MOOCs (Massive Open Online Curriculum)-based Framework of Quality Curriculum Resources Sharing for Local Universities

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Abstract

The construction of quality curriculums is an important part of the national implementation of quality projects. The quality resources sharing is the starting point for China in the promoting the construction of quality curriculums. The sharing of inter-school quality curriculums is of great significance in improving the quality of teaching in local colleges and universities. In the context of MOOCs education, the huge quantities of quality curriculums makes it difficult to manage and share, which is the major issued facing the colleges and universities. Therefore, in order to solve the launch, management and sharing of curriculum resources in quality curriculums sharing, the construction and development of the quality curriculum sharing in local universities should be strengthened. The purpose of this paper is to improve the training quality of qualified personnel for better serving teachers and students in higher institutions, promoting the transformation of teaching concepts in colleges and universities, as well as the reforms of teaching contents and teaching methods.

Keywords: MOOCs Education, Quality Curriculums Resources, Shared Curriculum, Evaluation Model.

1. RESEARCH BACKGROUND

1.1 Literature review

The rapid development of a variety of information technologies, such as the Internet, multimedia information processing, artificial intelligence and cloud computing, have provided solid support for the development of online education. Chen Jining, president of Tsinghua University, said that online education provides a new mode of knowledge dissemination and learning, which will lead to a major change in global higher education. Professors at Carnegie Mellon compared the new wave of online education to a tsunami of technology and education (Guo, 2017). As regards online open education, it has been ten years since the OCW campaign started in 2002, and the effect has been unsatisfied. Until 2013, a new type of open resource model MOOCs aroused strong concern, which leads to hot discussion. At present, the three leading curriculum organization platforms that lead MOOCs are the two profit-making organizations, Udacity and Curriculumra founded by Stanford University, and the non-profit Edx jointly founded by MIT and Harvard University. China's Tsinghua University, Peking University, Hong Kong University of Science and Technology, Hong Kong University and other elite universities have joined Edx platform, while Fudan University, Shanghai Jiaotong University, The Chinese University of Hong Kong and other elite universities have joined the Curriculumra platform. Till May 2016, there are 2145 ordinary colleges and universities nationwide, the vast majority of which are local colleges and universities. In local colleges and universities, most of them are teaching-oriented universities with a few teaching and research universities (Ni and Ying, 2015). For universities directly under the guidance of Ministry of Education, their strong teaching force and quality teaching conditions ensure a high standard of undergraduate teaching. In contrast, the relatively weak teaching resources of local colleges and universities result in obvious shortcomings in terms of teachers, teaching conditions and teaching management, which seriously hampers the improvement of their educational quality. Therefore, it is important for local colleges and universities to improve their teaching quality by communication and sharing their quality curriculum resources with each other.

1.2 Research significance

Corresponding to the shortage of high-quality curriculum resources, the teaching level in local colleges and universities is relatively low. Such colleges and universities are usually located in remote areas, which make it difficult to carry out the construction of a sound curriculum resource sharing with high-level universities.
Especially in the current context of MOOCs education, it puts forward higher requirements for the teaching quality in local colleges and universities. Therefore, it is important for local colleges and universities to improve their teaching quality by communication and sharing their quality curriculum resources with each other (Yang, 2015). Curriculum sharing includes teaching video publicity, mutual-credit-admittance classes and student exchange. According to the scope size, curriculum resources sharing can be divided into three categories: the sharing of curriculum resources within universities, the sharing of curriculum resources within and between regions and the sharing of curriculum resources between different countries or between universities. School-based curriculum sharing can effectively improve the student’s basic knowledge structure. However, there is limited help in improving their professional knowledge (Li and Wei, 2015). Sharing the same or similar professional curriculum among the universities can improve the professional knowledge learning.

2. OVERVIEW OF MOOCS AND QUALITY RESOURCES SHARING

2.1 Concept and development of MOOCs

MOOCs, short for Massive Open Online Curriculums, can spread quality education resources to every corner of the world mainly through information technology and network technology. MOOCs originated in the registration of more than 160,000 people in 2011 in the artificial intelligence curriculums designed by Sebastian Thrun and Peter Norvig. In 2012, the top universities in the United States set up online learning platforms in succession and provided free classes online (Zhou, 2015). In light of the above, several characteristics of MOOCs can be drawn. First, large-scale, that is, a huge number of curriculums and a large number of participants which form the relatively large scale. Second, opening, that is, free learners of different nationalities and different regions can browse these curriculums for free. Third, online, that is, the learners can learn through the Internet. Table 1 shows the comparison between the MOOCs teaching and the traditional teaching methods.

