

## **BRIX — Elements for Language Course Creation**

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**Abstract:** This paper describes the design of a courseware authoring tool, BRIX, which was built specifically for the second language acquisition domain. A needs analysis identified specific requirements of online language learning and the inadequacy of commercial course management systems with respect to these requirements. BRIX has been developed to fulfill language educators' requirements focusing on reading, writing, and listening activities. The design of BRIX is based on pedagogic approaches and theories of teaching and learning second languages and on the results of analytic and empirical evaluation of test versions of the software.

### **Introduction**

The Internet has played an important role in recent developments in every industry. Education is no exception. Second Language Acquisition (SLA) is one of many academic fields in which Internet technology has been applied in instruction. Distance education is desired and useful for SLA, especially for languages that are not commonly taught in a given university. (Fleming and Hipple 2002). According to a survey conducted by the Chinese Language Teachers Association (1996), many U.S. institutions did not offer Chinese programs because there were not enough prospective learners at their home institutions. Online language learning provides an opportunity for universities to offer courses in any language by combining scattered groups of learners from diverse locations. Furthermore, online learning also makes possible global language-partnering connections between native speakers and learners of different languages who can collaborate and exchange knowledge, serving as peer educators.

However, current commercial software systems for distance education are not adequate for most SLA applications. Distance education for SLA requires a system that supports not only input and output of the character set of the target language but also a range of learning tools such as discussion boards, vocabulary activities, grammar clinics, online dictionaries, and writing draft books, and instructor tools such as feedback and assessment tools, all organized around learning activities and communicative practice in listening, speaking, reading and writing. Although some tools such as discussion boards, chat rooms, and quizzes, are provided by commercial course management systems, they are not tailored for the teaching and learning of second languages and are provided piecemeal rather than being organized in a manner conducive to the desired learning activities. Consequently, many language education institutions have built their own courseware for online classes. This work requires intensive programming experience, which language instructors cannot afford the time to pursue. Changes to course content and organization relies on the labor of programmers or Web developers. Language educators need a system that can allow them to work independently as course designers, with no need for programming skills.

This paper reports a needs analysis of system requirements for SLA, motivating the design of BRIX, a tool for building SLA courses. We first propose specific requirements of SLA and identify problems in two major commercial course management systems currently used in distance education: Blackboard and WebCT. We then describe the conceptual framework of BRIX and its features.

## **Requirements for Second Language Acquisition Environments**

Computer Assisted Language Learning (CALL) has existed since the 1960s (Levy 1997, cited in Glatz 2000). However, the use of computer technology has increased dramatically with the advent of multimedia and Internet based technology, especially the World Wide Web (WWW), in the 1980s and 1990s. The WWW has changed second language learning by providing rich content and interactive multimedia material that can be integrated into of language learning activities, enhancing language learning efficiency (Bush 1997 cited in Glatz 2000; LeLoup, Cortland & Ponterio 1999). Many websites of for-profit and non-profit language education organizations, therefore, provide interactive language exercises for self-study. These materials are built using mainly HTML, various multimedia authoring tools, and JavaScript (LeLoup, Cortland, & Ponterio 1999; Zhang 2001). However, language learning based only on self-test computer exercises presents limitations. Zekulin (1993) stated, "In doing computer exercises, some students are primarily interested in right and wrong answers, less in why a particular answer is right or wrong." Moreover, in the field of SLA it is now generally accepted that communicative use of a language with other learners is an essential ingredient in language learning settings (Omaggio Hadley 2001).

Due to the importance of communicative practice, educational needs in SLA courses are best served by courseware enabling the development of complete courses. Courseware for language learning should feature more than human-to-computer interactive material or an electronic form of a written textbook; it should facilitate a cooperative learning environment (Nelson 1999; Zhang 2001). Courseware should provide means for virtual communication and interaction with other classmates because students learn and strengthen their comprehension by contribution and sharing information (Fleming 2001; Glatz 2000). Additional distinctive design features may characterize ideal SLA courseware. The courseware platform should offer functionality that facilitates connections between online and offline activities. Plass (1998) summarized particular language learning activities and features for which foreign language multimedia software should provide support.

