reduces the circulation of reference. In order to make up for the lack of manual processing, we develop a college information room management system to achieve shared information management. In this paper we present the analysis, design, and implementation process of the reference room management system.

2 Current Status of College Reference Room Management

Take College of Computer Science for example, College of Computer Science of Inner Mongolia University was established in 1997, and the college reference

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room has kept abundant books in computer science and related fields, including computer application basis, discrete mathematics, Programming, network theory and development etc. College has 55 kinds of Chinese periodicals and 13 kinds of foreign periodicals. With the development of computer science in recent years, the college has undertaken more than 60 scientific research projects at the provincial and national level, including 50 projects funded by the National Natural Science Foundation of China, 6 key projects under the Ministry of Education, 6 projects under the Ministry of Industry and Information Technology Development Fund, 6 key projects in Major autonomous regions. These projects encourage teachers to spend large amounts of funds to purchase the necessary books and materials, and the books are targeted, practical and timeliness. However, due to the outdated management, there are disadvantages of repeated book and material purchase, book and material information is not disclosed, and so that cannot share the resource. Our library information management system provides eight management modules including user management, book management, periodical management and loan management etc., as well as six user modules such as reference inquiry and reference application, which realizes information management of information and satisfies user query, borrowing, application and other needs. Meanwhile, it achieves generating report, uploading, downloading, collection, sharing, sending message, online retrieval and other features.

3 System Design and Implementation

According to the actual needs of the reference room, all users are divided into two categories, including ordinary users, and administrators. In addition to the needs of two types of users, reference rooms requirements should also be considered when developing the system. The main needs of ordinary users are data query and borrow materials. To meet this demand, the primary task of the system is to provide comprehensive and standardized reference and information. Apart from the basic information, the system should provide information such as catalogs, profiles and other information to facilitate the borrowers' search, reference and borrowing. Second, in order to provide a better rental service, in addition to providing comprehensive information, the system should provide detailed loan information for each reference to inform users of the current borrower of the reference and the earliest return time of the reference. Finally, the system should automatically generate borrowing log information according to the borrowing situation, and feed the borrowing log to the borrowers. According to the characteristics of the reference room, users can also apply for information, the academic research purchased reference into archive reference. The main requirement of the reference room manager is the management and maintenance of much information: such as books, magazines, loaning business and users. The administrator needs to manage the above information conveniently and quickly through the system, and back up, update and maintain the information and report the information. Because of the huge amount of information that is managed and maintained, the system should provide convenient and fast information entry functions. For example, books, periodicals and other materials require a large amount of information to be entered. However, such information can be obtained by querying the ISBN number or the ISSN number. Therefore, this access to information and information interface to reduce the workload of the input reference. Reference room construction needs are the most important; reference management system is different from library management system, reference management focus on the construction of the reference, which has a strong professional pertinence. Therefore, the system of reference management and maintenance should be based on the actual situation of the college, according to their professional characteristics of reference classification.

4 System Outline Design

4.1 Module Design

According to the characteristics of college reference room management and actual needs, the system is divided into two parts, including the user system and administrator system. The common function of both systems is to log in and retrieve the password. The system function structure module is shown in Fig. 1.

4.2 System Main Function Flow Chart

According to the data room business processes and system requirements analysis and functional module design. System main function flow chart was shown in Fig. 2.

