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Teaching Research-Based on Case Scenario for Multi-Mode Assessment Program Design Course

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***Abstract*—Program design has been increasing significantly due to the rapid development of artificial intelligence and big data, which renders our need for highly qualified programmers extremely urgent. The traditional teaching mode is rigid, in which teachers mainly teach and students only use the examples given in class to further enhance their study. Therefore, besides an examination paper being crucial, it also greatly hinders the advance and development of students' innovative and practical ideas and skills. In this paper, we propose a new teaching mode of multi-mode assessment program design course that aims to solve these problems based on case scenario. More concretely, we put students in a real industrial field environment, and they simulate the actual scene and make corresponding feedback plan. In this way, we form a set of teaching process with students as the main body, teachers' and students' multi-stage mutual evaluation as the standard around the case scenario.**

In general, it is proved that this teaching mode can improve students' self-learning ability, teamwork awareness and innovative ability by the teaching practice of advanced program design course.

Keywords: case-driven, wisdom classroom, practical ability, program design

I. INTRODUCTION

Due to the innovation of the new generation of information technology as well as the rapid development and wide application of artificial intelligence, internet plus, cloud computing and big data, program design courses have become one of the basic courses of information technology revolution and development, where they play a paramount role in various universities and training institutions [1-2].

The traditional teaching mode is mainly based on students' passive learning after teaching. This makes the abstract program design class boring and fails to cultivate students' ability to solve practical problems, which makes them fear program design and discourages them to study it [3]. Therefore, the solution to solving the problems of the program design being boring and difficult to figure out, plus the teaching effect not being ideal, are always the teachers' focus [4]. Based on this, it is only by thoroughly reforming the current teaching methods of the teachers that the students' enthusiasm in studying can be aroused, so as to make them unravel their full creative potential. At present, the common reformed teaching methods include Inverted Classroom, Mooc and other emerging teaching methods. Among them, Inverted Classroom was first popularized in foreign countries and was translated from English. The main idea is to adjust the roles of students and teachers, that is, the teacher-oriented classroom teaching changes to student-centered classroom teaching. One of the motivations of Inverted Classroom is to mobilize the students' spirit of ownership, so that they can have a deeper understanding of the course in the process of participation [5]. Emerging teaching modes such as Inverted Classroom and Mooc are mainly innovating in teaching methods, but not essentially solving the problems of students' varying from study degrees to low initiative in discussion and learning. Based on this, some experts and scholars introduced situational and case teaching approach for program design courses, which mainly combines case demonstration, analysis, knowledge point explanation and student practice to inspire the students' enthusiasm and interest to some extent [6-9]. The cases are selected into different levels from simple to complex, which mainly includes several classic examples and interesting procedures. Meanwhile, the assessment method that combines practical operation with written examination is relatively simple. However, the selected cases are generally far from the actual projects used by enterprises not to reflect the whole process of learning. Therefore, we introduce intelligent classroom to get fully activated [10-11].

In this paper, we aim at the current rigid and boring classroom teaching, low correlation between case selection and engineering, single assessment method, and so on. Then a teaching mode of multi-mode assessment program design

course based on case scenario is proposed, which runs through the whole teaching process. The selected cases are appropriately tailored and modified to better fit the teaching process according to the actual cases of enterprises. Meanwhile, a multi-dimensional assessment mechanism is proposed to comprehensively reflect the learning process and effect of students. In general, the teaching mode makes full use of information means to kindle students' initiative and enthusiasm for study and cultivate an idea of analyzing and solving problems based on the practical application of enterprises, focused on the cultivation of creative thinking.

