WQ: An Environment for Teaching Information Access Skills

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Abstract

WQ is a Web-based system which reflects some of the ideas found in WebQuests. We intend to analyze the characteristics that make the WebQuests so popular and determine which of their components give them the greatest educational value. The WQ system which we have implemented presents sites to be browsed and searched, it allows students to make notes on those sites, and it lets the students manage those notes to respond to the Quest. Ultimately, we hope that the WQ system will incorporate collaboration, integrate digital libraries, be scalable, and support a wide variety of content areas.

1 WebQuests

WebQuests are Web-based learning activities that have become very popular with both teachers and students [6]. Students are given questions to investigate and Web-based resources to use in answering them. The students produce answers to the questions that include references to the resources. WebQuests are closely related to other systems for inquiry-based learning such as ThinkQuests [18] and Internet Quests [5]. In a larger view, they are related to e-books [9] and digital libraries.

1.1 Variety of WebQuests

WebQuests are not a single, simple educational approach but a collection of related approaches. The essence is that students synthesize answers to questions based on Web resources. These resources may be either public Web sites or sites custom-designed for the Quests. Types of resources may vary greatly depending on the educational goals and the resource familiarity of both teachers and students. Some WebQuests also require cooperation among teams of students.

1.2 Underlying Skills

WebQuests are a type of inquiry-based learning [2, 7, 10, 19]. WebQuests combine many layers of skills. At a low level, the student must pick out material that is relevant to the question. This is similar to the challenge of reading comprehension [13, 14]. There is also the challenge of navigating the text on the page via cognitive organizers [8]. At a still-higher level, the student must engage in problem solving to determine where to find the best material. There are aspects of "active reading" in note taking (e.g., [12]) and in the management of the notes.

1.3 Digital Libraries and WebQuests

A WebQuest may be thought of as a very simple digital library which the student has to search. We take that analogy literally and attempt to combine digital library technologies (e.g., [3]) and educational strategies. Digital libraries can support teachers in creating a collection of works for the students quest. The student then navigates within the colection. Various different strategies can be applied in scoping the collection, such as appropriate levels of scaffolding.

2 The WQ System

While current WebQuests generally require the student to write essays either by hand or with a word processor, it is useful to develop a completely integrated framework. In this case, rather than writing essays, we simply ask the students to make notes on a selection of articles. These notes can then be arranged to present a response to the question. WQ provides a single interface for the associated activities of searching, reading, and writing.

The main control for the WQ system is via a tree widget which is presented in the left frame. This widget lists several Web Quests and for each Quest it presents background information and separate questions. In the present version, the basic paradigm for student interaction is creation of notes on the texts provided. The collection of notes taken together represents the student's response to the questions. Later, we propose models for extending this interactivity.

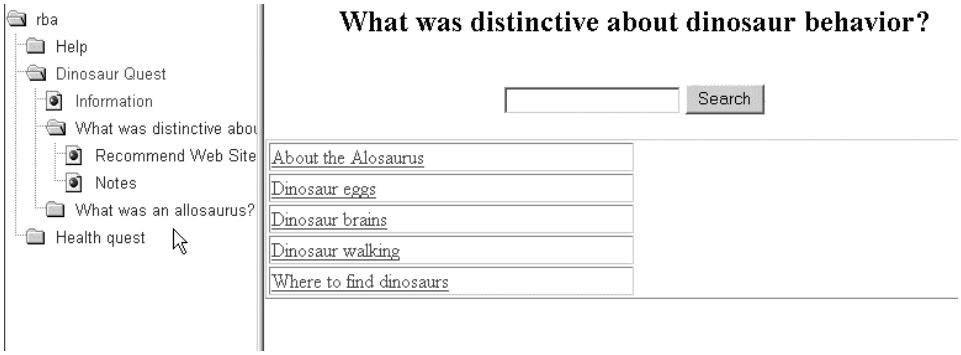

Figure 1: The Quest Manager (left) allows selection of Quests and questions within those Quests. Recommended Web pages (right) can be accessed either by browsing or via search.

2.1 Selecting Web Pages

The right side of Figure 1 shows the screen for presenting the list of web pages that have been recommended by the teacher for a particular WebQuest. While the current five articles are small enough to be browsed, we have also implemented a search feature that will be useful for larger collections which may be more properly thought of as digital library collections. The search utility allows teachers to provide a controlled domain of material, supporting the student by narrowing the field of resources but still providing an environment of exploration.

