Development and Application of College Music Massive Open Online Course Teaching Platform Based on Web Technology

Chengcheng Qi

qcc_sun@163.com

Qingdao Institute of Technology, Jiaozhou City, Shandong Province, 266300, China

Abstract. With the deepening of "Internet+Education" mode, massive open online course, as a product of information education, has attracted wide attention at home and abroad, and further promoted the deep integration of digital education platform and traditional music education in colleges and universities. In this regard, starting from the current problems faced by music education in colleges and universities, this paper puts forward a set of teaching platform construction scheme based on Web technology, so as to promote the digital transformation and upgrading of music massive open online course teaching in colleges and universities and create a complete online music education and teaching system. The whole system is based on Web technology, and a distance education platform with stable framework and complete functions is built, which is convenient for teachers and students to efficiently and conveniently complete many systematic teaching tasks such as daily teaching, learning detection and teaching evaluation through online operating system. Through the systematic functional operation test, each link runs smoothly, and the simulation results meet the actual needs, which is of great significance to the upgrading of teaching quality and teaching mode, and provides reference value for the development of music massive open online course teaching platform in colleges and universities in the future.

Keywords: Web technology; college music education; massive open online course teaching platform; Python; Computer software application

1 Introduction

With the deepening of the reform of the education system, the entry point of talent training in China's higher education has also undergone tremendous changes, from the cultivation of a single professional talent to the shaping of comprehensive and all-round talents. Confucius, a famous thinker, put forward the idea of "It is by the Odes that the mind is aroused. It is by the Rules of Propriety that the character is established. It is from Music that the finish is received", pointing out that there is an inseparable relationship between scientific culture and music art. Under the background of multicultural tide, music education in colleges and universities needs to be attached great importance, especially to form a new music teaching system based on China's traditional music culture, which meets the needs of the current era and keeps pace with the times and innovates, and finally build a new framework for music teaching in diversified colleges and universities. [1] However, due to the influence of traditional ideas, the current music courses in colleges and universities are mostly traditional elective courses. In addition,

ICMEIM 2023, September 08-10, Wuhan, People's Republic of China

DOI 10.4108/eai.8-9-2023.2339993

the teaching form is single, the content is lagging behind, and the students' enthusiasm is generally not high. At the same time, problems such as weak teachers, insufficient interaction between teachers and students, fading atmosphere of art education, and lack of characteristic courses have long existed, so that the teaching effect and the quality of personnel training are greatly reduced. [2] In view of this, this paper holds that under the background of promoting the high-quality development of modern education, colleges and universities should make use of massive open online course, the inevitable product of "Internet+Education", organically integrate music education in colleges and universities with digital education technology, give full play to the practical advantages of online teaching, and free music education from the constraints of time and space to form a brand-new music education and teaching system. [3] The massive open online course teaching platform for music in colleges and universities can set the teaching process with students as the main body, and each functional module in the platform can meet the actual application needs of teachers and students as much as possible, so that teachers and students can complete various educational and teaching tasks through convenient and efficient operation, thus effectively solving many problems faced by the traditional teaching mode, creating a new ecology of music teaching in colleges and universities, and making an attempt for the modernization and intelligent construction of higher education.

2 System construction

Based on the actual needs of users, the massive open online course teaching platform for music in colleges and universities will design and develop the overall structure and functions of the platform while ensuring the strong scalability of the platform, so as to realize integrated management and open and interactive teaching. The whole teaching platform of music massive open online course in colleges and universities adopts B/S architecture, which is mainly divided into two main technical lines: the front-end interactive interface and the back-end server.

First of all, the front-end interactive interface is developed with the VUE framework as the core, so as to realize responsive data binding through a relatively simple API interface, and quickly complete the deployment of various functional modules in a component-based manner. [4] Secondly, the back-end server will be built based on Django framework. Django further decomposes the view in MVC into two parts: Django view and Django template, forming MTV mode. Among them, the view determines which data to display, and the template determines how to display it, and the template can be changed at any time according to different needs of users, not limited to the built-in template. Figure 1 shows the workflow of Django framework.