The following subsections summarize and illustrate requirements for SLA and motivate the development of BRIX by evaluating two commercial Learning Management Systems (LMS), Blackboard and WebCT, with respect to those requirements. Requirements are adapted from Plass (1998) and from the pedagogical approach used in language classes developed under the National Foreign Language Resource Center (NFLRC) at the University of Hawai'i (Fleming 2001). This analysis draws upon other comparisons of these LMS (Bayne & Cook 1999; Lewis, MacEntee & Maher 2002; Siekmann 2000) and the Blackboard and WebCT websites, as well as on our own experience.

### **Language**

Neither WebCT nor Blackboard was developed specifically for language classes, but they can handle some target languages. According to their websites as of December 2002, WebCT supports 14 European languages, while Blackboard has developed multi-language support including East Asian languages. Blackboard can display menus and navigator bars only in English while WebCT can display menus and navigator bars in 14 different languages but not Asian ones.

### **Discussion Boards**

Asynchronous collaborative language learning environments require discussion forums as places for sharing and gathering information, strengthening comprehension, and facilitating peer review. Group discussion can be either public (whole-group) or private (restricted groups). However, in the context of language teaching and learning, private or restricted group discussions should not necessarily restrict all access to group members only. Rather, language learning goals are better served when students in small groups are able to engage in conversation in their own group, for example to carry out a role play activity, while the messages in their discussion can be shared with other groups. Therefore private-group discussion in this context means that the system should grant read/write privileges for group members, but read-only privileges for non-members.

WebCT and Blackboard both support discussion boards. Instructors can create multiple discussion forums in each course, but basically they can place the forums only within the discussion board frame. Both Blackboard and WebCT support private and public group discussion. However, neither of them allows non-members to view messages of other private groups. Messages in WebCT are accessed by clicking on their titles and are displayed one at a time in a single secondary window. Usability testing shows that students suffer from having to click repeatedly

in order to view posted messages on WebCT unless a compiling feature is applied. From the instructor's point of view, it is desirable for all messages to be displayed under each topic/subject. This makes it easier for the student to compare, refer to, and reply to messages.

## **Dictionary**

Dictionaries are key tools in language classes. For online language classes, the instructor should be given the chance to pick the most suitable dictionary if there are many online versions, and the online dictionary should be integrated in the courseware to allow students to search for unknown vocabulary items.

Neither WebCT nor Blackboard has a dedicated dictionary feature as they have not been specifically designed for language classes. However, WebCT has a glossary that instructors can create in which they can store words, terms and annotations. Nevertheless, manually entering all vocabulary items and synonyms into the WebCT glossary is a prohibitively laborious task.

## **Composition Activities**

Writing activities require certain specific features facilitating peer review, editing, and rewriting of essays. One example of these is a composition draft book – a personalized organizing tool, notebook and storage area for student drafts of essays. For composition exercises, the instructor often asks students to hand in two to three drafts of each essay. For each draft, the instructor gives feedback to the student about problems in content, grammar or organization. Students use the feedback and rewrite the essay before handing it in again. In fact, students often need to revise their drafts multiple times. In the ideal online language learning environment, peer feedback would also be facilitated. Therefore, for supporting the writing process, a language courseware system should integrate an essay composition area featuring a discussion board associated with a draft book. This makes it easy for students to compare first and subsequent drafts along with feedback from the instructor. Furthermore, the system should provide thematically related keywords that have been posted to the class word bank earlier in the unit. A student drafting an essay can then easily incorporate words from the list, strengthening the incorporation of new vocabulary into his productive language use.

WebCT and Blackboard both have internal notepads with which a student can take notes. Discussion boards are also available for posting draft versions of essays and getting feedback from instructors and classmates. However, these features are in separate locations and are not organized or integrated in support of the writing process as described above. Like many other learning activities, SLA requires better integration of discussion tools with the student work to be discussed (Suthers & Xu 2002).

## **Reading Activities**

Reading activities require features such as an area designed specifically to store vocabulary items and their annotations, textual and audio pronunciation, and comprehension exercises. Two principles followed in the NFLRC language reading courses are that an instructional sequence should begin with what students already know, rather than an instructor's assumptions about what they know, and that the reading process should be an interaction between text-based elements and reader-based elements (Fleming 2001). In line with these principles, a warm-up activity is introduced at the beginning of each lesson. In this activity students post words and sentences they already know in connection with the topic of the lesson. Words and sentences the students contribute, together with their pronunciations and definitions, are stored in a database (Language Bank) after being vetted and corrected by the instructor. The Language Bank is freely accessible by students throughout the duration of the course.