2.2 Making Notes

The students interact with the Web sites by selecting relevant sentences. Specifically, the students click on sentences to annotate them and to add those annotations to the list of notes. This is illustrated in Figure 2 which shows the highlighted text and a box for adding the note title and body. The main paradigm we wish to explore with this first version is linking into the text of documents. However, the current implementation allows access to any Web page in addition to formatted documents. For these Web pages, the notes can be posted only at the top of the page. In the future it may be possible to attach notes to particular passages as with the formatted docs.

2.3 Notes Manager

All of the student notes are collected into a single list as shown in Figure 3. The student can arrange the order of the notes to respond to the questions. In particular, notes are managed by selection of the note with a radio button and the selection can then be moved up/down or right/left in an indented hierarchic list. Integration of the notes manager with the browsing utility allows the student to respond to questions in the quest with out leaving the browsing environment.

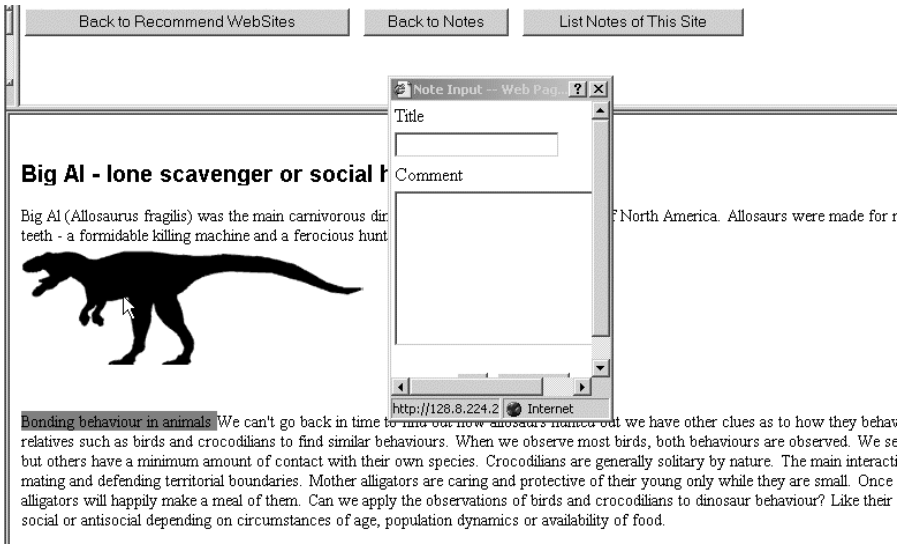

Figure 2: The student can create a note by clicking on a sentence from the text. This screen shows a frame with control buttons, a text with a highlighted (selected) sentence, and a note-entry box.

2.4 Implementation

This implementation uses a frameset which includes HTML, Javascript, and Java. In order to be able to add notes by clicking the text, we built a Java applet for the presentation of the text. This also meant that specialized Web pages had to be constructed. This is in the spirit of WebQuests that have tailored Web pages. The text of five Web pages from [4] was selected and reformatted for presentation via the Java applet. A future implementation may be adapted to automate reformatting either in batches or on the fly. The login control, recommended site listings, and notes are all managed with Perl scripts which connect to a Postgres database.

3 Digital Library Resources for WebQuests

WebQuests depend on high-quality content for the students to access. This information resource may range from a single Web page to a large collection of Web resources. We treat the Web resources as a scalable digital library. We have recently completed work on a digital library for The Maryland Electronic Learning Community (MELC), a part of the Baltimore Learning Community (BLC), has focused on the creation, maintenance, and cultivation of a digital library for teachers in five middle schools in the Baltimore area [16].

OAI, the Open Archives Initiative, has developed an open protocol supporting free sharing of metadata among diverse digital libraries. Using the OAI open protocol and an XML interface provides navigable access of the metadata from the MELC digital library as well as other digital collections. The OAI protocol [11] was initially developed within the e-print community with very task specific feature sets. Early directions evolved to open the standard and lower the barrier to entry for non-e-print collections. Thise opens the door to a great many potential resources for Web Quests. With further development, WQ could be expanded to take advantage of any OAI compliant resource. Here we see a different balance being struck between specificity and generality. Building on that foundation, information providers have a great deal of freedom to develop specific enhancements. The approach has great strength in that it offers one of the first structured protocols for metadata sharing. Our system uses XML to provide a minimal foundation of interoperability.

