

Design and Implementation of Web-Based English Autonomous Learning System

<https://doi.org/10.3991/ijet.v14i06.9718>

Huimin Han

Jilin Institute of Chemical Technology, Jilin, China
hanhui.min@163.com

Abstract—This paper attempts to solve the following problems of traditional Internet English learning websites: the emphasis on the teaching process over the timely feedback of the students, the bottleneck on the autonomous learning ability of the students, and the delay in the update of relevant resources. For this purpose, the author established a web-based English autonomous learning platform. Specifically, the conceptual model was analyzed by the object-oriented technology, the browser/server (B/S) architecture was set up to send data to the ADO.NET-based backend database, and displayed as webpages. The research results show that the design and implementation of the proposed system offers a preliminary solution to the lack of collaborative communication in traditional webpage learning, and widens the range of resource sharing. The system is in line with the English learners' demand for and interests in Internet learning, and arouses the students' interests and enthusiasm of English learning.

Keywords—Internet, Web, English autonomous learning, ADO.NET, Browser/server (B/S) system, Learning interests

1 Introduction

The rapid development of computer and Internet technologies has inaugurated the information age. New technologies like infobahn and multimedia are exerting a profound influence on our work, learning, life and social networking [1]. Against this backdrop, Internet technologies have been applied to the teaching process [2], which blurs the spatiotemporal boundaries of education and reshapes the pattern of English teaching. With the aid of Internet technologies, English learners can obtain and select English learning materials according to their own interest, while English teachers can access a wealth of up-to-date teaching materials online and upload the relevant materials to their own English teaching websites. These websites provide the students with a proactive environment of autonomous learning, enabling them to actively acquire English knowledge they need. This is in line of the direction of English teaching reform [3].

Education information was proposed in the 1990s along with the construction of the infobahn [4]. This concept refers to the application of computer technology, Internet sharing and other technologies in the field of education, aiming to realize the in-

novative training of talents and promote the quality education of students [5]. According to the existing studies at home and abroad, the main purpose of Internet teaching research and design lies in the creation of a learning environment and the design of shared learning.

Currently, there are still many defects in the infrastructure and teaching resources of Internet education. Out of the numerous English learning websites, many provide English learners with test-oriented teaching contents; if not completely blank [6]. In general, the traditional Internet teaching emphasizes the teaching process over the timely feedback of the students, failing to arouse the interests or enthusiasm of English learners. Thus, it is imperative to find a better way to enhance the English teaching effect. Based on the campus network of universities, the web-based English autonomous learning system can offer a platform of autonomous learning and collaborative communication for teachers and students. The platform boasts rich educational resources and a high degree of information sharing.

In this paper, the conceptual model is analyzed by the object-oriented technology, and the association structure and network mechanism are established between each object. Next, the browser/server (B/S) architecture was set up to send data to the ADO.NET-based backend database, and displayed in cascading style sheets. The proposed website consists of such five parts of teaching module, interest module, chapter quiz, grade examination and interactive platform. Each part is embedded an online feedback and communication mechanism. The teachers and students can communicate in time via chat rooms, message boards, forums, etc., making English learning lively and full of fun. The design and implementation of the web-based English autonomous learning system creates a suitable learning environment for English learners, allowing them to learn and give feedbacks anywhere, anytime. With this system, the students will be more interested and active in English learning.

2 Technical Solution of the System

2.1 Object-oriented technology

Object-oriented technology is a two-step strategy of website development: understanding objective things through common thinking and depicting these things in an intuitive way [7]. This technology has two basic features, namely, encapsulation and inheritance [8]. Encapsulation refers to the packaging of objective things in software development, so that only the external information is visible. Encapsulation mainly targets objects. An object is the encapsulation of properties and operations. The user only needs to access the interface of the object, without noticing the details of the object [9]. Inheritance refers to the shared use of the properties and methods of an object, such that developers can reuse different objects. Relying on inheritance, developers can express the “classes” or the common features of various objective things. The general and special properties of an objective thing must be described simultaneously to ensure the correct understanding of it. Similarly, the general and special classes should be described as an organic whole to draw a clear picture of different things

[10]. Following this train of thought, it is easy to grasp and distinguish objective things. In object-oriented technology, the general classes are referred to as the parent classes or base classes, while the special classes are called the child classes or derived classes. One or more child classes can be derived from one parent class. This relationship lays the basis for multiple inheritances in object-oriented technology.

2.2 B/S architecture

As shown in Figure 1, the B/S mode has three tiers: database, web service and browser [11]. During the operation, the browser sends the “Ask” to the web service layer for transaction processing; then, the web service layer sends the “Ask” to the backend database for data processing; the processed data is fed back via the web service layer to the browser for display [12].

