Research on Teaching Reform Based on BOPPPS+ Learning, Competition and Research Links

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Abstract: "Web Front-end Design" is a professional elective course for computer science and technology majors in our school. This course includes three scripting languages, HTML, CSS and JavaScript, each of which has a variety of marks and attributes that students need to remember and apply. In the process of teaching, boring teaching can easily lead to students' low participation in class and weak practical ability. In order to solve the above problems, this paper proposes to build an innovative classroom based on the BOPPPS teaching model with "learning, competition and research as the core links", change passive participation to active learning, and realize the transformation of teachers and students. At the same time, the thematic content is adopted as the teaching unit, the integration of local culture to achieve ideological and political education, and the full use of more flexible teaching methods to guide students to achieve independent learning. Through classroom practice, this method can effectively improve students' participation in class and enhance students' practical ability.

Keywords: BOPPPS; Learning; Competition; Research; Specialization; Autonomous Learning

1. Introduction

With the continuous development of network application technology in our country, the network platform also pays more attention to humanized design with the increase of user demand, so as to attract users. In the face of the broad needs of society, professionals skilled in the use of HTML, CSS, JavaScript and other Web front-end development technologies have become widely recruited in the current talent market[1]. According to the exploration and research of teaching reform, many scholars have invested in the research of classroom teaching[2-5].

Web Front-end Design is an important professional course for computer science and technology majors in our school, which covers the basic syntax of the three scripting languages of HTML, CSS and JavaScript, Through the study, research and practice of the three main development technologies of Web front-end, it is helpful to cultivate students' basic operating skills and job adaptability in developing and designing Web sites. However, while teaching the theoretical knowledge of web front-end, how to better stimulate students' enthusiasm and initiative in learning and cultivate students' ability to design innovative front-end pages in combination with practical applications is an urgent problem that this course needs to solve.

Therefore, in order to better adapt to the learning characteristics of students majoring in computer science and integrate the classroom structure, this paper proposes to build an innovative classroom based on the BOPPPS teaching model with "learning, competition and research as the core links", and adopts thematic content as the teaching unit to better realize the transformation of the interactive teaching mode between teachers and students and between students and students.

2. Existing Problems and Solutions of Web Front-End Design Course

2.1 Existing Problems

2.1.1 The degree of knowledge integration is poor, and the difference of students' mastery of knowledge is obvious

In "Web Front-end Design" course, each web design element has an independent mark, and the same design mark also has different attribute value pairs. The knowledge point is

scattered and the integration degree is poor, which can easily lead to students' memory disorder. At the same time, there are differences in the ability of different students to receive knowledge. If the teaching progress is accelerated, it is easy to cause some students to fall behind, resulting in unclear learning goals in the later period, and it is difficult to proficiently apply what they have learned to subsequent exercises.

2.1.2 Class participation is low, hands-on practice lacks exercise

In the past teaching process, most relevant teaching methods focused on teachers explaining theoretical knowledge and analyzing cases, ignoring students' proactive thinking, resulting in low student participation in class, However, the content of this course is numerous and miscellaneous, and the blind delivery will make it difficult for students to internalize and absorb in time. In addition, there is a phenomenon of separation between theoretical and practical courses in the course, students can not verify the effect of relevant web design knowledge points in class in time, and there are few opportunities to apply and exercise after class, which is not conducive to deepening students' learning impression.

For example, a 2-hour theory course may cover the three web design knowledge points of formatted text, paragraph and list in HTML, covering more than 30 kinds of marks. It is difficult for teachers to make students remember the simple teaching and lack of impression on the effect of marks. If the corresponding knowledge points are given to students in a timely manner, it will help students to remember the new marks, and can be applied to specific examples.

2.1.3 The teaching process is simple and the types of cases are scarce

The teaching mode of "cramming" and "filling" can no longer satisfy the current education concept of "student-oriented". As a new generation of college teachers, they should actively explore new teaching mode and adopt more flexible teaching methods to enrich the classroom.

In addition, as a key course for computer majors, web front-end design should actively respond to the national educational philosophy and integrate ideological and political thinking into the curriculum. At present, it is difficult to integrate ideological and political elements into engineering courses. Most existing textbook cases of this course do not integrate ideological and political elements, but simply show simple information. If the ideological and political education content is presented as a webpage effect, it will achieve a good integration of teaching content and ideological and political education, and achieve all-round education. Therefore, ideological and political cases applicable to web design should be added to the teaching examples.

