

Application of the Teaching Mode of "PAD Class" in the Teaching of Civil Engineering Specialty in Higher Vocational Colleges

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ABSTRACT

With the continuous advancement of college education and teaching reform, the teaching mode of PAD Class is gradually recognized and adopted by teachers in higher vocational colleges, which greatly improves the efficiency and effect of learning. Based on the analysis of the development and status quo of classroom teaching mode in colleges and universities at home and abroad, this paper analyzes the connotation of PAD Class, expounds the teaching practice process and application effect of PAD Class in higher vocational civil engineering majors. Research practice shows that the reform of teaching content and method should be promoted to the teaching mode of PAD class. Students' participation in discussion increased and their confidence increased. The content of classroom teaching has been optimized. The content of classroom teaching has been optimized. Students' communication ability is improved and their sense of responsibility is enhanced. This research project provides reference for the further promotion of the sub-classroom teaching model.

Keywords: *The teaching reform, PAD Class, Teaching mode, Teaching practice, Application*

1. INTRODUCTION

For a long time, the teacher-centered teaching mode has become less and less satisfactory under the influence of the increasing amount of teaching content and the continuous compression of teaching hours. Classroom teaching is the main field of higher education, and the reform of higher education is largely realized through classroom teaching reform. If the classroom teaching in colleges and universities still adopts the teacher-centered teaching mode, it will be difficult to ensure that the classroom teaching has a good effect.

In this context, Xuexin Zhang, professor of psychology department of Fudan University, put forward the new classroom teaching mode of "PAD class" through the comprehensive analysis of the advantages and disadvantages of traditional teaching class and discussion class, and the integration of the advantages of both. The proposed teaching mode of PAD class not only creates a new opportunity for the classroom teaching in colleges and universities, but also provides strong support for the independent innovation learning of college students.

The appearance of "PAD class" teaching mode has changed the present situation of university classroom to a certain extent. In view of the problems existing in the course teaching of civil engineering specialty in higher vocational colleges, this paper studies the application of "PAD class" teaching mode in the course teaching of civil engineering specialty in higher vocational colleges from the implementation conditions of the teaching mode. The subject can provide some reference and experience for the further promotion of the teaching mode of divided classroom.

2. THE DEVELOPMENT AND PRESENT SITUATION OF CLASSROOM TEACHING MODE IN DOMESTIC AND FOREIGN UNIVERSITIES

The classroom teaching mode of foreign universities originated from the traditional professional teaching. With the revolution of information technology, the increasing demand for high-tech talents and the rapid development of PBL and other innovative teaching theories, the classroom teaching mode of foreign universities has been transformed into problem-oriented

teaching mode. The conclusion from all walks of life is that higher education fails to cultivate all-round talents. In the teaching reform, critical thinking and other teaching standards have been widely adopted, thus developing heuristic teaching mode. With the promotion of Internet technology, students' participation and learning motivation have been attached importance, which has further developed into personalized teaching mode and mixed teaching mode favored by teachers and students at present^[1].

The classroom teaching mode of domestic colleges and universities also originates from the traditional lecture-oriented teaching mode. With the development of multimedia, computer and other technologies, social needs and national policy guidance to promote education reform, the teaching mode is developing towards the direction of dual subjects of teachers and students. With the introduction and development of foreign teaching theories and the requirement of quality education, inquiry teaching mode appears in university classroom, especially in undergraduate schools. In the "Internet +" to promote the development of online education platform and the society's urgent demand for innovative talents, colleges and universities further carry out teaching reform, the emergence of guided teaching mode to guide teaching to promote thinking and learning.

3. THE PROPOSAL OF PAD CLASS

With the reform of teaching mode at home and abroad, "positive teaching method", "flipped classroom", "MOOCs" and so on have come into view and become popular. The idea behind the "flipped classroom" is a realignment of learning time in and out of the classroom, inspired by two teachers at Woodland Park High School in Colorado. In this mode, learners are required to learn basic knowledge based on recorded video materials before class, complete independent learning of key and difficult points, and have discussion in class or answer questions through interaction between teachers and students.

