

Design and Analysis of Project-driven Flipping Classroom Teaching Cases--Take the "Web Design and Production" course as an example

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"Web Design and Production" is a strong practical computer science foundation course. The concept, ideas and techniques of web front-end development have an important impact on the follow-up courses. The paper compares and analyzes the reform in current teaching methods of the course, and proposes a project-driven flipping classroom teaching method, which rationally decomposes and reorganizes the curriculum knowledge system, and divides the curriculum content into several modules. Meanwhile, each module is driven by a project, mixing problem-based teaching methods, task-driven methods and flipping classroom teaching methods. The paper clarifies pre-class, in-class, and after-school tasks. Knowing the project tasks before class, understanding the knowledge and skills needed for the design project, using the micro-curriculum resources to learn and practice knowledge autonomously; detecting the learning effect of knowledge in the class, solving the problems in the self-learning, and apply the learned knowledge to the actual project development by the way of group collaboration in order to promote internalization and application of knowledge, when encountering new problems, teachers not only explain new knowledge to help students continue to implement the project, but also promptly recorded the completion of the project of the group collaboration; After class, teachers summarize questions, build a knowledge system, and guide students to complete extended design of project. In this way, students' practical application ability, project development ability, self-learning ability and creative ability can be improved. This article also provides specific instructional design cases based on the "Web Page Layout and Beautification" module and provides specific teaching design cases.

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--Take the "Web Design and Production" course as an example

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"Web Design and Production" is a strong practical computer science foundation course. The concept, ideas and techniques of web front-end development have an important impact on the follow-up courses. The paper compares and analyzes the reform in current teaching methods of the course, and proposes a project-driven flipping classroom teaching method, which rationally decomposes and reorganizes the curriculum knowledge system, and divides the curriculum content into several modules. Meanwhile, each module is driven by a project, mixing problem-based teaching methods, task-driven methods and flipping classroom teaching methods. The paper clarifies pre-class, in-class, and after-school tasks. Knowing the project tasks before class, understanding the knowledge and skills needed for the design project, using the micro-curriculum resources to learn and practice knowledge autonomously; detecting the learning effect of knowledge in the class, solving the problems in the self-learning, and apply the learned knowledge to the actual project development by the way of group collaboration in order to promote internalization and application of knowledge, when encountering new problems, teachers not only explain new knowledge to help students continue to implement the project, but also promptly recorded the completion of the project of the group collaboration; After class, teachers summarize questions, build a knowledge system, and guide students to complete extended design of project. In this way, students' practical application ability, project development ability, self-learning ability and creative ability can be improved. This article also provides specific instructional design cases based on the "Web Page Layout and Beautification" module and provides specific teaching design cases.

Keywords: project-driven; flipping classroom; instructional design; case;

1. Background of the study Heading

The "Web Design and Production" course is an important professional foundation course for undergraduate computer majors, and it is also a theoretical and practical course^[1]. With the rapid development of Internet technology, new platforms such as mobile Internet have grown, and the development concept and technology of web front-end have undergone major changes^[2]. In order to comply with the development of technology, close to the needs of enterprises for talent quality, the content of the course must be kept up to date, and the objectives of the course should be upgraded to a website that meets the W3C norms, has

commercial development characteristics, and achieves enterprise-level application level. In order to accomplish the teaching objectives in the same class, the curriculum reform is imperative.

2. Putting forward a question

Using the knowledge network search keyword such as "web design" or "web front-end development" or "web front-end development", there are a large number of articles related to educational reform. At present, there are several popular teaching methods, for example, problem-based teaching methods, task-driven methods, and project-driven methods. The task-driven teaching model is based on constructivist learning theory and diversified learning theory, making students to be driven by tasks to continuously explore and solve tasks and ensure the diversified development of students. The task-driven approach is mainly based on the task-oriented, teacher-led, student-centered teaching model^[3]. The PBL (Problem-Based) pedagogy focuses on "problems" and "learners" and combines various teaching concepts such as "self-learning", "inquiring learning", "cooperative learning", and "group discussion"^[4]. The project-driven teaching method is a type of teaching activities based on the project, which is implemented to combines students' learning activities with actual projects and make teachers and students jointly study and implement a specific project. And it is a teaching model that encourages students to actively participate, collaborate and innovate^[5].