2.2 Solutions

2.2.1 Develop modular teaching programs and determine differentiated learning objectives

The course "Web Front-end Design" focuses on the basic syntax of the three scripting languages of HTML, CSS and JavaScript, and can develop modular teaching plans according to the characteristics of the course and promote the teaching content in stages. The content of the course is divided into three major modules. First, the HTML scripting language is promoted as the basic page design element; Secondly, on the basis of HTML, learn how to use CSS scripting language to decorate page markup; Finally, on the basis of the first two modules, learn to use JavaScript to achieve page information interaction, combining static pages with dynamic pages.

Due to the differences of individual students, background checks should be fully conducted when setting phased teaching goals. In the early stage, we can learn about students' learning through other teachers and set basic goals based on the feedback results. In the subsequent teaching process, according to the feedback of homework, classroom performance and other timely adjustment, divided into two parts of the foundation and improvement to develop different stages of goals.

2.2.2 Update teaching methods, Practice and theory go hand in hand

The traditional classroom group discussion is easy for students to confuse the audience, slack participation, enjoy the success and so on. Combined with the characteristics of the course, the classroom can be designed to adopt the "world coffee session method"[6], peer mutual teaching method[7], peer mutual review, student self-assessment and other individual and group cooperation methods[8]. Among them, the World Coffee method can

help different groups of students take turns to share the team's web design results, so that everyone can participate and stimulate the innovation consciousness among students. Peer mutual teaching can promote group members to teach each other, practice language expression ability, and narrow the knowledge mastery differences. Peer mutual review and student self-assessment can be used as the testing stage of knowledge mastery among group members, which is helpful to fully understand students' knowledge mastery. According to different teaching links, different methods are used to achieve the best teaching effect.

Web Front-end Design is a course that emphasizes the application of theory to practice. In the teaching process, students' enthusiasm and interest in learning should be fully aroused. In the class, the theory and practice are taught simultaneously by means of inter-group competition. After class, students are encouraged to actively participate in project research application, "Internet +" competition, etc., and fully integrate learning, competition and research into the learning process, and strive to cultivate students' hands-on practical application ability. Abandon "spoon-feeding" teaching and advocate the application of "teacher-student, student-student interaction" teaching mode.

2.2.3 BOPPPS replaces "Cramming" teaching and integrates special training of local culture

BOPPPS includes six teaching parts: introduction, goal, pre-test, participatory learning, post-test and summary. The model can be flexibly applied according to the course content and avoid rigid use[9,10]. The application of this teaching model will help to solve the phenomenon of teachers speaking alone, and help teachers and students to clarify the tasks of each stage, including stimulating students' interest in learning, clarifying learning objectives, encouraging participatory learning, understanding students' knowledge reserves, and designing classroom links from simple to deep.

Based on the BOPPPS teaching model, local culture is integrated into group participatory learning design in a thematic way in three stages to stimulate students' innovative thinking, design different regional culture publicity websites, and realize the example of teaching results. For example, in the HTML learning stage, the thematic task of Heilongjiang regional culture publicity is initially set, such as Hezhen culture, Oroqen culture, etc., including the ethnic culture that students are interested in. During the CSS learning phase, the group is encouraged to use CSS techniques to improve the website effects of the previous phase. Add dynamic web effects and improve website functions during JavaScript learning. Gradually realize the results of the thematic output, to achieve the combination of "curriculum + ideological and political" education effect.

3. BOPPPS+Learning, Competition and Research Teaching Model Construction

3.1 Curriculum Teaching Measures

In the web front-end design course, teaching, competition and scientific research are combined. Based on the theoretical knowledge of the teaching subject, the practice of student group competition, and the motivation of scientific research project research, it stimulates students' learning initiative, helps students improve their professional practice ability and master the skills of web front-end design, so as to meet the needs of society for front-end engineers.

Group teaching, combination of learning and teaching. BOPPPS teaching model is used to design the teaching process. In the participative learning step, the teaching plan is designed based on group learning to realize the learning effect of "co-learning in the group and promoting learning by the group".