Flipped classroom focuses on students' pre-class micro-class or video course learning, and enables students to deconstruct and absorb new knowledge through discussion between teachers and students or students. This model emphasizes learning before speaking, which is also the core of flipped classroom. The purpose of pre-class preview is to strengthen students' self-learning ability of new knowledge. However, the students in higher vocational colleges have low enthusiasm for pre-study and poor self-study ability. They are easy to give up when they encounter difficulties in the actual pre-study process. Moreover, watching teaching videos before class is still the initiative of teachers, but covered with the coat of Internet technology. This mode of learning before teaching often

becomes "busy self-study before class, busy performance in class" for vocational college students, which greatly increases the burden of students after class, and the effect is very different among students.

MOOC is a large-scale open online course. With the emergence and rapid development of MOOC, online education has gradually become a new way of modern education, which promotes the networking and modernization of social learning and is conducive to the dissemination and sharing of knowledge. However, as students in higher vocational colleges lack motivation to learn, learning has become a utilitarian behavior. Coupled with the lack of face-to-face communication of MOOCs, the learning effect of MOOCs in higher vocational colleges is not good^[2].

The above teaching modes have changed the teaching and learning modes between teachers and students to varying degrees, but there are still some problems, such as course evaluation, learning effect and examination mechanism, which are out of touch with traditional teaching.

In 2013 Professor Xuexin Zhang of Fudan University put forward a new teaching model suitable for local conditions based on pedagogy and educational psychology. The specific teaching process can be divided into three processes: Presentation, internalization and Assimilation, and Discussion, namely PAD class^[3].

The idea of PAD class is the interactive learning of "teacher lecturing + student discussion". Specifically, teachers spend half of class time lecturing and students spend the other half discussing. The core of it is classroom discussion, and its advantage lies in the internalization and absorption of responsibilities and rights of teachers and students through the three links of classroom and after-class discussion^[4]. Students from more than 56 universities, such as Fudan University, University of Shanghai for Science and Technology, and Anhui University, have experienced the divided classroom teaching after the proposal^[5]. Preliminary practice shows that the PAD class can fully mobilize students' learning autonomy, significantly reduce the teaching burden of teachers, improve the quality of teaching and teaching effect, the PAD class is clear, concise and practical, once launched by the highly praised^[6].

Since then, the teaching mode of "PAD class" has been widely promoted in domestic colleges and universities. The innovative teaching reform activities of the teaching mode of "PAD class" have been implemented in domestic colleges and universities in succession. At the beginning, it was basically carried out in undergraduate colleges and universities, and some experience has been accumulated through active practice

and exploration [7]. In recent years, the teaching reform of "PAD class" has been carried out in higher vocational colleges. However, the implementation of the teaching mode of "PAD class" has put forward higher requirements for teachers in higher vocational colleges because of the poor foundation, poor learning autonomy and low learning enthusiasm of students in higher vocational colleges.

4. TEACHING PRACTICE OF PAD CLASS FOR CIVIL ENGINEERING STUDENTS IN HIGHER VOCATIONAL COLLEGES

In order to change the shortcomings of the above teaching modes, try new teaching methods and improve students' learning interest and effect, the research group conducted the spring semester from September 2021 to January 2022. The teaching mode of PAD class is adopted for four basic courses and core courses: Architectural Structure and Drawing Recognition, Flat method drawing Recognition and Reinforcement Calculation, Architectural Construction Technology and Housing Construction Engineering Measurement and Valuation. The course the author undertakes is the course of "Flat method map recognition and Reinforcement Calculation", so this paper focuses on the application practice of the PAD class in the teaching of "Flat method Map recognition and Reinforcement Calculation".

4.1. The teaching status quo

"Flat method map Recognition and Reinforcement Calculation" is the core course of engineering cost, construction economy information management and construction engineering management, which plays an important role in the cultivation of students' professional quality^[8]. According to the professional talent training program, this course has 68 class hours in total, and the teaching cycle is 17 weeks. There are 4 classes twice a week, and each class is 90 minutes.

