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Application of BOPPPS Teaching Mode in Electrical Engineering Classroom Teaching

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Abstract

In view of the problems of low participation of students and poor teaching effect in traditional classroom teaching, this paper uses BOPPPS model to design and practice the classroom teaching of Electrical Engineering course. On the basis of clarifying the connotation of the model, this paper discusses the specific application of the model in classroom teaching design closely around the six elements of bridge-in, objective, pre-assessment, participatory learning, post-assessment and summary, so as to improve the students' learning initiative and enthusiasm, improve the teaching effect and achieve the teaching objective.

Keywords

BOPPPS; Electrical Engineering; Classroom teaching; Curriculum ideological and political.

1. Introduction

At present, in the traditional classroom teaching in Universities, teachers are emphasized as the main body, and students passively accept knowledge. This situation leads to students' low learning enthusiasm and participation, poor learning effect and effectiveness. How to change this boring, inefficient and passive learning style into an interesting, efficient and active learning style has become an urgent problem for universities to solve.

BOPPPS model is originated from ISW (instructional skill workshop) in Canada, and it is widely used in skills training in North American universities [1-2]. It is a closed-loop mode of teaching interaction and reflection, which is fully participated by students who can communicate with teachers in time [3-4]. BOPPPS model divides the classroom teaching process into six teaching modules: Bridge-in; Objective; Pre-assessment; Participatory Learning; Post-assessment and Summary. These six modules echo and link together, forming a closed-loop teaching system of teaching objective-teaching behavior-learning activity-

teaching evaluation-teaching objective [5].

2. The Connotation of BOPPPS Teaching Mode

The BOPPPS teaching mode emphasizes the core position of teaching objectives, and the other five modules are all closely around it. In the design of the whole process of classroom teaching, Every module should be paid attention to. Ignoring any module will affect the achievement of teaching objectives in varying degrees.

(1) Bridge-in: Before the beginning of classroom teaching, the bridge-in module is set up to attract students' attention. It can arouse students' strong interest in learning, promote students to establish a strong learning motivation and pay attention to the learning content of this

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classroom teaching. According to different teaching contents, teachers can use pictures, videos, stories, examples and so on in bridge-in module.

(2) Objective: The teaching objectives are the starting point and the end point of classroom teaching. Teachers should convey accurate teaching objectives to students through concise and comprehensive language, so that students can understand what they will learn, make clear the direction of learning and pay attention to the keynote and difficulty of learning. The formulation of teaching objectives should be observable, measurable and operable, and should not be ambiguous or vague, too high or too low. At the same time, teaching objectives should involve three aspects such as knowledge, skills and value guidance.

(3) Pre-assessment: The purpose of the pre-assessment is to make an in-depth analysis of learning situation. Through pre-assessment, we can accurately grasp the students' knowledge and ability basis, their understanding of the teaching content, and even the students' emotion and personality, so as to provide the basis for better organizing the teaching content and focusing on the teaching objectives. The pre-assessment can be completed by questioning, examination, discussion and other ways. According to the students' situation, teachers should adjust the progress and depth of teaching in time, further improve the design of teaching process, teaching strategies and teaching methods.

(4) Participatory learning: Participatory learning is the core of BOPPPS teaching mode, which emphasizes student-centered and highlights students' learning initiative and enthusiasm. Interactive learning can be realized through teacher-student interaction and student-student interaction. The key point of this module is that teachers should create a relaxed and lively learning environment for students, so that students can speak boldly, have the courage to explore and discuss, and dare to ask questions to the authority. Participatory learning can be completed by flipped classroom, project teaching, task driven, problem exploration, etc. It can fully mobilize students' autonomous learning ability. students' participation in the classroom is improved. They learn knowledge more deeply and master skills more solidly.

(5) Post-assessment: In order to assess the students' learning effect and the achievement of teaching objectives, the post-assessment module is set up. Through this module, teachers can have a targeted understanding of the students' learning situation, and make clear the students' mastery of the keynote and difficulty. The assessment results can help teachers to reflect on teaching timely, promote the continuous improvement and perfection of teaching design, and improve the quality of teaching constantly. At the same time, It can also help students to understand their learning effect in time, and adjust learning strategies and methods. The post-assessment can be carried out by asking questions, taking exams, and making students summarize etc.

