

Function Design for Inquiry-Based Learning Platform Based on a Computer Network

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Abstract—This platform emphasizes the design of inquiry-based learning's function and interaction and organization of information. In this platform, students can adopt independent research and cooperative learning modes and teachers can carry out remote guidance in the students' learning activities, which improves the students' innovation capabilities and the practical capabilities. This platform embodies the concept of inquiry-based learning and emphasizes the establishment of an ideal environment for in-depth learning, cooperative inquiry and announcing achievements. However, it cannot replace the teachers' functions nor can it replace the students' dominant positions, but it embodies student-centered and teacher-directed inquiry-based learning.

Keywords—computer network, higher education, student English study, study method.

1 Introduction

Currently, in the implementation of inquiry-based learning activities, because of limited hours, students cannot collect a large amount of information required for inquiry-based learning activities in a short period of time. The teaching process is still mostly teacher-centered, and students are still in a passive position to receive knowledge, which does not reflect the fact that students are the center and purpose of the whole education endeavor. In the practice of inquiry-based learning, utilizing computers and internet technology has been applied, and most of the practices are still in the process of inquiring for information. The characteristics of the computer network, such as being bi-directional or having multi-directional interaction, the ability of the timely update of resources, the equality of users, and having no limits of place or time, have not been fully exploited. Therefore, the application of a computer network as a resource library, information processing platform, communication platform,

results-publishing platform, etc., is a very practical and challenging new topic to construct inquiry-based learning mode based on computer network. At present, no satisfactory results have been achieved in the aspect of theoretical innovation of the network inquiry-based learning mode, and there is a lack of typical examples for the construction of the teaching model guided by the theory of inquiry-based learning [1]. In view of above mentioned situation, this paper will combine computer network technology, teaching design elements and inquiry-based learning to construct an inquiry-based learning mode based on computer network. It aims at stimulating students' learning interest, improving students' capability for innovation, practical abilities and information literacy, and promoting the students' life-long learning and development. The teaching examples provided in this paper can provide practical experience and guidance for similar level schools and teachers. At the same time, this author offers some opinions on network teaching theory being applied in practice, and proposes certain innovations in inquiry-based learning mode based on a computer network.

2 Construction of Inquiry-Based Learning Pattern Based on Computer Network

Guided by constructivism learning theory, cognitive flexibility theory and social constructivism, and referring to multiple teaching modes, the inquiry-based learning pattern based on a computer network is established according to the training objectives of elementary education reform and laws of physical and mental development of students, as well as principles of learning to learn, learning to do, learning to cooperate, learning to behave and cultivation of personality. The inquiry-based learning pattern based on a computer network includes six basic elements: topic, teacher, student, learning resource, evaluation, and inquiry-based learning platform, as diagramed in Figure 1, and then analysis and integration is carried out for various elements. Finally, five sub-models have been designed: teachers, students, learning resources, inquiry-based learning platform, and learning assessment.

1. **Topic:** There are two major ways to select the research topic in the inquiry-based learning pattern based on the computer network. The first is selecting a topic from a list of topics provided by the teacher [2]. For those students with poor learning ability, teachers should provide some research topics for students to refer to. The second way is to allow students to make their own choices. For those students with strong learning ability, teachers should respect students' individual interests, thoughts and ideas by allowing them to select their own research topics.
2. **Teachers:** Firstly, teachers will determine the topic and release it into the inquiry-based learning platform. Secondly, they will collect and organize related information for students to refer to. Thirdly, they they create an atmosphere which motivates students' learning interest and arouses students' enthusiasm for learning. Fourthly, they will guide and organize network research and communication activities among the inquiry-based learning activities. Finally, they will organize formative assessment and summative assessment to research group and students for students.

