

# Teaching Reform and Practice of the AI-Empowered Model in Web Front-End Development Courses

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## Abstract

The deep integration of artificial intelligence technology with new engineering education provides a brand-new path for the transformation of teaching models in computer-related courses in universities. In response to the problems existing in the traditional Web front-end development technology courses, we have constructed an AI-driven teaching reform model. This method first systematically reconfigures the teaching content through five dimensions (interest, problem, project, integration, and ideological education), and then designs a multi-dimensional guiding teaching system of “interest-driven, problem-driven orientation, project practice, interdisciplinary integration, ideological and political education”, integrating artificial intelligence technology throughout the entire classroom teaching and complementing it with a diversified process assessment system, aiming to improve the course quality and enhance students’ professional abilities. Teaching practice shows that this method effectively compensates for the shortcomings of traditional teaching, significantly improving students’ classroom participation, code development ability, and autonomous learning literacy, providing a replicable practical framework and theoretical reference for Web front-end and similar computer courses in the context of new engineering education.

## Keywords

AI; Web Front-end; New Engineering Education.

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## 1. Introduction

### 1.1 Research Background

With the innovative development of new engineering technologies in the country, the related courses in computer science are undergoing deep reforms. Web front-end development technology, as a core course in computer science, not only requires students to master grammar knowledge such as HTML and CSS, but also demands proficiency in using mainstream enterprise technology frameworks like Vue. Therefore, the quality of university courses determines whether students can directly meet the requirements of enterprises after graduation.

With the development of artificial intelligence technology, AI technology has begun to play a role in the education field<sup>[1]</sup>. The government has also clearly required that universities should vigorously promote students’ AI learning ability and application ability, and improve the application of AI technology in teaching. Therefore, AI tools are no longer just learning aids, but an extremely important knowledge carrier in the entire teaching process<sup>[2-3]</sup>.

The BOPPPS teaching model is a very popular teaching method in recent years. Its core idea is centered around students, emphasizing participatory learning and encouraging students to actively discuss with teachers<sup>[4]</sup>. And Web front-end development technology is a highly practical course that requires students to practice writing code frequently. Therefore, applying the BOPPPS teaching model in the teaching of this course can not only enhance students' learning initiative, but also better meet the talent cultivation needs in the context of new engineering education.

### 1.2 Existing problems with Traditional Courses

In the traditional teaching process, there are still some issues. In terms of teaching objectives, the course teaching objectives are mostly described as “mastering, understanding, and being able to implement”, emphasizing the understanding of theoretical knowledge while neglecting the actual mastery of students, and weakening the practical ability. In terms of teaching mode, most teachers still continue to be centered on the teacher, conducting “filling-in-the-blanks” teaching, focusing on whether the prescribed teaching content is completed according to the teaching plan, regardless of whether the students understand and master it<sup>[5]</sup>. In addition, most teachers only teach students the rules and usage of grammar and require them to write according to the examples step by step, ignoring the students' thinking needs, resulting in students merely passively accepting knowledge, knowing the facts but not the reasons. In terms of teaching content, this course mainly includes three parts of knowledge: HTML, CSS, and JavaScript, while mainstream Flex flexible layout, Vue framework, etc. are rarely covered, resulting in the lag of course knowledge content. Moreover, the practical exercises in each chapter of the course are independent and have no connection, preventing students from thinking from an overall perspective about the complete process of front-end page construction, which is not conducive to the improvement of students' systematic development ability<sup>[6]</sup>. In terms of teaching environment, some colleges still conduct theory and practice separately, with teachers giving lectures in the theory classroom and students practicing in the computer room classroom. The time gap between the two courses prevents students from practicing in time, weakening the related memory, and seriously affecting the teaching effect. In terms of teaching assessment, many colleges still adopt the traditional “classroom teaching - exam review - exam” assessment method, focusing on students' understanding and mastery of theoretical knowledge, lacking the assessment of students' practical ability<sup>[7]</sup>. Under this assessment method, students only need to attend classes carefully, take good notes, and do relevant review before the exam to achieve excellent grades and become “excellent students” of this course, but they do not possess the professional ability to become Web front-end developers. In terms of teaching summary, although most universities require teachers to write teaching summaries at the end of the semester, most teachers only complete the task to fulfill the requirement, without considering the actual teaching process and teaching results, lacking their own thinking, resulting in the summary content being superficial and lacking depth. At the same time, there is no feedback mechanism for circulation, and students' shortcomings and areas for improvement cannot be fed back to students, resulting in students only seeing the final score, hindering their learning progress and ability improvement.

### 1.3 Reform Strategy

To address the aforementioned issues, we plan to apply the BOPPPS model to the learning of Web Front-End Development Technology course and deeply integrate AI tools to develop an efficient learning method suitable for this course.