Commercial courseware has no specifically designed feature facilitating this type of vocabulary activity. Special areas with specific layouts enabling students to post words or sentences to build up vocabulary are not available.

## **Exercises and Quizzes**

Language exercises in SLA range from very closed-ended and practice-oriented types, such as true/false or multiple-choice questions, to very open-ended and use-oriented types, such as contributing one's opinion in a discussion. In

general, closed-ended exercises are used more at the beginning of a lesson in what are often called the input and practice stages, and less later on in the lesson as students gain freer productive use of the language covered in the lesson. Quizzes often incorporate a mix of the two types. The capability of courseware to facilitate a variety of exercise types is of critical importance in assessing its suitability for SLA.

It is of particular importance that courseware be able to accommodate both self-practice exercises and quizzes or tests. When doing self-practice exercises, students should be able to try as many times as they want without negative consequences. Scores should not be reported to instructors, but a history of page visits should be available for purposes of monitoring students' levels of participation. Hints or feedback should be provided as needed. Quizzes designed for assessment, on the other hand, should have scores attached and be constrainable in other ways, such as being accessible only once.

Blackboard and WebCT both provide a quiz function. Self-practice exercises are not available as such in Blackboard. Instead, Blackboard provides quizzes in which grading can be optional. WebCT has a better self-practice feature in which students can work through the exercise as many times as they want without a score being reported to the teacher.

### **Organization and Navigation**

The NFLRC language courses are divided into units (lessons). There are groups of activities for each lesson such as warm-up (vocabulary activities), language exercises, small group discussions, grammar clinics, core content, essays, and quizzes. These activities are organized in a progression from vocabulary study at the word/phrase level through conversational use at the sentence level to presentational use at the paragraph level.

In general, two main types of navigation are used in course management systems. In the first type, navigator menus are organized by activity type — all discussions are listed together, all content pages are listed together, all quizzes are listed together, and so forth. In online courses organized using this type of navigation tool, students navigate by looking at a schedule and then returning to the activity-type menu, where they click on a link and jump to the related activity. Problems may result when students jump into areas in which they are interested regardless of the directions of the instructor. For example, students might want to do an exercise before an assigned reading — the opposite of the assigned order.

In the second type of navigation, the course menu is hierarchical and presented in chronological order of the course content. Branch, Kim, & Koenecke (1999) recommend this organization for comprehensive course sites. Students can go step by step along the chronologically arranged hierarchy tree menu. Evidence from our own study of the log files of existing courseware systems suggest that chronological navigation works better for online learning. 98% of students could return to the correct activity after logging on to the class without accessing the course schedule page. 90% of students never missed activities and course contents that instructor assigned to them.

WebCT and Blackboard differ in organization and customization of courses. WebCT has better customization and organization of content and navigation, but is also more complex (Siekmann 2000). Instructors can create course content and activities such as quizzes and HTML pages, and then organize them in different areas within the course. A table of contents in WebCT can be built hierarchically and in chronological order. Even though WebCT allows tools for releasing course content in chronological order, it does not make this available for all system features. Features such as the discussion board cannot be integrated as a part of the table of contents unless the user is familiar with certain specialized techniques. Blackboard, on the other hand, doesn't allow much customization unless the user has HTML programming skills.

### **BRIX — Elements for Language Course Creation**

Given the limitations of commercial systems such as those just outlined, it is understandable that language learning institutes often build custom systems. For example, the National Foreign Language Resource Center (NFLRC) at the University of Hawai'i created four advanced (third-year) Web-based courses in Chinese, Korean, and Japanese, all developed and coded by hand. Yet the cost of custom development is too high. The prospect of developing additional courses in new languages using a similar instructional model spurred the development of language course creation software to reduce the need for intensive programming for every course. The result is BRIX, a platform for creating second language online courses. BRIX is designed to support the language learning activities mentioned in the previous section, with a particular focus on the pedagogical requirements of the NFLRC (Fleming 2001). Courses are taught in lesson units, each of which consists of a standard sequence of activities.

