

# On the Design of Web-based Interactive Multimedia Contents for English Learning

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## Abstract

*We present a web-based authoring tool to create interactive multimedia contents for English learning. Target users of this authoring tool are English teachers and content designer, therefore, ease of use and simplicity are the fundamental issues. Furthermore, the authoring tool and multimedia database are integrated in the context of Intelligent Web-based Interactive Language Learning (IWiLL) system. Special language tools to access corpus, manipulate multimedia elements, and create collaborative learning sessions are designed in the system. These resources and tools on hand yield the potential to create rich and deep interactive multimedia contents.*

**Keywords:** *Authoring tool, web-based language learning, information retrieval*

## 1. Introduction

The popularity of the Internet and the web has resulted in changes in teaching and learning [1]. Universities and content providers are using the web as the main vehicle to deliver their programs in distance as well as classroom learning. Briefly speaking, using the web to support teaching and learning conveys three different types of operation models: (1) as a supplement to face-to-face instruction, (2) in a mixed mode with face-to-face instruction, and (3) web-based instruction instead of face-to-face instruction. No matter what type of operation model, a general purpose web server such as MS IIS, or a special purpose learning management system (LMS) such as

Blackboard [7] and WebCT [8], and content authoring tools are vital to create and deliver interactive multimedia contents on the web.

Nowadays, many web pages and animation authoring tools, for example, MS FrontPage, Macromedia Dreamweaver, and Macromedia Flash MX, are available. People who are familiar with these tools they can design web-based learning contents in common HTML presentation formats. On the other hand, many Internet portals also provide convenient web-based authoring tool to people with very limited knowledge on HTML to help them generate web pages easily. Although these authoring tools have powerful toolsets, they do not take learning, including language learning, into special account.

To overcome the weakness of the present authoring tool in the design of learning contents, we design a web-based authoring tool to create interactive multimedia learning contents and interactive learning activities for English learning. Note that the authoring tool and multimedia database are both integrated in the context of Intelligent Web-based Interactive Language Learning (IWiLL) system [2][5]. Target users of this authoring tool are teachers and content designers. To the best of our knowledge, we are pioneers in providing this kind of approach in computer assisted language learning contents design. From the high-level application viewpoints, the integration of authoring tool and IWiLL has special features and advantages as follows.

- (1) **Ease of use and simplicity:** Tools for document layout and text editing are in common format. Common knowledge in usual software is enough

to operate the authoring tool in a straightforward manner. As a result, users are able to implement their instructional strategies on the web easily without being an expert in HTML programming.

- (2) **Rich set of multimedia elements:** Users collect and manage their own multimedia elements and share these elements among users in the IWILL system. Images and movie clips in the system can be accessed and manipulated to create an authentic learning environment.
- (3) **Rich set of language tools:** Intelligent language tools are useful to content design and language learning. We have designed language tools for learning purpose, e.g., lexical difficulty filter, collocation explorer, and vocabulary-based keyword search, vocabulary spider, and so on. These tools are used either explicitly or implicitly in the system to facilitate contents design.
- (4) **Rich set of collaborative sessions and assessment components:** Collaborative sessions such as discussion board are established directly by users. Meanwhile, creating online essay assignment and quizzes are also straightforward. Therefore, the interaction between the teacher and his/her students are on the hands of the teacher at the content design phase.
- (5) **Record teaching and learning profiles:** The teaching and learning events are kept in the system for further analysis. Users of the system can examine their performances. For example, a comment bank in the system records all of the teacher's comments in students' essays. The analysis of this comment bank produces valuable information to both teacher and students in improving their performances.

With the above features and supporting elements, user is in a better environment to create interactive multimedia contents. Furthermore, users possess their design contents. As they release it, these contents can be shared, modified among users in the system. The main idea of doing this is to help generate and spread ideas.

The rest of this paper is organized as follows. In section 2, we present the designed authoring tools. The corresponding functionalities that used are described. Implementation results and examples are illustrated in section 3. Finally, the conclusions and future work are given in section 4.

## 2. The authoring tool

Appropriate integration of multimedia in the learning process can stimulate learning interests and improve learning efficiency, while building creative learning environment at the same time [3] [12]. Experiences reveal that creating learning contents is not a simple issue. The designed authoring tool aims to create interactive multimedia contents for users to share among other users of the system. Let's elaborate further to illustrate this design goal. The main design philosophy of the authoring tool is shown in Figure 1. Two main resources, teacher's creativity and multimedia materials, integrate with language tools and interactive components as inputs to generate desired contents. At present, the available multimedia raw materials in the system include (1) BNC corpus [9], (2) Taiwan learner corpus [2], (3) the web page, (4) image database, and (5) video database. These raw materials can be accessed and manipulated through the corresponding language tools in the system. The resulting contents are shared among the users of system. Note that the learning outputs, such as learning profiles, are also important issues. Although this part is outside the scope of this paper, we have considered this issue in the design of IWILL system.



