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Research on the Formative Evaluation and Evaluation Method of BIM Modeling Course of Summer School Practical Curriculum

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Abstract: The exploration on the reform of evaluation is carried out in accordance with characteristics of the practical curriculum and the requirements of the syllabus for the summer school. By taking BIM Modeling course as an example, diversified formative evaluation and evaluation mechanisms are adopted to research the formative evaluation and evaluation methods of BIM Modeling course. Theoretical and empirical researches on the formative evaluation and evaluation method of summer school practical teaching are carried out from the aspects of curriculum thinking, curriculum plan design and performance analysis.

1. Introduction

In recent years, more and more colleges and universities in our country have tried to set up the summer school period to focus on practical teaching to implement the semester reform, which in fact is to arrange a short-term practical teaching on the basis of not affecting the normal teaching in the spring and autumn semester. As a significant link of concentrated practice teaching, the summer school period is different from other teaching practice. The teaching design, teaching content, and organization and implementation of the concentrated practical teaching closely focus on the students' practical ability and innovative ability. Each practice course is given independently, which is to create more practical opportunities for students. It is the integration and promotion of teaching practice ^[1].

The formative evaluation teaching model has always been the focal point of teaching reform in recent years. Compared with the traditional evaluation model, formative evaluation pays more attention to the developmental evaluation of the continuous observation, recording, and reflection of the entire learning process. The formative evaluation emphasizes that students are the principle part. It can stimulate students' interest in learning, regulate and control the learning process, and cultivate teams and innovative spirit by adjusting teaching through the feedback and the evaluation.



2. Implementation Methods

2.1 Curriculum Ideas

The “BIM Modeling” course in the summer school period is usually arranged in the second and third week after the term begins. Its pre-requisite course is “Engineering Drafting”, which is the further modeling learning based on the students’ understanding of 2D and 3D graphics.

The conduction of BIM Modeling practical course in the summer school period is carried out on the methodology of task-based teaching. Hand-painted design and computer modeling are mainly used. Reversed classroom is adopted and daily learning tasks and teaching materials are given out to students for their self-learning. Practical operation is the main content. The classroom is finished through giving guidance and answering questions except for the necessary theoretical concepts. Students accomplish the learning process through teams by cooperating to complete the learning task and submit it.

2.2 The Design of Teaching Process

The design of the teaching process centered on the evaluation platform is shown in Figure 1.

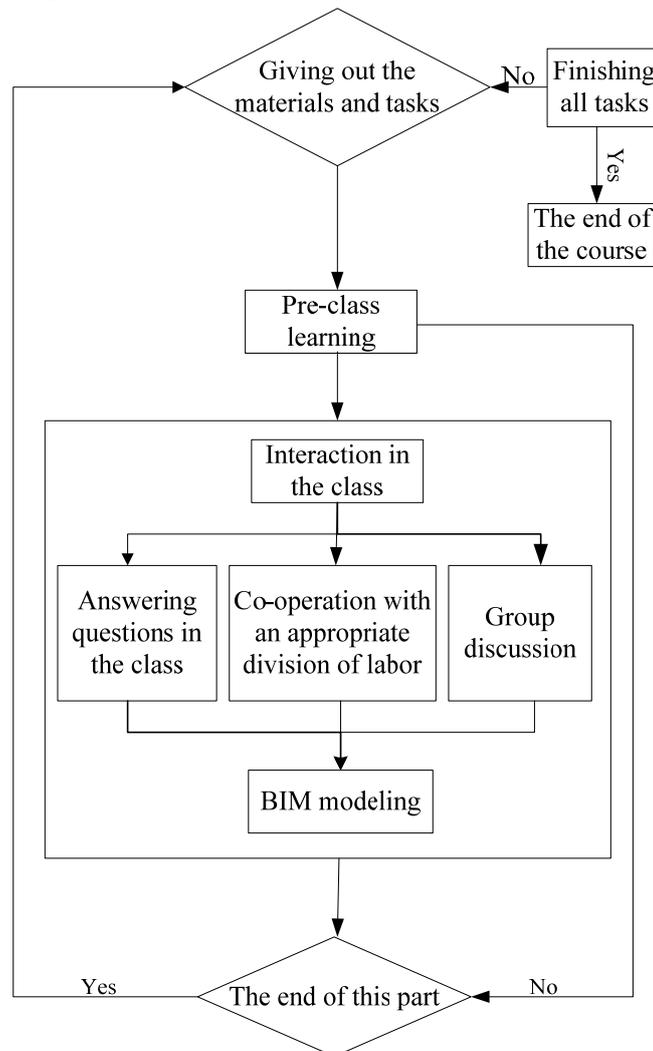


Figure 1 The Picture of the Design of Teaching Process

In this process, teaching objectives are taken as the starting point, and teaching tasks as the orientation, which focuses on improving students' practical ability. It mainly relies on practical operation and is carried out through reversal classroom, including pre-classroom preparation, questions-answering in the class, co-operation with an appropriate division of labor and group discussion. The final learning results presented in the form of works, essentially through repeated training to achieve the final teaching requirements [2].