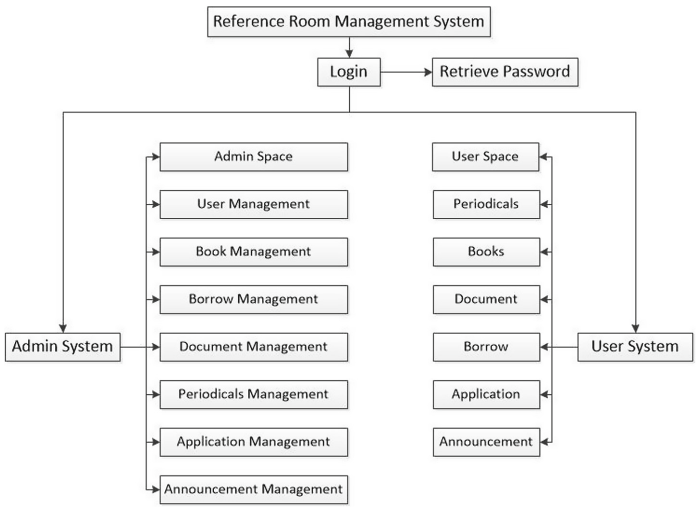

Fig. 1. System function structure module

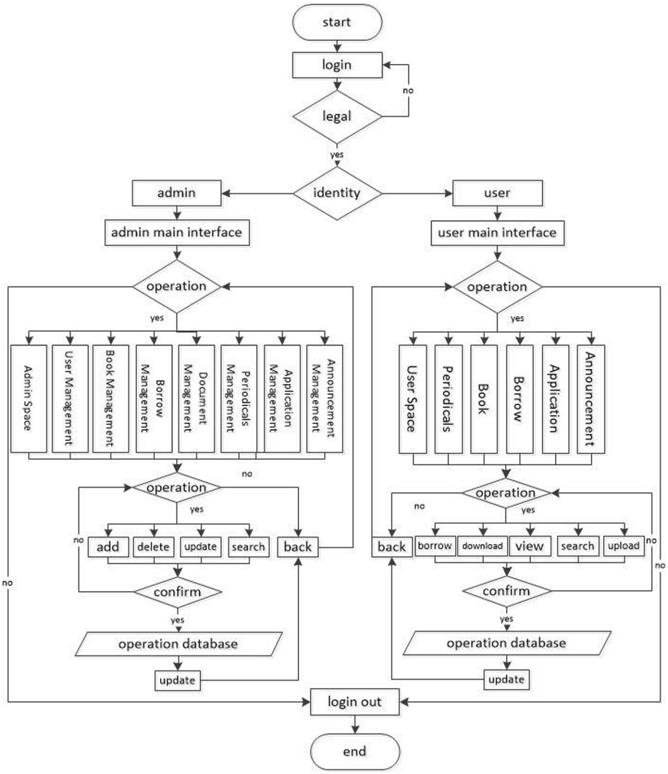

Fig. 2. System main function flow chart

5 System Model

5.1 Login Module Design and Implementation

The login module is the entrance to the college reference room management system. The front of the login module is a login.aspx page, the form is defined by the $\langle form \rangle$ tag, and two $\langle input \rangle$ tags are defined in the form for obtaining user name and password. The login_Click method of the login page background verifies the login information of the user by calling the userinfo service published by the Web Service. If the authentication succeeds, the user interface of the login page or the login page of the administrator is entered according to the user type and the login information is stored in the session. If the user is logged off or entered incorrectly by the administrator, the page prompts the corresponding error message. The login page is shown in Fig. 3.

5.2 Design and Implementation of User Management Module

User Management part includes additions and deletions to change all users, change user status, export information to Excel and other functions. It has a

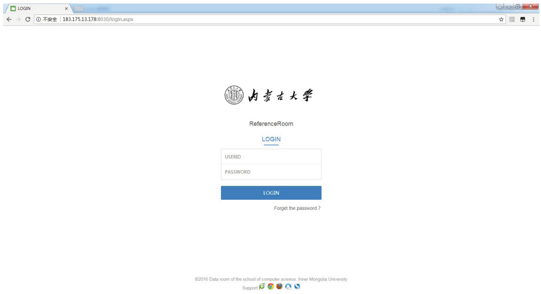

Fig. 3. Login page

variety of ways to check users, supports paging and photo display. When add users to the system, it supports local upload and multiple formats of image files.

5.3 Design and Implementation of Book Management Module

The book management module contains all kinds of books and information to add, delete and export the information to Excel. Support a variety of query methods, page display, book information, as well as image display. The page list shows the key information of the book; click the title hyperlink to view the book details. The book management page is shown in Fig. 4.

