Discussion on the Information-Based Teaching Method of Student-centered in Undergraduate Course–Take the Course of "Mine Emergency Rescue" as an Example

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Abstract—With the advent of the information and digital era, the "teacher-centered" teaching model will inevitably change to a "student-centered" teaching model. Students should play a major role in acquiring knowledge. This paper summarizes the connotation of "student-centered" in university teaching, the thoughts and theoretical basis of informatization teaching. This paper presents an information teaching model of student-centered, and takes the course of "Mine Emergency Rescue" as an example for teaching practice. It can improve the effect of learn that including the improving student participation, changing the learning method, and expanding the learning space. Moreover, the teaching model improves the quality of the course teaching.

Index Terms—student-centered, informatization teaching, undergraduate course, major course teaching

I. INTRODUTION

At present, university teaching modes mainly include physical classroom teaching (offline), virtual classroom teaching (online), and mixed teaching of physical and virtual [1], [2]. However, these teaching modes are still teacher-led and students passively receive knowledge, which cannot fully reflect the main role of students [3]. Therefore, correctly understanding the basic connotation of "student-centered" in university teaching and the information-based teaching theory, and constructing a student-centered information-based teaching model are of great significance for promoting the reform of undergraduate education. With the help of informatization. the "teacher-centered" computer teaching mode has changed to the "student-centered" teaching mode, which makes it easier to realize the fundamental teaching tasks of making an example to educate the people.

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II. REVIEW OF CONSTRUCT THEORY

A. The Connotation of "Student-centered" in University Teaching

"Student-centered" is centered on the overall development of students. In order to realize the transition from "teaching" to "learning", from "teaching mode" to "learning mode", we can change the traditional "teacher-centered" and "teaching-centered" teaching methods, and pay more attention to students' dominant position in teaching. Meantime, the students' rights, interests and needs can be more respected [4], [5]. For students' learning, communication, life, development and other aspects good platform and environment, we can use non-instructive teaching methods, which encourages students to accept new things, learn new knowledge, and stimulate students' innovative spirit, innovative consciousness, and innovative consciousness. All of these can cultivate students' critical thinking, creative thinking, and independent learning habits. What we do is improving the quality of students' learning, and promoting the overall development of students, making them a person who integrates "body, mind, emotion, spirit, and mind" [6].

B. The Concept and Theoretical Basis of Informatization Teaching

Informatization teaching refers to the use of modern educational technology to support the transfer of information in the modern teaching environment and the psychological process of knowledge processing. It mobilizes as many teaching media and teaching resources as possible to build a good learning environment. Under the organization and guidance by teachers, teachers release learning goals and learning plans (design of students' autonomous learning environments), students use online resources to communicate online and offline, teachers use social software to communicate with students in real time online, and teachers offline students communicate face-to-face and analyze the important and difficult problems of teaching, and conduct inspiring lectures, interactive exchanges, inquiry discussions with students' theme project activities and reports, and give full play to students' initiative, enthusiasm, and creativity, so that students become the active construction of information. Teaching mode to achieve good teaching results [7].



Figure 1. Informatization teaching model

The information-based teaching model (shown in Fig.1) is based on cognitive construction learning theory as the main theoretical basis, information-based resources as the hardware foundation, modern teaching concepts as the guidance, and innovative teaching models as the core. Deconstruction, reorganization, and optimization [8], [9], emphasizes student-centeredness, gives full play to learners' initiative and enthusiasm, constructs meanings of learned knowledge and solves practical problems. The relationship between the four elements of the teaching process in information-based teaching has undergone a fundamental change. Teachers have been transformed from passers of knowledge to helpers for students to obtain information. Students have been transformed from passive receivers of knowledge to the subject of information processing and the construction of the meaning of knowledge. The teaching process has changed from teacher explanation to the process of student's autonomous learning and inquiry. The role of media has also changed from the demonstration tool explained by the teacher to the cognitive tool of student learning.

III. CONSTRUCT THE STUDENT-CENTERED INFORMATION TEACHING MODEL

A. Construction Principles

1) Student-centered principles

Student-centered refers to the transformation of teaching concepts, management concepts, teaching methods, and teaching evaluation methods. "Student-centered" requirements and principles for teachers including: Firstly, to promote the development of students, we should base on the existing development level of students and fully respecting individual differences. We should teach students in accordance with their aptitude, and fully develop their potential and

advantages. Secondly, teacher is only an organizer, guider, and collaborator in teaching. We guide students to think independently and learn independently, and train each individual or "guide its development" into a "useful" person that meets the needs of society. Without letting they develop into harming society.

2) Principles of informational teaching

Informatization teaching refers to the use of modern multimedia information technology to creatively design teaching activities, to play the unique function of computer-assisted teaching. We should combine the characteristics of information technology and teaching, to make the expression of teaching more visual, diverse and visual. Principles of information-based teaching: before and after class, teachers and students use the library, digital library, and online teaching platforms to expand the scope of classroom teaching knowledge; in the classroom, teachers and students go online through social tools such as microblog, WeChat, and QQ groups Brainstorm discussions and exchanges, teachers from across the line and students flip the classroom, increase teacher-student interaction, share learning and research experiences, and avoid cellphone playing and sleeping in the classroom.

B. Student-centered Information Teaching Mode

The student-centered information-based teaching model is to promote teaching and learning through information-based teaching methods, through teachers' online publishing of teaching tasks and offline inspiring lectures, online and offline interactive exchanges, and discussion and discussion methods between teachers and students. Role transformation, that is, the teacher is only the organizer and guide of the learning activity, and the students are the participants and explorers of the learning activity, exerting the main talents of the student learning, improving student participation, guiding the students to find problems, analyze problems and solve problems, inspire students' innovative spirit, creative consciousness, creative wisdom, and training students' critical thinking, creative thinking, and autonomous learning habits. The student-centered information-based teaching model is shown in Fig. 2.



