

# A Construction Method of MOOC Courses in Colleges and Universities

Zhihuan Zhang, Zhe-Ming Lu, Longhua Ma, and Chao Hu

**Abstract**—As a new online teaching mode, large-scale online courses have entered people's vision and brought great influence to traditional higher education. According to the preset teaching objectives, subject characteristics, students' cognitive laws and teaching methods, this paper focuses on the core concept of the curriculum and the relationship between teaching content and resources. The content and resources of teaching, teaching design, teaching activities and evaluation, teaching effects and impact, team support and services, information security and intellectual property protection were explored, which can provide reference for the construction of fine online open courses. It can also be used for mixed teaching.

**Index Terms**—The construction method of MOOC course, curriculum design, teaching material, e-learning.

## I. INTRODUCTION

With the development of Internet technology, education has also brought new challenges. The essence of "Internet + education" is to use the educational information technology represented by MOOC (Massive Open Online Course) as a representative to realize the student centered teaching reform [1]. Blended Learning and Flipped Classroom provide a new teaching mode for teachers [2].

According to the presupposed teaching objectives, discipline characteristics, students' cognitive rules and teaching methods, and around the core concepts of discipline and the relationship between teaching content and resources, fragmentation of teaching content and resources, setting up teaching situations, forming a short video module set around knowledge points and clearly expressing knowledge framework [3]. In order to help learners master learning content or test learners' learning effect, homework or discussion questions of embedded test should be set for each module's knowledge points or topics. Each course should be introduced by the person in charge, course introduction, syllabus, preparatory knowledge, teaching guidance, reference materials, assessment methods, online homework,

online question bank and online question answering.

## II. CURRICULUM DESIGN

The characteristics of MOOC Courses are different from those of previous courses, including rich media, modularization of curriculum content and management of learning process.

### A. Rich Media Content

A MOOC Course is a course resource package centered on teaching content, which includes rich media content such as video, audio, books, papers, texts, pictures, animation and so on.

The main content of the course is video, including PPT + audio recording and PPT + audio recording. References and electronic versions of the course are also required. Both students and teachers can read online.

### B. Knowledge Unitization

The organizational form of the course content is no longer in accordance with the class hours, but in accordance with the knowledge unit. Each knowledge unit is an independent course unit, which teaches a specific knowledge point [4].

An independent knowledge point is a knowledge unit. Each knowledge unit contains the teaching video, reference materials, homework questions, examination questions and so on.

Video time for each knowledge unit should be 8 to 20 minutes. The content of each knowledge unit can be transformed into students' learning tasks. Each knowledge unit can set assessment points, including homework, discussion and so on.

### C. Learning Process Management

It has perfect learning process management function, realizes students' autonomous and individualized online learning, video broadcasting, discussion, question answering, homework, examination, evaluation and other functions, and achieves challenging, gate breaking and free learning. At the same time, it provides online and offline mixed teaching support [5].

The course should provide clear teaching objectives and syllabus. The teaching tasks should be formulated according to the syllabus, which can include video broadcasting, reading reference materials, discussion, homework, examination and other types of tasks, and should be selected according to needs.

The curriculum should provide clear assessment methods and standards, which can be divided into knowledge unit assessment and curriculum overall assessment. The MOOC

Manuscript received March 25, 2019; revised July 5, 2019. This work was supported in part by the teaching construction and research project of Ningbo Institute of Technology, Zhejiang University under Grant Number NITJG-201706.

Zhihuan Zhang, Longhua Ma, and Chao Hu are with the Ningbo Institute of Technology, Zhejiang University, Ningbo, China (e-mail: zzh6488@163.com, lhma\_zju@163.com, huchao@nit.net.cn).

Zhe-Ming Lu is with the School of Aeronautics and Astronautics, Zhejiang University, Hangzhou 310027, China (e-mail: zheminglu@zju.edu.cn).

lesson should build question bank for homework and examination. Examination questions include objective questions such as judgment, choice and subjective questions.

#### *D. Course Teaching Design*

We should pay attention to the construction of curriculum connotation, the selection of teaching methods and the selection of teaching organization strategies. We should choose more suitable teaching methods and means to organize teaching according to the different characteristics of curriculum and chapter contents. We should pay attention to the combination of teaching methods and information means, carry out online and offline mixed teaching, pay attention to the effective mixing of systematic teaching and fragmented learning, and improve teaching efficiency and effect. Course design should include online and offline teaching design.