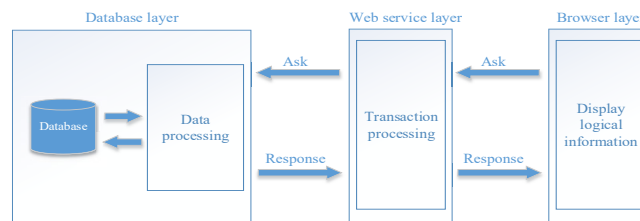


Fig. 1. The three-tier architecture of B/S

2.3 ADO.NET database access technology

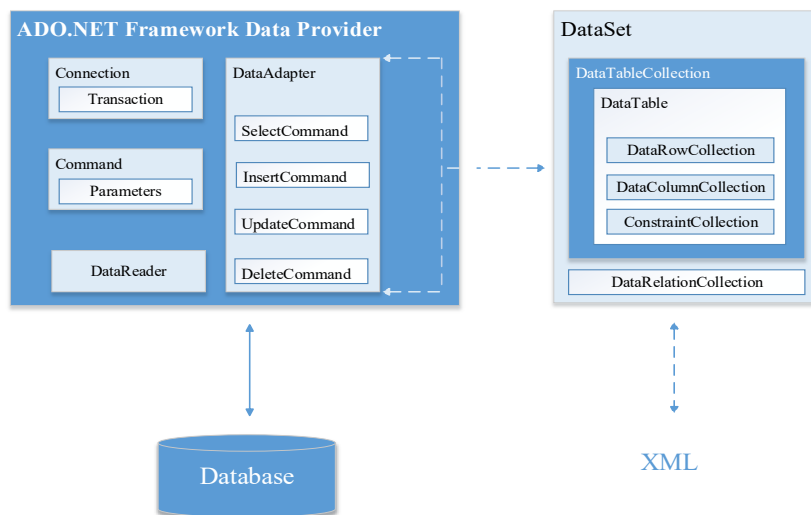


Fig. 2. Architecture of ADO.NET

The advent of the era of big data has caused the explosive growth of Internet data, and an upsurge in the speed and information of Internet users in their access to websites [13]. As a result, database access technologies have attracted more and more attention from software developers. ADO.NET is one of the most trusted database access technologies in the circle of software development [14]. The architecture of ADO.NET is shown in Figure 2 below.

3 System Feasibility Analysis and Functional Design

3.1 System feasibility analysis

With the deepening of education reform, quality education has been promoted vigorously across China. Many universities have established their own English autonomous learning systems. Nevertheless, these systems and their related websites are not frequently visited or used by students, because their contents, forms and feedback mechanisms are out of touch with the interests of today's university students. In other words, the current English autonomous learning systems cannot satisfy the demand for English teaching and the requirements of the society for English proficiency. In view of these problems, the development of a web-based English autonomous learning system is feasible in the following three aspects:

- **Feasibility of operation management:** The feasibility of operation management is demonstrated in the attitude and recognition of the system among the university management, teachers and students. Compared with the traditional English learning systems, the web-based English autonomous learning system boasts rich and complete knowledge points, arouses the learning interests of today's students, and highlights the feedbacks and communication between teacher and student, student and student and teacher and teacher. As a result, the system has won the recognition of university management, teachers and students, who have put forward rational management modes. Hence, the system development is feasible in operational management.
- **Feasibility of technical implementation:** In terms of technical implementation, the web-based English autonomous learning system is essentially the same as the current webpage and software development. With the rapid development of Internet technology, the software development technologies have become relatively mature. Meanwhile, universities, as knowledge-intensive places, are strongholds of computer professionals. Thus, it is feasible to technically implement the proposed system.
- **Feasibility of economic benefits:** The economic benefits of the system should be evaluated from the development cost and the economic benefits after development. The system development effectively integrates English teaching resources, improves English teaching efficiency, and saves human, material and financial resources. Therefore, the system development is feasible in economic benefits.

3.2 Functional design of web-based english autonomous learning system

To fulfil the expectations of university teachers and students on English learning and in light of the teaching purpose and learning interests, the web-based English autonomous learning system was designed with five sub-systems:

- Teaching module
- Interest module
- Chapter quiz
- Grade examination
- Interactive platform

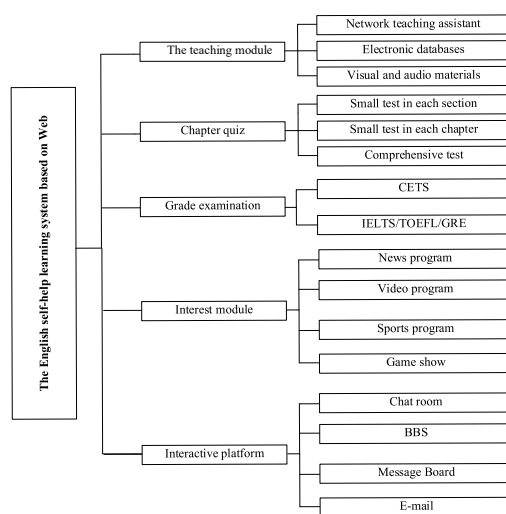


Fig. 3. Module design of web-based english autonomous learning system

Teaching module: This module contains the teaching contents, learning methods, electronic database and audio-visual materials. There are two aims of this module: the knowledge not mastered in class can be presented after class in the same environment as that in class; the students can develop a stronger autonomous learning ability. In addition, this module provides good learners with the links to websites on relevant knowledge.