These three methods have received certain teaching effects, which emphasize that teachers should improve students' ability of self-learning and solving practical problems in the actual operation, but they also have the following problems:

2.1 Limitations of the method

The three methods have different focuses on the solution of knowledge points in teaching, and cannot solve all the problems encountered in teaching. For example, project-driven teaching is suitable for the case of multiple knowledge points. A project is divided into several sub-projects, which are completed by the group students, but each sub-project can be driven by questions or by task. For example, in the project of designing a pure HTML5 video player, it is complicated in the steps to setting the appearance of the player for a beginner. But it is easy to understand, and it can be completed by the students themselves by the way of task-driven method; However, the player's custom control bar needs to be set using JavaScript's pause() and play() methods, currentTime and volume attributes. It is necessary to organize the teaching based on PBL.

2.2 The depth and breadth of knowledge

In the implementation process of the three teaching methods, the teachers speak relatively little, that is, at the beginning of the class, some new knowledge points or relevant resources will be explained according to the requirements for the students to self-learn, which aims to help students carry out follow-up self-investigation and left most of the time to students to practice, which leads to the improvement of students' knowledge and practical ability. However, it is difficult for students to have a deep understanding of the knowledge. At the same time, in order to complete a problem, task or project, most of the non-coherent knowledge content is taught in units, which is easy to fragment the knowledge points and lack knowledge relevance. It is impossible to achieve systematic and in-depth study, and subsequent learning practices are difficult to implement effectively.

2.3 Teaching efficiency and teaching effect

All three methods require students to have high information literacy, thoughtful thinking and self-consciousness in learning. It is easy to get lost when students are finding resources. At the same time, there are problems such as discarding the false information and retaining the true information and effect verification, which will lead to that teaching and learning task may not be completed in a limited class. At the same time, task-driven or project-based teaching will fragment knowledge and not cover all knowledge. Students just complete tasks, and innovative applications will not be discussed.

In response to the above problems, the "Web Design and Production" course can use the project-driven flip classroom teaching method, and make full use of the three time periods -before, during and after the class, to effectively combine a variety of teaching methods to solve problems.

3. Research methods

3.1 Literature law

Reading, analyzing, and collating relevant literature materials on topics such as flipping classrooms, blended learning, and "project-driven" in China Knowledge Network, providing argumentation basis and research methods for research topics, and clarifying the research direction of the research.

3.2 Action Research

Guided by constructivist learning theory and humanistic learning theory, it uses a variety of research methods and techniques to construct a project-driven flip classroom teaching model.

3.3 Practice method

The teaching model will be constructed using practical teaching to find out the shortcomings and correct them.

4. Purposes of research

Investigate and improve the project-driven flip classroom teaching design model, and provide teaching reform demonstration cases for the practical courses in the computer major.

5. Process of research

5.1 Project-driven flip classroom teaching method

The flipping classroom is a teaching method of "student learning first, teacher after teaching", including three stages before class, during class and after class. The first stage is self-learning of pre-class knowledge, the second stage is to solve problems in class, to promote the internalization and application of knowledge, and the third stage is the evaluation and expansion of knowledge. ^[6]

The project-driven method is a project-based teaching activity which is implemented by providing a complete project. ^[7] The teacher arranges the project tasks, the students understand the project and learn new knowledge, the teacher explains some difficult content, and the student cooperates in groups to complete the project. This teaching method can combine theory with practice, fully explore the creative

potential of students, and improve students' comprehensive ability to solve practical problems.