(6) Summary: This module is the review, carding, overview and induction of teaching content, which can further consolidate the teaching objectives. Summary is not only the brief sum-up of this teaching content, but also the introduction of the next teaching content, which plays a role of connection. Teachers can guide students to summarize the teaching content, re-emphasize the keynote and difficulty, forecast the next class content, and arrange homework after class. Teachers can also let students use simple language to summarize themselves, make it clear what they have learned, harvest and experience, so as to further improve the teaching effect.

3. The design of the Classroom Teaching of "Electrical Engineering" Based on BOPPPS Model

"Electrical Engineering" is an important technical basic course in engineering universities. Facing non electrical engineering majors such as mechanical engineering, energy engineering, chemical engineering and materials engineering etc, it shoulders the important mission of "building a complete electrical knowledge system for engineering managers or non electrical

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engineers who go out of school". "Electrical Engineering" is a technical science that studies and reveals the phenomena and laws of electricity and magnetism in engineering. It is characterized by wide knowledge coverage, profound theory, strict logic, wide engineering background and strong practicability. In order to enable students to learn relevant theoretical knowledge and improve their engineering ability, this paper uses BOPPPS model to design the classroom teaching of "Kirchhoff's law" of "Electrical Engineering" course, so as to improve students' classroom participation and mastery level of knowledge points.

3.1. Bridge-in

A good beginning is half done. The unique and interesting bridge-in can make students have strong interest and eager to know the new content of teaching, so as to lay a good foundation for teaching and make teaching better.

In the section of "Kirchhoff's law", the class begins by telling a story, that is, "Kirchhoff's life" to attract students' attention. In the process of telling, the teacher always pays attention to the students' expressions and reactions. From the carelessness at the beginning to the worship expression at the end, It can be seen that they have been deeply attracted by the story. At this time, the teacher immediately strike while the iron is hot and put forward: "today, we will learn Kirchhoff's law, which was established by Kirchhoff, who was only 21 years old, and is of great significance in physics." It can be found that the students can't wait to learn this new law.

3.2. Objective

After the bridge-in, the teacher explains the learning (teaching) objectives to the students. Students can make clear the keynote and difficulty of this classroom teaching, have a clear idea and prepare for the following study. The objectives include three aspects: ① Knowledge objectives: To understand the concepts of branch, node, loop and mesh; to master the content of Kirchhoff's law; to be able to use the law to calculate. ② Capability objectives: To cultivate students' ability to think independently, study and explore new knowledge; to cultivate students' innovative consciousness and improve their ability to analyze and solve problems. ③ Value leading: Everything must follow the rules.

3.3. Pre-assessment

In order to master the students' knowledge reserve, learning ability and interest, the pre-assessment is carried out closely around the objectives to stimulate students' enthusiasm for exploring the learning content. The way of classroom questioning can be used: ① What are the characteristics of series and parallel resistance circuits? ② How to define the positive direction of voltage drop and electromotive force? What is the reference direction? ③ What is the content and expression of Ohm's law? Through the above questions, the teacher understands the students' mastery of basic knowledge, which can help them to set teaching rhythm and adjust the depth of teaching content. At the same time, the pre-assessment can promote students to enter a good learning state as soon as possible, and pave the way for students to learn new content.

3.4. Participatory Learning

According to the teaching concept of "student-centered", in the implementation process of classroom teaching, the problem-based teaching method is adopted to guide students to continuously think deeply, so that they can actively participate in classroom teaching and boldly express their own opinions. There are two main tasks for teachers: ① Set reasonable questions. The German educationist Desdoway put forward: "The art of education is not to impart skills, but to excite, awaken and inspire." Therefore, teachers set up appropriate questions at appropriate time nodes to stimulate students' interest in exploration and discovery. The progressive problems lead the students to follow the teacher's thinking. Students think deeply

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step by step, discuss fiercely again and again, and untie the "veil" layer by layer, so as to feel "so it is". So far, the students have understood and mastered the teaching content and achieved the teaching objectives. ② Create a relaxed and lively learning environment for students. First of all, with love and respect for students, teachers walk into the classroom with a smile, so as to let students feel relaxed and happy. Then they maybe turn to love the classroom learning. Secondly, teachers, who hold a rigorous and serious attitude and pour great enthusiasm towards teaching, should pay attention to their subtle influence on students, which can infect and edify students, and make students deeply like classroom learning. Finally, in order to stimulate students' interest and motivation in continuous learning, teachers try to meet the psychological needs of students who feel to be concerned and taken seriously.