Hands-on practice, to promote learning. The teaching content of web front-end design mainly focuses on the teaching of front-end design code. In addition to technical requirements, web design also requires students to have certain innovative application ability. In order to promote the overall development of students, the teaching mode of web design competition is planned to be integrated into the experimental teaching, and the design results are displayed in groups according to the class plan. The team members introduce the design concept, and finally recommend students to participate in the web design competition according to their characteristics, so as to achieve the teaching effect of promoting learning through competition.

Scientific research feeds back and promotes education through research. To integrate scientific research into practical teaching, practice is the basis of scientific research, and scientific research is the direction of practice. Combining scientific research innovation with practical teaching and encouraging students to participate in research and development projects according to their own characteristics will lay a solid foundation for students' subsequent studies and work.

3.2 Classroom Teaching Method

The course of web front-end design includes theoretical explanation and experimental operation. Theoretical knowledge learning is the basis of practical operation, and experimental operation is the concrete embodiment of theoretical knowledge application. Combining online platform with offline classroom and setting up teaching implementation plan will better promote curriculum implementation. In class, we use LearnCom software to achieve teacher-student interaction, so that everyone participates in class and the effect of fair competition in groups. Use the intelligent tree platform to publish pre-test, group task, post-test content, etc., optimize course steps and improve class efficiency. Use MOOCs platform and LearnConnect software to share learning materials after class to consolidate learning in class and after class. The smart tree platform is used to publish important and difficult tasks, group thematic activities, and receive course feedback, etc., to achieve real-time course promotion and real-time monitoring of effects.

3.3 Classroom Teaching Process

The teaching process is designed based on BOPPPS teaching mode, taking the content of web page form in HTML module as an example.

3.3.1 Bridge

The use of the introduction link can attract students' attention, and its main function is to stimulate students' interest in learning and mobilize their enthusiasm for learning. Real cases of relevant applications can be thrown out in different teaching contents. For example, in the process of explaining the content of web forms, the heuristic method is adopted to guide students to think about which commonly used websites in life use web form technology to design website pages, introduce the important position of page forms in social life, and stimulate learning interest.

3.3.2 Objective or outcome

Also teach the students. According to the teaching content, the course objectives are set from three aspects: knowledge, ability and quality. Focus on students as the main body, analyze the characteristics of students, formulate differentiated goals, to achieve specific training. At the same time, according to the thematic teaching content, we can formulate appropriate quality objectives to achieve all-round education. For example, the teaching objectives of the web table are shown in Table 1.

Table 1. Learning Objectives

Knowledge objective	Ability objectives	Quality objectives
Keeping in mind the relevant attributes and setting methods of the table, you can use the cross-row and cross-column attributes of the table cells to realize the combination of cells and achieve the nesting of multi-layer tables	Proficient in using VSCode, HBuilder and other editors to write and debug form pages, with the ability to analyze and design form web pages	Cultivate students' spirit of seeking knowledge, enhance their awareness of socialist core values, and enhance cultural confidence and national pride.

3.3.3 Pre-assessment

You can ask questions to students in a guided way, and the content of the question is guaranteed to lead to the content of the lesson. For example, guided questioning is used to ask students to "Embed a list of definitions in a web page, including the name of the project and the description of the project, what is its basic syntax?" How do you implement list nesting?" In this way, the list grammar is used to test whether students have a good grasp of the nested thinking mode, and the teaching content of the web table and the nested grammar of the table are introduced.

3.3.4 Participatory learning

Participatory learning can well reflect the educational concept of "student-centered", which focuses on the interaction between teachers and students, students and students by using the world coffee method, peer mutual teaching method, peer mutual review method

and self-assessment method, focusing on student learning and stimulating the motivation of students' independent learning.

3.3.5 Post-assessment

The post-test is mainly to test students' classroom learning. Students can use an example in class to organize group cooperation or complete it independently, publish the answer, and finally conduct self-test or exchange test. It can also use platforms such as wisdom tree to publish tasks, which students submit after class, and teachers can grasp the learning situation according to the feedback results of homework and adjust the teaching content in real time.

3.3.6 Summary

The summary part mainly summarizes the important and difficult knowledge of the course. At the end of the course, the teacher can summarize the class content in the order from easy to deep, and clarify the important and difficult knowledge. Students can also be invited to summarize themselves according to the form of the course, and the teacher adds.

