



Construction of Online Education Model of Marketing Specialty Based on Cloud Computing

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Abstract. In the process of constructing the online education model for marketing major, the actual application requirements are not considered, and the problems of low functional success rate and poor operation performance exist. In order to provide auxiliary work for the teaching work of marketing major, the cloud computing technology is used to realize the optimization design of the online education model for marketing major. Install cloud servers, modify cloud storage, communication networks and other hardware devices as the operation support of the model. Determine the online education mode and teaching content of marketing specialty. Use the web crawler algorithm to collect the online education resources of marketing specialty, and complete the sharing of online education resources according to the principle of cloud computing technology. Finally, through the design of online education activities and interactive functions, the construction of online education model is realized. Through the model test experiment, it is concluded that the functional success rate of the design model reaches 98.6%, and the response time and memory occupation meet the test requirements.

Keywords: Cloud computing · Major in marketing · Online education · Construction of educational model

1 Introduction

The major of marketing is to cultivate senior professionals of business administration who have the knowledge and ability of management, economy, law, planning and copywriting, market research and marketing, and can engage in marketing and management, teaching and scientific research in enterprises, institutions and government departments. It is an emerging and popular specialty, and the market is everywhere. Marketing is not only sales, but also includes the development of the market, providing needed services and help for people or things in need, and understanding can achieve correct marketing [1]. Marketing is divided into macro and micro levels. Macro marketing is a reflection of social economic activities. Its purpose is to meet social needs and achieve social goals. Micro marketing is an economic activity process of an enterprise. It produces marketable

products according to the requirements of target customers, and flows from producers to target customers. Its purpose is to meet the needs of target customers and achieve the objectives of the enterprise. The core of marketing activities is exchange, but its scope is not limited to the circulation process of commodity exchange, but also includes prenatal and postnatal activities. The marketing activities of products are often longer than the circulation process of products. The transaction scope of modern society is very wide, which has broken through the barriers of time and space and formed a universal market system.

Education requires both theoretical teaching and practical teaching. Theory aims at “moderation and sufficiency”, and practical skill teaching should be strengthened. Marketing specialty is not only a traditional specialty, but also a specialty that needs to constantly update its teaching contents and teaching methods. It is closely related to social progress, the development of productive forces, the renewal of science and technology, the change of economic situation and the reform of economic system. Theory is closely related to practice, and has strong theoretical and practical significance. The traditional teaching plan and system of marketing major only pay attention to the teaching of the theoretical part, but do not place the practical part in its due position and pay full attention to it. This practice is closely related to the training objectives, analysis methods, teachers’ inherent concepts and ability levels of graduates in the past. Higher vocational education is a new way of education. Practical teaching is incorporated into its teaching system and regarded as a very important part. According to the reflection of the society on the talent demand information over the years, the demand for marketing professionals has always been in the forefront, but the society has low satisfaction with the job performance of marketing graduates, which is mainly reflected in the unsatisfactory practical application ability, the long time to adapt to the post, some basic businesses are difficult to carry out, it takes a long time, and it is difficult to find high-quality marketing talents, There are too few talents who can formulate scientific, reasonable and effective marketing strategies and marketing plans. In view of this situation, it is not difficult to find the reasons, and its root is the problem of education. The practical teaching of marketing specialty is a weak link. Therefore, we should reconstruct the teaching plan of marketing specialty, pay attention to practical skill education, and constantly explore the practical teaching mode, so as to cultivate excellent marketing talents. In order to provide sufficient and high-quality marketing talents for the market and break the problems existing in the traditional teaching of marketing specialty, an online education model of marketing specialty is constructed.

From the current construction of the online education model of marketing specialty, we only pay attention to the teaching of knowledge, ignore the subjectivity of students in learning, seriously inhibit the sense of innovation, lack of vitality in the classroom and lack of interest in learning, which is not conducive to the cultivation of students’ overall quality. The online education model has obvious problems such as low success rate and poor performance. Therefore, cloud computing technology is introduced. Cloud computing is not only a method of sharing it infrastructure, but also an extensible software library and program library. It connects a large number of computing resources to form a “resource pool” in a secure and flexible way to provide users with cloud applications and services stored in large data centers. In the optimization design of online education

model of marketing specialty, the application of cloud computing technology is expected to provide auxiliary tools for the teaching of marketing specialty while improving the educational function and operation performance of the model.

