Research on the Teaching Mode of University Computer Course Based on Computational Thinking in MOOC Environment

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Abstract. As a new online education model, MOOC has the characteristics of large-scale, online, open and interactive. More and more college students become MOOC learners. The paper conducts a case study on the basic computer culture course based on computational thinking, constructs the teaching design pattern and corresponding design template of the university computer course under the MOOC environment, and provides the theoretical framework and practical guidance for the related research of the micro-curricular under the MOOC environment.

1. Introduction

With the rise of the mass open online course (MOOC) in the past two years, more and more college students have become MOOC learners, and more and more research has begun to pay attention to MOOC [1-3]. However, there is still a lack of research on the new teaching model of the practical level that combines face-to-face teaching and online micro-curriculum. More empirical cases are still needed to deepen research in this field. This paper explores the teaching model of the foundation-based curriculum based on computational thinking in the MOOC environment. The first part of this paper briefly describes the teaching design pattern of the Udacity platform and micro-course in the MOOC environment. The second part describes the design of the teaching model based on the computational thinking of the large-based micro-curriculum. Finally, the paper summarize and point out further work directions.

2 Teaching Design Patterns in MOOC Environment

2.1 Udacity Course Platform

Udacity was founded by former Stanford University professor and Google X Lab researcher Sebastian Thrum. The course covers computer science, mathematics and physics[3,4]. Udacity's homepage layout is divided into a course platform information introduction area, a course list area, and a website information update area. Udacity's course list area is divided into three types: “primary”, “intermediate” and “advanced” according to the level of learner mastery which Udacity updates the message in the form of a blog.

Udacity's website interface consists of a course introduction, course predecessor skills, course objectives, course syllabus, presenter introduction, and sharing process. A separate wiki page is set up for each course in the Udacity course platform. The wiki interface mainly stores the download address of the micro-course instructional video, the core content of each unit in the course, and the text version of the practice assignments and related supplementary materials provided by the course participants. The use of the Wiki interface allows learners to quickly browse the course structure of the entire course and the relevant content of each unit, providing a good support for learners to understand the course of the course
and the current position of the course. An independent course forum is provided for each course in the Udacity platform for learner questions, teacher questions and announcements, and communication between teachers and students, students and students. The posts in the course forum can be sorted according to the chronological order, the popularity and the number of support orders, and the home page of the course forum displays the number of readings and replies for each post, supports voting and can add corresponding tags.

2.2 Micro-Course Design Based on Udacity Platform

Video resources in traditional online courses are often taught as the only method. In the Udacity micro-course video, the lecturer will use a lot of teaching strategies, such as problem guidance, case explanation, and constitutional interviews to guide students to learn[5,6]. In the process of recording video, the lecturer will also use the corresponding media expression in the video according to the needs of the teaching content and the use of teaching strategies. The design of the learning evaluation mainly includes the classroom exercises (Quiz) interspersed in the micro-course video and the homework after the classroom learning (Homework). In the process of self-learning, the video course content and the classroom connection are seamlessly connected. After reading a micro-course video, complete an exercise. Communication and interaction between teachers and learners and learners. In the case study, it is mainly done by the course forum and social networking tools. Among them, the curriculum forum is independent. The learners can raise their own questions and get responses from their peers or teachers. They can easily solve the difficulties encountered in the study and enhance the learners' motivation.

2.3 Design of Micro-Course Teaching Mode Based on Udacity Platform

The instructional design pattern of the curriculum is a guiding framework and implementation basis for the specific design, development and implementation of a type of curriculum [7,8]. MOOC originated from the network open course. We draw on the open education curriculum teaching design model, guided by the design principles of the micro-curriculum under the MOOC environment, and construct the micro-course design mode in the MOOC environment. The open-education course teaching design mode is shown in Figure 1. It includes seven aspects: student analysis of learning needs analysis, set learning objectives, teaching resource design, teaching process and support service design, learning evaluation design and course design Management issues. Among them, learning analysis learning needs analysis, setting learning objectives, analog course content is the basis of the entire teaching design, is the premise of resource design, service design and evaluation design; teaching the three parts of resource design, teaching process and support service design, and learning evaluation design are the main body of instructional design. The management problem of curriculum design not only regulates the design and implementation of the teaching, but also provides and services for each link and provides a stable operating environment.

3 Design of University Computer Course Based on Computational Thinking in MOOC Environment

As a basic skill and universal thinking method, computational thinking will guide computer educators, researchers and practitioners to promote social change not only in the computer field, therefore, in the university computer culture foundation course, the relevant micro-curriculum, which is dominated by computational thinking is important.

3.1 Determine the Teaching Objectives

The Computational Thinking Micro-course is to hope students to understand the basic courses of computer culture in colleges and to develop the development of students' knowledge and ability, so that
teachers and students realize that learning computer science courses is based on learning basic operational skills, and more importantly, mastering the use of computer science and technology. The process of finding and solving problems. The overall teaching objectives of the computational thinking curriculum are: to enable students to master the basic concepts of computational thinking; to calculate the core components of thinking; how to develop computational thinking skills in daily learning and teaching. The aim is to enable freshmen who are new to the university to master the development trend of computer science education, the core concepts of computational thinking, and the ways in which they can develop computational thinking.