<table>
<thead>
<tr>
<th>Table 1 Comparison of Traditional Teaching and MOOCs Class</th>
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2.2 Connotation of quality curriculums

The quality curriculums refer to the special and first-class teaching level of outstanding curriculums. The construction of quality curriculums should embody the universal laws, such as conforming to science, advanced nature and education and teaching, with modern teaching techniques, methods and means to improve teaching effects remarkably, functioning as demonstration and radiation promotion (Yang, 2015). In short, the quality curriculums are exemplary curriculums featuring first-rate teachers, first-rate teaching content, first-rate teaching methods, first-rate teaching materials and first-rate teaching management. On this basis, the understanding of the connotation of quality curriculums focuses on two aspects. First, quality curriculum lies in its essence of being selected. National, provincial and municipal level and the school-level quality curriculums are selected by level selection. Quality curriculums at all levels should become models for all curriculum construction, guiding other teaching reform and construction and promoting the overall quality of teaching (Fang and Yu, 2014). Selected refers to the advanced teaching philosophy, exquisite educational content, exquisite teaching art, modern educational technology and remarkable teaching effect. Second, quality curriculums focus on being useful. Quality curriculum construction aims to realize the sharing of high quality curriculum resources, in order to achieve the improvement of the overall teaching level. According to the document by Ministry of Education on the construction of quality curriculums, the construction of quality curriculums should be promptly uploaded to the media, which more people can share. The online public
dissemination of quality curriculum construction achievements to realize the sharing of curriculum resources can enable more faculty and students benefit from the resources by enjoying the real quality teaching resources. Therefore, quality curriculums focus on being useful, emphasizing the sharing of quality teaching resources.

3. SIGNIFICANCE OF QUALITY RESOURCES SHARING CURRICULUM

3.1 To promote other quality teaching resources sharing

With the ongoing internationalization and globalization of economic and social activities, the rapid dissemination and sharing of educational resources is of great significance to the improvement of schools, teachers and students. Compared with Western colleges and universities, Chinese university teaching activities are more closed, with the relative lack of shared educational philosophy and campus culture (Tang and Qin, 2014). However, with the successful implementation of the National Quality Curriculums and the development of online video curriculums, the concept of sharing is gaining widespread acceptance and implementation. With the openness of quality teaching resources, a large number of teachers and students in schools with relatively weak teaching and research strengths are exposed to the highest quality teaching resources via the Internet, so as to improve their educational quality.

3.2 To promote overall improvement of teaching quality

Quality curriculum has strong advantages in the teaching staff, teaching content, teaching methods, teaching materials and teaching management, representing the highest level of the related colleges and universities in the curriculum construction (Zhang and Li, 2014). The implementation of quality curriculum sharing has set higher requirements for the construction of quality curriculum, forming powerful impetus to the construction and reform of higher education and the improvement of overall teaching quality. At the same time, the sharing of quality curriculums has played the role of radiation, to promote other schools to make full use of quality curriculum resources, to improve the level of curriculum construction. Ultimately the universities who participate in the sharing of higher education quality can be fully improved. Figure 1 is quality resource sharing curriculum development process.

![Figure 1. Quality Resource Sharing Curriculum Development Process.](image-url)

3.3. MOOCs (Massive Open Online Curriculum)-based framework of quality curriculum resources sharing for local universities

3.3.1 Curriculum structure system

Three-tier structure of browse/server mode of .NET framework is used to constructed the platform, and B/S mode application system at client end is user-friendly for installation and deployment (Zhu, 2014). The three-tiered distributed system concludes the presentation layer, the business logic layer and the data access layer from left to right. These three layers are separated from each other and are independent of each other, which can mutually communicate with each other through an interface. The main functions of these three
levels are as follows.
First, the presentation layer. Users can intuitively see the layer, which is responsible for user interaction with the application system. The presentation layer of the platform varies due to different user roles, for instance, ordinary visitors can access the representation layer which is a series of pages that provide the curriculum resource information, such as curriculum teaching videos, multimedia curriculum and the like, that is, the front page of the platform; the reviewer has access to the front publishing information review page and the front page (Su, 2017). The presentation layer accessed by the system administrator, in addition to the front publishing information review page and the front page, is a series of pages responsible for publishing, managing and sharing the curriculum resource information, that is, the background management page of the platform.

