

Exploration of Course Teaching Methods based on PDCA Cycle Theory

-- Taking the Course of E-commerce System Analysis and Design as an Example

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Abstract: To ensure the implementation of the student-centered teaching philosophy and to improve the effectiveness of offline teaching through the use of information technology, this paper takes the teaching of the course "Analysis and Design of E-commerce Systems" as an example to explore the teaching design method under the guidance of PDCA theory. Practice has shown that the application of this theory can improve the quality of teaching to a certain extent.

Keywords: PDCA Cycle Theory; E-commerce System Analysis and Design; Superstar Learn.

1. Introduction

The PDCA cycle is a scientific method proposed by American quality management expert Walter A. Shewhart to strengthen quality management. It was popularized by William Edwards Deming and is also known as the Deming Ring. It consists of four stages: Plan, Do, Check, and Act, and can be used for the management process of all types of work [1][2][3]. Teaching is a job that places great emphasis on quality objectives. Modern teaching is not only about transmitting knowledge to students, but also about how to effectively convey it. In teaching arrangements, the PDCA theory can be applied to reasonably control the teaching process and promote a more effective virtuous cycle. Due to the development of advanced teaching technology, the support of many online teaching devices has made course design more flexible. The traditional teaching method has certain limitations in implementing PDCA, and the reasonable use of information technology can help to maximize its effectiveness.

2. Course Analysis

"E-commerce System Analysis and Design" is an integrated course that is based on almost all the courses in the previous course, including Introduction to E-commerce, C Language, Web Design, Computer Networks, etc. It analyzes and designs systems based on the characteristics of e-commerce [4][5]. If the previous course is well studied, the deeper the understanding of the requirements of e-commerce systems and the clearer the implementation process. The course is aimed at students majoring in e-commerce, which is an interdisciplinary field that combines knowledge

foundations in management and computer science. Due to the fact that the training direction is not limited to programming and development, students are not as solid in technology as computer science students, and their understanding of logical content is somewhat difficult, making it difficult to ensure learning outcomes. But if students master this course well, they can directly connect with positions such as product managers and demand analysts when applying for jobs in the future, which has important practical significance.

3. Platform Selection

Choose Superstar Learn as the main implementation platform, publish tasks and execute learning processes, recommend learning resources from other platforms such as MOOC and Bilibili in Chinese universities, for students to learn and consolidate independently outside of class. At present, there are many online teaching platforms available, such as Superstar Learn, Wisdom Tree, Rain Classroom, etc., each with its own advantages [6][7][8]. However, if too many platforms are used simultaneously, it is easy to confuse students. Moreover, the use of technology can only serve as an auxiliary means. What is more crucial is to consider how to design courses, apply technology reasonably, and play a greater role. In order to ensure uniformity and learning effectiveness, this course chooses a platform as the main implementation platform. Superstar Learn is one of the earliest platforms to carry out online teaching, and its functions are constantly improving. Students are also familiar with it, so it is chosen as the main implementation platform.

4. Construction Process.

Table 1. PDCA Planning

Step	Task
Plan	Identify the knowledge points of this lesson, set exercise questions, find suitable materials, and choose the teaching method.
Do	Implement plans through classroom teaching and Superstar Learn.
Check	Pay attention to collecting feedback during the learning process.
Action	Analyze the feedback situation and problems, identify the reasons, consolidate in the next class, and adjust the course design.

Taking the first section of Chapter 3 (Use Case Diagram in UML) as an example, we introduce a complete course design process, which has a certain representativeness. The course content and PDCA method are combined to arrange the tasks in each stage of PDCA, and this process should form a cycle. This method is also an important method for teachers to iterate themselves. The PDCA planning of this course is shown in Table 1[9]

4.1. Plan

For design courses, understanding and being able to do are completely different things. Practice leads to true knowledge,

and the point where students cannot draw by hand is the key point on the road to receiving knowledge. In the course design, it is necessary to strengthen students' hands-on activities, provide them with opportunities to exercise at any time, accumulate knowledge step by step, and avoid situations where they are overwhelmed. At the same time, it is necessary to listen to the feedback of students at all times. On the one hand, we can understand the effectiveness of teaching, and on the other hand, we can stimulate students' classroom enthusiasm. The content of this course is broken down, and the specific teaching process is shown in Table 2.

Table 2. Teaching Process Design

Teaching Link	Teaching Content	Teacher's Activities	Student's Activities	Design Intention
(1) Lead-in	Review the development process, role, and constituent elements of UML. Inspire students to understand the preliminary work of system development through the example of building a house.	Review content and examples through PPT presentation.	Recall the content and role of each part in the diagram of UML composition. Participate in the exchange of ideas on the imported examples.	Enable students to understand the role of use case diagrams in UML and enter the learning process.
(2) Teaching	Role of Use Case Diagram	The function of use case diagram is introduced through PPT presentation and examples.	Understand these functions and be able to integrate them with real-world systems.	Enable students to understand that different diagrams in UML have different functions and can be distinguished from each other.
(3) Teaching	Elements of Use Case Diagram	The composition of use case diagram is introduced through PPT presentation and examples.	Understand the composition represented in the diagram and have a preliminary understanding of the form of the use case diagram.	Enable students to have a preliminary understanding of the form of use case diagrams, which will facilitate further learning of each section.
(4) Teaching	The relationship between executors	Introduce the executors in the use case diagram through PPT and examples.	Understand what the executors are and the generalization relationship between them.	Enable students to understand one of the constituent elements of a use case diagram.
(5) Practice and Interaction	How to represent the generalization relationship between executors	Introduce the question requirements.	Think and draw an optimized use case diagram.	Deepen students' understanding through practice.
(6) Teaching	Three types of relationships between use cases	Introduce use cases and their generalization, inclusion, and extension relationships through PPT presentations and examples.	Listen and understand the use cases, and the differences between the three relationships between use cases.	Enable students to understand the second constituent element of a use case diagram.
(7) Teaching	The Relationship between Performers and Use Cases - Association	Introduce the relationship and representation between performers and use cases through PPT.	Listen and understand.	Enable students to understand the three constituent elements of a use case diagram.
(8) summary	All of the above content	String the knowledge taught over.	Listen and review.	Summarize the content of this lesson.
(9) homework	Analyze the use case based on the description.	Introduce the homework requirements.	Complete the homework.	Consolidate and absorb the knowledge in this section.