The online part includes the instructional design of online video teaching and the instructional design of online interaction. Among them, the main mode of video teaching should be micro-lesson, focusing on such methods as inquiry teaching, problem-based teaching, discussion-based teaching, interactive teaching, project-based teaching, case-based teaching, task-driven teaching, integration of theory and practice teaching, etc. Online interaction should adopt the combination of online communication, online discussion, online homework, teaching and online examination.

The offline part includes offline homework, offline assessment, project design, research and analysis, face-to-face tutoring and other teaching design. It should pay attention to the consistency with the training objectives of our school and our specialty. The offline teaching team can carry out secondary design according to the characteristics of our students and my teaching style.

### III. CURRICULUM REQUIREMENTS

#### *A. Course Introduction*

Course introduction includes course characteristics, teaching objectives, teaching content coverage, teaching methods and organizational forms, teaching object requirements, textbooks and reference materials, using doc or docx format.

#### *B. Teaching Program*

The syllabus prescribes the teaching content of the course in the form of outline, which should include the teaching purpose, teaching task, the structure of teaching content, the teaching objectives and tasks of modules or units, teaching activities and the basic requirements of teaching methods, and adopt doc or docx format.

#### *C. Teaching Design*

The course design includes online and offline teaching design. The online part includes online teaching video teaching design and online interactive teaching design. The offline part includes offline homework, offline assessment, project design, research analysis and face-to-face tutoring.

#### *D. Teaching Calendar*

Teaching calendar is a specific implementation plan for

teachers to organize online course teaching. It should clearly stipulate the teaching process, teaching content, teaching methods, online and offline homework, etc.

#### *E. Instructional Video*

Teaching videos are recorded in accordance with the teaching unit, requiring sufficient light and quiet shooting environment, proper clothing of teachers, clear speech and clear blackboard writing.

The teaching video of the course should meet the requirements of the teaching mode of MOOC Course. One video is aimed at 1 to 2 knowledge points, the content structure is complete, and the length of one video should not exceed 20 minutes. The content of the course is systematic and complete. The duration of each credit course should be no less than 16 hours, and the teaching video (excluding material) should be no less than 320 minutes.

#### *F. Courseware*

##### *1) Presentation*

Documents are produced in ppt, pptx or PDF format. If the presentation has embedded audio, video or animation, an unembedded document should be provided separately in the corresponding directory. At the same time, the software version description about the best playback effect is provided [6].

##### *2) Webpage courseware*

The web page catalogue has clear hierarchy, concise, accurate and reasonable naming. The title of the content displayed on the current page should be marked on the page. Each page should have a complete label, and the label in each page should indicate the title of the page between the labels, and the same as the title on the page. Relative paths are used for all paths in the web page.

##### *3) Flash courseware*

The beginning of the courseware should have a striking title, which can reflect the content of the courseware. The text should be eye-catching, avoid using the same color as the background color, according to the content of the courseware and the characteristics of the object to determine the overall color and tone. The font size can be adjusted according to the number of words.

#### *G. Teaching Cases and Examples*

Teaching cases [7] must have typical meaning, can explain certain practical problems, format is unlimited, can be used normally through common browsers or software; examples must have typical meaning, and the structure is complete, including at least two parts of the stem, solution process (parsing), format is unlimited, and can be used normally through common browsers or software.

#### *H. Tasks*

Assignments support filling in blanks, single choice questions, multiple choice questions, numerical questions, judgment questions, short answer questions, calculation questions, operation questions, matching questions, discussion questions and other types of questions. In addition to the discussion questions, all types of questions need to support the operation of question bank, support on-line

problem-making, support on-line automatic problem-solving, and support real-time on-line prompting operation. Homework supports on-line writing of topics, integration of various teaching resources into homework, on-line compiling of formulas and tables, and LaTeX system typesetting. The questions are in doc, docx or PDF format, with answers and reference questions.

#### *I. Tests*

Supports interactive testing with video, independent testing and other ways. The test questions meet the requirements of the test objectives and cover the main knowledge points within the scope of the examination. The quantity and difficulty distribution of the examination content should be consistent with the structure of the teaching content [8].

The test questions have certain validity and reliability, and the order must be reasonable; they can not prompt each other, and can not contradict each other. The test supports filling-in questions, single choice questions, multiple choice questions, numerical questions, judgement questions, short answer questions, calculation questions, operation questions, matching questions and discussion questions.

#### *J. Common Problem*

The problems should be typical and universal, and have practical reference value. Questions should include the text, answers, references and keywords.