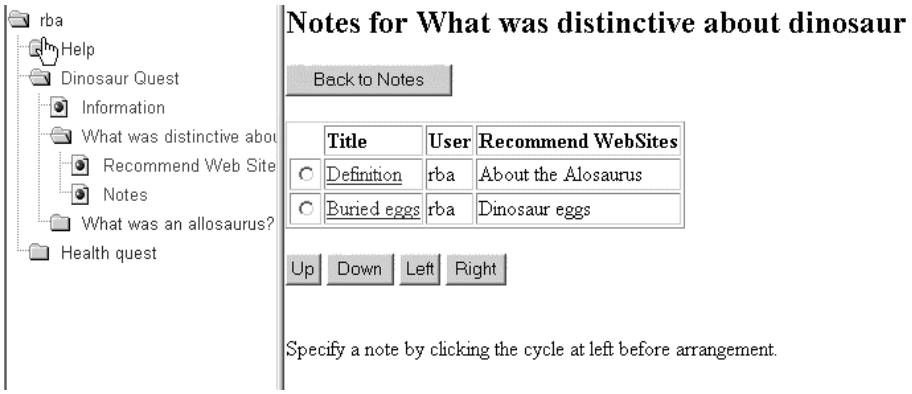

Figure 3: The entire set of notes for a Quest can be viewed. In addition, the order and nesting of notes on the list can be be controlled.

4 Future Directions

We will extend the initial work to incorporate additional features including (1) access to video and other multimedia resources, (2) support for collaboration, and (3) the ability for the teacher to harvest resources and evaluate student work in progress. We will also systematically examine the use of Web-based online resources in inquiry based-learning. Ultimately, students could have flexible resource management desktops (e.g., extending the ideas in [1]) and the underlying model could allow flexible interaction among the components.

4.1 Multimedia and Collaboration

We will incorporate videos as information resources, add the ability to jump to specific frames of the video, and we will develop simple summaries and indexes for those videos. The WebQuests of students with different multimedia indexing and access tools will be contrasted. Some existing WebQuests include multimedia, but that multimedia is not seamlessly integrated with the Quest. Because XML is rapidly being extended to encompass multimedia, our XML-based framework should be able to leverage that work. Similarly, simulation may be added.

Collaboration often makes learning more engaging [17]. Our existing annotation facility can be extended for use by several students at one time. We will extend the current model by adding features to give each student the ability to have distinct annotations and resources while also being able to read and comment on the work of the other student(s).

4.2 Teacher's Interface

While we have focused on the student's environment for completing WebQuests, it is also possible to support the teacher while they build the WebQuests and while they interact with the students who are completing the WebQuests. The teacher's needs in many ways mirror those of the student interfaces.

The teachers in the Baltimore Learning Community have found WebQuests to be highly effective. Building a WebQuest, as well as many lesson plans, requires identification of useful and appropriate Web materials. Selection criteria for inclusion in a lesson plan generally hinge on readability. Many teachers report that the challenge is to find the right digital collections. There has to be enough text, at the appropriate reading level, but not too much to be digested. When teachers find these resources, it would be helpful if they could manage them in personalized collections with annotation capabilities.

Moreover, teachers are looking not just for evidence in support of lesson objectives, they must simultaneously screen for appropriate presentation. In building a WebQuest, the teacher plays the role of collection builder for the student. A collection that covers the topic being studied but presents it at an inappropriate level is of limited use.

The materials in an OAI compliant collection can be a resource of great value to teachers. The Open Archives Initiative also provides open access for "harvesting" collections, but the protocol alone is not enough to make the data useful. We have explored metadata sharing via the OAI in light of teachers' needs in the BLC. We find a need for a system that allows users to integrate collections of annotations of, and associations between, Web resources. For instance, tools built on top of the OAI architecture could allow teachers to add value to the metadata or resources they find.

We find in usage analysis that many of the same materials within a very diverse collection are reused, not necessarily because of their content but because of "word of mouth" [15] and the barriers to easily finding alternative materials. One of the greatest obstacles teachers face is the ability to obtain and interpret organized collection data. Teachers find an overwhelming amount of resources on the Web. But the transition from collection to collection can be a somewhat nomadic process. Teachers use words like "hunting" and "searching" when describing the process of obtaining task-appropriate materials from multi-media sources and digital libraries.

Finally, teachers could also monitor the progress of the students and, eventually, could even provide interactive suggestions to the students while they worked, using the WQ interface. We envision the computer as a support for the teachers to track the progress of individual students. WQ could be extended to help teachers identify which students need the most help with a particular Quest.

5 Conclusion

Although Web Quests are very popular, their educational value is not well understood. We have developed the first stage in a unified environment for managing WebQuests. The current system allows the students to attach notes directly to texts. The collection of the notes allows the students to respond to the questions. This is not the final version of this system; we are close to completing access to multimedia and support for collaboration in note taking. We anticipate that WQ will become a successful model for an integrated WebQuest interface.

6 Acknowledgement

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