2 Design of Online Education Model for Marketing Specialty

The online education model of marketing specialty refers to an open teaching system based on teaching concepts, teaching methods and teaching processes. For marketing related majors, good teaching results can be obtained through the teaching platform according to their own syllabus, teachers' characteristics and students' situation. At the same time, the teaching methods of marketing planning should include a variety of teaching methods, not specifically a certain kind of teaching methods. In the teaching platform of marketing planning, the collection of teaching methods needs to maintain long-term openness, and can continuously update their own contents and methods according to the changes of the external market. Schools and teachers can update their teaching method system according to their own resources and students' overall knowledge reserve. The optimized online education model of marketing specialty is an organic whole composed of various elements of practical teaching activities, including target system, content system, management system, guarantee system and other elements. Its specific framework is shown in Fig. 1.

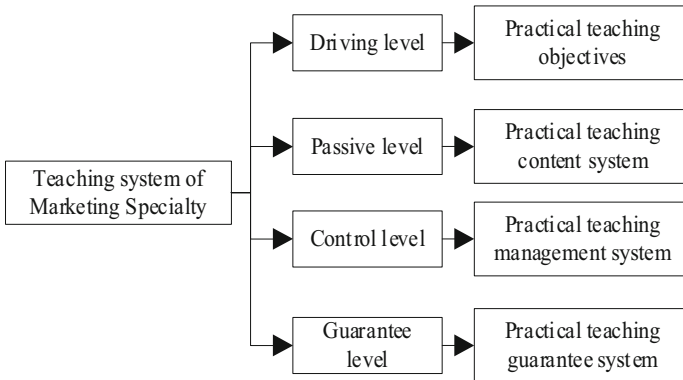


Fig. 1. Block diagram of online education model of Marketing Specialty

Under the constraints of the principles of demand orientation, system construction, focus, personality development and combination of production and learning, the online education model of marketing specialty is optimized through the application of cloud computing technology.

2.1 Install ECs and Related Hardware Devices

The optimized online education model of marketing specialty based on cloud computing technology needs to be supported by ECs and related hardware devices. The optimized ECS is composed of four independent modules, as shown in Fig. 2.

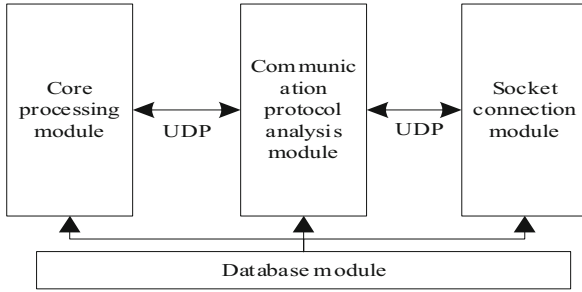


Fig. 2. Internal structure of ECS

As can be seen from Fig. 2, ECS consists of socket module, communication protocol analysis module, core processing module and database module [2]. Socket module provides TCP connection with gateway or administrator, and is the communication interface between server and gateway or administrator; The communication protocol analysis module has a receiving buffer and a sending buffer. The module preliminarily processes the data reported by the socket and stores it in the receiving buffer, waiting for the core processing module to read the buffer data. At the same time, the data command issued by the core processing module is processed, stored in the sending buffer and sent to the socket module; The core processing module is the core of server data processing. It analyzes the data frame information in the original data and makes corresponding processing, or stores the data in the database or reads the data from the database for processing. After the data operation, it sends the feedback information packet to the gateway or administrator through the communication protocol analysis module [3]. The communication between modules within the server adopts UDP transmission mode. Although UDP is a connectionless communication mode, it can be considered that using

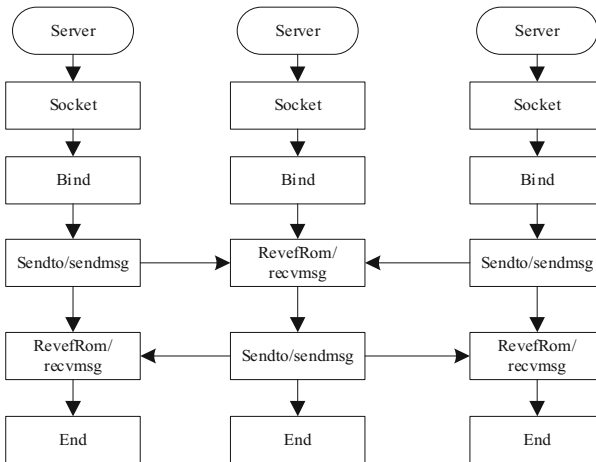


Fig. 3. Schematic diagram of UDP communication

UDP to transmit data between modules within the server has high reliability and little packet loss rate. The connectionless UDP communication model is shown in Fig. 3.