Figure 1. The authoring tool: design philosophy

As shown in Figure 2, the toolbar of the authoring tool consists of tools for the operation of the following tasks:

- (1) Configuration of fonts, colors, and type settings.
- (2) Functions of the clipboard, undo/redo, text search and inserting table
- (3) Functions of page control, storing, and checking out

- (4) Functions of inserting hyperlinks, images, essay assignments, movie clips, discussion boards, annotations, and quizzes.

Most functions in the toolbar are common. Users, who are familiar with text editing software, are able to work on it. There are special designed tools such as (1) vocabulary-based corpus search, (2) collocation explorer, (3) semantic image retrieval, (4) movie clip search and editing, (5) discussion board, (6) essay assignment, (7) essay writing, and (8) assessment tools are given on hand. The details of the above tools can be found in our papers or IWILL web site [10]. We give a brief description on essay writing, collocation explorer, image retrieval system and mining movies that tools related to multimedia elements and used in section 3.

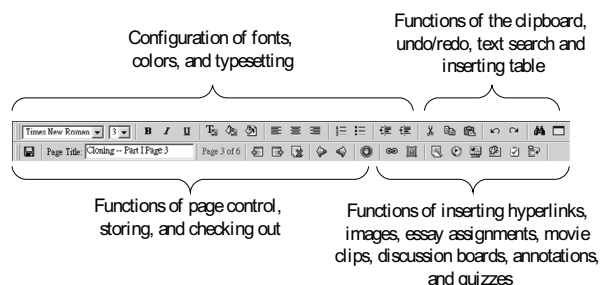


Figure 2. The authoring tool: toolbar

### 2.1 Essay writing environment

The writing environment has been used in IWILL for several years [2][5]. Essay writing is not only helpful for students in learning English, but also of benefit to teachers in making comments and detecting learners' common difficulties or mistakes. Furthermore, the collected essays from students and comments from teachers constitute a useful learner corpus. The system also records all teachers' comments and students' errors. Many types of Error statics for each individual and whole class is able to be accessed by teachers and students. This is also beneficial to researchers in analysing learners' persistent errors.

### 2.2 Collocation explorer: Collocator

A lot of language resource mining tools in a language learning environment is definitely very useful. For example, word collocation is one of the most difficult areas for learners in acquiring second

language vocabulary. To solve this problem, we have designed a collocation explorer, called *Collocator*, a platform-independent online tool, to address a specific source of this difficulty in any web environment. An apparent source of learning difficulty is that collocations are idiosyncratic. For example, *make a conclusion* is odd whereas *draw a conclusion* is acceptable and *great respect* for someone but not *big respect*. The tool detects such collocations by exploiting statistical word association measures on a 20-million-word portion of the British National Corpus (BNC) [9]. Combinations of words that achieve a sufficiently high association score in BNC to constitute collocations. A link from each detected collocation is added to show additional examples of this same collocation.

### 2.3 Images retrieval system

Images are crucial elements of contents. Visual information retrieval is an active field of research [4]. In the image collection and management, we have designed the uploading and annotation subsystems, which allows users to manipulate personal preference images. In the annotation phase, users are requested to describe the uploading images with metadata and main data. The metadata includes category, type (still or moving), texture, color (black and white or color) and so forth. The main data consists of the following items: object (who, what object), event (what action), place (where), time (when), abstract, subject and description. These fields guide the users to provide more complete descriptive features used in semantic indexing and keyword-based search. To provide semantic retrieval features, we integrate keyword extraction, expansion, and filtering in the construction of indices of images. WordNet [11] is used in the keyword expansion mechanism to extend the meanings of keywords and BNC corpus is used to filter uncommon words.

### 2.4 Mining movies

In the movie collection and management, we transform movies in DVD format to the Internet streaming format, e.g. Microsoft WMV file format. Meanwhile, we extract subtitles of DVD movies to obtain the annotation of movie clips. By using the recently developed DVD technology, we extract the movies' subtitles and the corresponding audio time codes. With the time code of the corresponding subtitles, we are able to synchronize the subtitle texts and movie clips to facilitate queries and broadcasts of movie clips. As shown in Figure 3, a keyword

“knowledge” is given as a query input. As a result, the scripts of movies in the movie databank that convey the corresponding keyword are shown. Note that multiple words as a query input is allowed, e.g., acquire knowledge. Users may append/delete the length of the resulting sentence by clicking on + or - button and click on that sentence to get a preview of the movie clip. In our implementation, there is a maximum of 5 sentences increased in both directions. After the selection and modification, the corresponding movie clips and sentences are merged into the design contents by a mouse click on the O.K. button. When the content is assigned to learners, they can playback the corresponding movie clips as many times as they want.

