Design and Implementation of College English Online Q&A System

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Abstract: Online Q&A system is a key component of network teaching mode and an important way to supplement the lack of communication between teachers and students under network teaching mode. The application of college English online Q&A system can help teachers check the teaching effect and get teaching feedback in time, which is of positive significance to improve the quality of college English teaching. Based on this, this paper discusses the function of Q&A link based on motivation theory, and discusses the feasibility of online Q&A system in college English from two aspects of education and technology. It also analyzes the solution of question information characteristics in English online Q&A system in order to provide corresponding reference for English teaching in colleges and universities in China.

Keywords: college teaching; English teaching; online Q&A

1 Introduction

Q&A is an auxiliary project of college English teaching activities, a continuation of answering students' doubtful questions during classroom teaching, and an effective way for teachers to get teaching feedback. However, at present, there are many problems in college English classes, such as large class size and few class hours. Teachers often can't take care of all students in the classroom, resulting in many students' problems in the learning process can't be answered in time. Therefore, some colleges and universities began to design and develop online Q&A system to further improve the quality of college English classroom teaching.

2 The importance of Q&A link in college English teaching

(1) The value of Q&A

Q&A is the key link of learning interaction. At the beginning of the development of distance education, scholar Moore divided the interactive activities of distance education into three different types, including the interaction between students and teaching content, the interaction between students and the interaction between students and teachers. In the interaction between students and teachers, teachers should provide all students with necessary advice, support and encouragement. Zheng Qinhua, a scholar, combined with the data analysis of MOOC students' investigation, shows that in the interactive activities that students think are beneficial to learning, teachers take the initiative to understand students' needs in the first place, followed by Q&A in

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the course. It can be seen that students' willingness to interact in Q&A is very strong. Moreover, Q&A is also a requirement to improve students' English learning ability. In the China English Proficiency Rating Scale, it is proposed that students should have the ability to ask questions from multiple dimensions in the learning strategies of structural knowledge, including that students should be able to learn grammar in different ways, read grammar books independently or consult teachers. It can be seen that students can participate in Q&A activities on English learning independently, which is also one of the abilities that students must have. [1]

(2) The importance of Q&A from the perspective of motivation theory

Foreign language learning motivation is the key factor that determines students' final learning achievement. After 1990s, motivation research emphasized education itself, and scholar Dornyei divided foreign language learning motivation into three different levels, including language level, learner level and language environment level. He believes that it is necessary to pay attention to the multiple attributes of foreign language learning motivation. Based on Weiner's analysis of attribution theory, learned helplessness and self-efficacy theory, and Oxford and other scholars' analysis of achievement demand theory, he believes that the learner level contains two important factors, namely, the need for achievement and personal self-confidence. The existence of the Q&A link can help students complete the correct attribution, avoid falling into learned helplessness, and form a certain degree of confidence in their language level.

Fully stimulating students' learning motivation is one of the tasks of course teaching. Dornyei, a scholar, once listed 51 strategies, and sorted them according to the results of questionnaire survey, that is, ten commandments to stimulate language learners' motivation were obtained. In the Ten Commandments, Q&A activities are conducive to stimulating students' learning motivation. For example, some students can confirm the difficulty level of the test questions to the teachers after the stage test, so as to deepen their understanding and understanding of the scores, or use one-on-one Q&A activities to establish targeted and customized learning plans with the help of teachers. It can be seen that the existence of Q&A activities can really help students improve their English level, realize missing and filling vacancies, and apply English knowledge more skillfully. [2]

3 Feasibility analysis of the online Q&A system

(1) Feasibility analysis of education

Nowadays, college English classroom teaching methods generally take teachers as the core of the classroom, and teachers unilaterally instill curriculum knowledge into students, which ignores students' dominant position and enthusiasm for participation in the classroom. The fundamental reason for this phenomenon is that teachers and students have not yet divorced from the traditional teaching concept. With the increasing number of college students, the existing teaching resources in many schools can no longer meet the teaching needs. For example, students don't have enough time to ask teachers questions in class. Over time, students' doubts can not be solved in time, which affects their learning progress, their enthusiasm and self-confidence, and is not conducive to the improvement of students' English level. The application of online Q&A system can guide students to actively participate in classroom learning activities, break the limitation of time and space in traditional teaching, and enable teachers and students

to communicate at any time and any place to conduct Q&A activities. Students who encounter difficulties in their daily study activities can directly log in to the system to find solutions. Students lay a good foundation in the initial stage of learning and lay a good foundation for systematic English learning later. Moreover, when students encounter English-related difficulties in daily life, they can also log in to the system for Q&A, which not only helps students master English knowledge, but also cultivates their autonomous learning ability. [3]