The UDP transmission communication frame for communication between modules in the server is composed of five parts, in which the length represents the sum of the length of source address, destination address, load and error correction code; Each module is assigned an ID with a size of 1 byte to represent its address information; The load fills the original data collected by the sensor node, and the length is variable; The error correction code is used to check the error correction ability starting from the length.

In addition to the cloud server and its communication network, in order to provide sufficient educational resources for the marketing specialty, it is also necessary to expand the storage space of cloud shared memory [4]. Finally, the modified and optimized hardware equipment is connected together through the power supply circuit to provide hardware support for the operation of the online education model of marketing specialty.

2.2 Determine the Online Education Mode of Marketing Specialty

Based on the concept of online education model and preliminary research, combined with the talent training and curriculum characteristics of marketing specialty, the curriculum model of marketing specialty is determined, as shown in Fig. 4.

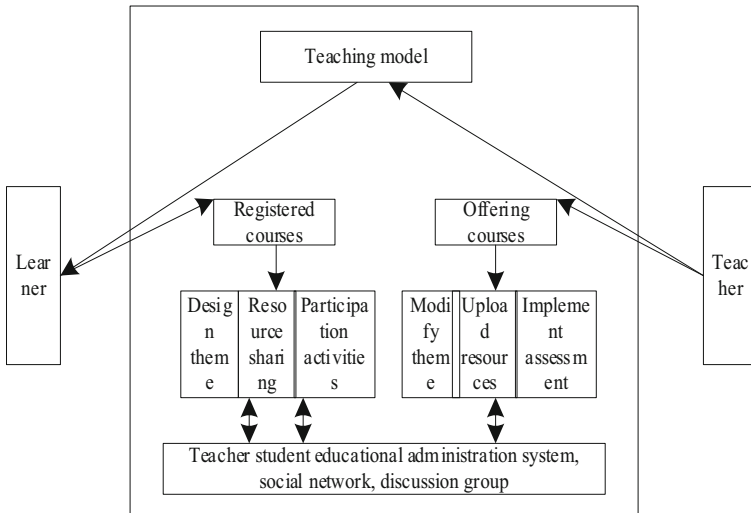


Fig. 4. Schematic diagram of marketing education mode

The selected curriculum model takes students as the main body of education. Students can learn about the curriculum dynamics through the interactive network platform, design or participate in the theme activities of the curriculum based on their own needs and interests, and independently obtain the curriculum resources required for theme learning. Under this curriculum model, students are no longer passive learning recipients, which not only mobilize students' learning enthusiasm, stimulate students' in-depth research

on specific problems, but also improve students' ability to adapt to the society. At the same time, each course takes students' learning path as the core, with clear course objectives, themes, time arrangement, assessment, interaction and resource download, giving learners a clear learning orientation. The course model of marketing specialty includes four structures: course introduction, course content, course assessment and communication and interaction. Among them, the course introduction includes the course outline, teaching plan and teaching announcement, which is the course information that learners need to know in advance to select and register the course [5]. The course content includes a large number of video courseware, handouts, guiding documents, examination question bank, case bank and related information link resources. Rich curriculum resources are the key to the education model. Course assessment includes teacher assessment and assessment between students. Teacher assessment includes in class test module and final test module with randomly generated test questions. Teachers can set the type and difficulty of test questions in the background system and extract them in groups according to the purpose of the test. Assessment among students refers to the mutual scoring of homework among students. The communication and interaction platform includes the teaching and educational administration system of teachers and students, various forms of social networks, discussion groups, etc. it can be used to provide and share resources, organize and accept assessments, communicate and discuss courses, answer homework questions and discuss freely.

