Improvement and Optimization of Function Modules of College English Distance Education Based on Intercultural Theory

Yin Zhang

Tourism Department, Changzhou Institute of Light Industry and Technology, Changzhou 213164, China

Abstract

With the continuous development of globalization, the trade and cooperation among countries increase and the clashes between cultures get more frequent. As an international lingua franca, English plays an increasingly important role in globalization. Therefore, cultivating highly qualified personnel with English communicative competence has become a significant direction of our higher education system. With the rapid development and popularization of computer and network technology, the research on scientifically practical online learning system will become more and more important. This paper aims to study a student model of English grammar online learning system, and the core is to use Bayesian network technology to build student models. It aims to find a convenient way to apply bias network technology to student modeling to improve the ability of system model in handling uncertain information. In this paper, based on the Bayesian network learning model, students can learn English grammar and involve themselves in effective autonomous and collaborative learning. The modeling process and the computer adaptive testing techniques will help figure out students’ cognitive ability, authentically reflect their knowledge state and support the correct decision on teaching.

Keywords: Intercultural Theory, College English Teaching, Online Education System.

1. RESEARCH REVIEW

1.1 Research background

With the development of science and technology, some new technologies have entered the field of education, and boosted both the teaching and learning processes. These techniques not only reduce the practical application cost of pedagogy theory, but also get new discoveries in the exploration of other fields that penetrate and integrate with pedagogy (Shu, 2016). Theories such as “Zone of Proximal Development” and “Mastery Learning” require teachers to understand student difficulties, provide them with corresponding contents, mobilize their enthusiasm, give full play to their potential, and realize personalized teaching. Meanwhile, with the constant improvement of computer AI technology, teaching and learning interactive platform is built to realize the system design of teaching content and teaching methods under these theories and stimulate students’ learning initiative and creativity. The development of cognitive science, computer science and pedagogy urges people to pay more and more attention to individual differences of learners, and constantly seek ways of teaching according to their aptitudes. In order to effectively improve the quality of digital learning and the cultivation of innovative talents, researchers have begun to study different learning content and strategies based on individual differences, namely, adaptive learning system. The adaptive learning system can take into account the individual characteristics of each student, and the key part of such a system is the student model that stores all of the student’s information, including his/her level of cognition in a field.

1.2 Literature review

The level of cognition is obtained through student-system interaction. Such a reasoning process is called “diagnosis.” The diagnostic process is undoubtedly the most complex part of the adaptive learning system. In addition to the difficulties of reasoning itself, the diagnostic process also needs to handle uncertain and inaccurate information. Although the student model is proved not to be very accurate, obviously the more accurate the model is, the better it will be. Due to the lack of basic theory, students’ modeling problems have not been well solved. Overlay model and error model are two widely used and representative modeling methods. Under the conditions of the new era, online English education is mainly reflected in the deepening the core elements of student model and the study on adaptability. Based on adaptive testing systems, the student model represents
students’ systematic cognition and their individual differences (Zhou, 2016). In the network environment, students’ knowledge bases, goals and learning styles vary significantly, and the traditional network teaching system cannot realize personalized teaching. This study takes into account the individual differences of students and their knowledge level and construct student model to realize personalized teaching. With Bayesian network, student model is also set up to the characteristics of grammar lesson. With the widespread development of computer technology, especially artificial intelligence technology in various fields, the network teaching system has gradually developed towards intelligence and adaptation (Wu, 2016). Currently, the network teaching system tends to be homogenous in function and form, and it is difficult to realize personalized, intelligent and adaptive teaching. It cannot adapt to the needs of network teaching system development in the new era. The establishment of an online learning or testing system can be beneficial, as the differences among individual learners inevitably lead to different knowledge structure, learning motivation and learning styles. To guarantee individualized teaching demand, online learning systems must take into account individual differences among learners (Zhu and Su, 2015).

