

Using the Internet in the Classroom: Variety in the Use of Walden's Paths

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Abstract: Walden's Paths provides annotated guided paths over World-Wide Web pages. Designed as an approach for organizing classroom use of contextualized Web-based material, Walden's Paths provides a general mechanism suitable for use in implementing a range of different pedagogical strategies. This paper reports on some of the uses that teachers have made of Walden's Paths. One of the surprises for us in this project has been the range of ways in which Walden's Paths can be used in practice.

Introduction

Over the past three years we have been developing Walden's Paths (Shipman et al. 1997; Furuta et al. 1997; Shipman et al. 1998), software supporting the use of existing Web-based materials in elementary and secondary classrooms. This work has been motivated by the belief that as more information is made available via the Web, that there is a greater potential, and indeed need, for educators to make use of this resource.

The Internet is becoming an intrinsic part of society and the most effective method of distributing many types of information. Because of the relatively low publication cost of the Internet, economic pressures will favor increased use of it for information dissemination. Schools will have to find methods of making use of this resource or ignore a growing amount of content with educational potential. The question should not be whether to use the Internet in the classroom but how.

There are a number of problems with using the Web in the classroom. The Web is an unedited publication media and so there is information that is inaccurate and inappropriate for students. Web materials, when on topic, are most often authored for other purposes than education, leaving students confused due to their lack of vocabulary or context. Finally, browsing Web materials can reduce the student to being a "button presser", navigating from page to page as they might flip from channel to channel on television.

Walden's Paths represents one attempt to ameliorate these difficulties by providing teachers a way to focus student exploration, to add explanation and context to materials, and to integrate the Web resources in the existing classroom environment.

The next section of this paper provides an overview of Walden's Paths' functionality and interface. After this we present examples of how teachers have made use of Walden's Paths within the context of their existing curriculum. This leads to a discussion of issues for the use of Walden's Paths and, more generally, the use of the Web in the classroom.

What is Walden's Paths?

Walden's Paths, named after the paths Thoreau unselfconsciously created through the woods while living at Walden Pond, is a tool that allows teachers to construct guided paths using the information on the Internet. Like Thoreau's trails, guided paths provide structure through an otherwise unstructured environment.

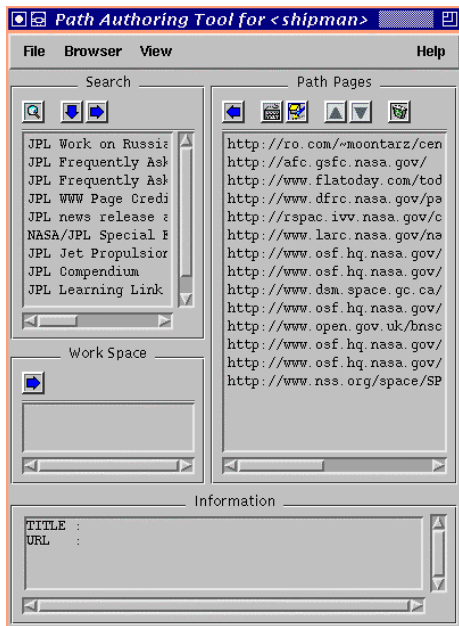


Figure 1: The Path Authoring Tool

The guided path as a concept goes back at least as far as Vannevar Bush's Memex (1945). Paths have been developed in specialized software environments and investigated with limited user communities in the late 1980's (Zellweger 1989; Trigg 1988). Paths in Walden's Paths are an ordering of Web pages with associated annotations. The pages used can be from anywhere on the Internet and their ordering in the path is independent of any existing navigational structure.

Walden's Paths consists of three components, a Path Authoring Tool for creating and editing paths, a Path Database for storing, retrieving, and sharing paths, and a Path Server that provides access to published paths.

The Path Authoring Tool, shown in Figure 1, is a Java-based interface that allows keyword searches for Web materials, the display of those materials in an external browser (e.g. Netscape Navigator), and the selection, ordering, and annotation of pages for the current path. The authoring tool also includes a "Work Space" for storing pages that do not fit into the current path but may be of use in the future.