Finally, the platform completes the deployment of the overall development environment in "LNMP" mode, that is, the bottom operating system chooses Linux CentOS 8.5, the Web server chooses Nginx, the database server chooses MySQL 8.0 and the development language chooses Python 3.8. A special Web Server Gateway Interface(WSGI) interface protocol is needed between Django framework and Web server to realize data communication. [5] As far as this system is concerned, the logic running on the Web Server side is Nginx-WSGI-Django, and related settings need to be completed with the help of Pycharm integrated development

tools, that is, Django is directly selected when creating new items and an independent virtual environment is created. At the same time, the basic directory of the project is set up, which mainly includes Manage.py, Urls.py, wsgi.py and Settings.py [6] When all the designs are completed, all the files are packaged and published on the server, which can support users to log in remotely.

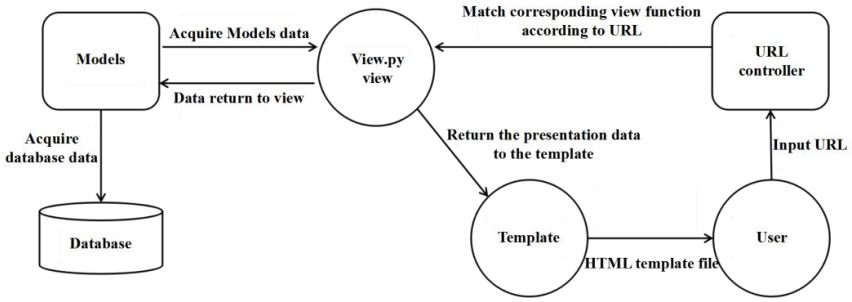

Fig. 1. The workflow of Django framework

3 Functional implementation

3.1 Student side

A. Registration, login and platform home page

The platform has a unified initial login interface, which is convenient for student users to complete account registration by submitting materials, so as to complete the login and use of the system. After the student user enters the account password, the platform uses MD5 encryption algorithm to encrypt the user password to ensure the security of the system user information. The key code of the encryption algorithm is as follows.

```
import hashlib
md5 = hashlib.md5()
file_path = 'example.txt'
with open(file_path, 'rb') as f:
    md5.update(f.read())
result = md5.hexdigest()
print(result)
```

After the user logs in successfully, the system will automatically jump to the homepage interface, which mainly contains Banner dynamic picture news, course classification information, recent course popularity ranking, new course recommendation and other modules. Among them, the course classification information is designed according to the tree structure, and there are many categories such as music performance, music theory, music education, composition and composition technology, conductor, music production. Each category also

has many subdivided courses, which is convenient for students to quickly screen and obtain. [7] The recent ranking of course popularity reflects the degree of interest and concern of students, which has certain recommendation and reference value. The ranking of heat needs the help of StackOverflow ranking algorithm. Formula 1 shows the algorithm calculation formula, S represents ranking results, Q_v represents the total number of students in the current course in a certain period, Q_a represents the total number of learning, Q_s represents the difference between the number of positive and negative course reviews, Q_h represents the course release time, Q_u represents the time when the latest student users joined the course. The heat calculation results of some courses are shown in Table 1.[8]

$$S = \frac{\lg Q_v \times 4 + \frac{Q_a \times Q_s}{5}}{\left((Q_h + 1) - \left(Q_h - Q_u / 2\right)\right)^{1.5}} \tag{1}$$

Table 1. The heat calculation results of some courses

Course	Q_v	Q_a	Q_s	Q_h	Q_u	S	Ranking
European Music in the Romantic Era	11638	189	219	05.22	07.29	0.123	2
Listening —The Form and Aesthetics of Music	2974	93	66	04.29	07.05	0.097	5
Piano Foundation	5849	151	181	05.03	07.22	0.114	3
Touching the Heartstrings — Enlightenment of Classical Guitar	4644	257	162	03.11	07.04	0.106	4
Classic of China National Instrumental Music	21767	381	220	04.09	07.19	0.213	1

B. Online learning

Student users can enter the online learning module to learn after selecting the corresponding courses. The course has an established teaching plan, which can support students to complete various learning tasks according to their own time schedule. The teaching form of the course is mainly video class, and students can click and watch it directly online. At the same time, the platform also provides auxiliary learning materials such as PPT, graphic content and micro-lesson video.

Facing the network teaching environment, the eduplayer player is integrated into the page to support the playing of various multimedia teaching resources. It also supports learning users to complete operations such as "play", "pause", "fast forward", "rewind" and "sound adjustment". In addition, student users can ask questions to the teacher during the learning process, and the questions correspond to the teaching content units they belong to, and are synchronized with the teacher's side, which provides convenience for students to get the teacher's guidance on answering questions in time. After the course is finished, student users can initiate the evaluation of the course online. There are two evaluation methods: scoring and content evaluation. There are five criteria for scoring, and content evaluation can be expressed from different angles and details.