#### *K. Teaching Resources*

Documents such as national policy documents, laws and regulations, industry norms, enterprise norms, national standards and international standards should adopt the latest official documents [9]. Documents should have practical reference value, relevant requirements of catalogue reference (digital library standards and specifications), version number, release date, publishing unit and use scope should be clear.

#### *L. Practice Resources*

Practice courses must prepare experiments or training or practice resources, and electrical engineering and its automation, automation, machinery, automobile and other professional courses must contain teaching simulation content [10].

The program of experiment or training and practice resources can start and quit normally, the function buttons can work normally, there is no link interruption or error, and there is no obvious technical failure. Single-machine running experiment or training and internship resources can run on Windows XP or higher version. The experiment or practice and practice courseware based on static web pages, or the interactive experiment or practice and practice courseware based on server, must be able to use normally through common browsers, independent of the hardware platform.

#### *M. Link Resources*

Support Http, Ftp, Rtp, Mms and other protocol types of URL links.

Link resources are divided into internal resources, superstar resources, Internet resources and external resources.

#### *1) Internal resources*

Construct the local resource center and store the curriculum resources of colleges and universities according to the prescribed classification to the local resource center. The resource server can be deployed in the prescribed schools, or can be deployed to the super-nebula platform. When the MOOC user initiates a request to the resource database, the user can extract data directly from the local resource server.

#### *2) Superstar resources*

Superstar resource servers are deployed on super-cloud platforms (or mapped to local resource centers). When users request resources, they can extract data directly from local resource servers or super-cloud platforms.

#### *3) Internet resources*

When users need non-above two resources, such as free quality course videos on the Internet, users can save the URL address and add external links to become external auxiliary resources for users to build courses.

#### *4) Third party platform resources*

If users need resources in the third system platform, there are two modes of operation: one is to import and export data; the other is to connect data to MOOC Alliance platform through system interface, which requires system developers to provide data interface.

#### *N. Assessment*

The formative evaluation and summative evaluation are combined in the course assessment. Generally, the formative evaluation is based on the results of online learning, and the proportion is not less than 50%. Summary evaluation can be done online or offline.

Courses requiring certification, assessment methods and assessment requirements need to be filed with the Alliance and examined by the Alliance Expert Committee.

As the basis of credit recognition, schools can organize school-based offline assessment according to the training requirements of their own schools and their majors.

#### *O. Teaching Teams*

Course construction team should be relatively stable, including online and offline teaching support team.

The person in charge of curriculum construction should be a teacher with rich teaching experience and high academic attainments, and the members of the curriculum team should undertake the teaching task for a long time in the front line of teaching. Supporting and encouraging famous teachers and experts to teach open courses. In addition to the main lecturer, it is also necessary to equip the necessary assistant teachers and modern educational technicians to provide long-term online service for curriculum construction, undertake curriculum content updating, online counseling, answering questions and so on. After the formal operation of the curriculum, it can ensure that every school year is open to the outside world. The course team shall be responsible for the training and teaching seminars of the relevant teachers. Through the construction of online open courses, an excellent teaching team with reasonable structure, stable personnel, high teaching level, good teaching effect and strong ability of

resource design and production will be formed.

#### IV. TEACHING MATERIAL

All media materials involved in the course, including links within the course, need to meet the following requirements.

##### A. Textual Materials

Pure text is encoded by UTF-8 or GB18030. Common storage formats are adopted, such as txt, doc, docx, pdf, rtf, htm, html, xml, etc.

##### B. Graphics and Image Material

The number of colors in color image is no less than true color (24-bit color), and the gray level of gray image is no less than 256. When the screen resolution is no less than 1024 \* 768, the scanning resolution of the scanned image is no less than 72 dpi.

Common storage formats, such as gif, png, jpeg, jpg, bmp, etc.

##### C. Audio Material

The pronunciation is dubbed in standard Mandarin, American or British English, with the exception of special language learning and materials. Use a suitable intonation for teaching.

The sampling frequency of music audio is not less than 44.1 kHz, and that of voice audio is not less than 22.05 kHz. Quantization bits are larger than 8 bits and the bit rate is no less than 64 Kbps. Audio playback is smooth, sound clear, low noise, low echo.

Using common storage formats, such as wma, mp3, MP4 or other streaming audio formats, it is recommended that MP3 format be preferred.

##### D. Video Material

Resolution is not less than 320\*240. The image is clear, the playback is smooth and the sound is clear.