Table 1 Disintegration of BIM Modeling evaluation Target

| Item | Evaluation Mode | Evaluation Content | Evaluation Method | Weight (%) | Time |
|------------------------|------------------------|---------------------------------------|---|------------|-------------------------|
| Task 1 | Theoretical evaluation | Basic theories | Evaluation for knowledge in the book | 4 | The first day |
| Task 2 | Practical evaluation | Set of sampled files | Operating with machine and submitting the model | 4 | The second day |
| Task 3 | Practical evaluation | Construction of structural components | Operating with machine and submitting the model | 4 | The third day |
| Task 4 | Practical evaluation | Construction of building components | Operating with machine and submitting the model | 4 | The fourth day |
| Task 5 | Practical evaluation | Deepening of the ichnography | Operating with machine and submitting the model | 4 | The fifth day |
| Task 6 | Practical evaluation | Deepening of elevation | Operating with machine and submitting the model | 4 | The sixth day |
| Task 7 | Practical evaluation | Deepening of detail drawing | Operating with machine and submitting the model | 4 | The seventh day |
| Task 8 | Practical evaluation | Deepening of the profile | Operating with machine and submitting the model | 4 | The eighth day |
| Task 9 | Practical evaluation | Deepening of the model | Operating with machine and submitting the model | 4 | The ninth day |
| Final results | Practical evaluation | Performance display | Submitting of final model | 34 | The tenth day |
| Mutual evaluation | evaluation | | Grade for paper table | 5 | Middle and later period |
| Self-evaluation | evaluation | | Grade for paper table | 5 | Middle and later period |
| evaluation of teachers | Report and communicate | | Oral defense | 10 | The tenth day |
| Attendance | Regular evaluation | | Roll call in the class | 10 | The whole process |
| Total | | | | 100 | |

2.3. The Disintegration of Evaluation Goals

The "BIM Modeling" course has high requirements for both theoretical knowledge and practical operation. Its practical operation takes a complete architectural project as an example, and the work is completed through joint efforts of the team. The task is specific to the day. The scores objectively

reflected the student's actual situation by checking the time, quality, attendance, team work, team evaluation, and personal assignment of the daily work. The students' learning dynamics and depth are timely understood through personal self-evaluation, personal reflection and PPT display so as to improve the students' ability to express their works ^[3]. The specific evaluation content settings are shown in Table 1.

In the above table, the task is disintegrated from easy to difficult, from less to more, from single to comprehensive: task one and task two are less and simple; task three and task four are construction of the basic framework, which is difficult for beginners; task five to task nine shows the continuous deepening process of the model; the final result is based on all previous tasks, and integrates the knowledge of the pre-requisite curriculum and the first four tasks ^[4].

3. Practical Application and Analysis of Evaluation Methods

3.1 Formative Evaluation Method

"BIM Modeling" is a practical course with strong degree of operation. Attendance, theory, practice, and evaluation constitute the evaluation goal, which is the formative evaluation for students in all aspects and in the whole process ^[5-6]. The proportion of each part is shown in Figure 2.

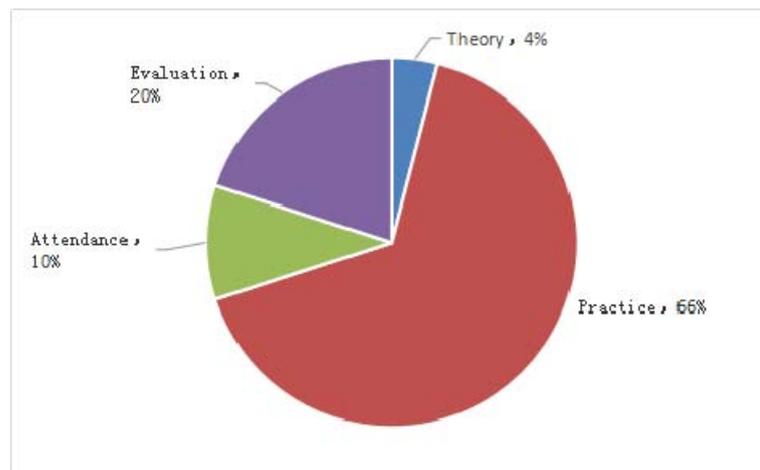


Figure 2 Diagram of Score Composition of the Formative evaluation and Evaluation Mechanism

3.2 Analysis of Students' Score

The sampled data comes from the "BIM modeling" course of civil engineering. There are 28 students in the class. The disintegration scores and total scores of the target are analyzed. The average score of each part of BIM Modeling evaluation target disintegration is shown in Figure 3.