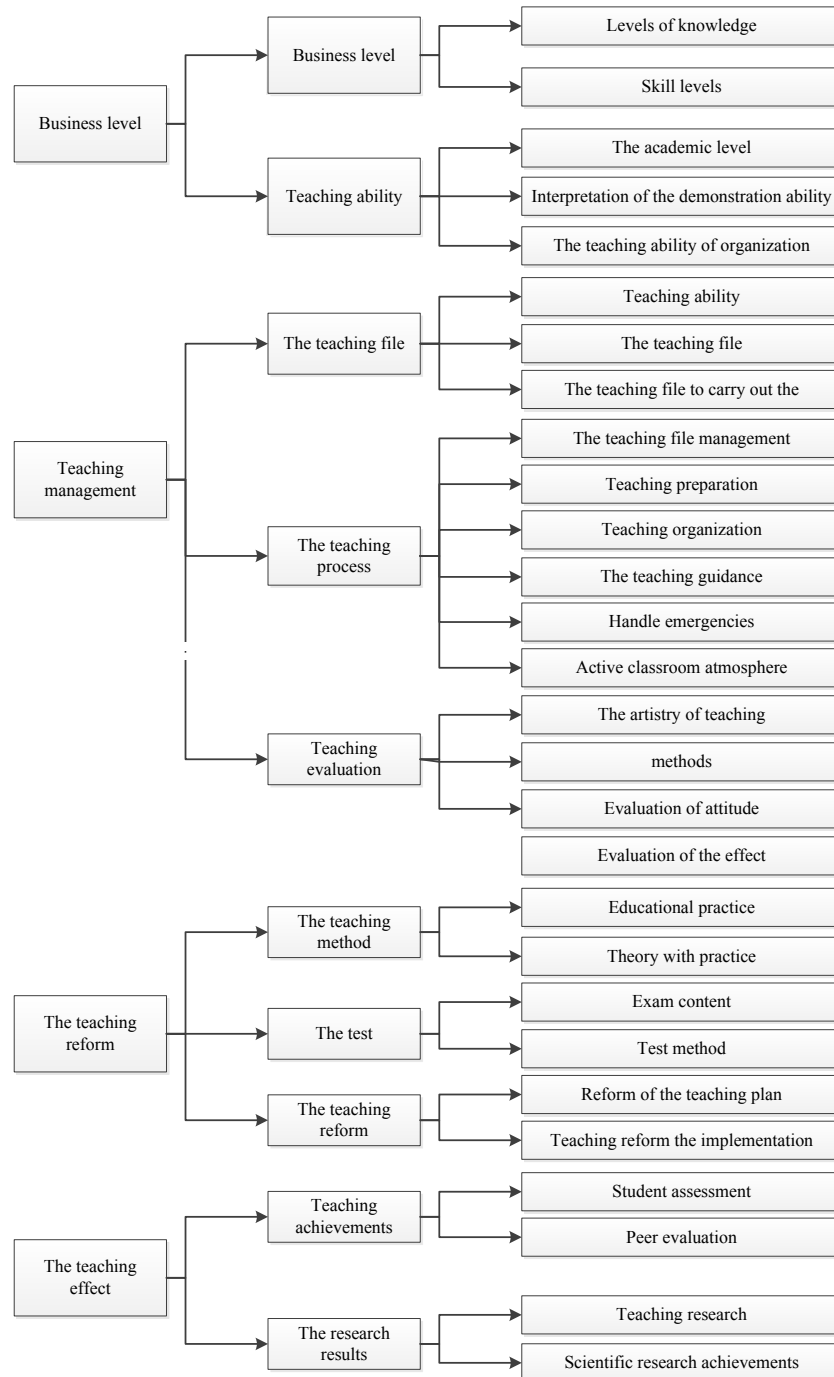


Fig. 1. Management evaluation index systems

3. **Students:** Firstly, students will collect and analyze information and raise questions about that information. Secondly, they shall will a subject independently and form research groups. Thirdly, they will make research scheme and research plan based on discussions with team members [3]. Finally, they will solve problems through independent research and cooperation through the computer network.
4. **Computer network-inquiry-based learning platform:** To address the problems in implementation of current inquiry-based learning, this author uses an inquiry-based learning platform to support the inquiry-based learning pattern based on a computer network. This platform is divided into three modules of resource module, interface module and management module. The resource module includes research direction and learning resources. The interface module includes a questionnaire system, system help, online communication, learning assessment and results exhibition. The management module includes user management and bulletin management.