Figure 2. Student-centered informational teaching model

IV. STUDENT-CENTERED INFORMATION TEACHING PRACTICE

A. Implementation Process

1) Preparation before class

Aiming at the characteristics of the mine emergency rescue course, students and teachers jointly build and share modular curriculum resources in the specialty. Teachers will according to the needs of students, according to the learning content, learning goals, real rescue of mine fires, gas explosions, mine floods, landslides and other accidents. Organize case resources, and make a variety of information-based teaching resources such as micro-lectures, micro-videos, question banks, multimedia interactive courseware, and upload course resources to online course sharing platforms. Teachers use online classrooms and various social software to publish learning tasks to students, and design and discuss analytical issues based on accident rescue technical points and dilemmas in rescue decision-making [10], [11]. They guide students to actively discuss online and offline, and use questions and tasks to motivate students. Find problems and count students' online learning, discussion and exchange participation; teachers and students jointly select the important and difficult points of teaching tasks; and push the exercises, mobile phone answers, on-site face-to-face answers, etc., and statistics on online work completion and online assessment situation, jointly discuss the knowledge.



Figure 3. Flip classroom and discussion

2) Classroom implementation

Informatization classroom practice is divided into opposite classroom teaching under the physical line and online virtual classroom teaching. Opposite the classroom teaching below the physical line, using a large number of pictures, videos, animations, etc. before class, using flipped classrooms, brainstorming discussions [12], self-evaluation and mutual evaluation of student learning groups [13], mobile phone interaction and other methods students' teacher-student interactive teaching encourages students to find problems, observes classroom activities carefully and captures students' concerns, makes teaching experimental classrooms interesting and concrete, enhances students' learning interest, and jointly describes phenomena in detail and discusses the formation of phenomena the reason. The online virtual classroom is where students use online learning resources and learning platforms for autonomous learning, online listening to lessons, completing homework, answering questions, participating in discussions, staged tests, and final exams to achieve online education for students and improve their ability to learn independently. "Student-centered" information-based teaching combined with online education and offline education, giving full play to the subjective initiative of students to participate in learning activities, making them participants and explorers of receiving knowledge. As shown in Fig. 3, two students are giving a lecture on the course of mine emergency rescue. With this flipped classroom model, students can understand relevant key knowledge by collecting pictures, videos, cases and other materials, and then quickly grasp the knowledge through explanation and discussion.

3) Promotion after class

Consolidate knowledge and improve practice through online classroom consolidation, online video case analysis, release of offline practice questions, laboratory visits, design-related practical activities and innovation competitions, etc.

B. Implementation Effect

By designing a questionnaire of teaching effect (as shown in Table I), learn about the changes in student satisfaction with the "student-centered information-based teaching model" and test its effects. In the experiment, two classes of Xi'an University of Science and Technology, which major is Safety Engineering were selected, and a total of 100 students were used as survey objects. Class A has 50 students in the experimental class and implements the information-based course teaching model based on resource sharing. Class B has 50 students in the control class and implements traditional classroom teaching. Take the "Mine Emergency Rescue" course of the safety engineering specialty as an experimental course, and conduct a questionnaire survey on the course teaching satisfaction for the two classes. A comparative analysis of student satisfaction is shown in Fig. 4.

TABLE I. COMPARATIVE ANALYSIS OF SATISFACTION		
Index	Class A (average)	Class B (average)
Teaching goal design		
Teaching activity design		
Satisfaction with the quantity and quality of teaching resources		
Satisfaction with the organization of the teaching process		
Satisfaction with the use of teaching methods		
Satisfaction with learning participation and initiative		
Satisfaction with the ability to comprehensively use knowledge		
Satisfied with knowledge points and skill points		
Description: Very satisfied with 10 points; more satisfied with 9 p	points; satisfied with 8 poi	nts; not satisfied with
7 points; do not like with 6 points		





²Teaching activity design

3 Satisfaction with the quantity and quality of teaching resources

- (4)Satisfaction with the organization of the teaching process
- ⑤Satisfaction with the use of teaching methods
- ⁽⁶⁾Satisfaction with learning participation and initiative
- O Satisfaction with the ability to comprehensively use knowledge

Satisfied with knowledge points and skill points

Figure 4. Comparison of student satisfaction

From the statistical results of the survey (as shown in Fig. 3), the students are satisfied with the various teaching joints the "student-centered of information-based teaching model", including satisfaction with learning participation and initiative, and comprehensive use of knowledge. The satisfaction of ability and satisfaction of knowledge and skills are relatively high, which shows that the "student-centered information-based teaching model" greatly promotes students' participation in learning activities and Initiative, students have made considerable progress in the comprehensive use of knowledge and in improving knowledge points and skills. At the same time, the "student-centered information-based teaching model" has greatly inspired students' learning interest.

V. CONCLUSION

A model of student-centered information teaching was put forward in this paper. What's more, this model was applied in the major course of the "Mine Emergency Rescue" as an example to conduct an empirical analysis. From the perspective of implementation effects, improving student participation, changing learning methods, expanding the learning space, and improving the learning effect, the teaching model improves the quality of the course teaching.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

All authors participated in the design of the teaching plan; Jun Guo applied the teaching scheme in the teaching process and revised the manuscript; Xuezhao Zheng guided the teaching process and put forward important suggestions for improvement; Xilong Wang and Guobin Cai wrote the paper; all authors had approved the final version.

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