The project-driven flip classroom teaching method is to mix the project-driven method with the flip classroom teaching, that is, in the whole process of course teaching, the project-driven method is used. In the process of project implementation, the task or problem-driven is mixed to the improve students' ability of knowledge exploration and practice ; In order to ensure the deep breadth and systemicity of the basic knowledge, the use of the flip classroom teaching method not only plays a leading role in guiding, inspiring and monitoring the teaching process, but also fully reflects the initiative, enthusiasm and creativity of the students as the main body of the learning process, which can promote effective teaching and effective learning. ^[8]

5.2 Update and reorganization of the course content

In order to meet the needs of the current talent development system for web front-end development related enterprises, this course teaching system is composed of three modules: HTML, CSS and JavaScript. It needs to be extended to HTML5, CSS3, JavaScript, JQuery and other core technologies and combine with responsive layout. Taking the "Web Design and Production Online Course" website design project as the main line, the course content is divided into nine major modules and 17 projects, including plain text web design, graphic display web design, form web design, canvas web design, audio and video web design, web page layout, responsive web page layout, and design of web pages based on the Bootstrap framework, each project contains the core knowledge points of the course, and the teaching hours are 64 hours.

The following is an example of the "Webpage Appreciation Page" design project in the "Webpage Layout and Beautification" module to explore how to implement a project-driven flip classroom teaching design.

5.3 Analysis of students

The learning objects of the curriculum are 28 students from the second year of the digital media technology major at our university, who have learned one-and-a-half-year professional courses. Therefore, these students have a certain understanding of the courses involved in the major, certain programming skills and preliminary project development capabilities.

The "Web Page Appreciation Page" design project is the course of the eighth week. In the first seven weeks, students have learned the basics knowledge of HTML5 and CSS3 and have carried out some project practices. They have mastered the way of setting tags and properties of HTML5 text, list, image, hyperlink, form, audio and video. Student can also use CSS3 to beautify page elements and rich content of web pages. Meanwhile, students have adapted to the project-driven flipping classroom teaching method, and have clarified the importance of the web front-end course for digital media technology major students. Thus, the purpose of learning is strong, and most of students have strong self-learning ability, interaction and collaboration ability.

5.4 Design of project-driven flip classroom teaching cases

The project-driven flip classroom teaching mode is divided into three stages: pre-class, in-class and after-class. The specific design of the case is as follows.

5.4.1 Before classes

Teachers' and students' activity process before classes is shown below:

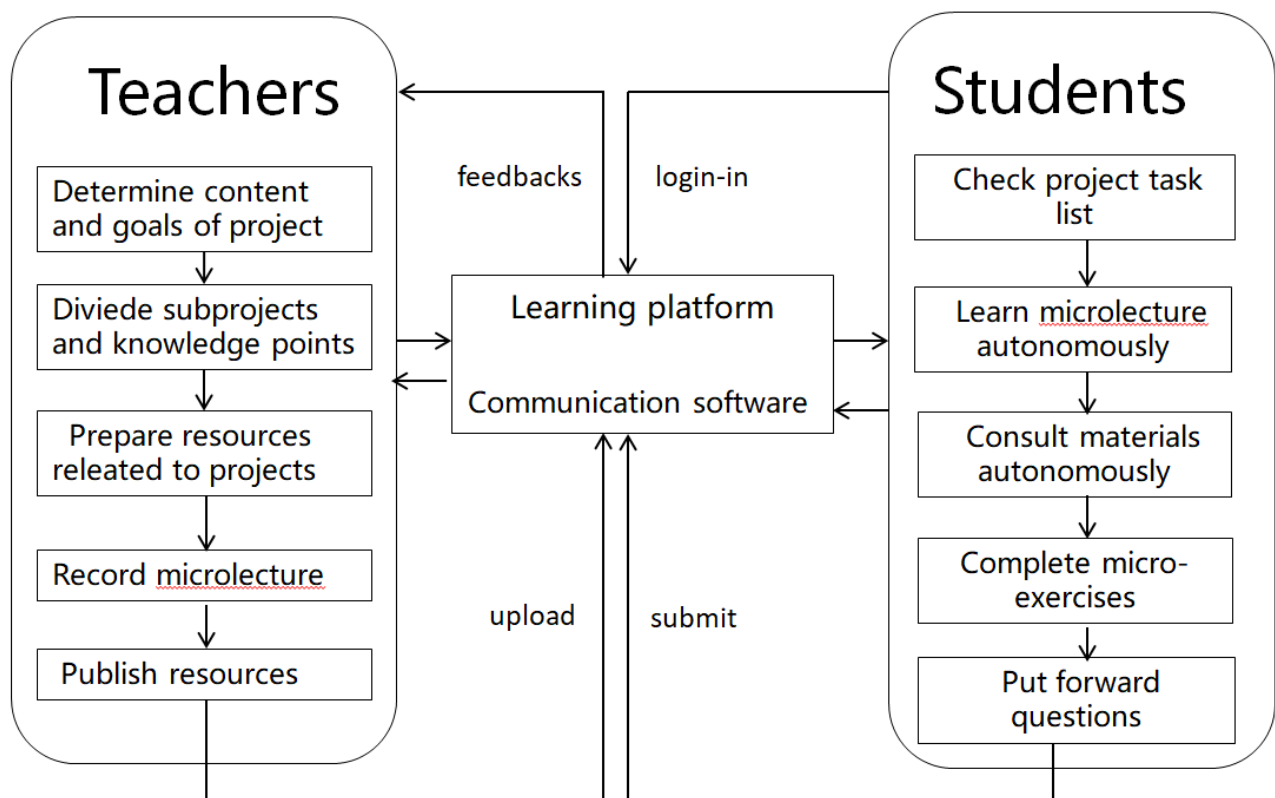


Figure 1. Pre-class teacher and student activity process diagram

1) Determine contents of projects and aims of curriculum

The project of “Web Page Appreciation Page” is the first project in the module of “Web Page Layout and Beautification”, whose main goal is to complete the graphics and texts layout design. The teaching objectives for this project based on the three-dimensional^[9] objectives are shown in the following table:

Table 1. three-dimensional objectives

Aims of knowledge	Master the respective characteristics of the two box models; Use properties of the display to flexibly set inline elements and block elements; Flexibly use div and span to build the HTML part of the webpage; Master the use of “left” and remove floating methods in float; Master the use of “relative” and “absolute” in position; Ability to use float and position to layout pages.
Aims of process and methods	Using the flipping classroom, students learn micro-videos before class. In the class, students work with students and teachers to solve problems. Apply knowledge learned comprehensively to complete the design of the project of "Web Page Appreciation Page" .
Aims of attitudes and value	Cultivate students' ability of communication and collaboration, analyzing and resolving problems. Strengthen students' ability to develop projects and enhance students' self-learning ability and professionalism.

2) Divide sub-projects and knowledge points, select teaching methods

The project is comprehensive and first decomposed into two sub-projects, that is, completing the addition of elements in HTML and the design of mixed layout of graphics and texts. Each sub-project corresponds to multiple knowledge points, each of which corresponds to a different teaching method, such as task-driven, or problem-solving. Its sub-project decomposition, knowledge points and teaching methods are as follows:

Table 2. sub-project decomposition, knowledge points and teaching methods

Name of sub-projects	Knowledge point involved	teaching methods of microlecture
Add elements of web-pages	Standard document flow	Problem-Based Methods
	Box model	Problem- Based Methods
	div and span	Task-driven methods
Layout of mixed graphics and texts	float	Task-driven methods
	position	Task-driven methods

3) Prepare resources relevant to projects

Description of the project task, through the task description, makes the students aware of the effects that the web design must achieve in this project. It can be represented by video or screenshot. Concept map of project knowledge decomposition, analyzes the main knowledge points and skills that must be possessed to achieve this web page effect; microlecture task list, include learning objectives, learning content, self-learning methods, learning reference resource addresses, etc., while leaving space in the task list, students can record the confusion encountered during study or practice on it; micro-video and courseware, according to the knowledge to make teaching micro-video; micro-questions, students can use the questionnaire star^[1], Storyline, etc. to develop micro-study questions, which is convenient for students to do questions and teachers to evaluate in time; semi-structured resources of the project can provide some codes to students. Students write additional code based on project requirements.

