

Evaluating a Second Language Learning Course Management System

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Abstract: This paper describes the design and evaluation of BRIX, an environment for developing online courses for second language learning. Commercial course management systems fail to meet the specific requirements of second language learning. For this reason, educators at the National Foreign Language Resource Center (NFLRC) of the University of Hawaii have hand-crafted several online language learning systems. However, hand-crafting is too expensive to be sustainable and scaleable. BRIX was developed to address the need for a more generic language learning environment that fulfills language educators' requirements focusing on reading, writing, and listening activities and can easily be customized for different language courses. The design of BRIX is based on pedagogic approaches and theories of teaching and learning second languages used at NFLRC. After describing the design of BRIX, we present an evaluation that compares the use and usability of a Chinese course in BRIX to a previous, hand-crafted version of the same course.

Introduction

Second Language Acquisition (SLA) is one of numerous academic fields in which Internet technology has been applied in instruction. Distance education is desired and useful for SLA, especially for languages that are less commonly taught at a given institution (Fleming and Hiple 2002). According to a survey conducted by the Chinese Language Teachers Association (1996), many institutes in the United States 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 learners from diverse locations. Furthermore, online learning also enables global language-partnerships between second language learners and native speakers who can collaborate and serve 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, 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 (Sawatpanit, Suthers & Fleming 2003). Consequently, many language education institutions have built their own courseware for their Web-based distance classes. This work requires intensive web programming experience, which regular language instructors cannot afford the time to pursue. Changes to course content and organization rely 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. BRIX, a tool for building SLA courses, was developed to meet this need. In this paper, we describe the conceptual framework and design of BRIX and then present an evaluation of an advanced Chinese course in BRIX in comparison to a hand-crafted version of the same course.

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 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 that “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 the 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). 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. For instance, to facilitate the writing process, courseware should be designed to support peer review, editing, and rewriting.

Sawatpanit, et al. (2003) details requirements for Second Language Acquisition environments and offer an evaluation of commercial LMS from the standpoint of supporting language acquisition. Below we summarize these requirements to motivate the development of BRIX. Our requirements are based on the pedagogic approach used in language classes developed at the National Foreign Language Resource Center (NFLRC) at the University of Hawaii (Fleming 2001), and guidelines in Plass (1998). A focus is placed on features that support reading, writing and listening activities.

Language. One should be able to select the language for all elements of the course, including the menus and navigation bars as well as course content and help facilities.

Dictionary. The instructor should be able to select the most suitable online dictionary, and the online dictionary should be integrated in the courseware to allow students to search for unknown vocabulary items.

Discussions. Asynchronous collaborative language learning environments require discussion forums as places for sharing and gathering information, strengthening comprehension, and facilitating peer review. 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 the system should grant read/write privileges for group members, but read-only privileges for non-members.

Annotation and Revision of Essays. 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. Students often need to revise their drafts multiple times. Peer feedback can also be valuable for all students involved. Therefore, a language courseware system should include an essay composition area associated with a draft book and featuring a discussion board. Linking documents to discussions (Suthers & Xu, 2002) makes it easy for students to compare first and subsequent drafts along with feedback from the instructor and peers.

Contextualized Vocabularies. Within each unit, the system should provide thematically related words or words that have been posted to the class word bank earlier in the unit. A student drafting an essay can then easily access words from the list, strengthening the incorporation of new vocabulary into his or her productive language use.

Reading Activities. Reading activities should be supported with an area designed specifically to store vocabulary items, vocabulary annotations, textual and audio pronunciation, and comprehension exercises. An instructional sequence should begin with what students already know, rather than an instructor's assumptions about what they know, and 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 an NFLRC language-reading course. 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 after being vetted and corrected by the instructor. The database is freely accessible by students throughout the duration of the course.

Exercises and Quizzes. Language exercises in SLA range from structured practice-oriented types, such as true/false or multiple-choice questions, to open-ended and use-oriented types, such as contributing one’s opinion in a discussion. In general, structured exercises are used more at the beginning of a lesson, 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 also of particular importance that courseware be able to accommodate ungraded self-practice exercises as well as graded quizzes or tests.

Navigation. In general, two main types of navigation tool are used in course management systems. In the first type of tool, navigator menus are organized by activity type, so that in a given course all activities of that type are grouped together — all discussions are listed together, all content pages are listed together, all quizzes are listed together, and so forth. In the second type of navigation tool, 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.