2. BAYESIAN NETWORK

2.1 Overview

Bayesian network is a probability network, and a graph network based on probability reasoning, with Bayesian formula as the basis. It is a kind of mathematical model based on probability theory, and the process is called probabilistic reasoning, that is, to obtain the probability information of other Bayesian networks based on some variable information. It is proposed to solve the uncertainty and incompleteness. It has huge advantage in solving the uncertainty and the correlation of complex equipment faults and widely adopted in many fields (Zou and Gao, 2015). The formula is as follows:

\[ P(H, E, c) = \frac{P(H, c) * P(E, H, c)}{P(E, c)} \]  

Among them, \( c \) represents a priori information, \( E \) represents additional evidence, \( H \) represents the degree of trust, \( P(H, E, c) \) represents the posterior probability. \( P(H, c) \) is the priori probability of \( H \) under the given condition \( c \), and \( P(E, H, c) \) represents the likelihood, that is, the probability of evidence \( E \). Assuming that \( H \) and \( c \) are true, \( P(E, c) \) represents a scale factor that is independent of \( H \) (Shao and Yu, 2015).

With the rapid development of Bayesian networks, two types have been formed: static Bayesian networks and dynamic Bayesian networks. Static Bayesian networks mainly involve computer vision, planning, artificial intelligence and expert systems. As they are not suitable for space-time transform, they are gradually replaced by dynamic Bayesian networks. Based on traditional static Bayesian networks, dynamic Bayesian networks are extended to the evolution of time, and successfully applied in pattern recognition (Ke and Dong, 2014).

2.2 Bayesian network learning

The Bayesian network constructed by the prior knowledge of people is called priori Bayesian network, and the Bayesian network that combines objective data and expert knowledge is called posterior Bayesian network. The process of prior and posterior is Bayesian network learning. The structure is show in Figure 1:

\[ \text{Prior Bayesian network} \rightarrow \text{data} \rightarrow \text{Posterior Bayesian network} \]

\[ \text{Posterior Bayesian network} \rightarrow \text{correct} \rightarrow \text{Prior Bayesian network} \]

Figure 1. Bayesian Network Continuous Learning Graph
2.3 Bayesian network topology

Figure 2. Bayesian network topology construction of English grammar

In the Bayesian network topology of English grammar teaching, the root lies in the grammar which mainly includes syntax and morphology. The latter includes nouns, pronouns, infinitive, etc., and the former, subjunctive sentences, passive voice, conditional sentences, etc. (Cai, 2014).

The knowledge item formula $Org(I, (I_1, I_2, ..., I_n))$ is used. The difficulty of each knowledge item is different from others, and simple grammar can be assigned with relatively light weight, and vice versa. The harder the knowledge item is, the greater the impact of its parent knowledge item will have on it, and vice versa. Assuming that the sub-knowledge items are all meta-knowledge items, the weight of their parent knowledge items are $W_i$, then:

$$\theta_i \in \{\text{High, Medium, Low, UMaster}\}$$

(2)

Therefore, the weight of the parent knowledge item is:

$$W_i \begin{cases} \frac{1}{3} W_i, & \text{if } \theta_i = \text{High} \\ \frac{2}{3} W_i, & \text{if } \theta_i = \text{High} \\ W_i, & \text{if } \theta_i = \text{High} \\ 0, & \text{if } \theta_i = \text{High} \end{cases}$$

(3)

The conditional distribution probability is as follows:

$$P(I, (I_1, I_2, ..., I_n)) = \sum_{i \in N} W'_i$$

(4)

Among them, $N$ represents the number of knowledge items. The evaluation of overlay student models has always been the focus and difficulty of research, as they involve many factors for consideration. Here are three aspects, that is, the contents of test questions, and the amount and length of the test papers. It is difficult for online learning systems to test students with a large number of questions, so it is necessary to choose those most informative ones for high-precision evaluation even with a few students (Ma and Zhang, 2014). Domestic and foreign scholars have proposed a variety of algorithms for the selection of the thematic model of Bayesian
network student model. Among them, MillanE proposed a selection strategy function and its mathematical
model is as follows:

\[ U(P, C) = ((P(P = 1, \ C = 1) - P(P = 1))P(C = 1) + (P(P = 0, \ C = ) - P(P = ))P(C = 0) \]  \tag{5} 

Where P represents test questions, and C is the knowledge related to test questions.

