

Reform and exploration of transportation engineering curriculum based on Bloom's goal classification theory

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ABSTRACT: Bloom's theory of classification of educational objectives divides the dimension of people's cognitive process of knowledge into six stages from shallow to deep, according to which the transportation engineering course adopts the hybrid teaching mode of online and offline, guides the graduate students to study independently before class, internalizes the knowledge in the classroom, and fully mobilizes the students' enthusiasm for learning through the introduction of real engineering cases, which is helpful to stimulate the student's interest in learning and enhance the student's sense of blended teaching, identification, and improve students' action ability and vocational abilities.

KEYWORDS: Bloom's theory of classification of educational objectives; Transportation engineering; blended teaching model

I. INTRODUCTION

Under the background of the new automobile science and technology revolution, the transportation industry will inevitably face structural adjustment and change of growth mode, and "wisdom, high efficiency, safety, and environmental protection" has become the future development direction of the transportation industry. Various new facilities, intelligent technologies, new management modes, and methods are constantly emerging, which put forward higher requirements for the quality of cultivation of transportation engineering professionals. How to improve the theoretical quality and practical ability of transportation engineering degree students is of long-term significance to ensure the sustainable development of transportation engineering degree students. The traditional classroom teaching mode has many drawbacks, the

problem of "superficialization" of teaching is highlighted, and the teaching process does not pay enough attention to the cultivation of students' thinking[1], which leads to a lack of independent thinking, and it is difficult to realize the depth of digestion of knowledge and improve the thinking ability of students. We take Bloom's theory of classification of educational goals as a guide to carry out the reform of blended teaching in transportation engineering courses to improve students' knowledge and learning enthusiasm..

Overview based on Bloom's theory of categorization of educational objectives

Bloom's Classification of Educational Objectives is intended to establish a classification system of educational objectives to help teachers analyze and think about teaching more carefully and deeply, to answer better the four questions of "what to teach, how to teach, how to assess, and how to increase student's interest", and thus help teachers design more appropriate and reasonable teaching objectives, This will help teachers to design more appropriate and reasonable teaching objectives, teaching activities, teaching assessment, and improve the effectiveness of teaching[2]. Bloom divided human cognitive ability into six levels[3-4], from low to high: memory, comprehension, application, analysis, evaluation, creation, memory, understanding, and application of the three cognitive abilities are attributed to the lower cognitive ability, which is also the lower-order education goals of education, while the analysis, evaluation, and creation of the higher cognitive ability are attributed to the higher-order education goals of education.