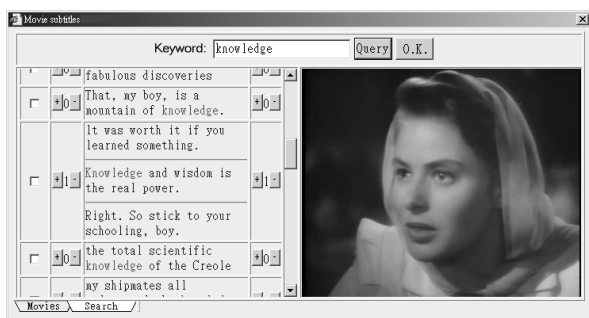


Figure 3. Mining movies: user interface and video playback

### 3. Implementation results and discussions

*Repeat exposure* is an important principle for vocabulary learning [6] but extremely hard to implement in traditional classroom. Our strategy provides learners who are repeated exposure to targeted vocabulary via multiple channels learners in a digital environment. In this example, we implement this popular instructional strategy by combining reading, listening, and then writing activities through different media within a learning path.

Examining the English Taiwan Learner Corpus (TLC) in IWill, we found out students have miscollocation problem in using the word *acquire knowledge*. Due to Chinese background, many students in Taiwan choose *learn knowledge* instead of *acquire knowledge*. A lesson called “how to use the word knowledge” is presented in this section to illustrate the content design steps. Note that our main purpose here is to show the power of the authoring tool on the design of learning contents not on the instructional strategy. We would like to include

interactive multimedia elements in the lesson as follows.

- (1) Reading: sentences to illustrate the meaning of the word “knowledge” and its corresponding usage;
- (2) Listening: playback focused movie clips containing target expression in context to deepen learners’ impression and understanding;
- (3) Writing: writing assignment, sentence writing with image support requiring learner to produce collocation themselves. It is also an evaluation process.

To accomplish the first task, the user makes use of collocation explorer to get more examples from a 20 million words subcorpus of BNC [9]. In this case, 53 sentences are obtained from the IWill Collocator, as mentioned in section 2.2. Partial results are shown in Figure 4. The user selects suitable sentences or modifies these sentences for the lesson content. For the second task, as shown in the previous section, the user may make use of mining movies to obtain and select one or multiple suitable movie clips in the system. For the third task, the user selects a picture from image database to stimulate learners’ creativity (see Figure 5), and then gives hints to guide learners to write down what they see in the picture using the collocation *acquire knowledge* in their essay.

1	However, he can not always escape the results, or move away; and may not be able to use this newly <b>acquired knowledge</b> to amend much within the institution.
2	This means that a child acquiring language who does not yet know what chair means but will <b>acquire the knowledge</b> must already have represented in his “language of thought” a predicate of the kind “is a portable seat for one”.
3	Some undergraduates seek simply to broaden their horizons and develop analytical skills; others wish to <b>acquire</b> a more specialized <b>knowledge</b> to be used in a subsequent career.

Figure 4. Partial results from IWill collocation explorer

Up to this stage, we have accomplished interactive multimedia learning content design, which includes thinking, learning, and evaluation phases to learners. The above learning content can be presented in a multimedia classroom or be accessed many times at a home PC with the Internet access. Then, as learners

turn in their essays we enter into an evaluation phase to examine their learning performance.

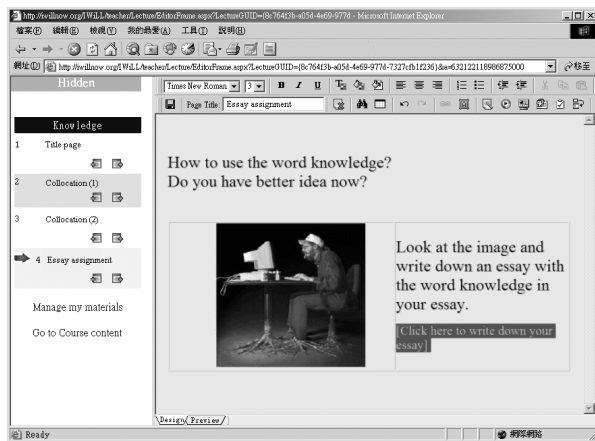


Figure 5. Learning content example: Writing assignment

Our experiences indicate that a user is able to create the above interactive multimedia content after one-hour training program in the authoring tool. We have better opportunity to explore the power of the web in English learning and to build an *interactive, informative, and collaborative* learning environment.

#### 4. Conclusion and future work

We describe a web-based authoring tool in this paper. This special design facilitates content design for Language Learning. By using the equipped components such as discussion board, movie clips, image, online quiz, and so on, user's ideas and creativity are represented and delivered in a straightforward and efficient manner. Without obstacles or unnecessary effort, users can create the virtual communities in the IWiLL system. Five workshops for introducing this authoring tool have taken place in four different cities in Taiwan, with about 400 participants. So far, we have very encouraging results. In fact, the designed authoring tool can be easily extended to other language learning and other disciplines such as natural science with slight modifications.

The precise design of contents with multimedia support is a very useful element to improve learning efficiency. Today, we are working on many research issues related to the enhancement of the authoring tool. These issues include the functionalities of image and video database in terms of retrieval in the semantic level and the corresponding multimedia presentation, the mechanism of contents sharing, and the design of language tools. Our final goal is to provide users an ease of use and simplicity and powerful tools to create rich and deep authentic multimedia contents.

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