With the popularization and development of information technology, colleges and universities also need to actively introduce advanced teaching techniques and methods. Under the modern educational technology environment based on multimedia technology and network technology, students can use the above emerging technologies to search and download the necessary learning resources according to their actual needs. At the same time, it can also break the constraints of time and space under the traditional teaching method, so that students can consult teachers more conveniently and quickly. Teachers can also keep abreast of students' current learning progress, evaluate students' learning effect and adjust teaching plans in time through the system.

In addition, under the background of network environment, English teaching relying on multimedia technology breaks the constraints of time and space and further expands the communication space between teachers and students. Classroom teaching based on multimedia network technology meets the needs of constructivist learning environment. Constructivism theory shows that language learners should not be passive recipients of knowledge, but independent builders of knowledge structure. During the whole teaching period, teachers provide students with enough time and space for autonomous learning, and at the same time ensure that students can actively participate in teaching activities. Network system also provides convenience for information teaching, teachers can modify teaching instructions at any time and place, so that students can get the guidance of teachers in time. [4] The application of online Q&A system can really enrich students' methods of learning English and stimulate their enthusiasm for learning.

(2) Technical feasibility

As far as database technology is concerned, because the Q&A system in college English classroom is a system developed for online Q&A content. Therefore, in terms of database selection, Microsoft Access is the main database, which is one of the Microsoft Office software packages, so it can be matched with Microsoft Word and Microsoft Visio adopted by Q&A system. Moreover, Microsoft Access's own functions can basically meet the actual needs, so the database technology is feasible.

From the aspect of system development environment, in order to ensure the stable operation of online Q&A system, the corresponding environment configuration is set in the server and browser respectively. Because the system is based on B/S mode, the requirements for browser environment configuration are low, and the focus is on server-side configuration environment. Specifically, the following technical indicators can be adopted: CPU adopts InterPentium above 20GHZ; The memory is more than 256MB; The hard disk uses more than 20G; The software environment adopts Windows 2000 Server SP4 (including IIS 5.1), Microsoft Access; The software environment of the browser is set to Windows 2000/NT/XP/VISTA/7, IE6.0. The above proves that the research and development of the system, that is, the running environment can be satisfied, so it is feasible in the system development environment technology.

4 English online Q&A system question information characteristic solution realization

(1) Text segmentation based on query information

Providing more accurate Q&A information for query information is the key to ensure the quality of Q&A system. Mastering the research characteristics of question information is regarded as the key point of the answer to the question information supply. Therefore, question information segmentation and feature extraction are the key points to ensure the quality of Q&A.

In the online Q&A system of college English, the information data about learning questions uploaded by students are generally text information in both Chinese and English. English information is described by words, and English text can be segmented directly according to the spaces in English text, while Chinese word segmentation is relatively difficult. The style of interrogative information text is significantly different from that of other texts, showing very obvious language characteristics. Therefore, the unsupervised Chinese text-based word segmentation method is not suitable for the linguistic features of query information text, which may lead to low accuracy of word segmentation. The word frequency information and dictionary information can ensure the credibility of word segmentation of query information text.

During the period when the system uses semi-supervised learning method to segment the query information text, there are two specific processes: First, based on the maximum likelihood principle, combined with the query information text corpus, EM algorithm is applied to learn the frequency of vocabulary in students' uploading questions, and after preliminary analysis and division, all unregistered vocabulary in the query information text is divided into multiple segments. Second, according to the information such as boundary entropy and vocabulary length, the word segmentation structure of students' consultation is adjusted by ordered clustering algorithm, and the query information text is recombined except for some unregistered words that were previously eliminated. The details are as follows: On the basis of dictionaries in various fields, we use forward and backward matching algorithms and other methods based on literal matching to segment the query information text, because it is difficult to deal with the ambiguity in word segmentation because of the characteristics of the query information text. Take "Under what situation does the adjective modify indefinite pronouns need to be postpositioned" as an example. Because the word "indefinite pronouns" does not exist in the open domain dictionary, the sentence is finally subdivided into "What", "Situation", "Adjective", "Modify", "Indefinite", "Pronouns", "Need" and "Postpositioned". Obviously, there is something wrong with indefinite pronouns's segmentation method. According to the text characteristics of question information, the following algorithms can be introduced:

Let a string in the query information text be S=C1C2……Cn, and it is expected that the string will be subdivided into SS=W1W2Wm by word segmentation algorithm, and the word Wi in the word string is derived from the dictionary V. In order to simplify the calculation method, the segmented word strings SS are independent of each other, that is, the occurrence probability of words in the word string does not affect other words. If you follow the probability subdivision of $\theta = \{\theta_i | \theta_i = p(W_i), i = 1,2,\ldots\ldots,|V|\}$, you can complete the maximum segmentation of the string S by combining the maximum likelihood rule. For any segmentation method SS of the

string S, the likelihood of string segmentation is confirmed according to prob（SS，S|θ）= $\prod_{i=1}^{M}\theta_i$.

The purpose of preliminary segmentation of query information text with open domain dictionary is to find a word segmentation method to maximize the likelihood function value of the obtained word string SS*, as follows:

$$SS^{*}=\text{argmax}\{\text{prob}(SS|S,\theta)\} \quad (1)$$

The system uses Viterbi training to complete word segmentation. The ideas are as follows: First, in the initialization stage, the system uses the forward maximum matching algorithm to complete the text segmentation, and then takes the relative frequency of all words in the segmentation result as the starting probability of Chinese word segmentation; Second, the system applies dynamic programming algorithm, combined with the occurrence probability of feature words, to segment the text again for text prediction; Third, the system updates the relative frequency of word segmentation based on the segmentation results of text corpus, and takes this frequency as the frequency of word segmentation; Fourth, the system repeats the third step until the number of iterations reaches the upper limit, or the segmentation result of question information text corpus is determined. Then, the unknown words in the query information text are divided into words in the development zone and general dictionary, or single Chinese characters. [5]

(2) Query information feature extraction

After the word segmentation, singular value decomposition is applied to extract the keywords from the word segmentation content. After many students describe the word segmentation, a word segmentation matrix is constructed, and the dimension is reduced by SVD to obtain the key vocabulary for uploading the query information in the query information management system. Then, by comparing all the query information with the overall keyword library, the important vocabulary set of the project achievement description information can be obtained. After the word segmentation of question text, the question matrix is established, and the corresponding U0, $\sum_0$ and V0 can be obtained by SVD, and the appropriate parameter k is selected. After the word segmentation matrix of question text is finished, the dimension reduction decomposition Ak=U0 $\sum_0$ VkT is obtained. The matrix Ak represents the representation of word segmentation characteristics in the K-dimensional space of the question text, and the word segmentation characteristics are the coordinate values in the new space of the question text.

In the SVD vector space model, the project description information is represented by vectors, and at the same time, the matrix Am*n indicates that all query information is combined with internal keywords, m and n represent the total number of keywords in query information and the total number of query information documents, and the matrix element aij represents the weight of feature ti in document dj. Therefore, Am*n represents m*n, and the order is a real-valued matrix of R. Combining the properties of matrices, there will be an m-order orthogonal matrix U and an n-order orthogonal matrix V, and the following algebraic relationship can be obtained:

$$Ak=UkEkVkT \quad (2)$$

U represents the left singular vector matrix corresponding to the singular value of matrix A, V represents the right singular vector matrix corresponding to the singular value of matrix A, the matrix U is represented as the standard orthogonal matrix of m*m, and all columns of matrix U are left singular vectors of matrix A. If the rank of matrix A is set to r, then the singular values of matrix A are arranged according to the decreasing continuation, and the diagonal matrix E can be obtained. The matrix V=[vij] is n*n standard orthogonal matrix, in which all rows are singular vectors of matrix A. By zeroing the r-k singular values of the minimum value in E, the formula can be obtained:

$$Ak=UkEkVkT \tag{3}$$

Among them, the matrix Ak represents the K-rank similar matrix of matrix A, that is, in the sense of least squares, Ak is similar to the initial matrix A, that is, Ak is the optimal approximate matrix of A. Moreover, Ak contains the key structural information of matrix A, so it is understood that matrix Ak is the reconstruction of matrix A, and the noise of word items in application will be eliminated during this period, and the dimension of the original matrix will be reduced, that is, the characteristics of suspected intervals in the project description information will be merged; After dimensionality reduction, the features displayed in similar query information in K-dimensional space can be regarded as feature approximation even if they have never been generated in the same item description information. [6] That is, in the new semantic space, it already has the characteristics of concept retrieval. The matrix after clipping by using the latent implied meaning index should conform to the following formula:

$$Am*n=Um*rFr*rVr*nT \tag{4}$$

$$Am*n\approx Um*kFk*kVk*nT \tag{5}$$

After the dimensionality reduction of SVD, the high-dimensional word segmentation space formed by word segmentation shows a lower-dimensional word segmentation space, and the word segmentation set in the latter represents the query information characteristics of the original word segmentation content of the self-proclaimed content, thus realizing the extraction of the query information content.

(3) Similarity calculation and solution recommendation

Combined with the final result of word segmentation of query information text and the description of key words of answer information, the similarity between query information text and answer information data is analyzed, and the similarity calculation is calculated by Person similarity calculation method. The calculation method of the similarity between the actual question information text and the answer information is to abstract the question information text and transform it into a vector. [7] If the word segmentation vectors of consultation a and answer information b are set to x and y, the similarity calculation method is used to analyze the similarity formula of question a and answer b as follows:

$$P_{x,y}=\frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2(y-\bar{y})^2} \tag{6}$$

Where $\bar{x}$ represents the expected value of vector x as E(x), and $\bar{y}$ represents the expected value of Y as E(y). Pearson correlation coefficient $P_{x,y}$ indicates the relationship between variables, and the range of the final calculation result is [-1,1]. The higher the value, the higher the matching degree between them. According to the size of the final result, the most suitable answer information is pushed to the student's client, and $P_{x,y}$ is used as the estimated probability. [8]

5 Application effect and present situation of online Q&A system

A scholar takes college students in the second semester of 2019-2020 as the research sample, adopts the completely online teaching method to carry out teaching, and establishes the MOOC learning+homework+Q&A mode. Online Q&A explains the key and difficult knowledge of textbooks, exercises in textbooks and exercises in synchronous training units through the screen sharing functions of online platform live Q&A, Tencent classroom, QQ group live broadcast and other media platforms, and completes Q&A activities by using the continuous wheat function of online platform. In this regard, the scholar distributed 945 questionnaires and collected 945 questionnaires. After statistics, 95.56% of the students recognized the teachers' efforts in Q&A online. However, students think that the learning effect is not ideal. The fundamental reason is that students lack the supervision of teachers and instructors, so their learning enthusiasm is weakened, and many students can't ask questions on their own initiative. At the same time, after a long period of online learning, students have produced negative emotions such as negativity and slackness, which makes the overall learning situation unable to achieve the expected results. Generally speaking, there are still some limitations in the current online Q&A system, mainly in the following aspects:

First, objectively speaking, online Q&A system has high requirements for network and electronic equipment, but the network conditions and electronic equipment vary from person to person. Some colleges and universities have poor network quality, and some students' electronic equipment has not been updated in time. Therefore, there are obvious stuck problems in the live broadcast or Q&A process, which seriously affects students' final learning quality. In addition, the addition of online teaching has also increased students' learning tasks to a certain extent, and the types of homework are more complicated, which is obviously different from classroom teaching. Students lack familiarity and understanding of this Q&A mode, so there may be fear of difficulties and even resistance in actual learning, so they cannot be effectively applied. [9]

Secondly, subjectively, many students fail to develop good study habits and lack self-control, and need the supervision and urging of teachers to complete their study tasks. After adopting the online Q&A system, students are reluctant to ask questions to teachers actively, but think that they can avoid learning and teachers' supervision under this learning mode. In addition, many students are still limited by the traditional classroom teaching mode, that is, they must have the guidance of teachers. After leaving the guidance of teachers, some students don't know how to ask questions, or the questions they ask lack logic, so they can't ask questions effectively.

6 Conclusions

With the development of information technology, the application of information technology in the field of education is more and more extensive, and network teaching based on information technology has become the focus of many scholars' research. Therefore, teachers should be clear about the importance of Q&A in teaching, and at the same time make full use of information technology to help students solve problems and improve their English learning efficiency.

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