BRIX — Elements for Language Course Creation

Given the limitations of commercial systems documented in Sawatpanit et al, (2002), it is understandable that language learning institutes often build custom systems. The NFLRC created four advanced (third-year) Web-based courses in Chinese, Korean, and Japanese, all developed and coded by hand. These courses are divided into units (lessons). Courses are taught in lesson units, each of which consists of a sequence of activities as shown in Table 1.

Table 1. Instructional activities of online language courses in NFLRC (Adapted from Fleming, 2001)

	Sequence of Activities
I. Preparatory Activities	1. Warm-up (pre-knowledge vocabulary)
	2. Preparation (self-test exercise)
II. Core Activities	3. Pre-activities
	4. Authentic Text
	5. Global, Specific information, Linguistic, and Post Activities
III. Follow-up Activities	6. Trouble shooting (Q&A forum)
	7. Small group discussion
	8. Grammar Clinic
	9. Final Essay
	10. Quiz

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 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).

To support asynchronous learning regardless of the location of the learner, BRIX was implemented as a WWW-based system. It uses a three-tier architecture. The ColdFusion web application server was selected as a middleware of the system. The implementation is based on the FuseBox methodology for ease of development and maintenance.

System Development and Formative Evaluation

BRIX was developed by the first author using an iterative cycle of requirements analysis, rapid prototyping and formative evaluation (Hix & Harston, 1993). Requirements analysis was accomplished with interviews of prospective instructors and students, and by analysis of existing NFLRC web-based courses and commercial course management systems (WebCT and Blackboard: see Sawatpanit et al, 2002). 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 served as an advisor and 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. Summative evaluation will be described later in this paper.

Conceptual Model

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 create a course, an instructor can begin by preparing a course outline of lessons or content modules, or by preparing content and activities. The instructor can create activities – vocabulary, grammar, discussion, essay, self-test, and quiz – using BRIX's authoring tools. Other contents such 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.

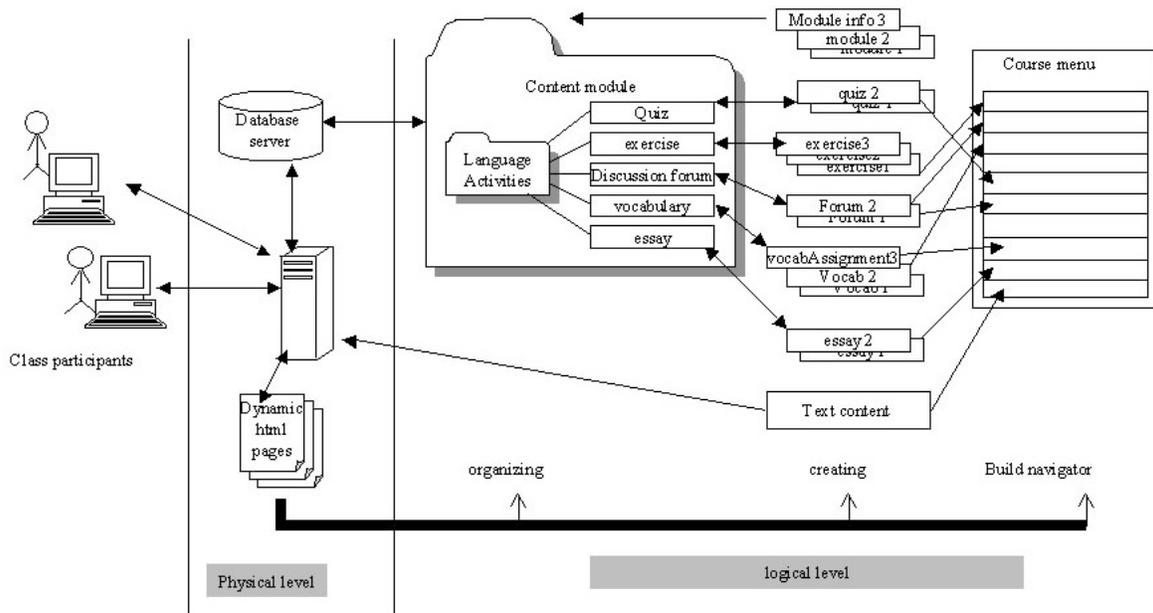


Figure 1. Conceptual Framework of BRIX

Activities and contents can be defined first, and then grouped and organized into specific lessons. Navigation need not be specified until the last step of the course building processes (but can be specified earlier). The instructor can use a menu builder to indicate the location of a lesson and its activities in course menu. Menu items can be displayed in either English or the target language. BRIX offers only the chronological menu style, as it is the best design for language learning activities. An example of the menu may be found in Figure 2. Yet, authoring can be undertaken independent of course chronology for maximum flexibility.