Second, the business logic layer. This level defines all the components related to the business functions of the system, such as front part column management, front navigation management, administrator login management, data sharing, database maintenance and other components. This level runs the execution and interpretation of the page according to the presentation layer request. A request for access to the database will be achieved by collecting the relevant interface of the data access layer (Lou, 2015).

Third, the data access layer. The main function of this layer is to perform operations on the background database, including data inquiry, writing, modifying, deletion and the like. This level defines all the categories and interfaces for database access. Figure 2 shows the curriculum platform system structure of quality resources.

Figure 2. Network Structure Chart of Quality Resource Sharing Curriculum

Three-tier structure of quality network resources sharing platform is inseparable from the campus network and related data standards of digital campus construction (Qi and Cai, 2016). Building a data dictionary of the back-end database of the platform according to a unified data standard can achieve the data sharing between the platforms and other application systems via the campus network, so as to avoid information islands of the campus network.

3.3.2 System framework design

3.3.2.1 Main functions of front user interface

Data acquisition module collects the information that should be displayed in the front, such as pictures, texts and videos, from the database by collecting the corresponding interface in the data access layer and sending the above information to the page display module. Page Display Module receives the information sent by the data acquisition module and displays the above information in the corresponding position of the page template according to the administrator’s requirement, and finally generates a display page for the user to browse.

3.3.2.2 Main functions of background management

System Management Subsystem includes system basic management module, system login management module, data sharing management module, and database maintenance module. Among them, the system basic management module includes system parameter, upload file setting and login log inquiry. The system login management module includes administrator information registration, administrator information inquiry, administrator password modification, auditor information registration, and auditor information inquiry (Lu and Yan, 2012). The data sharing management module includes open external data sharing and open internal data synchronization updating. The external data sharing refers to the sharing of curriculum resource information for other application systems via the campus network, mainly through a server. Internal data synchronization refers
to the updating of other applications via the campus network data sharing. Database maintenance module includes database backup and database restoration. Figure 3 shows the curriculum management organization chart.

![Diagram](image)

Figure 3. Organization Chart of Curriculum Management.

Front information audit subsystem includes audit information inquiry module, information release audit module, audit results for modification module (Li, 2012). The audit information inquiry module is used to inquire the unaudited or audited article information that has been assigned to the auditor; the information release auditing module is used for auditing the information to be released in the front; the auditing result for modification module is used to view the status of the audited information or review the audited information.

4. QUALITY RESOURCES SHARING CURRICULUM SYSTEM EVALUATION MODEL STRUCTURE FOR LOCAL UNIVERSITIES

4.1 Multi-index comprehensive evaluation method

The multi-index comprehensive evaluation currently uses the weight method as the evaluation standards. In order to improve the insufficiency of weights determined by empirical method or regression method, this paper adopts the principal component analysis method of multivariate statistical analysis. After obtaining the principal components of multiple indicators, comparing the size of the value of the main components is used to assess the performance of the evaluated objects.

4.2 Specific evaluation steps

4.2.1 Analysis of main components of model and principles

With regard to the multivariate (index), the complexity of the problem increases rapidly due to the large number of variables. The principal component analysis method is to study how to integrate a plurality of related variables into one or a few comprehensive indexes; the one or a few comprehensive indexes can best reflect the original variables as a multivariate statistical analysis method.

Suppose $A = (A_1, A_2, ..., A_P)'$ is a P-dimensional random vector, the moment method is $E(B)=\mu$, $C(A)=\Sigma$, the basic idea of principal component analysis is to select the constant vector $T$ with

$$T_i^T_i = 1, \ i = 1, 2, ..., p$$

its linear transformation is:
\[
\begin{align*}
B_1 &= T_1A = t_{11}A_1 + \cdots + T_{1p}A_p \\
B_2 &= T_2A = t_{12}A_1 + \cdots + T_{2p}A_p \\
& \vdots \\
B_p &= T_pA = t_{1p}A_1 + \cdots + T_{pp}A_p
\end{align*}
\]

(2)

\[
\text{Var}(B_i) = T_i \sum T_i, \text{Cov}(B_i, B_j) = T_i \sum T_j, (i, j = 1, 2, \ldots, p)
\]

(3)

is obtained.