In addition, Collinst also provides another mathematical model:

\[ U(P, C) = P(C = 1, \ P = 1) - P(C = 0, \ P = 0) \]  \tag{6} 

To facilitate the calculation, it can be reduced to two functions:

\[ U_1(T, I) = \sum_{\theta \in S} P(I = \theta^T) - P(I = \theta), S = \{H, M, L\} \]  \tag{7} 

\[ U_2(T, I) = \sum_{\theta \in S} P(I = \theta^T) - P(I = \theta, T = 0), S = \{H, M, L\} \]  \tag{8} 

3. OVERALL STRUCTURE OF COLLEGE ENGLISH ONLINE LEARNING SYSTEM

3.1 Overall framework

The overall structure of college English online learning system is shown in Figure 3:

![Figure 3. The Overall Framework of College English Online Learning System](image)

3.2 Advantages of college English online learning

The new model of listening and speaking in college English is based on computer, multimedia and network. It
stresses the combination of classroom teaching and campus culture, social practice, and the creation of a good
English learning environment. With links to English Courses, teachers and students in the library information
base, English teaching e-library, English learning resources, tutorial system, performance assessment, self
assessment and tracing learning, it has greatly enriched the teaching and learning resources. It enables online
counseling and the establishment of a virtual English community where teachers and students can launch free online conversations, human-computer interviews and panel discussions (Shu, 2013). Multimedia English teaching under network environment breaks the limitation of time and space, and enriches teachers and students communicate at different levels. The openness, interaction, sharing and cooperation of English “teaching” and “learning” improve the language ability of students and facilitate their communicate with each other. Such an openness can greatly stimulated students’ interest in learning English. Multimedia technology and network technology have enhanced English learning environment where students want to express themselves completely in English. They can ask questions and fully express their views in discussion in English. Teachers can also break the time and place restrictions and modify their teaching or revise students’ assignment anytime they want.

3.3 Module design of college English online learning system

3.3.1 B / S system, ASP and database

College English online education system based on the B / S structure is basically a computer application that uses browser and server technology for horizontal development. With web server as a carrier, this program does not need to be downloaded, as long as there is relevant browser. As it is installation and maintenance free, it can effectively solve the school’s educational funds problem. At the same time, as it mainly adopts the Access database + ASP scripting language, it can build a college English online education system based on the B / S structure more effectively, and can access web pages and obtain related resources through most browsers and computers with a high degree of openness and flexibility, which is also one of the major advantages of the B / S structure (Wang and Li, 2012).

3.3.2 Hardware and software configuration of system server

College English online education system mainly provides English teaching services to teachers and students through the Internet, therefore, it should be available to many people simultaneously online and its requirements on server configuration is high. Tsinghua Tongfang dedicated server, IntelXeo3.0G dual CPU, DDRII memory 8G, SCSII47G dual hard drive, Gigabit Ethernet, etc. are recommended to ensure its availability.

3.3.3 Features of college English online education system

College English online education system mainly adopts B / S structure that is easy to use. As long as students can use the browser, they can use the college English online education system for English learning. Its main functions are as follows:

First, user management. In college English online education system, a user file, including student photos, personal description, address, major, etc. is to be created for each teacher and student. For each class, teachers can set the password and give the password to the students, so as to prevent the access of unrelated persons. SMS, QR code, etc. can be used to verify, so that students can create their own college English online education system account.

Second, curriculum management. In the College English online education system, teachers have the highest control over every feature, such as forum, quiz, resource, assignment, chatting, and workshop. They can also display the dynamic changes in the curriculum intuitively in the home page of each course.

Third, assignment management. Teachers can create after-school assignments for students through college English online education system, set the deadlines and highest points. Students can record their upload time after completing their English assignments in the online English education system, while teachers’ ratings and feedback on assignments can be intuitively displayed on the students’ homework interface and the students are given the option to resubmit their assignments (Cai, 2011).

Fourth, forum management. Educational informationization is one significant feature that enables students to independent communication and thus solve problems that can not be solved in traditional independent study. To ensure the accuracy of content and answers posted in the forum, teachers can manage the forum, requiring photos to be attached to each post. Meanwhile, the forum can provide a number of ways for topic browsing and for part of the posts, teachers can set as not to reply.
Fifth, test management. The platform allows teachers to customize the college English exam. Teachers can set the test to be tried many times, and display the correct feedback. Test: Random extraction to reduce the possibility of cheating. Education platform system testing: Mainly multiple choices and single choice, later there will be blank filling, questions and other functions. Multiple choice questions support one or more answers. At the end of the test, the teacher can set it up immediately so that students can view the test results (Shu, 2012; 2010).

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