## 2. Multidimensional-oriented Teaching Content Reconfiguration

The course is guided by the new engineering concept, based on interest stimulation, problem-driven, and project practice. The goal is to cultivate students' professional abilities in interdisciplinary integration and positive and healthy ideological and political qualities.

1) Interest-driven orientation

Interest is the best teacher for learning. During the first class, teachers don't need to rush to explain the knowledge. They can introduce the relevant content of the course to students through teaching examples, thereby attracting their interest. Teaching examples can be generated by AI tools, such as Douba, Deepseek, ChatGPT platforms. In addition, teachers should also pay attention to the diversity of teaching content. They can reasonably add popular elements to attract students' attention and improve their learning concentration.

#### 2) Problem-driven orientation

Before teaching, the teacher guides students through questions to stimulate their thinking. It is essential not to directly jump to the main topic. The types of questions that can be raised include pre-class study, application of module scenarios. The questioning methods include posting on the learning platform and asking questions during the class. The process of solving problems is conducive to cultivating students' logical thinking and developing the habit of thinking. AI tools will also provide students with timely feedback to help them grasp the direction of thinking.

#### 3) Project practice orientation

Integrating project practices into daily teaching, linking closely related knowledge points in the course content with specific projects, and through the breakdown and explanation of projects as well as practical exercises, students can gain a deeper understanding of enterprise project frameworks and skill requirements while learning theoretical knowledge. For example, when explaining "box model design layout", some teachers only ask students to build a single box for relevant parameter settings, or use simple examples from textbooks for practice. Such a practice is not conducive to the improvement of students' level. At this time, the JD Mall project can be used. After explaining the layout thinking of the JD homepage, simplify the core idea of the layout and let students practice to achieve the effect page.

#### 4) Interdisciplinary integration orientation

Students study front-end, but they should not only learn front-end. It is advocated to break the boundaries between traditional disciplines and integrate the knowledge, methods, and thinking of two or more disciplines organically to solve complex real-world problems and cultivate students' comprehensive abilities. For example, when explaining the form chapter, connect the form working principle with the "computer network" course, briefly summarize the relevant knowledge such as the layered model of the network and transmission protocols, and "computer network" is also one of the core professional courses for students to participate in the national postgraduate entrance examination. This cross-disciplinary knowledge connection and thinking is conducive to cultivating students' comprehensive thinking and enabling them to view problems more comprehensively.

#### 5) Ideological and political education orientation

Raising moral character is the fundamental task of education. During the teaching process, based on the knowledge points of each chapter, starting from political orientation, ideological orientation, moral orientation, and value orientation, guide students to establish correct worldviews, outlooks on life, and values, and enhance students' sense of identity and responsibility towards the country and the nation.

### 3. Teaching Reflection

After the curriculum reform, all teaching data have improved, such as peer evaluations among teachers, student evaluations, and leadership evaluations. However, there is still considerable room for improvement in the score of "students' evaluation of the course". Through questionnaire surveys and student feedback, it was learned that the reason for this result is that some students feel that there are too many practical exercises in the course and some knowledge is too difficult, making the learning process somewhat challenging. In the subsequent teaching process, students should be guided to develop the qualities of not fearing difficulties and being diligent in thinking. At the same time, the teaching content should be further optimized to make the knowledge points more closely

connected and the thinking process more natural. While not lowering the course requirements, students should be made to learn the course more easily.

In addition, with the advancement of AI technology and the dissemination of online resources, a small number of students have behaviors such as AI-generated and written assignments in experimental practice and course design, which seriously violate the learning intentions and teaching requirements. In response to this situation, teachers can adopt appropriate methods to improve the assessment mechanism during the final assessment and review of relevant documents. For example, adding an acceptance and defense stage, where students present the website and explain the design basis and how to implement it. During the acceptance process, teachers can assess the authenticity of students' understanding of the project through questions or requiring students to locate the code, and promptly dissuade and educate students who adopt incorrect learning methods to avoid adverse effects on students and teaching.

#### 4. Summary

This study successfully adapts and integrates the AI+BOPPPS teaching model with the computer science course "Web Front-end Development Technology" in the context of new engineering, undergoing localization transformation to form a new teaching paradigm. This paradigm provides a replicable theoretical model and practical scheme for cultivating students' engineering practical abilities and comprehensive qualities. The paradigm emphasizes student-centeredness, with teachers transitioning from knowledge impartors to learning designers. By enhancing students' participation in teaching processes, it facilitates the transformation of students from passive knowledge receivers to active problem solvers. Simultaneously, teachers focus on the integration of teaching and practice, meticulously designing process assessments and course evaluations to more accurately evaluate teaching effectiveness and student abilities. In future teaching, based on "AI-empowered education", we will further explore how to achieve deeper technical integration of this paradigm with online intelligent teaching platforms, enabling automated collection of process data and intelligent analysis of learning situations.

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