C. Test and homework

Under this module, the platform supports students to finish the homework assigned by teachers online, and upload and submit it to get the teacher's correction in time. In addition, students can complete the staged evaluation test organized by teachers online. The test content is not only a comprehensive assessment of learning effect, but also a unit test for each learning unit, which is conducive to the consolidation and mastery of knowledge and skills by student users.

D. Communication and discussion

Under this function module, student users can initiate topic discussion by themselves or directly join other discussion topics. The discussion content can be problems or doubts in the course, or general topics about study, work and life, which is beneficial to the exchange and sharing of learning experiences among students and forms a strong learning atmosphere. In addition, this module also includes the questions initiated by students in the course of learning into sub-blocks, so that student users can focus on the teachers' questions and answers.

3.2 Teacher side

Compared with the functional design of students, teachers pay more attention to the guidance, organization and supervision of online teaching activities. When teacher users log in to the system, their main work lies in the collection, arrangement, production, uploading and maintenance of various teaching resources. At the same time, they also take into account the management of student users and students' information, and complete the work of answering students' questions and counseling.

A. Uploading and management of teaching resources

When a teacher user initiates online uploading of online teaching resources, he can rotate the file to be uploaded in the front-end interactive interface and click the "Upload" button. The Django framework at the back end of the platform will automatically receive the file and save it to the specified location. Table 2 shows the design table of teaching resources in the database.

Table 2. Teaching resources table

Field name	Data type	Restrain	Description
Resource ID	int	PRIMARYKEY,AUTO _INCREMENT	Unique identification
Resource name	varchar(50)		Violin playing posture
Type ID	int		02-Video
Form	varchar(20)		MP4
File size	int		11.53MB
Source	varchar(50)		The teacher upload
Contributor	varchar(50)		Teacher's name
Upload time	Datetime		-
Resource profile	varchar(100)		Standing posture and hand shape when playing

In Django, the platform sets the storage path and access path in the MEDIA_ROOT and MEDIA_URL configuration items in the settings.py file in advance, and uses the view function to process the request. The upload function code is shown below. After the online teaching resource upload operation is completed, it will return to the upload success page and generate resource thumbnails. [9]

```
from django.shortcuts import render
from .forms import UploadFileForm
def upload_file(request):
    if request.method == 'POST':
        form = UploadFileForm(request.POST, request.FILES)
        if form.is_valid():
            file = form.cleaned_data['file']
            return render(request, 'upload_success.html')
    else:
        form = UploadFileForm()
    return render(request, 'upload.html', {'form': form})
```

B. Student management

Under this function module, teacher users have many operation rights, such as applying for audit, modifying information, inquiring information, deleting information, obtaining address book, etc., which greatly enriches teachers' teaching management means and effectively improves teachers' actual work efficiency. Figure 2 shows the operation flow chart of the student management module.

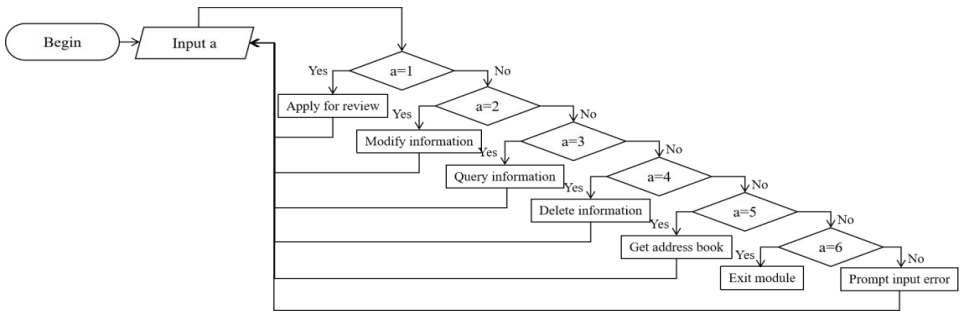

Figure 2: Operation process of student management

C. Communication and Q&A

Teacher users can also join the discussion area, initiate or participate in different discussion topics. For many questions raised by student users in the learning process, teacher users can complete the answers online and return them to the students. With the application advantages

of the platform, teachers users can more conveniently and directly complete targeted counseling and help for students, and help improve the teaching effect.