3 Function Design for Inquiry-based Learning Platform Based on a Computer Network

Inquiry-based learning platform, as shown in Figure 2, is designed for the specific realization of inquiry-based learning pattern based on computer network raised by this author, and it is the main support platform for carrying out inquiry-based learning activities. This is a teaching platform for inquiry-based learning a basic course using computer application, and is implemented according to inquiry-based learning mode of a computer network, constructivism, cognitive flexibility theory and social constructivism. It provides students with a network environment in which students can learn a basic course using computer application by inquiry-based learning method, and it provides teachers with the means to create a learning environment, offer guidance in learning as well as supervision and management of students and offer teacher feedback [4]. This platform provides both teachers and students with a student-centered multi-mode network teaching environment. By virtue of this platform, teachers teach through the theme of created inquiry-based learning rather than traditional knowledge points or textbook chapters, and students carry out inquiry-based learning by group cooperation. The inquiry-based learning platform consists of the following 13 function modules, and its structure is shown in Figure 3.

3.1 Student information

Student information shows students' personal information, including the user name, actual name, Email, phone number, mobile phone number, gender, student ID, department, major, grade, class, personal profile, etc. Students can browse and modify personal information at any time.

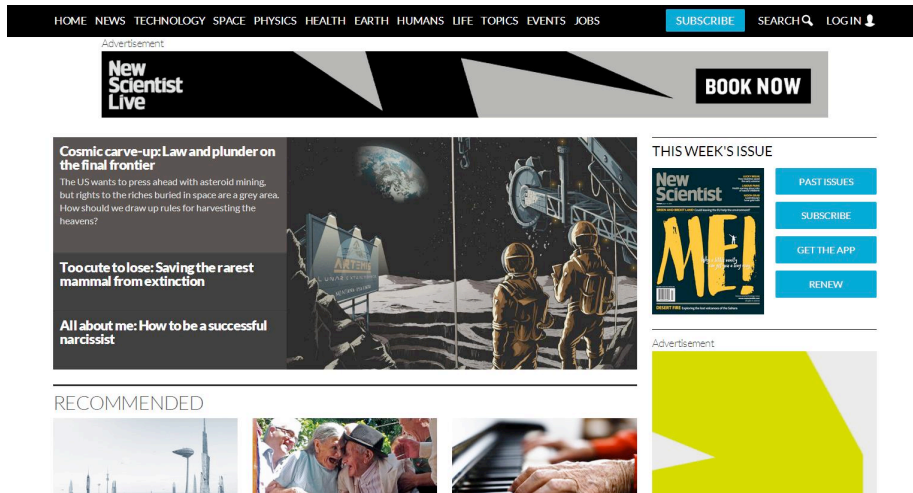


Fig. 2. English study platform

Create an account

Create an account for free access to:

- A selection of articles hand-picked by the editors available only to account holders
- The email newsletter delivering the top things you need to know to your inbox every week
- Event updates, special offers and competitions

Step 1 - Fill in your details

First Name

ALL FIELDS ARE REQUIRED

Please enter your first name...

Last Name

Please enter your last name...

Country

United Kingdom

Email

Please enter your email address (example@example.com)

Password

Your password must be at least six characters long.

Please enter a valid password...

Fig. 3. Personal resource

3.2 Teaching blog

Teaching blog is a personalized private space which records the experience, feelings, observations, ideas and thoughts of the author of the blog when carrying out inquiry-based learning activities every day. Teachers recommend special subject resources related to research topics, external links to sites and articles related to inquiry-based learning, etc., through the log form. Students can acquire needed information resources from the teacher's blog [7]. At the same time, students can also release information resources that they themselves have discovered and their own learning experience, etc. to the blog and communicate with each other. Users enter the teaching blog page, and click the "blog's home page" section in the left column, and enter the home page of the teaching blog, as shown in Figure 4. The blog page includes "recommended articles", "recommended blogs", "the latest articles", "article rankings", "blog rankings" and other columns and provides the function of searching blogs and articles. Users can also know the statistical information of the whole blog system and popularity rating of blogs and articles.