4) Recording micro lessons and uploading micro lessons

Produced courseware and recording micro-courses according to the instructional design and uploaded these materials to the learning platform.

5) Students learn independently and summarize questions before class

Students view project task descriptions, clarify project tasks, and know the knowledge points and skills required. According to the learning method in the study task list, learn micro-video autonomously. If a certain part of the micro-course cannot be understood, you can consult relevant resources to supplement the learning, or fill in the confusion encountered in the task list to be submitted to the teacher; the self-learning effect is detected through micro-questions. Through self-learning and testing, the absorption and digestion of learning content is initially completed. The teacher refines the problems discussed and solved in the classroom according to the completion of the micro-questions and the confusion raised by the students in the study task list.

5.4.2 In class

The project-driven flipping classroom is a two-way interactive process consisting of students' learning and teachers' teaching. If merely emphasize the self-study of students and neglect the teacher's teaching, the learning effect is not guaranteed.^[10] Because the most beneficial changes to student learning are still in class activities, therefore, it is necessary to carefully design classroom teaching activities, including effects check, communication, explanation - guidance, inquiry, supervision, and answering questions.

The process of activities of teacher and students in the lesson is shown below:

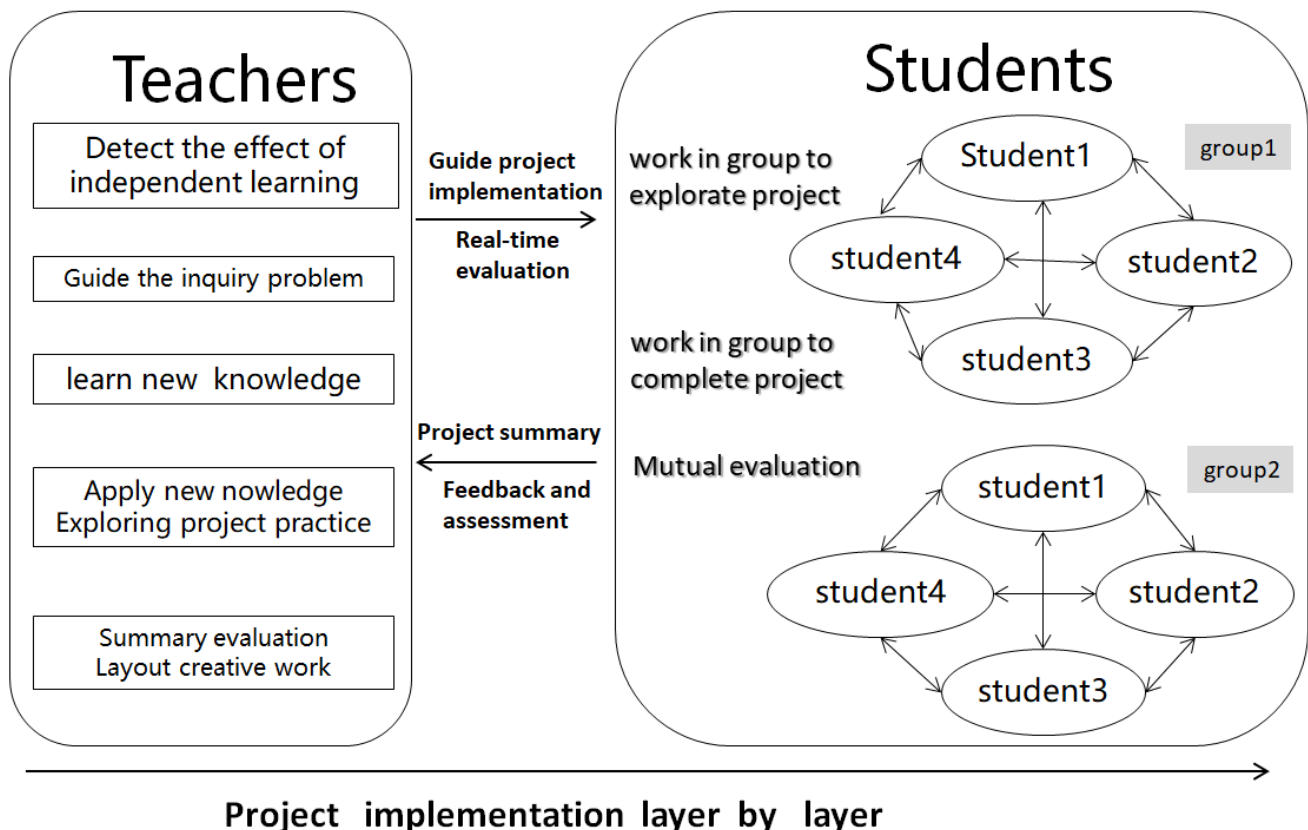


Figure 2. In-class teacher and student activity process diagram

1) Detection of learning effect and problem exploration

In the classroom, students are required to sort out the basic knowledge in the microlecture in the form of concept maps, and ask questions to strengthen students' understanding of design concepts and grammar rules. According to the description of the project task, initially determine the project implementation plan and report it to the teacher for review; the teacher summarizes the confusion that the student feed back in the study task list and the answer to the micro-questions, proposes common problems, organizes student inquiry based on the implementation of the sub-project, and promotes the internalization of knowledge.

2) Learn new knowledge and conduct project practice

In the implementation process of the sub-project, new problems will arise. For example, in this project, it is needed to design a list-based web page rendering area with a border effect, however it is found that the border effect is not achieved after add statements that border: 2px solid #8f8f70; according to the existing

knowledge. Therefore, it is necessary to explain new knowledge and analyze the reason using problem-driven methods. Because it is affected by the floating of the child element, the parent element without the height cannot adapt to the height of the child element, it becomes a straight line; then provide a solution, use the overflow attribute to clear the float, that is, set the parent element overflow attribute value to auto or hidden, then can solve the problem. By this way we can guide students to deep and comprehensively think about problems and broaden the breadth of knowledge.