An alternative approach is to integrate specific additional components, such as a language bank or dictionary, into a commercial learning management system (LMS). However, the commercial tools do not fully support the organization of language activities and contents into units with a vocabulary/conversational/presentational progression. Navigation remains awkward, affecting the learning process of students. Moreover, double-byte character sets were not handled well when we undertook this work.

### Conceptual Model and Features

With BRIX, language educators can easily create their own language course without involving a Web developer. An instructor can create text contents, self-test exercises, quizzes, discussion forums, and essay and vocabulary assignments by using instructor tools. Moreover, BRIX also includes student management tools, assessment tools, and a special tool for customizing the navigator menu. A conceptual model of BRIX is shown in figure 1. To support asynchronous learning regardless of the location of the learner, BRIX was implemented as a Web-based system. It uses a three-tiered architecture. The ColdFusion Web application server was selected as a middleware of the system. The implementation is based on FuseBox methodology for ease of development and maintenance.

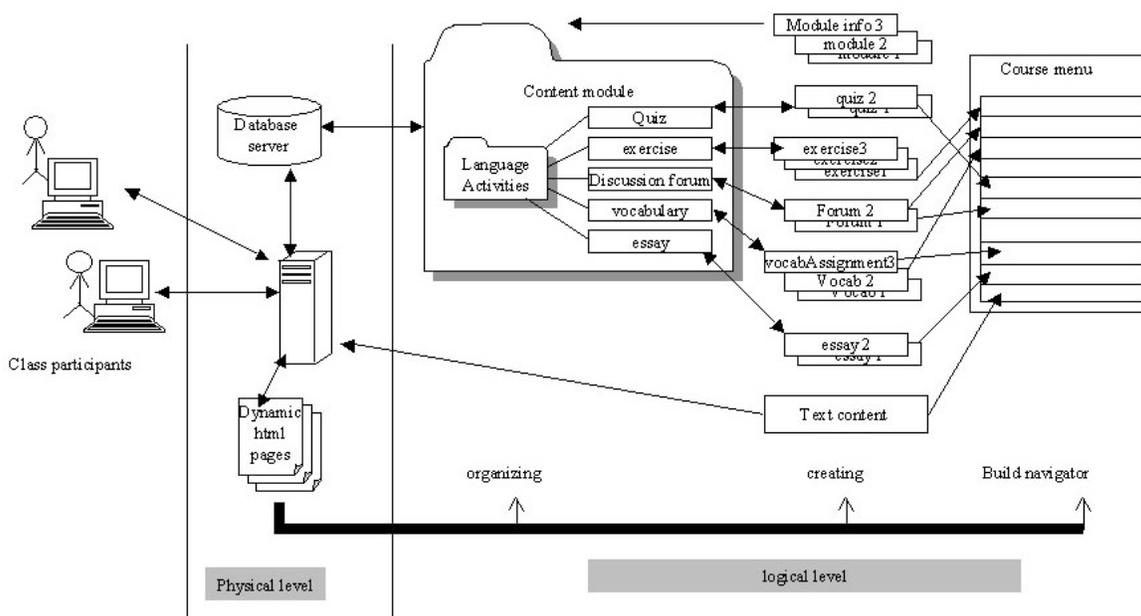


Figure 1. Conceptual Framework of BRIX

To create a course, an instructor first prepares a course outline by making lessons or content modules along with contents or activities of that module. The instructor can create activities -- vocabulary, grammar, discussion, essay, self-test, and quiz -- using BRIX's authoring tools. Other contents such as instructor-authored HTML files or links to external content on the WWW can be also integrated with the course. All information is stored in a database from which it can be retrieved and presented by the system using Dynamic HTML templates. Activities and contents can also be imported from previous course.

Activities and contents can be defined first, and then grouped and organized into specific lessons. If no lesson is specified, the created activities will be placed in a default module. Navigation need not be specified until last step of the course building processes (but can be specified earlier). BRIX offers only the chronological menu style, as it is the best design for language learning activities. Figure 2 depicts the course menu and organization tools.

BRIX also offers assessment tools for tracking students' progress. The instructor can create or customize evaluation criteria for grading students. Each criterion can be associated with any learning activities. Students can also check their progress and grade online.