4.2. Do

Execute teaching activities according to the plan and control the progress of the course. In addition to the main content taught by the teacher in the classroom, methods such as selecting students, asking questions, and classroom assignments can also be designed to enhance teacher-student interaction.

4.2.1. Classroom Teaching

Execute the teaching according to the plan, pay attention to comprehensive and focused explanations during the teaching process, control the teaching speed, and observe student reactions at any time. When explaining theoretical knowledge points, it is important to use examples to vividly help students understand the content.

4.2.2. Quick Answer and Candidate Selection Activities

Asking questions for students to answer can stimulate their enthusiasm. In situations where students lack initiative, use the selection activity of Superstar Learn to randomly select students to answer classroom questions. In the introduction section of this lesson, the teacher introduces the example of building houses to inspire students to understand system design and encourage them to put forward their own perspectives and opinions.

4.2.3. Classroom Exercises

Classroom exercises can be appropriately assigned when teaching key points. The exercise in this lesson is to draw a UML use case diagram. Students can directly draw it on paper, and after drawing it, they can learn to chat in groups, take photos, and publish it. This can not only motivate each other's enthusiasm, but also intuitively reflect on the problem-

solving ideas of other students. For beginners, drawing on paper is more effective in mastering knowledge points than using software to draw. It is more solid and can recognize key points in details.

4.3. Check

The "cramming" teaching method is no longer suitable for the current needs of students, and more attention should be paid to student experience and feedback. We can obtain student feedback through various methods such as online and offline interaction.

4.3.1. Classroom Feedback

In the classroom, it is necessary to arrange teaching and interaction time reasonably, and in addition to completing the teaching, we should obtain student feedback through certain means. Students can provide feedback at any time during the listening process, and the group chat in Superstar Learn have the same function with and QQ group and can also provide feedback at any time. Through these methods, we can understand the mastery of students and potential problems that may arise during the teaching process, in order to solve problems and achieve better classroom outcomes.

4.3.2. Voting Activities

After explaining some complex knowledge points, student feedback can be obtained through simple methods such as voting, and subsequent teaching tasks can be carried out based on the feedback, so that teachers have a clear understanding. If most students do not understand, they can further explain the difficulties according to the situation.

4.3.3. Homework

Another way is to check the completion of assigned homework. The homework is designed based on the key knowledge points of this lesson, which can effectively assess the student's mastery level. By publishing assignments on Superstar Learn and setting a deadline of three days for submission, students can seize the opportunity to consolidate their knowledge. Evaluation can be conducted through mutual evaluation between students and teachers.

4.4. Action

Summarize and analyze the progress of the course through statistical analysis of all data during the execution process. Charts and data can clearly and objectively reflect the results. In this lesson, students have a good grasp of the basic elements of use case diagrams, but a general understanding of the identification of generalization and inclusion relationships between use cases. In the course design of the next class, the problematic parts should be strengthened first, and considering that students are the source of spring enrollment, this course has certain difficulties. It is possible to appropriately reduce the difficulty in subsequent course case designs to avoid dampening student enthusiasm and affecting learning outcomes.

5. Conclusion

Applying PDCA theory to course design makes course design more organized. Through the application of this theory, this course can clearly experience a smoother course order and a significant improvement in teaching effectiveness.

5.1. Key Points in Course Design

The key to course design is to highlight the characteristics of the knowledge points. Each course has different

characteristics, and each part of the course also has different characteristics. Different teaching methods should be set according to the characteristics of the knowledge points, and different online teaching activities should be selected. For example, the content of drawing design can be uploaded on-site, and cases can be discussed and demonstrated in groups.

5.2. Difficulties in Course Implementation Recommendation

No matter what online method is used, it is impossible to fully obtain genuine feedback from students, and the course design can only take into account the effectiveness of most students, which will have an overwhelming impact. In addition, online feedback has a herd effect and cannot fully stimulate students' independent thinking ability.

5.3. Innovation Points in Course Effectiveness Achievements

Under the guidance of PDCA theory, online courses have progressed more smoothly. On the one hand, in course design, there is a more directional approach, no longer like keeping a journal, where everything is calculated; On the other hand, it is easier to identify the problems in the execution process, which facilitates the improvement of classroom teaching methods and is conducive to achieving better teaching results and improving teaching quality.

5.4. Key Points in Course Improvement and Promotion

The first point is that various software tools are auxiliary to teaching activities. It is necessary to distinguish between primary and secondary, and not put the cart before the horse, blindly going online for the sake of online learning. Content oriented, supplemented by methods.

The second point is that the setting of online activities should be reasonable and effective, with a purpose-oriented approach. By providing feedback on the rationality of the execution results, it must not be a blind accumulation of technology.

The third point is that PDCA is a cyclical theory, and each course design is not independent, but progressive in sequence. It is important to grasp the core value of the method.

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