Authored paths are stored in the Path Database. This database provides each authorized path author with a working area for storing paths. Paths stored here are not visible to the students and may be recovered for editing or continued work. When a path is ready for access by readers (here we are using the term reader instead of student to convey that the person accessing the path is not necessarily a student) it is "published" to the Path Server.

The Path Server is a Common Gateway Interface (CGI) program that creates the list of available paths and their presentation for readers. When a reader requests a path page, the Path Server constructs control-flow and annotation frames to appear at the top of the browser and requests the material from the source site on the Internet to appear in a lower frame (as shown in Figure 2). The reader can use the control-flow controls to step along the path. In addition, the links in the source page remain active. Following any of them takes the reader off the path, as shown in Figure 3. In this mode, further unconstrained browsing is permitted. The reader can return to the path departure point at any time by selecting the "return to path" button in the Walden's Paths navigation area of the display.

Use in the Classroom

The variety of ways in which Walden's Paths has been used to take advantage of Web-based materials in the classroom has been one of the surprises during the project. Our original conception of educational paths was that they would be created by teachers for use in the classroom as a convenient way for collecting widespread materials. We expected that teachers would then use the paths in ways similar to the use of traditional filmstrips—as an enabling way to direct their students' traversal of a sequence of related information items. In use, we discovered that