In addition to the basic professional education mode, it is also necessary to set up practical teaching mode for professional practical skills. The practical skills of marketing specialty can be divided into four modules: First, professional basic skills refer to the most basic basic skills required by the specialty, mainly including computer application, statistical analysis, financial analysis, economic writing, legal application, etc. Second, professional basic skills refer to the basic behavioral abilities required to carry out marketing work, mainly including market research, customer visit, product promotion, business negotiation, public relations, customer management, logistics distribution, Bill filling, market development, sales service, advertising practice, on-site management, etc. Third, marketing core skills refer to the ability to formulate marketing strategy and technology and plan marketing activities. According to the external environment and internal resource conditions of the enterprise, formulate the strategic technology of the enterprise and plan an effective scheme for the marketing activities of the enterprise [6]. Fourth, professional development skills refer to determining the employment direction and broadening the employment path according to the market demand and students' personality, interests and specialties on the basis of mastering corresponding knowledge and skills. Professional development involves retail, service, insurance, international trade, franchise and other industries, enterprises and posts. The above four practical teaching skill modules are contained in in class training, special training, comprehensive training and social practice. On the other hand, when arranging the practical skills teaching in the above four aspects, we should pay attention to the measurement and time sequence of class hour arrangement. The class hour distribution of professional basic skills, professional basic skills, professional core skills and professional development skills can be determined according to a certain proportion. According to the total practice class hours and the percentage of each module, the specific class hours of each module can

be quantified. When the total class hours of each module are known, the teaching hours of each specific practical project can be further decomposed and refined [7]. The first mock exam of four modules of the marketing practice skill is the ladder level. The first mock exam is the basis of the latter module, and the order relation should be considered when designing the teaching plan.

2.3 Choose the Online Education Content of Marketing Major

The online education content of marketing specialty is selected on the basis of providing students with meaningful expressive activities. The education content is carried out on the basis of the subject knowledge structure of the course. The content is divided into three chapters, of which the third chapter is divided into five units, as shown in Table 1.

Table 1. Online education content of marketing specialty

Content section	Unit	Educational objectives
Introduction to marketing planning	–	Understand the concept of marketing planning, understand the discipline characteristics and research objects of marketing planning
Marketing planning process	–	Understand the principles and processes of marketing planning, and be familiar with the structure and content of marketing planning book
Marketing planning training	Marketing planning purpose	Complete a marketing plan through group cooperation
	Market situation analysis	
	Analysis of market opportunities and problems	
	Determine specific marketing planning	
	Implementation and control of marketing planning scheme	

Take the content in Table 1 as the educational content, and take it as an important part of the online education model of marketing specialty.

2.4 Collect Online Education Resources of Marketing Specialty

The automatic collection of educational resources in school for marketing majors uses topic crawling technology to collect topic related information resources from the web in an automatic way. Topic crawling refers to selectively collecting topic related information

resources from the web for a specific topic field. Topic crawling needs to filter the content irrelevant to the topic, predict the links related to the topic, then add the relevant links to the URL queue to be collected, and determine the information collection order according to a certain priority algorithm [8]. The goal of general crawling technology is to collect as many web information resources as possible. When the collection capacity is limited, generally give priority to collecting influential site information, and the subject field of these resources is secondary. However, for topic crawling, its goal is to crawl topic information resources to the greatest extent in unit time, and bypass websites or web pages not related to the topic as much as possible, so as to save software and hardware resources, storage space and network bandwidth resources. In order to ensure the application value of educational resources, it is necessary to process the missing data in the resources. The processing process can be expressed as follows:

$$\beta_n(x) = \sum_{i=0}^n \left(\frac{(X - X_0) \cdots (X - X_n)}{(X_i - X_0) \cdots (X_i - X_n)} \right) \times Y_i \tag{1}$$

In formula (1), X and X_i represent the mean value and missing value of education resource data respectively, Y_i is non missing education resource data, and the final calculation result $\beta_n(x)$ represents the interpolation filling result of missing education resource data. On this basis, the initial resource data is normalized, and the processing formula is as follows:

$$y(x) = \frac{\beta_{n-\max}(x) - \beta_n(x)}{\beta_{n-\max}(x) - \beta_{n-\min}(x)} \tag{2}$$

In formula (2), $\beta_{n-\max}(x)$ and $\beta_{n-\min}(x)$ are the maximum and minimum values in the resource data respectively. Finally, in order to realize the efficient management of educational resources, it is necessary to classify the collected educational resource data. The similarity between any two educational resources is calculated by formula (3).