D. Statistical analysis of data

Based on the application and processing ability of university music massive open online course teaching platform for data information, teachers and users can statistically analyze and process the complex learning behavior data of student users, so as to strengthen the understanding of students and improve the teaching management effect. In the actual operation process, when the teacher user initiates the student behavior analysis online, the system will automatically complete the steps of data collection, preprocessing, statistical analysis and visual display. Among them, the data collection objects include CSV log files generated by the actual operation of the system and data records in the system database. Table 3 shows the main metrics of online learning behavior of student users. [10]

Table 3. Main metrics of online learning behavior

Behavior characteristics	Observational indicators	Numerical value
Basic information	Student number, name, department, and grade	
Online learning	Course information, learning progress, learning length, and number of courses	Time, times, and ranking
Test and homework	Homework completion degree, homework submission times, test completion degree, and test results	Time, times, and ranking
Communication and discussion	Number of questions, number of discussion initiated, number of discussion participants	Time, times
Other	Login time, cumulative time, login frequency, and evaluation information	Time, times and frequency

Teachers and users can choose according to different indicators and characteristics, so as to obtain statistical analysis results of data in different dimensions. Figure 3 shows the proportion of male and female students who choose the course "Touching the Heartstrings—Enlightenment of Classical Guitar". Figure 4 shows the data fluctuation of a student's accumulated login time in a week. Visual statistical analysis of data can more intuitively reflect the changing trend of students' learning behavior and provide scientific data support for teachers' teaching management.

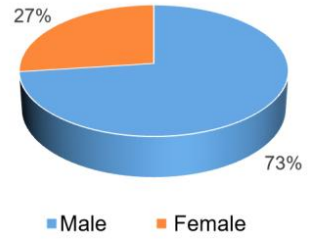

Fig. 3. The proportion of male and female

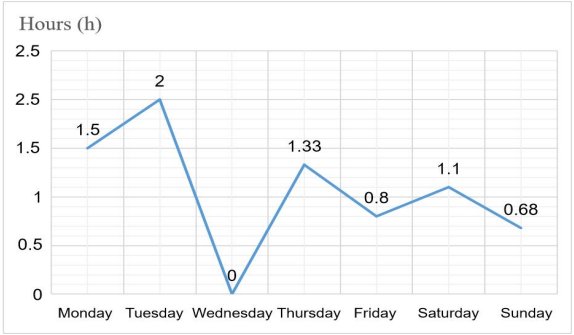

Fig. 4. Platform login duration fluctuation

4 Conclusions

In order to promote music massive open online course teaching in colleges and universities, this paper aims at many limitations in the process of music teaching in colleges and universities, and builds a digital teaching platform to promote the overall music quality level in colleges and universities. In the follow-up research process, the platform will continue to enrich the course content, optimize interactive means, increase practical functions, make online music massive open online course teaching truly integrated into the education and teaching of colleges and universities, promote colleges and universities to gradually build a high-quality music massive open online course teaching platform, and help the modernization of higher education.

References

[1] Huang Yuxiang. Exploration of College Music Reform Measures under the Background of "Internet Plus"[J]. ART EVALUATION.06 (2023).

[2] Jia Jia, Zhou Chang. Research on the Construction and Development of Music Education under the Background of "Internet Plus"[J]. INSPECTION(Forum).06 (2019).

[3] Yang Zhen, Pan Ge. Opportunities and Challenges Brought by "Internet Plus Education" to Music Education in Colleges and Universities[J]. Art and Education.05 (2021).

[4] Rifky Rahardian. Rancang Bangun Sistem Informasi Koperasi Xyz Menggunakan Framework Laravel Dan Vue.Js[J]. Jurnal Teknik Informatika dan Teknologi Informasi.11 (2022).

[5] Geetha S.Devang Dalvi. Bootstrap and Django Framework[J]. International Journal of Advanced Research in Science Communication and Technology.12 (2021).

[6] Bai Changsheng. Python Web development based on Django[J]. Information & computer.12 (2019).

[7] Duan Zhimin. Exploration on the Innovative Construction of Music Education Mode in Colleges and Universities under the Background of "Micro-era"[J]. INSPECTION.06 (2023).

[8] Tan Zhiyi. Research on Video Hotness Prediction Algorithm for Online Video Service[D]. Shanghai Jiao Tong University.12 (2019).

[9] Wei Limei, Su Bing. Overview of Python Website Development Process under Django Framework[J]. Computer & Telecommunication.12 (2019).

[10] Cheng Zhenlin. Analysis of Network Learning Behavior Supported by Multimodal Data[J]. China Adult Education.04 (2022).