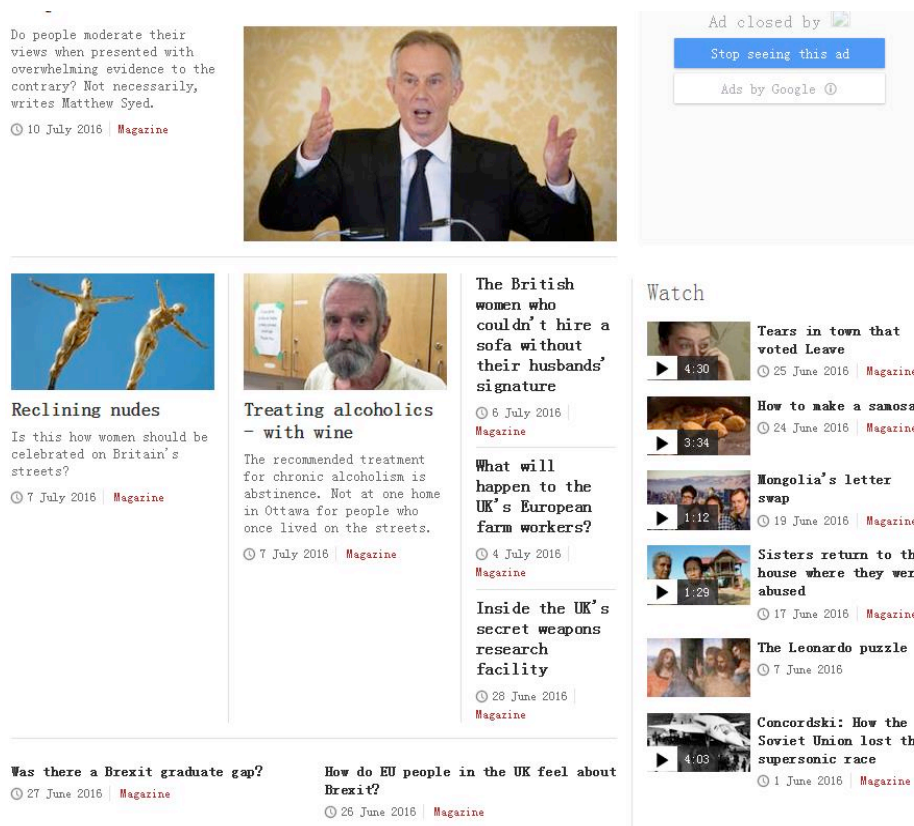


Fig. 4. English reading study

3.3 Personal resources

Personal resources provide users with a tool by which users can store personal information freely. Users can store the material related to inquiry-based learning activities into personal resource tools according to personal hobbies, interests or needs. Data can be classified according to text, picture, sound and video, etc. [8]. Users can also establish the corresponding folder in accordance with personal needs. “Personal resources” organizes many various resources in the form of a directory tree. All materials and resources can be widely applied to the construction of various learning courses of the user and have the features and functions to which the idea “construct once, use many times” is applicable. Users enter the inquiry-based learning platform, and click “personal resources” section in the left column and then enter their personal resource page.

3.4 Question answering and discussion

After students log into inquiry-based learning platform, they click on “question answering and discussion” at the left navigation bar, and then a subordinate menu displays the options “online forums”, “FAQ”, “automatic question-answering” and “mail answering”.

The function of online forums is to provide communication between teachers and students, and among students, in the process of inquiry-based learning. Teachers can organize students to do free discussion on “online forums”. Students and teachers can post discussion topics, and they can also reply to other students’ topics. Teachers can also maintain the curriculum discussion forum as the administrator of the online forum.

The online forum page contains a topical search forum, top topic list, basic problems list, topic list, quick-publishing of new topic and other columns. Teachers can query and browse topics, and they can also publish new topics. Additionally, the page provides teachers with a forum management function and shortcuts for blocking users. Students can search topics, view topics by category, publish new topics and use other functions in the online forum. When students search one topic in this discussion forum, they can enter the topic to be searched into the text box in the topic search area on top of the online forum display screen, and click the “search” button to search for eligible topics. Articles in the discussion forum can be displayed in three formats, “topic”, “time” and “tree list”. Topic can be switched among different displaying methods by clicking the function button of “displaying topic by topic”, “displaying topic by time” and “displaying topic by tree list”. The system default is displayed by “topic”, as shown in Figure 7. If students want to publish new topics, they can enter the topic title and edit topic content in the “quick-publishing of new topic” below the topic list or article list.