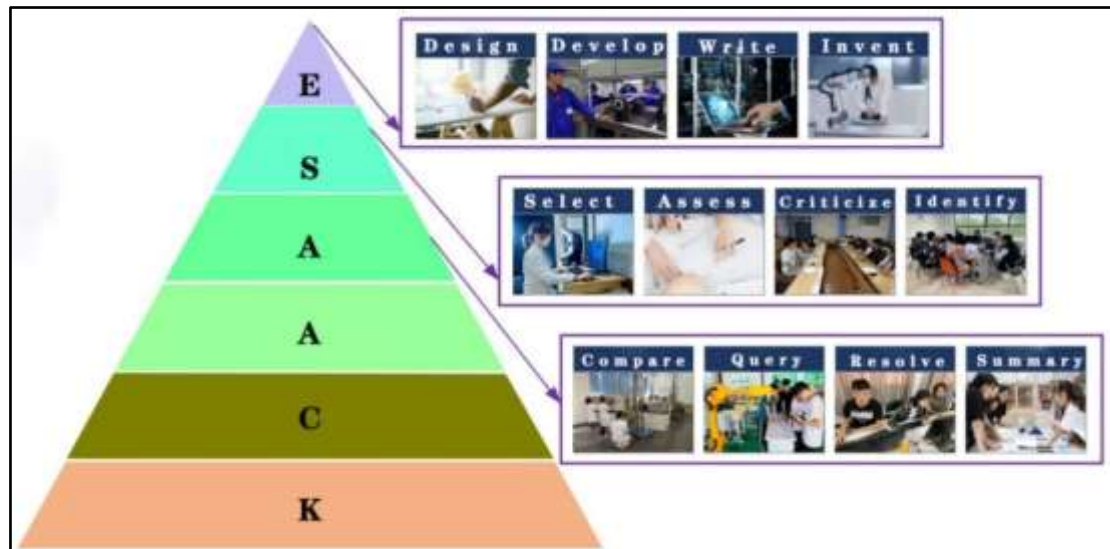


Fig.1 Bloom's theory of classification of educational

Centering on professional core courses, scientific frontier achievements, and technical difficulties of large-scale backbone enterprises, the hybrid teaching mode of online and offline is adopted to combine traditional offline teaching with online teaching to fully mobilize students' learning enthusiasm and enhance the teaching effect. The hybrid teaching mode has the leading and dominant role of traditional classroom teaching, but also enables the teaching to break through the limitations of time, space, and experimental conditions, utilizes diversified teaching methods and rich teaching resources, stimulates students' learning participation and autonomy, and enhances students' cognitive level of knowledge.

II. DESIGN OF TEACHING OBJECTIVES FOR THE COURSE "TRANSPORTATION ENGINEERING" INDEPENDENT STUDY BEFORE CLASS

According to Bloom's theory of classification of educational objectives to categorize some of the knowledge points of the transportation engineering course, different parts of the knowledge require students to achieve different cognitive levels. Nomenclature, engineering theory, and so on only need to be memorized and understood, while specific plans to operate and other steps not only need to be memorized but also need to strengthen the analysis and application of the actual problem, in the actual engineering problems, to put forward solutions and preventive solutions, to provide a theoretical basis for the study of transportation engineering. Creation is located at the top of the pyramid in Bloom's classification theory system of educational objectives, for this course of transportation engineering, if

students can independently deal with the ability to deal with practical problems has reached the requirements, but students in the study of this course of professional knowledge system is not perfect enough to achieve the creation of this degree of cognition.

The main purpose of independent study before class is to understand and memorize relevant basic concepts, basic methods, etc. Students are allowed to preview, memorize, and understand the relevant knowledge points before class. The basic knowledge mainly includes the explanation of terms, basic concepts nameplate numbers, etc. Students are required to conduct a self-assessment of their learning effectiveness through the pre-course test, and the teacher uploads some real-world application cases of transportation engineering. The lower-order teaching goals of memorization and comprehension in Bloom's classification of educational goals are achieved through this teaching design. This teaching design cultivates students' independent learning ability and allows students to come to class with questions through pre-class pre-testing and self-assessment, which changes students' learning from passive to active and makes learning more efficient.

Internalizing knowledge in the classroom to achieve higher-order instructional goals

Through independent study before class, students have reached the learning goal of understanding and memorizing the basic knowledge, and know the practical application methods of part of the knowledge, therefore, teachers should pay more attention to the focus and difficulty of the knowledge in the classroom. The classroom is the most important place to cultivate students' ability of

divergent thinking and enhance their cognitive ability, teachers should guide the communication between teachers and students, between students and students, and in the summary feedback of the communication to constantly reflect on the possible problems in teaching.

Consolidate and review after the lesson to achieve common improvement

Utilizing after-school homework to check gaps and fill in gaps, students complete after-school homework not only to consolidate what they have learned in class but also to extend their knowledge and abilities. Students will learn the content in practice into the ability, which requires that the task set must be specific, and contextualized, and students can contact real life through the context, to enhance the ability of students to cross-situational migration. Teachers can arrange a few engineering examples in the learning pass for students to leave a message to answer, the priority answer, and correct students can get extra points in the usual performance. In the case of competition, students' brains will speed up the operation, and unique insights and novel ideas will often be generated in this context. The teacher, as the classroom guide, reviews the teaching priorities and makes reasonable improvements to the teaching program by correcting students' homework and collecting students' feedback from the class.