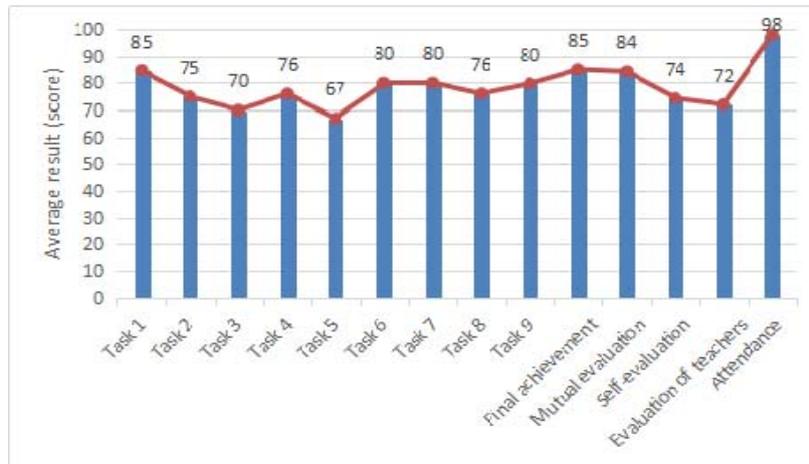


Figure 3 The Average Score of Each Part of “BIM modeling” evaluation Goals Disintegration

According to Table 1 and Figure 3, the content of the teaching evaluation changes from easy to difficult. First, in term of the theory and practice, students generally have a good grasp of the theoretical knowledge of Task one. In practical part from task two to task nine, although it gets difficulty gradually, the score curve shows the rebound trend, that is, appearing from high to low and then from low to high, which reflects the student’s practice in the learning process. At first, they have a superficial knowledge, and then they understand. Finally, they have a skillful operation until the sublimation of learning status. Secondly, in the evaluation section, students generally have higher mutual evaluations, lower self-evaluations scores, and lower teacher evaluations, reflecting the style of students’ being lenient in treating people and strict with themselves and teachers’ strict requirements. In the third part of the attendance, the overall attendance rate was higher, except for some leave and late arrivals. The distribution of total scores is shown in Figure 4.

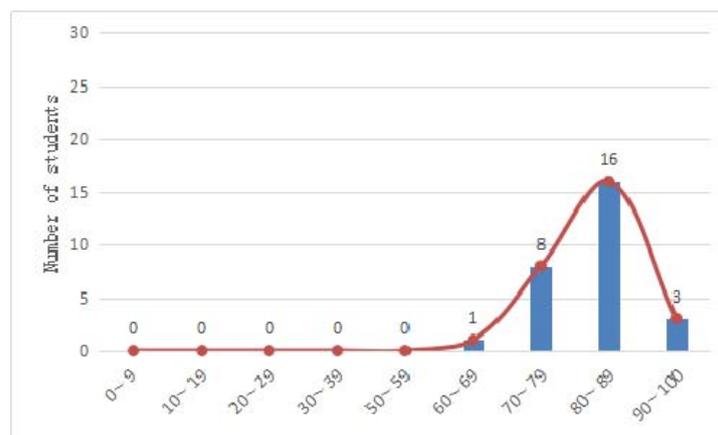


Figure 4 Distribution of Total Scores

Each score is calculated by multiplying the scores in Figure 3 with the weights in Table 1 and the total score is got by adding the all of scores. It can be seen from Figure 4 that there are none from 0 to 59, 1 student from 60 to 69; 8 from 70 to 79; 16 from 80 to 89; 3 from 90 to 100. 80 and above accounts for 2/3 of the total number of students, 60 points to 80 points accounting for 1/3 of the total number of students. It can be seen that because task is specific to the day in formative evaluation, students can grasp the progress and effect of learning in a timely manner, and improve their learning

methods to adjust the learning progress. Most students eventually have good academic performance.

4. Analysis of Implementation Effect

4.1 The teaching process is set up reasonably; credit and class hours are set to meet the teaching requirements.

BIM Modeling practice teaching lasts 2 weeks. From division of project at the beginning, group discussion and determination of design plan to start actual modeling, both individuals and teams can have a systematic and complete practical operation on BIM Modeling. Teaching process and credit and class hours are set up reasonably ^[7].

4.2 Diversified formative evaluation methods are achieved.

Students' enthusiasm, autonomy, and team cooperation spirit are improved with teaching method of reversal classroom by "theory, practice, work and evaluation". The curriculum evaluation method emphasizes student-centeredness and student participation is extremely high. Judging from the distribution of scores, diversified formative evaluation methods plays a greater role in promoting learning enthusiasm and cultivating students' practical abilities. evaluations disintegration goals, and the resulting comprehensive evaluation scores can truly reflect students' practical ability.

4.3 Learning Attitude of Students and Implementation Effect

Through the task-driven project teaching method, students form a conscientious, positive and proper learning attitude, strong self-study ability, and keen interest. Especially in the final display, most of the students have a certain sense of rewarding and accomplishment when they demonstrate modeling design results to the teacher and classmates through efforts of themselves and their teams.

Through two weeks of practical operations, project awareness and teamwork awareness have been enhanced. Students have deeply experienced the design process and working ideas, mastered the operation skills in practical works, which lay a good foundation for students' employment.

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