$$\text{sim}(q, d_j) = \frac{d_j \cdot \beta(x)}{|d_j| \times |\beta(x)|} = \frac{\sum_{i=1}^t w_{i,j} \times w_{i,\beta}}{\sqrt{\left(\sum_{i=1}^t w_{i,j}^2\right) \left(\sum_{i=1}^t w_{i,\beta}^2\right)}} \tag{3}$$

In formula (3), variable d_j represents the category of educational resources, $w_{i,j}$ and $w_{i,\beta}$ respectively correspond to the weight of feature items in educational resources and their weight values in resource category d_j . Set the classification threshold to $\eta_{\text{threshold}}$. If the calculated $\text{sim}(q, d_j)$ value is higher than the classification threshold, the corresponding educational resources need to be classified. Otherwise, calculate the similarity of the next group of resources until all the collected resources are classified.

2.5 Using Cloud Computing Technology to Share Educational Resources

The collected and processed online education resources are stored in the modified cloud shared memory. Through the compression and transmission of resource data, the resource

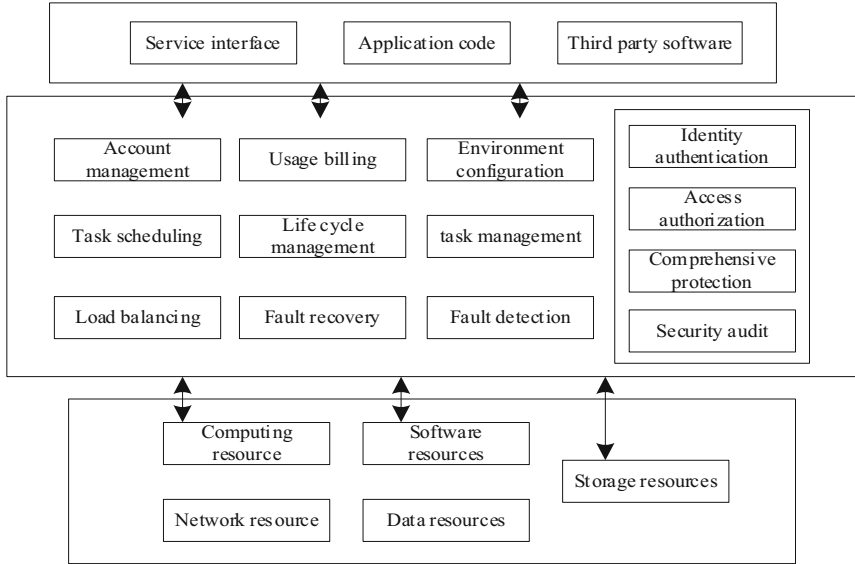


Fig. 5. Cloud computing technology block diagram

sharing is realized with the support of cloud computing technology. Figure 5 is a block diagram of cloud computing technology.

The compression process of online education resources of marketing specialty can be expressed as follows:

$$F = \frac{1}{4}y(x) \cdot \cos \frac{(2x + 1)u\pi}{16} \tag{4}$$

In formula (4), the variable u is the transformation scale. The teaching resources initially collected and processed are uploaded from the teacher side to the cloud server side. The upload process can be expressed as:

$$H = \psi \frac{\mu_i}{\mu_j} + (1 - \psi) \frac{\text{Time } (i)}{\text{Time } (j)} \tag{5}$$

In formula (5), ψ is the proportional coefficient, Time (i) and Time (j) respectively represent the upload transmission time of resources i and j , and μ_i and μ_j correspond to the channel selection coefficient [8]. Student users can apply to the cloud server for sharing. After the application is passed, a communication connection is formed between the server and the user, and finally a sharing task of educational resources is realized through reverse transmission.

2.6 Design of Online Education Activities for Marketing Major

The implementation of the activity is mainly divided into clarifying the activity content and requirements, collecting and sorting learning activity resources, discussion, display

and exchange of discussion results, classroom summary and other steps. Teachers make clear to students the teaching arrangement, the organization of learning activities, how to carry out group activities, specific tasks, relevant evaluation methods, etc. Students collect resources according to their division of labor. Collect and sort out the required data by consulting books, the Internet, questionnaires, interviews and other means, and complete the tasks of information screening, classification and analysis. Teachers should give appropriate guidance to students' online learning activities and guide students to learn to collect and process information. At the same time, students can feed back information to teachers and exchange opinions with other groups at any time, so that teachers can solve the problems of students in the learning process in time. In the process of discussion, teachers should pay attention to appropriate guidance, stimulate students' positive thinking ability, and cultivate students' questioning ability, debate ability and expression ability. Teachers can prompt, ask and ask questions, stimulate students' interest and self-confidence, and enable students to participate in activities efficiently.