3.2 Analysis of Teaching Content

The analysis of teaching content is based on the analysis of overall content and the division of teaching content. Therefore, the teaching content of the computational thinking micro-curricular in the MOOC environment is divided into [6]:

(1) Graph theory and social network
The course will begin with the discussion of the structural characteristics of the network and enter the social network analysis theme, including the introduction of the classic concepts of "weak relationship advantages" and "structural balance" in sociology, as well as large-scale implementation with computer technology support. Relevant methods and results of empirical research on online social networks.

(2) Game theory basis
In addition to the rich social meaning of structural features, the interactions of entities interconnected by networks are subtler and more colorful. The mature technical tool that portrays the interaction of these behaviors is game theory. We will discuss the examples through examples, including the nature of different auction forms, as well as some paradoxes that appear in the network traffic model.

(3) Market and strategic interactions in the network

![An Open Education Curriculum Teaching Design Model.](image-url)

Figure 1. An Open Education Curriculum Teaching Design Model.
The interaction between market participants can naturally be seen as a phenomenon that occurs in the network. Through network modeling, we discuss the relationship between the individual's position in the network structure and its trading ability. Through this discussion, students can feel the context of graph theory and game theory in the analysis of network behavior.

(4) Information Network and World Wide Web

Students should already have a general knowledge of the Internet and its applications. Here we will discuss the macro image of the World Wide Web as a network, how search engines use the relationship between information to rank pages, and the market mechanism for pricing of search engine ad slots.

(5) Overall model of network dynamics

The network promotes the flow of information (including ideas, beliefs, innovations, technologies, etc.). Here we discuss how the flow occurs in the general sense of the crowd. The so-called "population total" means that the network itself may not be visible (but exists), so that we can only observe the aggregation effect. This section introduces some interesting phenomena, including the cascading of information, the turning point of product success in the network, power law, long tail and Ziboff’s law.

(6) Structural model of network dynamics

This section discusses how things spread across the network when you understand the details of the network structure. The so-called "things" include information, behavior, and diseases. The small world phenomenon and the existence of mitochondrial Eve are the highlights of this part.

(7) Institution and its aggregation behavior

Based on the network and its implicit information dissemination capabilities, we discuss the understanding of the nature of some institutions, which may motivate students to provide new insights into policies in some areas. These will be explained by some classic examples, involving information and market, elections, and property rights.

3.3 The Design of Computational Thinking Micro-Course

The thesis uses the Udemy course platform as the curriculum platform environment for the computational thinking micro-course. Udemy provides a course publishing platform and management tools. After the basic outline of the course is completed, the course publisher can add course resources for each lesson, including video, audio, pdf documents, presentations, texts, compressed files, YouTube, etc. At the same time, Udemy provides the test questions in the editing test, and the answers to the exercises can be set up synchronously. After the learners complete the exercises themselves, the platform will give feedback in time, and the learners can simultaneously see the completion of the questions by other people; In Udemy, the right side of each class's content page will contain a question and answer page, support URL, image, embedded HTML, etc., learners can ask questions or answer other people's questions at any time in this area, teachers can also answer; Question and answer module, the content page of each lesson also contains a note page, the learner can record notes while learning content; Udemy sets up a chat module to allow discussion between teachers and students; the notification module is published by the course publisher Important ways of topic, curriculum or learning requirements. The Udemy Course Editor simplifies the process of creating a course with a step-by-step guide and modular management.

Teaching video design Using PowerPoint software to create basic video content After logging in to the Udemy course platform environment, enter the user course management page, click the "Create a Course" button, enter the course name in the pop-up dialog box, because the Udemy platform base language is In English, the author also names the course in English. Click the "Save and Go!" button to go directly to the course management interface and create a course. Production course

The first time you enter the course management interface, the course platform will automatically jump to the “Getting Start” page to introduce the steps of course production and release, and you can click the corresponding picture to enter the corresponding steps. Udemy course management interface to produce
course content, a total of three steps: the release of the course through the above two steps, the basic teaching content of the calculation thinking micro-course has been completed, and then set the relevant attributes of the release course. (1) Learning rights, Udemy course platform environment provides two kinds of learning rights, one is open, that is, any registered user in Udemy course platform can learn this course, the other is private, that is, learners need Learning can be done through authorization or password verification. Here, the learning permission selection of the thinking micro-curriculum is publicly displayed, and the learning permission is set. (2) Set the price, Udemy course platform environment allows course publishers to establish free or paid courses, here we choose free. (3) Set the teacher, Udemy course platform environment allows multiple people to collaborate to develop the course.

4. Summary

This paper analyzes the micro-curriculum case in the MOOC environment, proposes the micro-course teaching design mode under the MOOC environment, and develops the micro-course in the Udemy environment according to the teaching design pattern and the computational thinking as the theme, teaching the computer course of colleges and universities. The model provides a new perspective on research. With the emergence of MOOC environment and the increasing demand for mobile learning, the design of micro-courses in MOOC environment is a very meaningful research direction. There are still some problems to be solved in practical application. University computer culture based on computational thinking the basic micro-curriculum teaching design pattern and instructional design template are subject to further revision and improvement.

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References