Research on MOOC-based Blended Learning of Programming Language Course

Xiaofang Zhang, Xiaotao Huang, Fen Wang and Xia Cao

ABSTRACT

With the continuous development of information technology in colleges and universities, the emergence of MOOC has changed the teaching methods of teachers and the way students learn. This provides a new development opportunity for blended learning. The MOOC-based blended learning mode is constructed. The learning mode relies on the MOOC platform to mix online learning and classroom learning, including pre-analysis, learning activity design, and learning evaluation design. Through two years of teaching practice, good results have been achieved in the teaching of Visual Basic Programming course.¹

INTRODUCTION

With the rapid development of educational theory and computer science and technology, modern educational technology is changing people's ideas and has a major impact on the development of education. The concept of blended learning combining traditional learning with digital learning has emerged. The so-called blended learning combines the advantages of online learning with traditional classroom learning. In the learning process, it not only plays the leading role of teachers, but also reflects the subjective status of students[1].

The effective development of blended learning is inseparable from the perfect online learning platform and high-quality online courses[2]. As a new online course format, MOOC has the following advantages: (1) complete teaching link and functional design; (2) unique resource presentation; (3) instant learning feedback

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and mutual evaluation system; (4) Facilitate the collection of educational data. These advantages have injected new vitality and vitality into the blended teaching.

In 2016, we developed VB.NET Programming MOOC course and launched it on the website of the Chinese University MOOC in March 2017. MOOC online teaching is a great complement to classroom teaching. With MOOC resources, we have selected several classrooms for blended teaching.

**BLENDED LEARNING DESIGN PROCESS**

MOOC-based blended learning focuses on the construction of learning activities, emphasizing the leading role played by teachers in learning activities and highlighting the subjective position of students. The main idea is to combine traditional classroom teaching with MOOC-based online learning to stimulate students’ enthusiasm for learning and improve the efficiency of teaching and learning.

Josh Bersin believes that the design of blended learning should include four basic steps[3]: (1) identifying and defining learning needs; (2) developing learning plans and measurement strategies based on learner characteristics; (3) the basic facility is to determine whether to develop or purchase learning content; and (4) to execute the plan, track the process, and measure the results. Based on the existing blended learning design process, a blended learning design flow based on MOOC is proposed, as shown in Figure 1.

![Figure 1. MOOC-based blended learning design process.](image-url)
PRE-COURSE ANALYSIS

Teaching Objectives Analysis

Determining the corresponding teaching objectives plays a decisive role in the blended learning. Only under the guidance of the teaching objectives can the teaching activities be carried out smoothly and effectively. Similarly, in the teaching design of blended learning, it is also guided by the teaching objectives to ensure the smooth development of learning activities.

The Visual Basic Programming Language Course is an important computer technology foundation course for our medical and liberal arts majors. The goal of this course is to enable students to master the basic concepts of object-oriented programming, basic theory and programming ideas, programming methods and commonly used algorithms, to develop students' ability to use Visual Basic language for independent programming.

Learner Analysis

The programming course requires students to have strong abstract thinking and logical thinking ability, but also needs to master the theoretical knowledge of programming and more grammar rules. For non-computer majors, especially liberal arts undergraduates, it is difficult to learn. After the students finish the course, they have lower ability to use the knowledge they have learned to solve practical problems.

Learning Content Analysis

The analysis of learning content is the basis for formulating teaching strategies and is an indispensable part of the whole blended learning design. In MOOC-based blended learning, the learning content includes both textbook materials used in teaching and related curriculum resources on the MOOC platform, including video materials, courseware, and background materials. The learning content also has a certain hierarchical structure. The teaching design field often divides the learning content into three levels: curriculum, unit and knowledge point. The analysis of the learning content is mainly divided into the following steps: refine the course content into unit content; refine the unit content into specific knowledge points; and clarify the knowledge types of each knowledge point. According to the Bloom Teaching Objective Classification (2001 revision), the knowledge types are divided into four categories from concrete to abstract: factual knowledge, conceptual knowledge, procedural knowledge and metacognitive knowledge.

Due to space limitations, only the first section of Chapter 4 on the textbook, "Object-Oriented Basic Concepts", is used as an example to analyze the learning content and teaching objectives. The results of the analysis are shown in Table I.
TABLE I. LEARNING CONTENT AND OBJECTIVES ANALYSIS.

<table>
<thead>
<tr>
<th>Learning content</th>
<th>Knowledge point</th>
<th>Knowledge type</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object-oriented basic concepts</td>
<td>What is object and class</td>
<td>Factual knowledge</td>
<td>Understand</td>
</tr>
<tr>
<td></td>
<td>Three elements of the object</td>
<td>Conceptual knowledge</td>
<td>Know</td>
</tr>
<tr>
<td></td>
<td>Setting of attribute values</td>
<td>Procedural knowledge</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td>Method call</td>
<td>Procedural knowledge</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td>Event procedure</td>
<td>Procedural knowledge</td>
<td>Apply</td>
</tr>
<tr>
<td></td>
<td>Event driven</td>
<td>Factual knowledge</td>
<td>Understand</td>
</tr>
</tbody>
</table>

LEARNING ACTIVITY DESIGN

Learning activities are the sum of the operations performed by learners and their associated learning groups to achieve specific learning goals. Learning activities are the main part of teaching activities. The design of learning activities directly affects the overall teaching effect. In the blended learning design based on MOOC, the design of learning activities must combine the functional characteristics of the MOOC platform and design different types of learning activities according to different contents.

In the MOOC-based blended learning, the following types of learning activities can be comprehensively used: classroom lectures; reading; collaborative learning; self-directed learning; discussion and exchange; case analysis; information collection; problem solving; summary reflection[4].

According to the results of the previous analysis, the specific learning activities of the first section of Chapter 4, “Object-Oriented Basic Concepts” are shown in Table II.
TABLE II. LEARNING ACTIVITY DESIGN

<table>
<thead>
<tr>
<th>Title</th>
<th>Object-oriented basic concepts</th>
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</table>
| Activity objectives    | • Understand the concepts of class and object  
                        | • Know the three elements of an object  
                        | • Can set property values through property window and assignment statement  
                        | • Can call an object method in a program  
                        | • Understand the concepts of events, event procedure, and event-driven |
| Activity content       | • Teachers release learning tasks through class discussion groups  
                        | • Students learn about object-oriented theoretical knowledge through MOOC courses  
                        | • Teachers organize “problem solving” activities, requiring students to perform basic operations on objects  
                        | • Students write simple programs to understand the concept of event-driven |
| Activity organization  | • Activity form: self-learning + classroom lecture + problem solving  
                        | • Role Assignment: heterogeneous grouping based on students' understanding of object-oriented  
                        | • Form of results: information collection report, problem solving |
| Activity evaluation    | • Quizzes on the Chinese University MOOC platform  
                        | • Teacher evaluation (student performance in the classroom)  
                        | • Student mutual evaluation (student performance in the group) |

CONCLUSIONS

Under the new situation of the 21st century, the information of higher education has gradually deepened, using information technology and digital resources, relying on the information platform of education to improve the traditional teaching mode. This is the call of the information age and the requirement of the teaching practice of programming courses. In the process of curriculum construction and development, blended learning emerged as a new type of teaching concept, and in practice showed the application value of extreme potential. In the teaching and construction of the Visual Basic Programming course, we conducted a preliminary practice exploration of blended learning and achieved certain results.

ACKNOWLEDGEMENT

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REFERENCES