3.4 Teaching Evaluation

It pays attention to the development of students' knowledge, ability and thinking, adopts multiple evaluation methods to measure students' learning results, effectively combines process evaluation and terminal evaluation, and formulates reasonable evaluation system and scoring criteria. The specific evaluation mechanism is shown in Figure 1.
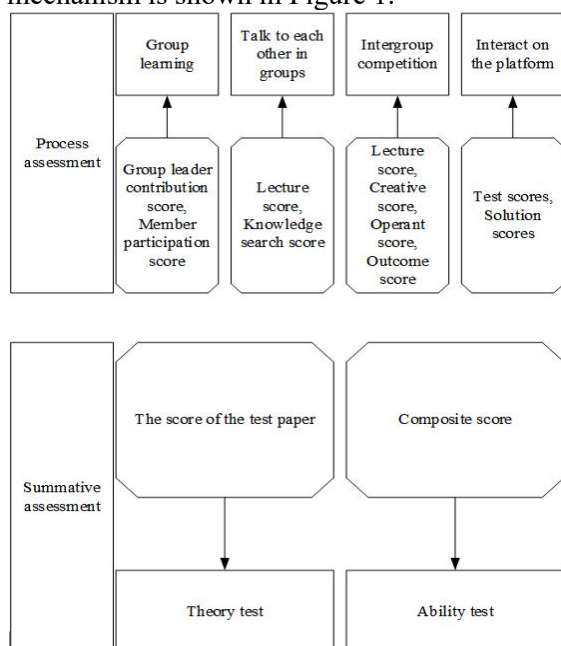

Figure 1. Evaluation Mechanism

Among them, the two parts of the score account for half of the total score. Each part of the process evaluation is worth a quarter of the score, and each part of the comprehensive evaluation is worth half of the score.

4. Conclusion

Based on the BOPPPS teaching model, the construction of an innovative classroom with "learning, competition and research as the core links" breaks the "cramming" teaching mode, and also teaches students, which not only helps to cultivate students' independent innovation and practical ability, but also helps to cultivate their scientific research consciousness. At the same time, the use of thematic stage group cooperation projects will be more conducive to the realization of all-round education.

References

[1] Ding Xiaomei, Wang Jing, Zhao Lihong. Analysis on the Teaching reform of "Web Design and Production" course in the New era. Journal of Beijing Institute of Printing and Technology, 2020, 28(12): 124-126. DOI: 10.19461/j.cnki.1004-8626.2020.12.037.

[2] Wu Xiaoying, Zhou Hai. A Preliminary study on the project-based teaching practice of "Web Front-end Interface Design" course based on professional competence. Office Automation, 2019,

24(24): 32-34.

[3] Zhou Xiaolei. Practice and Exploration of the Mobile Blended Teaching Mode of "Foundation of Web Design". Industry and Technology Forum, 2019, 22(01): 192-193.

[4] Li Lin, Hu Yong, Wang Zhihong, et al. Web page design and facture course reform research. Computer knowledge and technology, 2024, 20 (17): 151-154. The DOI: 10.14004/j.carolcarrollnkiCKT.2024. 0921.

[5] Chen Yan. Practical research on html5+css3 Web design teaching model based on Flipped classroom. Digital World, 2020, (10): 143-144.

[6] Xiu-zhen Cai. The world coffee session method in the innovation of entrepreneurship practice. Journal of Fujian Computer, 2020, 4 (4): 127-128. The DOI: 10.16707/j.carol carroll nki FJPC. 2020.04.038.

[7] Chan Mei. Flip classroom mode peer mutual teaching activity design research. Shenyang normal university, 2021. The DOI: 10.27328/dcnki.GSHSC. 2021. 000220.

[8] Chai Rong. Effective Implementation of Student Self-assessment and Mutual Assessment in senior high school English Writing Teaching. Lovers of Liberal Arts, 2024(02): 73-75.

[9] Wang Zhiyuan, Zhou Yun, Peng Xuefeng, et al. Application of BOPPPS Model in Signal Analysis and Processing classroom Teaching. Computer Engineering and Science, 2016, 38(S1): 68-71.

[10] Ju Y R, Cui H, Ning Y H, et al. Classroom teaching design of College Computer Foundation based on BOPPPS model. Computer Engineering and Science, 2019, 41(S1): 134-138.