3.5 Automatic question-answering

Automatic question-answering, provides students with the function of automatic retrieval of an answer from a common problem database. Meanwhile, this module

also allows students to submit questions with an unsatisfactory answer to teachers. After they enter problems to be retrieved in the “please enter a question” column, and click on the “retrieve answer” button after they finish it, then the system will automatically retrieve matching questions from “list of common questions”, and display the list of candidate answers according to degree of conformity. The function of “asking teachers questions” focuses on students [10]. Students can use this function when they fail to retrieve relative questions or when they are unsatisfied with the answers retrieved. Of course it can also be used for communication and discussion among teachers.

3.6 Question answering by email

“Question answering by email”, shown in Figure 4, provides students and teachers with the function of answering question by “mailbox for teaching”. Students can ask questions through mailbox for teaching, and the submitted question will be sent to the course answering directory of teachers’ mail. Then, the teachers’ reply will be sent back to students’ mailbox.

4 Empirical Study

This experiment chose two classes under similar conditions respectively as the experimental class and the comparative class. Two classes were taught by the same teacher, and learned the same content within one semester, but teaching methods for two classes were different. The experimental class adopted the inquiry-based learning method, while the comparative class used the traditional lecture method. Through the teaching experience in one semester, we can examine whether inquiry-based learning method had a significant impact on students’ interest in study, motivation, self-confidence, self-learning capability, scientific attitude, perspective of thinking, cooperative consciousness, query ability, academic record, etc. Self-compiled *Learning Situation Questionnaire of Basic Application of Computer* was used to survey students’ inquiry-based learning situation, and the school’s final examination paper of *Computer Applications Basis* was used to evaluate their learning result.

4.1 Experimental subjects

The experimental subjects were all the pupils in Japanese Class 0701 and Japanese Class 0703 from a college. Two classes were both comprised of students of the same major, had similar scores in the college entrance examination, and the ratio of males to females, ages, family backgrounds and other basic situation in these two classes were basically the same. The Japanese class 0701 of 26 students was randomly selected as the comparative class, and Japanese class 0703 of 27 students was selected as experimental class. There were altogether 53 students as experimental subjects in both the experimental class and the comparative class.

Table 1. College English tutors statistical information

Classification	Statistical information
Sex	Men 1, Women 3
Age	1 person under the age of 40; 2 people over 40
Education background	3 people with a Master’s degree; 2 people with a specialized subject
Years of teaching	2 people under 15 years ; 2 people over 15 years
Professional title	5 professors; 16 associate professors; 24 lecturers; 2 assistance teacher
Current teaching grade	2 people Intermediate; 1 person Subtropical high

Table 2. Students statistical information

		Out-standing students	The first table of under-graduates	The second table of under-graduate	The third table of under-graduates	Music, American under-graduates	Average percent-age
Network autonomous learning guidance and monitoring of the students	Good	36.2	44.6	42.3	48.2	45.3	45.2
	General	31.2	39.5	40.2	39.3	40.2	56.3
	Bad	32.6	16.5	16.3	11.5	4.9	16.3
Computer operating ability	Good	45.2	51.2	59.2	25.3	63.2	55.2
	General	29.3	37.2	24.3	16.3	20.6	26.3
	Bad	25.1	20.6	16.6	50.2	17.3	19.3
Promotes the teaching with computer	Good	50.2	43.2	52.2	46.3	50.2	45.2
	General	39.5	41.0	35.4	40.2	39.2	36.2
	Bad	6.3	15.8	12.3	13.3	6.3	12.1

4.2 Statistical methods and tools

This research used SPSS11.0 statistical software to analyze the data. The t test is usually used for analyzing scores and other measurement data, while the χ^2 test is often used to test variable degrees about ability, attitude, emotion and other enumeration data. So in this research, the χ^2 test was used to test the difference in the two classes of students in learning attitude toward a basic computer application course, affection, inquiry-based ability and other aspects. The t test was used to test differences in academic records between the experimental class and comparative class.