This course is explained based on 16G101-1 two-dimensional flat method atlas, mainly including flat method map recognition of each member in reinforced concrete structure, interpretation of reinforcement structure requirements and reinforcement measurement. In the teaching process, the difficulty lies in that the course content is theoretical, the rules are very complicated, and there are many memorizing contents. Since most students have not been to and seen the real scene of the construction site, students are relatively lacking in perceptual cognition of the principle and content of reinforcement construction, and only rely on the two-dimensional graphics of textbooks and atlas. It is very difficult for students' spatial imagination ability and the transformation of two-dimensional atlas into practical construction. Students generally expressed that the course was abstract and required a lot of

memorization, making it difficult for students to concentrate for a long time.

Although adopted in the teaching methods such as group discussion, project teaching, competitive learning, at the same time also cited a large number of 3D graphics and the construction site actual component reinforcement assembling pictures, but due to the higher vocational students do not have the habit of preview in advance, a large number of the ability to absorb new knowledge in the classroom is limited, even for group discussion. However, it is not effective and meaningful to discuss some knowledge points without digestion and absorption. At the same time, the communication with students is still limited to the traditional mode of question and answer, which indirectly leads to the poor learning effect of the course.

4.2. Design and implement of "PAD class"

The core of PAD class is divided and separated class discussion, and the advantage lies in staggered teaching and discussion, so that students have some time to arrange learning independently in the middle, carry out personalized internalization and absorption, and then strengthen the learning results in the form of discussion and homework.

4.2.1. Grouping strategy

According to the number of students in the class, they are divided into several groups of 4-6 students in each group, and temporary leaders are selected. In principle, men and women should be matched, and their academic performance should be matched. Too many groups will cause some students not to participate in or be ignored and have no chance to show, while too few groups are not conducive to brainstorming and affect the atmosphere and effect of discussion. According to different learning tasks, team members take turns to be the team leader. In this way, the result of each discussion represents a certain achievement of the whole group members, which is related to everyone's interests and the group members have to actively face it. The team leader rotation system allows students to take responsibility and also improves their organizational skills.

4.2.2. Discuss strategy

The PAD class is not an absolute 50/50 split between the teacher's teaching time and the student's discussion time, but a flexible arrangement according to the learning content of each class. According to the course characteristics of "Flat method drawing recognition and Reinforcement Calculation", students need to be familiar with drawing recognition rules and reinforcement structure requirements through a lot of practical project training. The teaching link is divided into discussion stage and lecture stage. In the first half of the class,

group discussion will be conducted in stages based on the contents of the last class and the after-class tasks assigned. In the first stage, the learning content of the last class will be mainly discussed, and the group members will take turns to speak for 10-15 minutes. After the group discussion, the teacher randomly selects one person from each group and asks the students to summarize the process and results of the group discussion. The time is generally about 5 minutes. The second stage is to discuss the completion of the project content and existing problems assigned last time after class. Students can ask questions freely, mainly by teachers and supplemented by classmates. Finally, the teacher summarizes the common problems of most students, and the time is controlled within 15 minutes. Taught stage in the second half of the classroom is a teacher, teaching, only roughly on this part of the framework, the emphasis and difficulty, the teaching goal and teaching requirements, but not explained in details, the details asked the students after class through the group or class of video uploaded to the learning platform, courseware, such as study, and decorated with project as the carrier assignments, students are required to complete the project.

4.2.3. The assessment strategy

For the teaching mode of PAD classe, both the process and the summative evaluation are taken into account, and the performance of students' independent thinking, participation in discussion, good at summing up and positive expression is reflected in the final scoring system. The process evaluation system can be arranged according to the following ideas: 15 points for homework completion, 10 points for independent thinking in homework, 20 points for classroom discussion, 5 points for summative speech, 50 points in total. Among them, 10 points of innovation can reflect students' independent thinking achievements, and 10 points of summative speech can reflect students' summary thinking and team leadership performance. By observing the students' performance in class, it not only achieves the exercise of thinking ability, but also enables the students to shift their focus from the final exam to the usual performance.

Assessment of student achievement is still composed of grades and final question paper grades, but heavy procedural examination, in the whole teaching design elaboration to each class scores, group discussion, project assignments and real-time announced in class learning platform, students can understand themselves and group learning at any time and the score is given by, In order to identify deficiencies in time and actively make changes.