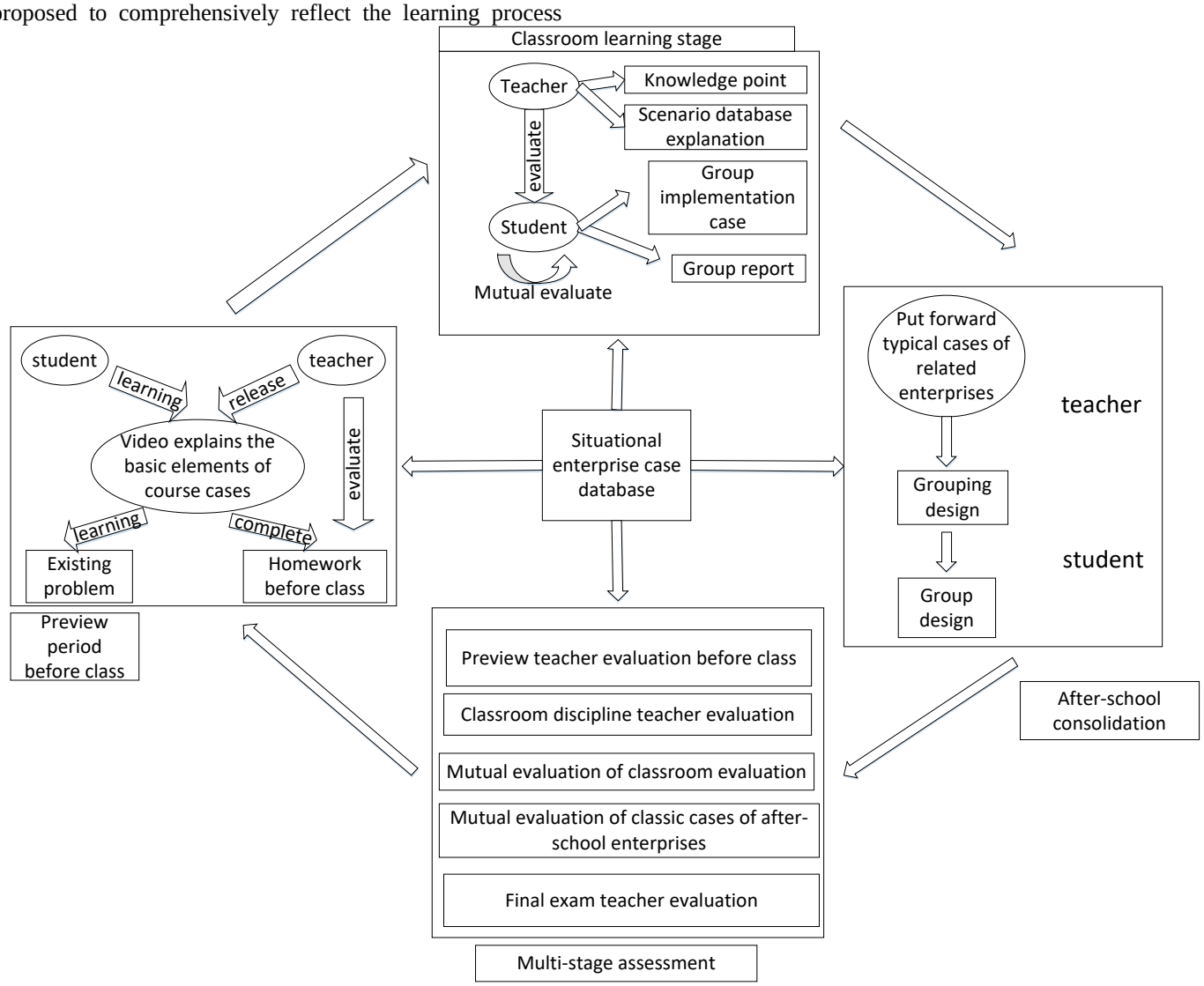

Fig. 1. Case-based programming curriculum intelligent classroom teaching process.

II. The Course Flow of Multi-mode Assessment Program Design based on Case Scenario

The four stages of the course are carried out around the case database, and students' initiative is fully aroused through teaching with student as the main teacher. On the other hand, the assessment stage is a combination of student mutual evaluation and teacher evaluation. The specific process is shown in Fig.1. It is mainly divided into four stages: pre-class preview stage, classroom learning stage, after-class consolidation stage and multi-dimensional assessment stage. Specifically, in the pre-class preview stage, a video of the basic elements of the course is given by the teacher, which mainly covers the knowledge points of the class, and the students will now study, research and discover problems, then finish the pre-class homework of watching the video. In classroom learning stage, based on the testing situation of preparation before class, the teacher continues on the related knowledge as well as the interpretation of the contents, and put forward on the various knowledge, at the same time let the students complete the session by forwarding the actual programming and operation team case implementation report, and in the end, students mutually grade themselves and teachers award scores for each group. In the consolidation stage, after class, the teacher proposes typical cases of enterprises related to the knowledge points in this chapter, which are completed by students in groups, and then the group program is designed. At last, the group writes and submits reports of the design content and results, which are evaluated and graded by the teachers and students together. In

the multi-dimensional phased assessment stage, it mainly includes the following parts: pre-class teacher evaluation, classroom discipline teacher evaluation, classroom case group achievement mutual evaluation, after-class case mutual evaluation and final exam teacher evaluation, which forms the multi-stage assessment as a whole.

III. Practical Application and Effect Analysis of Teaching

A. Experiment Setting of Teaching Practice

Selecting the advanced programming technique course taught by the authors and conducting the teaching research of multi-mode assessment program design course based on case scenario, we test the effects of teaching reform and teaching process proposed in this paper. We mainly tested a course about advanced computer programming techniques and a major of Electronic Information Engineering. The test lasted for 14 weeks.

B. Multi-Dimensional Evaluation Mechanism

It is always difficult to reflect the whole teaching process by only using the final written test as the final result of programming courses. This is so one-sided that even students with high scores fail to program and have no ability to solve practical problems, therefore, many students fall into the trap of only focusing on exams and neglecting the real purpose of course learning. The proposed multi-dimensional phased assessment method removes this phenomenon to its minimum. Multi-dimensional phased assessment means that students are given corresponding scores for each stage of learning.

This paper mainly investigates five aspects: preview, case completion in class, classic case completion after-class enterprise, examination and usual discipline. Among them, pre-view accounts for 10 points, examination with written exam and computer operation is 30 points. In addition, the usual discipline occupies 5 points, which are given by teachers. In other instances, class case completion accounts for 25 points and completing an enterprise classic case is 30 points, which are given by both teachers and students. For this proportion, teachers and students account for 40% and 60% respectively.