Subtitles should use standard words that conform to national standards, without traditional characters, variants or mistyped characters; the fonts, sizes, color collocation, placement, residence time and screen entry and exit methods of subtitles should be appropriate with other elements (pictures, commentaries, music), so as not to destroy the original pictures. Audio and video images have good synchronization, the audio part should meet the quality requirements of audio material [11].

Using common storage formats, such as mp4, wmv, mov, flv or other streaming video formats, it is recommended that MP4 format be preferred.

##### E. Animation Material

The animation color modelling is harmonious, and the correlation between frames is strong. The animation broadcasting process requires smooth, static picture time is not more than 5 seconds.

Common storage formats such as gif, SWF (no less than Flash 6.0) or SVG are adopted.

#### V. QUALITY ASSURANCE

In order to ensure the operation of the alliance and the teaching quality of the course, the alliance set up a special curriculum quality management team to manage the whole course quality of the alliance course. In order to implement the system of curriculum access, course construction needs to pass the project evaluation, the course audit organized by the alliance should be carried out before going online, and the course opening audit should be carried out every semester.

Real-time quality monitoring of online courses, accepting complaints about the content and quality of students, and multi-curriculum evaluation activities such as real-time evaluation of teaching, end-of-class evaluation of students, peer evaluation of experts, etc.

We should pay attention to the follow-up evaluation of teaching effect and carry out teaching research. Based on large data collection and analysis, teachers' teaching and students' learning process, content and feedback are recorded and tracked throughout the course. Individual characteristics and learning behavior of each student are tracked and mastered comprehensively, teaching quality of schools and teachers is improved, and teaching in accordance with their aptitude is promoted.

Give full play to the role of curriculum sharing and promote credit recognition and credit management system innovation of online open courses. Supporting the mutual recognition of online open and shared courses among universities on the basis of cooperation, win-win and agreement. The initial credits of the course are set by the universities that recommend the course. Other universities may decide the credits by themselves according to the professional setting and the standard of course credits setting on the basis of mutual agreement.

#### VI. INFORMATION SECURITY AND INTELLECTUAL PROPERTY PROTECTION

We should strictly abide by the national network and information security management norms, carry out teaching activities in accordance with the law and regulations, implement effective supervision of curriculum content, discussion content and learning process content, and prevent and stop the dissemination of harmful information on the network in a timely manner. Attention should be paid to copyright and intellectual property rights, and the source of materials such as pictures, audio and video used to construct curriculum content should be indicated. Relevant colleges and universities and curriculum construction teams should sign an equal and mutually beneficial intellectual property protection agreement, clarify the rights and obligations of all parties, and effectively protect the rights and interests of all parties.

#### VII. CONCLUSION

This new online education mode makes it possible for the world to share high-quality educational resources on a large scale and make personalized learning possible. This is not only an innovation of educational technology, but also a profound change in educational concepts, educational system,

teaching methods and personnel training process. This paper puts forward some new opinions on MOOC curriculum design, curriculum elements, teaching materials, quality management, information security and other aspects in order to meet the requirements of higher education development. But for such an online learning mode, which is different from the traditional classroom plus laboratory mode, how to carry out practical education to cultivate students' practical ability has become a question for many experts and scholars to think about. In the future, we will continue to study and put forward the reform of experimental teaching methods and establish a new MOOC virtual simulation experimental teaching platform. Students carry out virtual simulation experiments through "MOOC experimental cloud" personalized desktop and virtual platform.

#### CONFLICT OF INTEREST

The authors declare no conflict of interest.

#### AUTHOR CONTRIBUTIONS

Zhihuan Zhang conducted the research and wrote the paper; Zhe-Ming Lu revised the paper; Longhua Ma analyzed the data; Chao Hu checked the paper out; all authors had approved the final version.

#### ACKNOWLEDGMENT

This research was partially supported by Teaching Construction and Research Project of Ningbo Institute of Technology, Zhejiang University under Grant Number NITJG-201706.

This research was also partially supported by Zhejiang Science & Technology Plan Project (Grant No. 2017C35007) and Ningbo Science and Technology Plan Key Project (Grant No. 2016C51004).

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**Zhihuan Zhang** was born at Zhejiang, China. He received a bachelor degree of electrical engineering in 1985 from the Wuhan University of Technology, Hebei, China. In 1988, he received a master degree of automation and computer engineering from the same University, Wuhan, Hebei, and he received a Ph.D. degree of the control science and engineering from the Zhejiang University, Zhejiang, China, in 2002.