Interest module: This module updates the latest English information on the interested topics of today's university students. The specific programs are as follows:

- News program: The news and feature reports of foreign mainstream media are displayed, together with background knowledge and related vocabularies;
- Video program: British and American TV plays, especially trendy or classic ones, are provided, in addition to foreign speeches (e.g. TED talks) and open courses of famous universities like Harvard;
- Sports program: Sports loving students are provided with the information on the matches organized by various sports associations, such as NBA, FIFA and UFEA.

- Game show: The strategies and background stories (English) of popular games are presented, including DOTA, League of Legends and Hearth Stone.

Chapter quiz: According to the teaching progress, the teacher can arrange small test in each chapter, small test in each section, and comprehensive test for the students. The questions of these tests can be extracted for the final exam to stimulate the enthusiasm of the students. Besides, the teaching contents can be adjusted properly in light of the online self-test results of the students. This module helps the teacher track the students’ learning situation and cultivate their autonomous learning ability.

Grade examination: This module mainly contains the instructions, past exam questions and simulation questions of CET-4 and CET-6, which cover listening, vocabulary, reading and other aspects. In addition, the learning materials on IELTS, TOEFL and GRE are provided for good students.

Interactive platform: The module is presented in the form of chat rooms, BBS, message boards and E-mails. Of course, interactive platforms are also provided in other modules. Through this module, real-time communication can be realized between teacher and student, student and student, and teacher and teacher, which improve the participation and feedback efficiency of English teaching.

3.3 Data design

Table 1. Students’ information

Project	Allowed to be null	Data type	Allowable length	Primary key
Student ID	No	Int	10	Yes
Name	No	varchar	8	No
Gender	No	bit	2	No
Birthday	Yes	varchar	8	No
Major	No	varchar	8	No
E-mail	Yes	varchar	20	No
Photo	Yes	Images	50	No

For the web-based English autonomous learning system, the database was designed as a data-oriented type according to the information demand [15]. The information of all teachers and students in the university should be collected into information tables, and compiled into corresponding data dictionaries.

There are three types of information tables:

- Students’ information table
- Teachers’ information table
- Employees’ information table

The first two types are frequently visited. The students’ information table mainly contains student ID, name, gender, major, etc., while the teachers’ information table mainly contains employee ID, name, gender, department, phone number, job title, etc. Note that student ID and employee ID are the main identifier of the corresponding

table, and their data type should be int and should not be null. The details of the information tables are shown in Tables 1 and 2 below.

Table 2. Teachers' information

Project	Allowed to be null	Data type	Allowable length	Primary key
Employee ID	No	Int	20	Yes
Name	No	varchar	8	No
Gender	No	bit	2	No
Birthday	Yes	varchar	8	No
University	No	varchar	10	No
E-mail	Yes	varchar	20	No
Post	Yes	Images	8	No

4 System Implementation

4.1 System flow

The main process flow of the web-based English autonomous learning platform is as follows: First, the login verification checks if the user has registered and activated an account; if not, the user is asked to register a new account. Then, the system determines the identity of the user (student, teacher or administrator) according to the account information. After that, the relevant permissions are given to the user for he/she to use the modules. The system flow is explained in Figure 4 below.

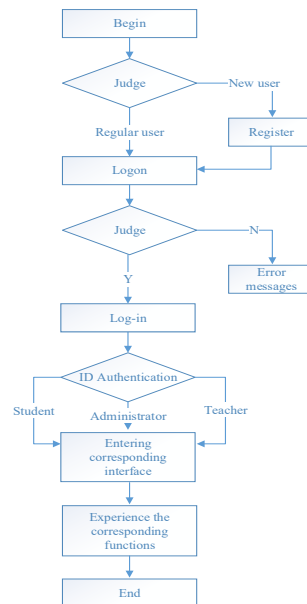


Fig. 4. System flow

4.2 Interface display

After user login, the web-based English autonomous learning platform will be presented as a webpage. The homepage will cover the main modules: teaching module, interest module, chapter quiz, grade examination and interactive platform. According to his/her needs, the user can click to enter a module, and acquire the needed learning materials and interested information. The homepage also has two information windows called the intramural information and international information. These windows are designed to help students learn more information and improve their English reading. In addition, the homepage offers a search bar and a share bar. The user can search for information by keywords in the search bar. If he/she is interested in some information or learning contents, the student can share the links to other users on campus with a click on the share bar. Figure 5 is a screenshot of the homepage.