C. Experiment Process and Results Analysis

The assessment of test results of entire class and after-class enterprise cases is mainly conducted by students, assisted by teachers. Students are divided into 5 groups. Each group records scores for each student's participation. Meanwhile, teachers award and record the scores. The weight of students and teachers account for 60% and 40% respectively. Examples of case scoring are shown in Table I.

We conducted an independent test for mid-term programming ability in the seventh week. The main test subjects are scientific calculator program design and guessing digital game design. The test results reveal that 70% and 72% of students in both classes can achieve the best results, respectively. Moreover, the students' average time of completing programming is approximately 46.5 minutes. After completing the 14-week course, we tested the programming ability again. Although the questions are slightly more difficult than the mid-term test, the results showed that the number of students in the two classes achieved good grades rising to 74% and 77% respectively, and the average time to complete the questions was reduced by about 10 minutes. According to the situation of enterprise case completion and scoring after class, students' programming ability is constantly enhanced, their algorithm ideas are more concise, and students are developing more interest in programming with the advancement of case teaching, which demonstrates that the implementation of case teaching is effective to improve students' learning capacity.

In the end of a semester, we performed a teaching test which let students conduct an assessment on self-improvement from these four sections in the class atmosphere, degree of teacher responsibility, teaching effectiveness. The comprehensive average score of teaching reform conducted in this semester was 94.28 points having increased greatly as compared to previous points of 85.88 points, which demonstrates that the majority of students prefer teaching mode of case teaching. The assessment in multi-dimensional phases of the whole teaching process is mostly set by multi-dimensional evaluation mechanism which comprehensively and effectively assess the students' learning situation. Some students' assessment situation is shown in Table II.

After 14 weeks of teaching, we organized students to fill an online survey. Twenty five (25) survey questionnaires were issued and all 25 were received. In the statistical analysis, we found out that all 25 questionnaires were effective. The questionnaire comprises five questions as follows: 1. Do you think case-driven programming classes are helpful to your understanding of algorithms? 2. Do you have a stronger sense of teamwork during group discussions and joint problem solving? 3. Will this teaching model improve learning motivation? 4. What do you think of the selected cases in the classroom? 5. Do you think preview is helpful to the classroom? For these 5 questions, we set four answer choices labelled A-D, which correspond to 'very favorable', 'relatively favorable', 'generally favorable' and 'unfavorable' respectively. As seen from Table III, considering the number of students who responded positively, it suffices to say that program design intelligent class based on case scenario is helpful in enhancing the understanding of algorithm and self-learning.

Ultimately, by combining comprehensive evaluation, questionnaire survey and comprehensive performance evaluation, the teaching method of multi-mode assessment programming course based on case scenario can be accepted by students. Moreover, this teaching method can reflect students' learning and practice level, innovative ability, teamwork ability and so on. Besides, case teaching is based on the needs of students combined with the students' characteristics to teach, which can improve students' self-learning ability, problem solving ability and innovative ability, and more so, significantly improve teaching results.

TABLE I. EXAMPLE OF CASE GRADE CALCULATION

name	*Group1*	*Group2*	*Group3*	*Group4*	*Group5*	*Teacher*
ZhangMing	90	80	85	88	86	89
WangQiang	75	88	96	87	87	96
ZhaoGang	93	97	88	91	92	87
Li Ting	71	73	69	72	78	71
…						

TABLE II. EXAMPLE OF STUDENT'S TOTAL SCORES

name	*Results before class*	*Classroom discipline*	*Classroom case*	*Case after class*	*final grade*	*Total points*
Zhang Ming	87	90	88	87	96	90
Wang Qiang	89	93	87	91	84	88
ZhaoGang	91	96	90	82	89	88
Li Ting	76	95	73	80	86	80
…						

TABLE III. SURVEY RESULT

	A.Best	*B.Better*	*C.Good*	*D.worse*
Understanding of algorithm	25.9%	70.4%	2.5%	1.2%
Team spirit	40.4%	38.5%	19.8%	1.3%
Learning initiative	35.2%	34.8%	28.6%	1.4%
Case selection	44.2%	36.7%	17.4%	1.7%
Information search	46.2%	33.8%	18.4%	1.6%

IV. ANALYSIS AND CONCLUSIONS

In this paper, we put forward a multi-mode assessment programming course teaching mode based on case scenario. This teaching method enables teachers adopt the industry actual case in the process of teaching, improve the students' learning enthusiasm, self-consciousness, innovative and problem-solving ability through the organic integration of pre-class preview stage, classroom learning stage, after-class consolidation stage and the multi-dimensional phased assessment stage. The teaching method has yielded very good results through teaching experiments in the Electronic Information Engineering profession. Not only does it improve the students' ability to analyze and solve problems, it also improves students' level of program design while maintaining the appeal of programming courses. Having largely achieved the requirement of programming courses, this teaching method can promote teacher-student relationship in more classes in the future.

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