4.3 Experimental results and analyses

Comparison and analysis of learning interests of the two classes’ students in the basic course with computer application: The inquiry-based learning methods will be adopted as independent variables and the learning interests in the computer application basic course will be used as dependent variables, and χ^2 will be used to test. The specific situations are shown in Table 1.

The problem situations in the inquiry-based learning can stimulate students’ desire for knowledge and arouse the students’ learning enthusiasm, thus strengthening the students’ learning interests. The investigation result shows that after one semester’s

inquiry-based learning practices, 48.1% students in the experimental class increasingly enjoy the basic course with computer application, 25.9% are slightly interested in this course and no one is increasingly disappointed at this course. Almost three-quarters of students started loving the basic course with computer application, and 51.9% of students always thought about unsolved problems after class. Therefore, 26.9% of students in comparative class were increasingly disappointed at this course, 46.2% felt the same way as before, 42.3% thought that learning the basic course with computer application was a burden and 38.5% always hoped the class to be finished earlier. Table 1 shows that there are significant differences in 4 items (the value of p is respectively 0.002, 0.003, 0.006, 0.002). Thus it can be seen that the inquiry-based learning made two classes' students have significant differences in their interests in learning the basic course with computer application.

Comparison and analysis of learning motivations of two classes' students in basic course with computer application: The inquiry-based learning method is adopted as independent variables and the learning motivations of computer application basic course are used as dependent variables, and χ^2 is used to test. The result shows that differences of two classes about the students' learning motivations of basic course with computer application are not significant. The specific situation is shown in Table 2.

The investigation result shows that, 77.8% of students in the experimental class thought the basic course with computer application was useful for their future learning and working, based on their answers to the six question in the questionnaire. However, only 38.5% of students in the comparative class thought in the same way, so the difference was significant ($p=0.027$). The reason for the large difference may be that situations and examples in the lessons selected by teachers in the inquiry-based learning mode were mostly related to students' lives and students can practice them in person as well as reflect on them seriously. But, 81.5% of students in the experimental class and 88.5% of students in the comparative class admitted that the reason why they seriously learn the basic course with computer application was in order to get high grades on exams. It is thus clear that this involves many exam-oriented elements. Inquiry-based learning requires not only conceptual changes of students and teachers but also corresponding reforms carried out in the overall educational system. These needed changes cannot be made all in one day, and they require leaders, experts, scholars and front-line teachers from education departments to work together. In general, the differences between the two classes in students' learning motivations of basic course with computer application are not significant due to the influences of exam-oriented education.

5 Conclusions

The practices of carrying out the inquiry-based learning pattern based on a computer network, arrives at the following conclusions:

1. The aim of using the inquiry-based learning platform is to better support inquiry-based learning. This platform emphasizes design of inquiry-based learning's func-

tion and interaction and organization of information. In this platform, students can conduct independent research and adopt cooperative learning modes, and teachers can control and guide the students' learning activities remotely, which promote the improvements in students' innovation capabilities and practical abilities. This platform embodies the conception of inquiry-based learning and emphasizes the establishment of an ideal place for deep learning, inquiry-based cooperation and announcements of achievements. However, it cannot replace the teachers' functions nor can it replace the students' dominant positions, but it embodies student-centered and teacher-directed conductor of the inquiry-based learning.

2. The method of realizing students' automated and personalized learning with the inquiry-based learning based on a computer network allows students to make full use of time. According to individual situations, the speed of inquiry-based learning can be fast or slow, and the process of inquiry-based learning can be constantly changing or repetitive. It changes the old phenomenon of more teachers giving presentations with less students' autonomic learning, requiring every student to follow the same course of study no matter how different their abilities are. Students' self-operation of a computer can be used to carry out independent research and make cooperative inquiries which are placed within a group or between groups, thus providing students with a space with better allows for independent thinking and with more opportunities for cooperation. In the meantime, teachers can give timely feedback and give direction as well as individual instruction to students when needed in a timely manner; give positive assessments to students for their activities in time; encourage students for their strong points in analyzing and solving problems as well as their flashes of creative thinking. They can arouse intrinsic motivation in students, as well as motivation to achieve and have more social interaction in the learning process.

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