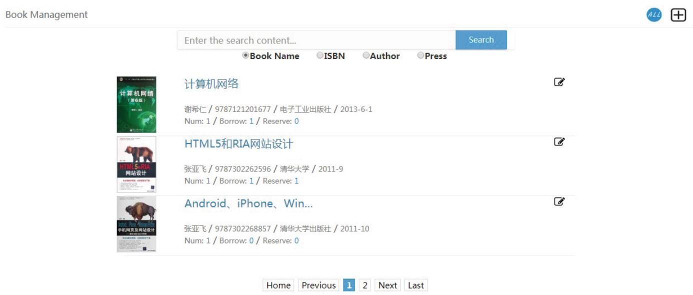

Fig. 4. Books management page

5.4 Design and Implementation of Loan Management Module

Lending management module includes borrowing, booking, return information management and reminder and other functions. The current lending function displays three types of loan information, including "no reference", "borrowing" and "overdue to be returned." "No reference is received" means that the pre-borrowing is successful and can receive the reference. For the borrowing information of "Borrowed" and "Expectable to be returned", a refund can be performed.

In the extended reimbursement function, you can view all extended lending information, click the "reimbursement" system to send overdue reminder mail to all overdue users. In the history lending function, you can view the borrowed information of "returned" and "canceled"; "canceled" means that the user cancels the loan himself or fails to receive the materials within 3 days before receiving the reference. The system automatically cancels the loan. In the reservation information function, you can view the reservation information of "active", "canceled" and "expired"; "active" means that the currently reserved book has not been returned by the borrower, the reservation user needs to continue to wait; "canceled" means the user cancels the reservation on his/her own account. When the reserved book is returned by the borrower, the system will send the information to all subscribers who subscribe for the book to borrow the information and set the reservation information as "expired".

5.5 Application Management Module Design and Implementation

Application Management contains the current application and application history; used to manage the application and review books. The current application page shows unapproved application information. The application approval page displays the unapplied user application information for the administrator to review the application. The history application page shows the completed applications. Support image display and paging, page list displays application for key information and clicked the book name hyperlink to view the details.

5.6 Design and Implementation of Notice Notification Management Module

This module provides announcement of the information addition, deletions, checking, changes, shows bulletin information and shows the key information of the announcement. Click the title link to view the announcement details. Notice notification support attachment upload, you can upload various types of attachment files. Announcement notification management page is shown in Fig. 5.

Fig. 5. Announcement notification management page

6 Design and Implementation of User Module

User system has six modules; including user space, reference topics, periodicals and magazines, notice notification, reference query and reference application. The foreground of each module function is an aspx web page, all the pages apply the master page user. Master unified page layout, each page defines the $\langle TextBox\rangle, \langle DropDownList\rangle, \langle RadioButton\rangle$ and other controls in the $\langle div\rangle$ layout Input and selection of information, use $\langle GridView\rangle, \langle Button\rangle, \langle Label\rangle$ and other controls to display information and complete the operation of information. The back end of each module function is an .aspx.cs file, and the background obtains the information reference set Reference Set by calling the service published by the Web Service and displays the information in the <GridView> control through other interface functions provided by the service. The function of each module, page design implementation described below.

6.1 Design and Implementation of User Space Module

There are user login information and unread new information in the upper left of the user interface, and the entrance of the six function modules is provided in the left navigation bar and the upper function bar. User space module has user information, message center, upload reference and user's collection and loan information, as well as upload topics and information of a total of seven functions. The main user interface is shown in Fig. 6.

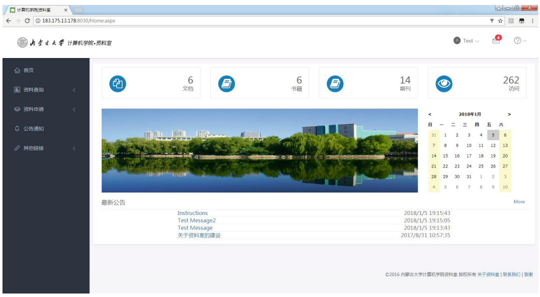

Fig. 6. User main interface

The design of each function in user space is described as follows:

(1) My information is used to display and manage the basic user information.
(2) Message center is used to display and manage the user's mailbox information. Divided into inbox and outbox, page shows mail information.
(3) My collection is used to display and manage the user's favorite information. Divided into topics, materials, books collection.