The following sections briefly describe the functionality and interface design of BRIX.

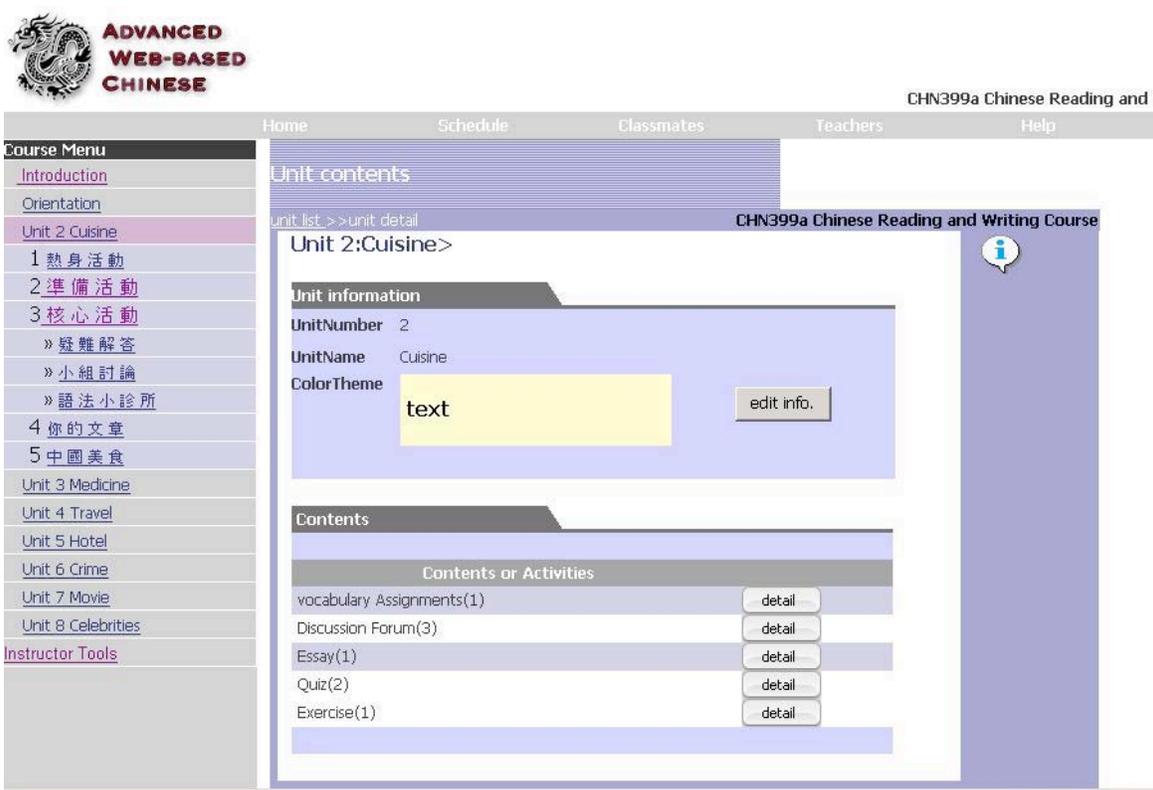


Figure 2. Course menu and content organization tools

### Creating a Language Lesson

A lesson unit is a group of content and activities. To create, the instructor indicates the location in the course menu and provides the name of the lesson and other information. The contents and activities associated with the lesson will be displayed under each lesson, even if they were created in other places, as this helps the instructor organize the course.

### Creating Language Activities

BRIX has tools for creating five types of language activities – Vocabulary Assignment, Discussion Forum, Quiz, Essay, and Self-test exercise. Instructors can organize these activities in a chronological menu. BRIX encourages but does not require instructors to follow the NFLRC progression from vocabulary to conversational (discussion) and presentational (essay) use. Activities can be hidden during the development process and released when the instructor wants.

*Vocabulary Builder.* To create a vocabulary builder assignment, an instructor provides a title, instructions, and a due date, and then adds multiple questions. Each question may require a vocabulary response or a sentence response. A vocabulary response consists of the word in its original form, the Romanized pronunciation, and an English gloss (definition). A sentence response elicits a sentence expressing background information about the lesson topic. Vocabulary Builder assignments may be placed early or late in a lesson. Placement early in the lesson targets elicitation of students' background knowledge associated with the lesson topic. This background knowledge may be linguistic (vocabulary) or substantive (facts and figures, pre-formed opinions). Placement later in the lesson targets strengthening of knowledge students have acquired from the lesson's core material.