3) Real-time recording and evaluation

The teacher checks the implementation at regular intervals and forms a file recorded in real time. After the students submit the homework in the classroom, the group will conduct mutual evaluation. Each group of responsible student will demonstrate the characteristics of the group project, list the puzzles. If the problems have been solved, students should share the solutions, and if the problems are unsolved, students should discuss them in the class. Finally, the teacher summarizes and reviews and arranges creative work.

5.4.3 After classes

Teachers gather questions after class and build a knowledge and skills application system. The teacher will conduct a detailed examination of the project assignment submitted by the student, and answer the common problems existing in the voice or screen recording in WeChat or QQ group. When individual students or groups are not doing well, teachers should provide supplementary study tasks and urge them to study again and complete the project as required. At the same time, according to the characteristics of each student or each group of webpage design, the task of expanding the target is proposed, and finally the effect of each characteristic project webpage is formed.

6. Summary and thinking

After the "Web Design and Production" course of digital media of grade 2017 is implemented based on the project-driven flip classroom teaching reform, the students' project development ability, communication and collaboration ability, self-learning ability and innovation ability are obviously stronger than other classes that have not implemented the teaching reform, especially in some platform development competition such as the computer design competition of national college students, students can use the existing web front-end project development experience to design smart and exquisite pages, adding a lot of points for the development of the entire platform.

However, reform is a complex and systematic innovation project. It requires support from advanced teaching theory and technological practice that keeps pace with the times. And teachers need to spend more energy and make more efforts. When designing micro-courses, teachers must skillfully design the content and activities of microlectures to enhance the efficiency of students' self-learning. At the same time, they should not rely too much on certain platforms, classroom teaching is still the core, and all kinds of teaching activities must be carefully designed. Teachers properly set doubts, processes of teaching should be progressive; effective guidance and organization, real-time communication and evaluation are necessary; expansion tasks should be set up cleverly, this is the only way to truly promote the internalization and

application of students' knowledge, and promote the effective learning of students.

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