(4) My borrowing is used to display and manage the user to borrow information. The current lending function shows pre-lending success and borrowing of uncommitted lending information and completing the cancellation of pre-lending; the user can view the lending information and cancel the pre-lending. Historical Lending function shows the loan information has been returned, “canceled” means the user to cancel the pre-lending before receiving the reference, “expired” means the system did not receive information within 3 days the system automatically cancel the pre-lending. Reservation information function shows all the reservation records, support the cancellation of reservations.
(5) My topic is used to display and manage the user’s topic information, including the subject of additions and deletions to change the topic information.
(6) My Upload is used to display and manage the electronic documents uploaded by this user.
(7) Upload reference is used to upload electronic documents for users, which supports a variety of file types.

6.2 Design and Implementation of Reference Topic Module

Reference thematic module contains the query, view and downloading all reference topics. Which support a variety of query methods and page display thematic information. The page list shows thematic key information. Click the title link to view the details. View reference in the special page can download, collect and contact the uploader.

6.3 Periodical Magazine Module Design and Implementation

Periodical magazine module includes inquiry, view and borrowing all periodical information. Support a variety of query methods, page display journal information, support for image display. The page list shows the journal key information. Click on the title link to view the details. In the Journal Information page, you can borrow an appointment for a review journals, you can also view the contents of the download journal catalogs. Check the magazine page is shown in Fig. 7.

Fig. 7. View journal magazine page

6.4 Design and Implementation of Notice Notification Module

Announcement notification module are used to view and download announcements. Paging shows bulletin information and the page list shows the announcement key information. Click the title link to view the details. In the bulletin information page, we can download the relevant attachments and send email to the administrator. Check the announcement notification page is shown in Fig. 8.

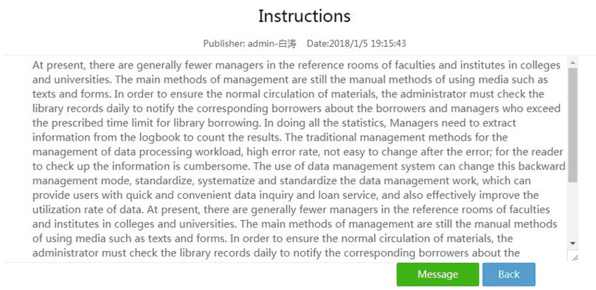

Fig. 8. View notice notification page

6.5 Design and Implementation of Reference Query Module

Reference inquiry module contains electronic document inquiry and book information inquiry. The Electronic Reference Inquiry page displays all the electronic documents that meet the search criteria. Query conditions are divided into name, uploader, keyword query and type and attribute query, query are fuzzy query and paging information. The page list shows the material key information. Click on the reference name link to view the details. The book information inquiry page displays all book information that meets the search criteria. Support a variety of query methods, page display book information and support for image display. Page list shows the book key information. Click the title link to view the details.

6.6 Reference Application Module Design and Implementation

Information application module contains my application and application information; used to view the application information and application information.

(1) My application contains the current application and history application. The current application page displays the application information that the user has not been approved, and supports the modification operation. The history application page displays the application information that the user has already reviewed.

(2) Application information page are used to apply for information for users. The requested information can be input by the user or through the online library API library query.

The reference application page is shown in Fig. 9.

Fig. 9. Information request page

7 Conclusion

According to the specific needs of university college reference room, College Reference Room Management System established a reference management system that meets the needs of reference room managers and borrowers and systematically manages the reference. The goal of the system is to streamline the workflow of the reference room manager, change the shortcomings of previous manual processing and improve work efficiency. At the same time, provide fast and convenient query and loan services for borrowers. The college reference room management system runs well after being deployed and used. The system can be accessed through any browser connected to the campus network to meet the needs of systematization of information rooms.

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