4.3. The effect of classroom implementation

Compared with the traditional teaching mode, it is found that there are the following changes in the teaching mode of "Flat method map Recognition and Reinforcement Calculation" :

4.3.1. The reform of teaching content and method should be promoted to the teaching mode of "PAD class"

In the teaching practice, the teaching content of teachers has changed, including the former principles, concepts, examples, content sorting, results and meanings of detailed teaching, into the construction of knowledge framework, extraction of key and difficult content composition. At the same time, teachers' teaching methods have also changed, from the teaching type of full lecture to the teaching model that helps students form a knowledge framework and provides teaching, reference and after-class reading materials. After students' knowledge system is formed, specific problems and related materials are internalized and absorbed after class, and teachers' teaching is transformed into students' learning experience. During the discussion, students' internalized and absorbed achievements were expressed and recognized in class, which significantly enhanced the effectiveness of class.

4.3.2. Students' participation in discussion increased and their confidence increased

In the past, group discussion was also used in teaching, but the discussion content centered on what teachers taught in class. Some students did not digest and absorb, and some knowledge was not understood, so they could not really participate in effective discussion. On the other hand, what is discussed in separate classes is the content taught by the teacher in the last class, which is internalized and absorbed after class and based on independent learning. The discussion is targeted, and the students are willing to actively show the content prepared after class, and the enthusiasm and initiative of the students are significantly improved.

4.3.3. The content of classroom teaching has been optimized

The flat steel calculate method of image recognition and quantitative course content is very complex, the former teaching should not only complete the talent training scheme to determine the teaching content, and to meet the time requirements, tend to appear in order to catch up, only in the class daunted, or consider the students' ability to accept, retelling some content, which affect the teaching schedule. Used for points after class, the teacher only to learn about the course content and objectives, key concepts, chapters content frame type

hydraulic press, facilitated the logical structure of do, important knowledge earnestly, "white space" is to let students through self-study, practice, discussion and conclusion, the students of knowledge acquisition mode change from passive infusion to learn actively. Through discussion, project training and other links, to achieve the purpose of knowledge internalization and absorption. In this way, students can not only learn the required content, but also meet the requirements of teaching progress.

4.3.4. Students' communication ability is improved and their sense of responsibility is enhanced

By participating in group discussions, taking turns to speak in class, taking turns to be the group leader and so on, students gradually enhance their sense of responsibility, communication skills and teamwork spirit have also been greatly exercised.

5. CONCLUSION

The PAD class teaching model gives students tacit knowledge and ability. In terms of knowledge, the three-stage teaching of teaching-internalization, absorption and discussion, as well as the process of understanding knowledge and summarizing experience, give students time and opportunity to reconstruct knowledge. The knowledge acquired by students is no longer a memorized perceptual knowledge, but a rational knowledge through repeated learning and practice. On points of classroom teaching students is generally reflect that in this learning mode, originally don't want to listen to, listen to don't understand, of course, after to get involved, became his willing to pay time and energy, and can get from the teachers and students in the classroom to talk about recognition and affirmation of new learning model, to their own learning self-confidence and initiative are enhanced. Most of the students have made varying degrees of progress in their grades. At the level of ability, students master the learning method of divided classroom teaching mode, have an intuitive understanding of their own learning process and learning level, and can see the learning progress and evaluation of other students who carry out learning at the same time. Students expressed that they had a more intuitive participation in the course and had a way to understand the teachers' evaluation of their learning, so they were willing to increase the opportunities for communication with teachers. These gratifying changes in the classroom effectively enhance students' self-study ability and time management ability, shorten the distance between students and teachers, which is of great benefit to the growth of students and the improvement of personal quality.

Through the practice of a teaching cycle, compared with the traditional teaching mode, not only students' homework and final exam scores are higher than those of the traditional teaching class, but also students' attendance rate, participation, initiative and creativity in class have been significantly improved. Therefore, it is a beneficial exploration of the current teaching reform in higher vocational colleges to adopt PAD class teaching practice in civil engineering majors, and it is worth further practice and promotion.

ACKNOWLEDGMENTS

Scientific Research Fund project of Yunnan Land and Resources Vocational College in 2021(2021YJ06).

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