*Discussion Board.* The instructor can create discussion forums for specific topics. For example a lesson might have discussion forums for Q&A, Grammar Clinic, and Small group discussion. Each discussion forum can be either public or private. Private in this context means group member have full privileges in posting (read/write) while non-

member can only view the posting messages. Creating a discussion forum is simple: the instructor enters the title of discussion either in English or in the target language, along with its type, instructions and due date.

*Essay.* An essay is an area for students to post compositions. Instructors and classmates can review and comment on the essay. To facilitate the writing process, the essay activity is supported by a draft book where a student can review and rewrite their essay based on instructor feedback and classmate comments. All vocabulary items that have been input during a given lesson using the Vocabulary Builder appear in an auxiliary window when the student uses the Draft Book in that lesson. To create essay assignment, the instructor specifies the title, instructions, number of drafts and due date of the assignment.

*Quiz.* There are five types of quiz questions; multiple choice, true/false, fill in the blank, short paragraph, ordering, and matching. Each quiz is organized into parts and sub-parts. A part is an area for related questions, and a sub-part is group of the same type of question. For example, part I might be for reading comprehension consisting of two sections – multiple choice and matching. The instructor can create instant feedback for each question that can be viewed by students after finishing the quiz.

*Self-test Exercise.* Exercises are based on same types of questions as the quizzes but are not graded. Feedback given to the student is not shown to the instructor. However, there are reports showing how many times a user visits the exercise pages.

### **Assessment Tools**

The instructor can check how many postings a student started and responded to in each discussion board; what pages have were visited and for how long; and frequently of login. The instructor can create criteria and grade by lesson, and when grading, give comments on each criterion and overall.

## **Formative Evaluations**

BRIX was developed by the first author using an iterative cycle of requirements analysis, rapid prototyping and formative evaluation (Hix & Harston 1993) under the direction of the other authors. Requirements analysis was accomplished with interviews of prospective instructors and students and analysis of existing NFLRC Web-based courses and commercial course management systems (Blackboard and WebCT). Design and formative evaluations were accomplished through rapid prototyping using Web-authoring tools, expert usability reviews, and evaluation and testing by instructors and students as representatives of their respective user populations. The second author conducted the usability reviews. Three language educators (including the third author) iteratively evaluated requirements and prototype designs. One to three students tested each prototype following an informal think-aloud protocol. Subsequently BRIX was used to develop and deliver the Advanced Reading and Writing in Chinese course of the University of Hawai'i at Manoa in the Spring 2003 semester. We conducted an evaluation by comparing usage patterns in BRIX to a hand-developed online course in Chinese. The results were favorable, and will be reported in Sawatpanit, Suthers & Fleming (submitted).

## **Conclusion**

Second language acquisition courseware should support particular features for learning activities such as vocabulary, grammar, essay writing, etc. Collaborative learning as well as self-study should be supported. BRIX has been built on pedagogical theory to provide effective tools for creating second language learning environments. The principles of SLA described in this paper have some features that are specific to language learning, and some that are general features of learning and cognition. In fact, there is currently a vigorous debate in the SLA field about whether the mechanisms of language acquisition constitute a distinctive cognitive phenomenon -- a "black box" for language, as it were -- or are merely a particular manifestation of general processes of human cognition. Because of the overlap between language acquisition and learning in general, the design of BRIX was informed by such general principles of learning as "from simple to more complex," "build on learners' existing schemata," and "input before output." BRIX was designed to accommodate instances of these principles that are particular to language learning. However, while it does facilitate the implementation of these principles, BRIX does not force them. Ease of use and flexibility are also issues for course authoring tools. Focusing on users, BRIX has been designed for ease of use, as

language educators are not skillful in computing technology. BRIX can yield great benefits to language institutes by saving the time and cost to develop courseware for each language course. BRIX supports reading, writing and some listening activities. Future development is needed to support speaking activities and to fully integrate audio and video functions.

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