III. TRANSPORTATION ENGINEERING INSTRUCTIONAL DESIGN

Applying the flipped classroom

After completing the online course online, PPTs are made in the form of round-table discussion groups to report in the physical classroom. For example, in the teaching of cutting-edge scientific achievements and technical problems of large backbone enterprises, students can form their own study groups according to their own interests, collect and organize literature on the relevant theories, and finally report the role of the problem, the source and the solution in the classroom with PPT. After the end of the report, students from other groups can ask questions and discuss, and finally, the teacher will supplement and explain the key points. Through this teaching method, students can be motivated to learn knowledge actively, but also develop students' ability to analyze and solve problems, exercise students' language, communication, and expression skills, improve students' teamwork ability, and help to improve students' scientific research literacy.

Teaching of engineering examples

Add examples of transportation engineering in life in the teaching process, guide students to use

the theoretical knowledge of transportation engineering, analyze the theoretical specifications, and so on through classroom discussion or writing treatment methods, and finally put forward solutions. This real occurrence of engineering cases let students understand the importance of transportation engineering in life, deepen students' understanding of the theory of transportation engineering, and improve students' ability to solve engineering problems. While encouraging students to seriously transportation engineering professional knowledge, cultivate their rigorous attitude.

Multimedia teaching

As an emerging and advanced teaching mode, multimedia teaching makes up for the shortcomings of traditional teaching mode. Multimedia teaching can display pictures, videos, PPTs, and other media information through the computer and projector, and show abstract knowledge in the form of animation [5]. For example, when it comes to traffic signal timing traffic organization and guidance, and other abstract chapters, it is difficult for students to fully understand and master the knowledge through books and simple courseware, and they can't directly observe with their naked eyes the real welding process. Teachers can play animations or short videos to make students understand the relevant theoretical knowledge in a more visual and intuitive way, thus breaking through the visual limitations of traditional teaching and realizing the scenario reproduction, which is convenient for students to deeply grasp the knowledge.

In addition, in the process of classroom teaching, multimedia display of the frontiers of professional development, not only can open up the eyes of students, so that students with curiosity to explore, but also introduce and extend the classroom the difficult and important content, increase students' interest in learning, stimulate students' sense of innovation.

IV. DESIGN OF EVALUATION OF TEACHING EFFECTIVENESS IN TRANSPORTATION ENGINEERING COURSES

Teaching evaluation is an activity of making value judgments on the teaching process and results according to the teaching objectives, and it is a process of making judgments on the real or potential value of teaching activities. Giving full play to the guiding role of evaluation can promote the reform of classroom teaching and improve the quality of teaching.

Firstly, the implementation of formative

evaluation in the teaching process. Teachers can judge the learning status of students by observing their facial expressions, sitting posture, and raising their hands to raise their hands to ask or answer questions, and then make timely changes in the teaching process.

Second, formative assessment on a unit basis was implemented. After the teaching of each chapter of the transportation engineering course is completed, a formative test will be conducted, and each test will be counted in the students' regular grades. Each quiz will be counted as part of the students' regular grades, and the students' answers to the quizzes will help them to understand the extent to which they have mastered their knowledge.

Thirdly, after the end of the welding metallurgy course, the network questionnaire is used to obtain the students' satisfaction and opinions on this course. Teachers make corresponding improvements in the teaching mode after getting students' real ideas and opinions, which is conducive to the improvement of teaching quality.

V. CONCLUSION

Teaching not only guides students on what to do but also motivates them to think and create, which makes an otherwise boring educational activity lively and interesting. In addition, the subsequent teaching activities also include the commentaries of each student on the solutions of others and his/her own, which on the one hand can stimulate the enthusiasm of students, and on the other hand, can promote the complementarity of knowledge and improve the interpersonal skills of students. Taking the "urban transportation hub location problem" as an example, students can analyze the specific problem, put forward their personal opinions, and discuss it in depth with relevant data.

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