According to the statistical analysis, the bigger \( \text{Var}(B_1) \) is, the more information \( B_1 \) contains. So, it should obtain \( T_2 \) under the constraint condition (1), so that \( \text{Var}(B_2) \) reaches the maximum, and then \( B_2 \) is called the first principal component. If a principal component is not enough to represent the original the number of \( p \) variables, and \( B_2 \) is used to effectively represent the original variable information. The existing information of \( B_1 \) are not included in \( B_2 \), that is:

\[
\text{Cov}(B_1, B_2) = 4
\]

(4)

So, \( B_2 \) obtained under the constraints (1) and (4) is to obtain \( T_2 \), and \( \text{Var}(B_2) \) reaches the maximum, and then \( B_2 \) is called the second principal component. Similarly the third principal component, the fourth principal component and the like can be defined. Usually, No. \( i \) principal component of \( A \) \( B_i = T_iA \) mainly refers to the maximum value of \( \text{Var}(B_i) \) with the constraint (1) and \( \text{Cov}(B_i, B_j) = 0, (k \leq i) \) to obtain \( T_i \).

From the matrix theory, the No. \( i \) principal component of \( A \), \( B_i = T_iA \ i = 1, 2, \ldots, p \), where \( T_i \) is the corresponding unit eigenvector of \( \mu_i \). At this time, \( \text{Var}(B_i) = \mu_i, i = 1, 2, \ldots, p, \mu_1, \mu_2, \ldots, \mu_p \geq 0 \) is the obtained root of the eigenvalue, \( T_1, T_2, \ldots, T_p \) is the corresponding eigenvector, then it obtains

\[
\mu_i / \sum_{i=1}^{p} \mu_i
\]

(5)

as the contribution rate of the No. \( i \) principal component \( B_i(i-1) = 1, 2, \ldots, p \), the size of which reflects the amount of information of \( A_1, A_2, \ldots, A_p \). The purpose of the principal component analysis is to reduce the number of variables. According to the needs of the problem, the number of \( nP \) principal components instead of the number of \( p \) principal components is used. In practice, the cumulative contribution rate is obtained through the number of \( m \) principal components and let

\[
\sum_{i=1}^{m} \mu_i / \sum_{i=1}^{p} \mu_i
\]

(6)

reach 75% to 85%. Since the first principal component \( B_1 \) has the largest contribution rate \( \mu_1 / \sum_{i=1}^{p} \mu_i \), with the largest amount of information of \( A_1, A_2, \ldots, A_p \) extracted and the strongest comprehensive ability. Therefore, the first principal component is often used as the multi-index comprehensive evaluation in many practical problems.

Of practical problems, the unknown covariance matrix \( \Im A \) needs to be estimated by samples. The sample matrix is

\[
A = (A_1, A_2, \ldots, A_p)'
\]

(7)

Then generally, \( \bar{A} = 0 \) is assumed and \( A \) is standardized by columns. The sample correlation matrix is

\[
G = \frac{1}{n-1} A'A
\]

(8)

Starting from \( G \), feature root of \( \mu i \) and the corresponding eigenvectors of \( G \) are calculated with Jacobi method, so as to obtain each principal component of \( A \):

\[
B_i = a_{i1} \frac{A_1}{q_1} + a_{i2} \frac{A_2}{q_2} + \cdots + a_{ip} \frac{A_p}{q_p}
\]

(9)

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Where, \( T_i = (a_{i1}, a_{i2}, \ldots, a_{ip}) \); \( \bar{A}_i = \frac{1}{n}\sum_{k=1}^{n} A_{ki} \); \( Q_{i2} = \frac{1}{n-1}\sum_{k=1}^{n} (A_{ki} - \bar{A}_i)^2 \); \( i = 1, 2, \ldots, p \)

Since the principal component values are obtained from the differences and correlations of each index, the results should consider the degree of variation of each index and the interrelationship between the performances of each index. Therefore, its information ability of the original comprehensive index values is the strongest, reflecting the objective reality to the greatest extent.

5. CONCLUSION

The rise of the MOOCs has brought opportunities and challenges to higher education in China, which influences the current stage of Chinese education greatly, ushering in a new era of education reform. MOOCs bridge the distance between local universities and elite ones, so that anyone have access to quality educational resources provided by elite universities. The construction of quality curriculums is an indispensable link in the education and teaching reform project. All local colleges and universities should be good at drawing lessons from the construction mode of quality resources and building open quality education resources, so as to truly achieve the goal of quality resource sharing based on the actual conditions.

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