In the classroom teaching of Kirchhoff's law, the teacher explains the concepts of branch, node, loop and mesh according to a specific circuit. Then, based on the principle from simple to complex, two circuits are given to students. Students can discuss and judge how many branches, nodes, loops and meshes are in the circuit, so that they can really understand the concept. On this basis, teachers turn to the first teaching keynote: Kirchhoff's first law (KCl), which is aimed at the nodes in the circuit. The content and basis of the law are given, so that students can not only know what it is, but also know why it is. Then, the teacher guides students to write node equations of 1~2 circuits according to the law, and lets students find and solve the problem by themselves: the number of independent node equations. Further, teacher and students work together to study the extension and application of the first law. At this time, the students' enthusiasm for learning has risen, and the teacher strikes while the iron is hot and turn to the second teaching keynote: Kirchhoff's second law (KVL), which is aimed at the loops in the circuit. The teacher gives the content of the law and guides students to think about the basis of it. Then, the teacher leads the students to write the loop equations according to the examples, asks the students to summarize the steps and think about the number of independent loop equations. Further, teacher and students work together to study the extension and application of the second law. Finally, according to a moderate example, the students are guided to master the application of Kirchhoff's law by writing and solving the node and loop equations, then get the method of solving the circuit --branch current method. The teacher and students discuss the matters needing attention in using this method.

Through close cooperation between teachers and students and fierce discussion between students and students, students really understand and master Kirchhoff's law. At the same time, it also cultivated students' ability to think independently, find and solve problems, innovate and cooperate with other teams. In addition, teachers carry out ideological and political education for students, so that build a trinity teaching system of knowledge imparting, ability improving and value leading.

3.5. Post-assessment

Based on the teaching philosophy of "unity of knowledge and action, learning for application", Teachers will understand the students' mastery of the teaching content in the way of "quiz". The time is about 5 minutes. Students are required to write independent KCl and KVL equations of the circuit as shown in figure 1.

According to the students' performance, teachers can judge whether the teaching objectives have been achieved. It will help teachers and students to reflect.

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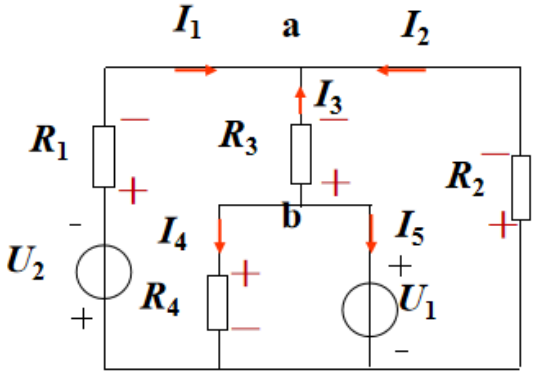

Figure 1. The circuit for students to practice

3.6. Summary

Finally, teachers use 5 minutes to emphasize the keynote and difficulty of the teaching content again, that is: definition of branch, node, loop and mesh; the contents and application of KCl and KVL; Be able to use Kirchhoff's law to solve each branch current, and lead students to repeat the problem-solving steps. At the same time, teachers inform the students of the following teaching content and requirements, and arrange homework, etc. Through the summary, the students consolidate what they have learned, and find out what they have not mastered. After class, they check and fill the gaps and review in time, so that they can firmly
grasp the teaching content and achieve good learning effect.

4. Conclusion

In this paper, the BOPPPS mode is applied to the classroom teaching of Electrical Engineering course. On the basis of in-depth study of the connotation of the teaching mode, taking the "Kirchhoff's law" as an example, six teaching modular are carefully designed to form a closed-loop teaching system, which make classroom teaching really "live" up, students really "move" up, so as to improve the teaching effect and achieve the teaching objectives.

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