2.7 Marketing Professional Online Interaction

Online interaction of marketing major is to watch and learn courseware in the network environment. After logging in the model, the user clicks the courseware on demand function to first display the list information of the courses selected by the user. The user can enter the learning forum for learning exchange, download simulation questions or directly click to play the courseware. When ordering a lecture courseware, you first need to obtain the information related to the courseware, such as the course, knowledge point and playback path of the courseware. Go to the background to verify whether the courseware is valid according to the obtained information. If it is valid, it is allowed to order, otherwise it is rejected [9]. When the course on demand request is sent out, the server side processes the user request and returns it to the user with JSP page to realize the jump from the business function interface to the course on demand interface. At the same time, the corresponding entity records the click event: the current time and the number of on-demand courseware are accumulated once, and the learning time length of these courseware is tracked. The learning record data obtained from the page is parsed into entities that can be recognized by the model, and stored in the database through background processing. This data is used to track and feed back students' progress, and can also evaluate students' learning quality.

3 Model Test and Experimental Analysis

In order to test the educational function and operation performance of the online education model of marketing specialty based on cloud computing, a model test experiment is designed. Cloud computing is built by the Open Stack framework and provides a Web-based visual online education interface with the help of Horizon components provided by Open Stack. Through the access interface provided by Open Stack, log in as an administrator. After successful login, enter the cloud management platform to realize the functions of user creation, resource sharing, online teaching and so on. To enhance the validity of the results, ensure that the control and experimental groups of the same environment.

Before starting the experiment, it is necessary to prepare the course information, user information and test task information of marketing specialty. The setting of some test task information is shown in Table 2.

Table 2. Model test task information setting table

Task number	Test content	Anticipate result
1	Educational curriculum selection and participation	Successfully play educational courseware
2	Educational resources query	Output educational resources search results
3	Educational resources download	Educational resources successfully downloaded to local
4	Upload educational resources	The ECS and cloud shared memory store corresponding educational resources
5	Put forward the learning problems of marketing major	The learning questions are successfully displayed in the interactive interface

According to the model test task information table in Table 2, the total number of test task information was set to 800 and divided into 8 groups on average to avoid the influence of accidental events on experimental results. In addition, in the model test experiment, the number of generated users is 400, and through the control of the number of users online, the constraint of the model test environment conditions is realized.

The quantitative test indicators set in the model test experiment include the success rate of educational function operation, response time and memory consumption. The numerical results of the success rate of educational function operation are as follows:

$$\lambda = \frac{n_{succ}}{n_{all}} \times 100\% \quad (6)$$

In formula (6), n_{succ} and n_{all} respectively represent the number of successful samples and the total number of samples set in the experiment. By comparing the model output results with the expected effect of the setting, determine whether the current task is running successfully, and obtain the specific value of n_{succ} through the statistics of the number of tasks. The numerical results of response time index are:

$$\Delta T = t_{sr} - t_{out} \quad (7)$$

In formula (7), t_{sr} and t_{out} are the start time of educational task and the output time of result respectively. In addition, the memory consumption can be directly read from the background data of model operation to obtain the test result data. In order to ensure the application value of the designed online education model in the actual teaching of marketing specialty, it is required that the success rate of function operation shall

not be lower than 95%, the corresponding time shall not be higher than 8000 ms, and the memory consumption shall not be higher than 50% of the total memory. Since the total memory in the model test experimental environment is 2.0 GB, the total memory consumption shall not be higher than 1.0 GB.

In the built experimental environment, the design model is converted into program code, and the implementation results of the functional tasks of the educational model are obtained through the operation of the computer and the input of the design and test tasks. Figure 6 shows the output results of educational course selection and adding test tasks.