The screenshot shows a web-based interface for an essay composition activity. At the top, there are navigation tabs: Home, Schedule, Classmates, Teachers, and Logout. The main content area is titled 'Cuisine: 你的文章' and includes a 'Due on' date of 2003-02-07 22:00:00. The instructions are in Chinese, asking students to write an article about a restaurant's specialties. A 'Keywords' list on the left includes terms like 蕪 (鹹肉), 切, 切片, 炒, 烤, 甜, 腥, 苦, 苦味, 酸, 香, and 鮮的. The 'Essay Title' field is currently empty, and the text area is labeled '(Draft 1)'. There are 'save' and 'cancel' buttons at the bottom of the draft editor. On the right sidebar, there are icons for 'Dictionary', 'Language Bank', 'My notebook', 'My Organizer', and 'Resources'.

Figure 2. Essay Composition

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 many learning activities. The instructor can check how many postings a student started and responded to in each discussion board; what pages have been visited and for how long; and the frequency of the student's logins. The instructor can create criteria and grade by lesson, and, when grading, give both criterion-specific and overall comments. Students can also check their progress and grade online.

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. All activities can be hidden during 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, 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 members have full privileges in posting (read/write) while non-members can only view the posting messages.

Essay Composition. 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. Figure 2 shows the essay composition screen.

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 has visited the exercise pages.

Evaluation

The evaluation was intended to investigate how well BRIX can support language educators to manage their class in the way they desire as well as the usefulness and effectiveness of specific tools – the Language Bank, DraftBook and Discussion Forum – for language learning. The evaluation compared the use of an online course, Advanced Chinese Reading and Writing (CHN332), that was constructed by hand with the use of the same course constructed in BRIX. Data gathered from students included questionnaires, log files, student-created contents, and observations of user behavior in usability testing. For evaluation of the instructor tools, we gathered data from language instructors in NFLRC. This evaluation may be seen as a summative evaluation with respect to the current version of BRIX, although it is formative with respect to our ongoing improvement of the software.

Evaluation of Authoring Environment for SLA

This portion of the evaluation addressed how well BRIX's course authoring tools support language educators in building and customizing second language learning courses. Evaluation of suitability for SLA focused on a language course, Advanced Chinese Reading and Writing (CHN332), taught using BRIX in the Spring of 2003. Additional (but non-SLA) evaluation of course authoring tools was based on a cultural exchange course, Contemporary Franco-American Views on the World of Work, between University of Hawaii at Manoa and the University of Paris. The ease of use of the system was analyzed based on data collected from teachers who created these classes and 5 additional volunteers in usability testing. The hypothesis was that BRIX was easy to use if the instructors and test users were able to figure out how to setup and manage their class by their own without help from the expert. A questionnaire was used to collect user opinions using scores ranging from 1 (extremely difficult) to 10 (extremely easy).

From the instructor's point of view, BRIX was easy to use overall: the average score given by actual instructors or course designers was 8.75 out of 10. These instructors had some prior experience creating language courses using WebCT and Blackboard. Based on test users and feedback from instructors, BRIX still needs an improvement for ease of use in some areas, including Quiz Maker, the interface between Course Content and Menu Builder, and the wording in descriptions of some tools. Quiz Maker and Menu builder were problematic in learnability for novice users. Due to the need to flexibly release the contents, content-creation tools and the menu builder tools were separated. Instructors had to build content first and then make the content available on the course menu. This concept was too complicated for novice users to figure out by themselves. But once they have been told, they could have succeeded the second time without help. Addition of a wizard-like interface may be used to make a connection between course content and menu builder tools. The Quiz Maker was also difficult to use for some users. The design was based on a complex hierarchy of parts and sections, which users could not figure out. Though the hierarchy and its parts are necessary for creating a SLA quiz that meets NFLRC requirements, we have been redesigning the users interface of Quiz Maker to be less complicated.

Assessment tools were a very successful feature in CHN332. The instructor of the class strongly agreed that the grading tools are effective and efficient. BRIX can provide a summary of the activities and performance of each student for each lesson and overall, helping the instructor to save a lot of time.

All of the responding instructors agreed that BRIX provided an excellent learning system for SLA, especially in reading and writing, and that it also can be used to support non-language courses. However, BRIX needs some expanded features to support voice interaction, which is necessary for listening and speaking skills.