He started to work as a teacher in the Ningbo University. Now he is an Associate Professor with the Ningbo Institute of Technology, Zhejiang University in Ningbo, China. His research focuses on the information visualization, robot control, electrical engineering and control systems, intelligent sensor and e-learning material development.

He has authored or co-authored more than thirty research papers, applied more than eighteen patents, and chaired more than sixteen national and industrial research projects.



**Zhe-Ming Lu** was born in Zhejiang province, China, in 1974. He received the B.S. and M.S. degrees in electrical engineering and the Ph.D. degree in measurement technology and instrumentation from the Harbin Institute of Technology (HIT), Harbin, China, in 1995, 1997, and 2001, respectively.

He became a lecturer with HIT in 1999. Since 2003, he has been a professor with the Department of Automatic Test and Control, HIT. He is currently a full professor with the School of Aeronautics and Astronautics, Zhejiang University, Hangzhou, P. R. China. In the areas of multimedia signal processing and information hiding, he has published more than 350 papers, eight monographs in Chinese, one monograph in English and three book chapters in English. His current research interests include multimedia signal processing, information security, and complex networks.

Dr. Lu won the second prize of National Defense Science and Technology of China in 2001, the first prize of the Ministry of Education of China and the award of Youth Science and Technology of Harbin City in 2002. He was the Chairman of Youth Science and Technology Association of HIT from 2003 to 2006. Dr. Lu organized and chaired the invited session titled: Image Compression and Digital Watermarking Techniques in the 7th World Multi-conference on Systemics, Cybernetics and Informatics (SCI 2003), July 27-30, 2003, Orlando, Florida, USA. Dr. Lu won the 100 Most Excellent Doctors in China award for authoring more than 40 papers in the field of vector quantization in 2003. Dr. Lu won the second prize of Heilongjiang Province Science and Technology and the first prize of Heilongjiang Colleges and Universities Science and Technology in 2004. He was elected as the New Century Excellent Talents in Universities of China in 2004. One of his papers was rewarded as the Best Paper Award in KES 2005 and one was rewarded as the Best Paper Award in ICICIC 2006. Dr. Lu won the second prize of Colleges and Universities Science and Technology of Ministry of Education of China in 2006. He obtained the Natural Science Foundation for Outstanding Youths of Zhejiang Province in 2011. Dr. Lu has been a Member of IEICE since 2012. He is currently rewarded with the third prize of Zhejiang Province Science and Technology in 2012 and the first prize of Zhejiang Colleges and Universities Science and Technology in 2013.



**Longhua Ma** was born in 1965. He received the B.S. Degree from Lanzhou Jiaotong University, Gansu, China, in 1986, and the M.S. and Ph.D. degrees from Zhejiang University, Hangzhou, China, in 1993 and 2002, respectively.

He was an assistant engineer with Changzhou Qishuyan Locomotive Factory, Jiangsu, China, from 1986 to 1990. He was a Lecturer with the Department

of Chemical Engineering Zhejiang University, from 1993 to 2001. From 2001 to 2012, he was an Associate Professor with the Institute of Industrial Process Control, Zhejiang University. Currently, he was a professor with the Institute of Automation and Electrical Engineering, Ningbo Institute of Technology, Zhejiang University. His current research interests include system optimization, information fusion, advanced process system theory and application.



**Chao Hu** was born in Ninghai, Zhejiang, China, at December 26, 1960. He got Ph.D degree in Dept. of Electrical and Computer Engineering at University of Alberta, Edmonton, Canada, 2006. He got his BSE degree in Dept. of Electrical Engineering at Zhejiang University, Hangzhou, China in 1982, and MSE degree in Dept. of Optical Engineering at Zhejiang University, Hangzhou, China in 1986.

From 1986 to 2001, he worked as a university faculty member in Ningbo University, Ningbo, China; and became an associate professor in 1996. During 1998, he did his visiting research on “Non-Destructive Inspection Techniques” in Japan. From 2006 to 2010, he worked as a research professor in Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences. Since 2011, he has been a professor in Ningbo Institute of Technology, Zhejiang University, Ningbo, China. He published more than 200 research papers. His research interests are in robotics, computer vision, microcomputer- based test and control systems.

Dr. Hu is a member of IEEE society, a director of Zhejiang Optical Engineering society, and a director of Ningbo Intelligent Manufacturing association. Has chaired more than 20 research projects, and obtained 10 research awards, including “Chinese National S&T Development Award”, and SPIE 2004 Education Award.