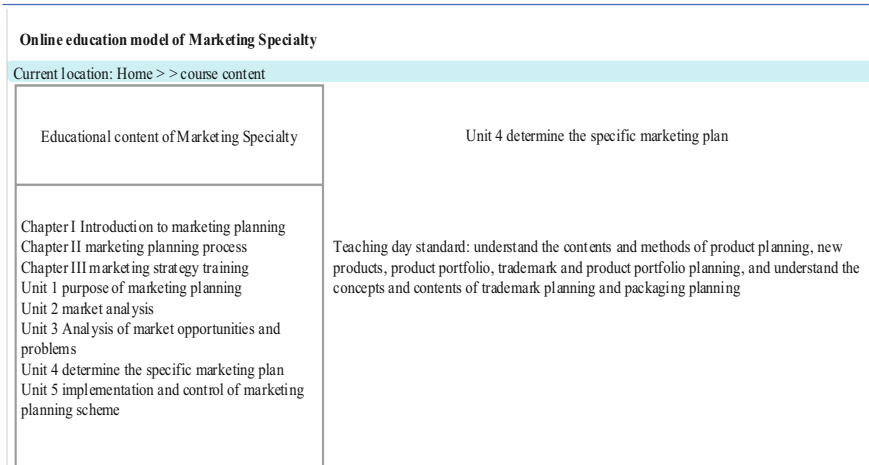


Fig. 6. Schematic diagram of online education model of Marketing Specialty

According to the schematic diagram of online education model for marketing major in Table 6, the operation output results of other educational function tasks can be obtained similarly. The operation status data in each group are counted to obtain the test results reflecting the model function, as shown in Table 3.

Table 3. Functional test results of professional online education model

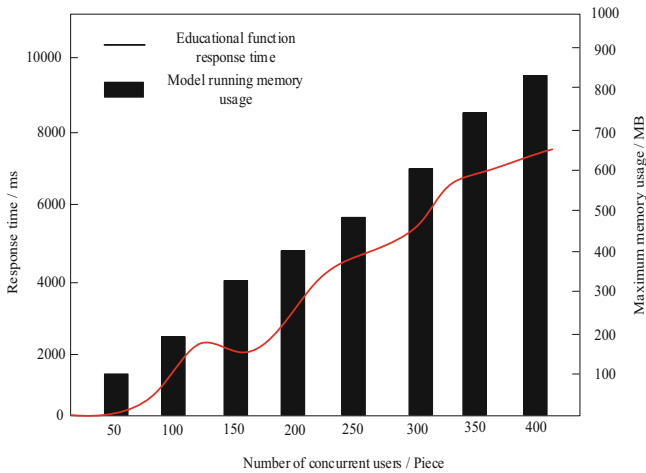
Experimental group	Total number of tasks/piece	Number of successfully run tasks/piece
1	100	100
2	100	100
3	100	98
4	100	99
5	100	100

(continued)

Table 3. (continued)

Experimental group	Total number of tasks/piece	Number of successfully run tasks/piece
6	100	95
7	100	97
8	100	100

By substituting the data in Table 3 into formula (6), it can be concluded that the average functional operation success rate of the design model is 98.6%, which is higher than the preset value, that is, it meets the functional design requirements of the model. In addition, through the calculation of formula 7 and the statistics of relevant data, the test results of model operation performance are obtained, as shown in Fig. 7.

**Fig. 7.** Performance test results of online education model

According to Fig. 7, as the number of concurrent users increases, the response time and memory footprint of the model run increases. It can be seen intuitively from Fig. 7 that the maximum response time is 7400 ms and the maximum memory consumption is 830 MB, so it can be seen that the operation performance of the designed online education model meets the design and application requirements.

4 Conclusion

Based on the basic theoretical knowledge of marketing planning, the marketing planning course guides students to understand the marketing environment and the methods, strategies and steps of marketing planning, so as to form a modern marketing planning concept and strengthen students' professional skills and professional quality. The average functional success rate of the designed model is 98.6%, which is higher than the

preset value. The maximum response time of the model is 7400 ms, and the maximum memory consumption is 830 MB, which meets the functional design requirements of the model. This paper analyzes the application of cloud computing technology and the construction of education model, in order to provide some reference value for academia and industry.

The next step is to make a detailed and in-depth study on how to effectively use the online education model of marketing major based on cloud computing to play an important role in students' learning, so as to better serve teachers and students.

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