Evaluation of Instructional Effectiveness

This evaluation was based on the premise that BRIX can effectively help students learn languages if the design and features of the system tools – The Language Bank, dictionary, discussion board, and DraftBook – encouraged students to use them as often enough as the instructor wants. BRIX is considered to be a viable replacement for the prior custom built online courses if usage did not decrease as compared to the prior course. Therefore we evaluated the usefulness and effectiveness of the tools by measuring students' use of these tools. Specifically, BRIX will be considered to be an effective support for students' learning if 1) students re-visited the Language Bank after they completed the pre-activities in order to accumulate and share knowledge with their classmates; 2) students were able to use the online dictionary when they encountered a problem in vocabulary; 3) students used the discussion board to share their problems and knowledge with their classmates; 4) students use the DraftBook to revise their composition assignment (essay) at least one time before they handed in their works; 5) students discussed and commented on other students works in a collaborate learning process. We analyzed the results of these criteria by comparing to the results from the previous system. With the same instructional method, our goal would be achieved if the performance of students who used BRIX met the above criteria and also improved over that of students who used the old online system. In this evaluation we assumed that students in an advanced reading and writing course have no problem dealing with Chinese characters. Therefore, lack of usage will not be due to inability to read the instructions or navigational devices. In comparing BRIX with the old system we are assuming that the average behavior and performance of students reflects the actual usefulness and effectiveness of both systems because they are based on the same instructional method and contents and involve similar student populations.

Two data sources were used: an opinion survey of students taking the course, and frequency of tool usage by those students as recorded in server log files. The evaluation is based on use of the previous online course by 54 students over three semesters, and use of the BRIX version by 21 students in one semester (of which 13 responded to the survey).

Using BRIX, students revisited the Language Bank about 72% more often than in the previous system. On average, 57% of students using BRIX revisited the language bank without instructions from the teacher. Of those who visited the Language Bank, visits averaged about 2.5 times per lesson. This number was double the number of students who visited the Language Bank in the previous system. Also, 40% of those visited the Language Bank to review other vocabularies from peers, while 60% of them visited the Language Bank to check the instructor's feedback on their word or sentence. Nevertheless, 86% of students responded that the Language Bank is not very helpful in their opinion and 14% of this 86% did not use the Language Bank due to lack of understanding of how it works. A redesign of instruction may help students understand the purpose of the Language Bank, and redesign of the user interface of the Language Bank would help yield better outcomes in future semesters.

The integration of the Language Bank, DraftBook and Discussion Forum improved the writing process. Typically, the language teacher encourages students to revise each essay draft before handing it in. This could help students improve their writing skill. From the log file of the old system, only 7% of the students revised their essay before submitting, and on average, each of those students revised their essays only 1.12 times per essay. BRIX yielded better results: 48% of students used the DraftBook to revise and edit their essays before submission, an increase of 585%. Moreover, the log file indicated that students revised and edited their draft an average about 3 times before submission, which is two times as many as in the old system and beyond the point the teacher expected. A third (33%) of students who did not revise and edit their draft reported that their essays were too short to need revision, and 17% of those who did not revise reported that they usually have no time for doing that. Students agreed that the keyword list was helpful, and the DraftBook was easy to use. More than 75% of students incorporated the words in the keyword list within their essay.

Participation in the discussion forum also increased in the BRIX system. On average, a student contributed about 3 messages per week compared to 2 messages per week in the old system. The online dictionary was the least successful feature: 75% of students did not want to use the online dictionary due to the complexity and incompleteness of the available vocabularies of the given site. (We used an external dictionary developed by others.)

Overall ease of use and navigation of organization of BRIX got good scores from the students. 76% of students agree that BRIX is easy to use, while 23% said they spent some time to figure it out. Note that the 23% of students who had problems at the beginning were novice users – they had never used any online learning system before they were using BRIX. The organization of BRIX's course contents yielded a slightly lower score. 62% of students reported that the organization was good, and they were always able to find anything they wanted. 31% of students reported that they needed to spend sometime to figure it out. However, 50% of those who complained reported that the problems mainly come from an unclear schedule rather than from BRIX's design.

Conclusions

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. Ease of use and flexibility are also issues for course authoring tools. BRIX has been built on pedagogic theory to provide effective tools for creating second language learning environments. Focusing on users, BRIX has been designed based on ease of use as concern that 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 was used in the Advanced Reading and Writing in Chinese course of the University of Hawai'i at Manoa in the spring 2003 semester. Comparing usage in this course to usage of a previously developed system, we concluded that BRIX is a usable authoring tool for producing more effective learning environments for second language acquisition, especially for reading and writing. However, some features need to be improved, such as the Language Bank and Quiz Maker. To make BRIX be completed for SLA courseware, BRIX need further expansion to support speaking activities and to fully integrate audio and video functions.

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