Fig. 5. The homepage

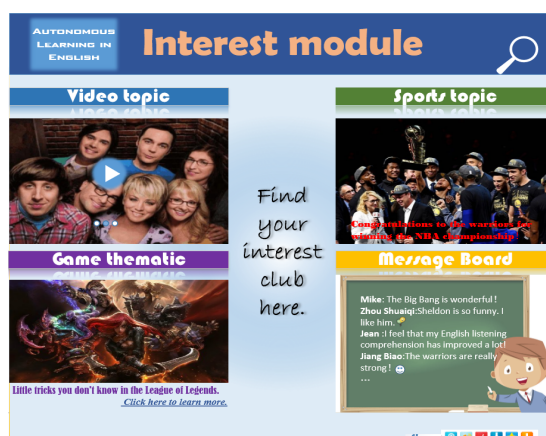


Fig. 6. The interest module

The user can click and enter any of the five modules on the homepage. Taking the interest module for example, this module contains the information on American TV plays, sports and games, which are of interest to today’s university students. A message board is on the module, where the students can exchange their interests and opinions. This module aims to create a relaxation platform for the students, so that they can learn while having fun. The screenshot of the interest module is shown in Figure 6 below.

4.3 System usage surveys

An anonymous survey was conducted on campus to evaluate how often the students visit and how much they like the system. The survey results in Figure 7 shows, at the beginning, the proposed system attracted much fewer visits than traditional learning websites; with the elapse of time, the number of visits of the proposed system gradually surpassed that of the traditional learning websites, and remained at a high level. Another survey was carried out to compare the students’ interests in the proposed system and those in the traditional learning websites. The survey reveals that most students preferred the proposed system to the traditional websites. These surveys fully demonstrate the effect of the web-based English autonomous learning platform, which has attracted the interests and promoted autonomous learning of today’s students.

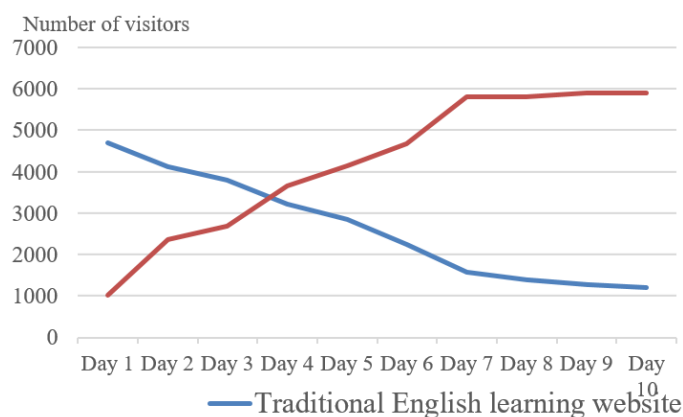


Fig. 7. Survey results

5 Conclusion

The concepts of autonomous learning and education informatization have penetrated into every corner of our life and study. However, the current English teaching websites of Chinese universities faces the lack of teaching resources and ineffective access and interaction mechanisms. To solve these problems, this paper creates the

association structure and network mechanism between each object after analysing a conceptual model based on the object-oriented technology, and adopts ASP.NET technology for webpage development and design. Then, the B/S architecture was established to send data to the backend database built by ADO.NET technology. With the aim to arouse the learning interests and enthusiasm of students, the author designed and implemented a web-based English autonomous learning platform through comprehensive analysis of system functions. The meanings of this research are as follows:

- The adoption of object-oriented technology in the programming guarantees the accuracy and effectiveness of the system demand analysis, and guides the design of functional modules.
- The database was built on ADO.NET technology and the webpages were designed by ASP.NET. These technologies enrich the contents and streamline the interfaces of campus English autonomous learning website.
- The web-based English autonomous learning platform, as an extension of computer-assisted English teaching technology, promotes education informatization and arouses the enthusiasm for autonomous learning of English learners.

6 Acknowledgment

JLICT's Key Project No: [2016]024.

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8 Author

Huimin Han graduated from Beihua University and majored in language testing. She is a professional English teacher since 2012 and had a working experience of six years. In scientific research, she has published more than 10 provincial papers. At the same time, she participated in Jilin Institute of Chemical Technology.' Key Project and Social Science Fund Project of Jilin Province. Also, she had written a textbook in 2017, and was chosen as an excellent teacher in 2017. Email id:hanhui.min@163.com

Article submitted 2018-10-15. Resubmitted 2018-11-26. Final acceptance 2018-11-26. Final version published as submitted by the authors.