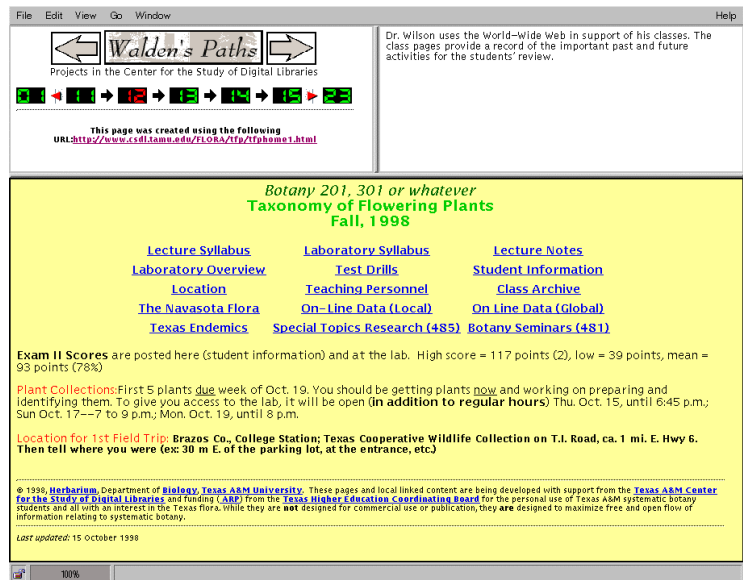


Figure 2: A path page created by the Path Server

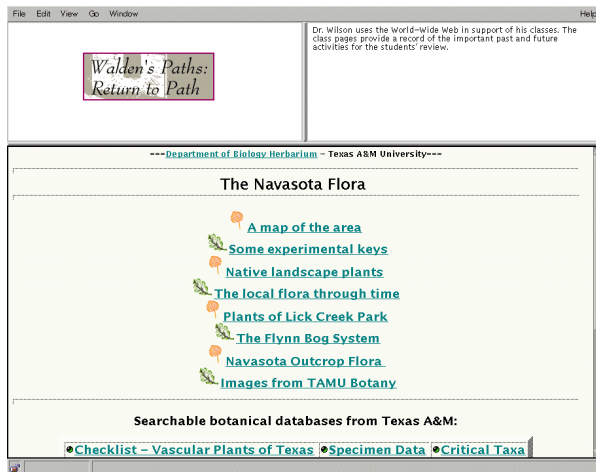


Figure 3: Off the path

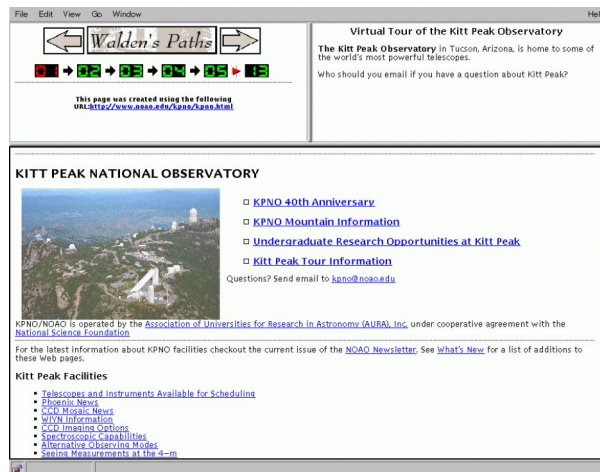


Figure 4: Kitt Peak Observatory path

this, indeed, did occur. However we also discovered that unexpected uses arose as well; uses that reflected a mixture of roles for both the materials and for the students. The following subsections will describe five separate uses of the system by teachers. For privacy reasons we do not identify the specific classrooms involved; some are located in Texas and others on military bases in Germany and Italy.

Embedded Assignments

A middle-school science teacher decided to use the path mechanism to create a virtual tour of the Kitt Peak Observatory. By collecting pages from different Web sites, he created a tour that not only described Kitt Peak, but also compared it to other observatories. A page from this path is shown as Figure 4.

The teacher made much use of the annotation feature of Walden's Paths, helping provide transitions between the information on the different pages and embedding questions for the students to answer on each page. The students, while traversing the path, were asked to answer (on paper) the various questions making use of the information provided on the pages.

The features are most interesting with this use of Walden's Paths are the mixtures of media—electronic and paper—used in achieving the teacher's classroom goals. Here, the teacher has blended Walden's Paths annotation feature with a paper-based assignment to focus and enhance the acquisition of information from the mixture of electronic information resources presented.

Modernizing Existing Practices

In a high school art and art history class, a teacher who had been using slides of paintings and sculptures for reviews and exams decided to use Walden's Paths to improve current teaching practices. Traditionally, during an art history review or exam, the students have to fill out a form as the teachers presents images in a 35mm slide show. Questions on the form might include the artistic period or style of the piece, the artist, defining characteristics of the piece, etc.

One problem with this approach is that each slide is available to the student during a short period of time. The student must quickly write down answers to the questions before the next slide appears. The teacher decided to replace the 35mm slide show with paths of images from on-line museums. In the revised exam each student could spend as much they needed on each image (within the time constraints of the class period).

The interesting feature of this use is the way in which a traditional teaching practice could be adapted and improved using the new medium. The updated solution preserves the familiar characteristics of the original situation while overcoming the technological limitations imposed by the equipment used previously.

Resources for Creative Work

A high-school computer music class teacher used Walden's Paths as a way to identify useful resources to students. Due to the technical nature of the computer music class there were few textbook resources available but much information on the Web.

The students, whose task it was to compose a new piece of music using MIDI, needed both explanatory and reference materials on the equipment and software they were using. The teacher created paths connecting sites with useful information on MIDI to act as a shared bookmark list for the whole class. Thus the teacher created a resource that enabled the use of Web-based materials in support of existing creative/constructive tasks.

The use of Walden's Paths to collect separate resources together to form a convenient package appears to be a common use of the system as we have observed it in other teachers' applications as well. In this use of Walden's Paths, the contextualization of information is not as important as is the coalescing of it in one place.

Class Projects

Another high-school music class used Walden's Paths in support of learning about musicians and music history. The unique aspect of this use is that Walden's Paths became an authoring environment for the students. The students had to form groups, pick topics, and author paths on these topics much like traditional group assignments to write reports on a particular topic.

Topics of paths ranged from specific composers and artists to areas of music (e.g., jazz). The students had to search and browse the Web to locate information on their topic and compose a useful path on the topic. The information selected by students included materials on music history, on the time period and context of the music, biographies of artists, and renditions of specific pieces.

A similar project was carried out in another high-school music class where each student had to suggest one or two pages for a class path on a particular topic. The students had to provide a reason why they thought their suggestion should be included in the path (why the reader would find it useful, or a description of the type of information it provided.) In this case, the teacher acted as a filter on what pages were included in the path.

While such an open-ended project could be given to students in this high-school classroom, there might be difficulties in such an assignment for younger students due to the challenges of locating information on the Web.

Extra-Credit

Another case of students authoring paths came in a high-school art class. In this case, an individual student, who was ahead of her fellow students, was given assignments for authoring paths that could be used by other students. This not only provided the student something creative to do that related to the course curriculum but also provided the teacher with assistance in developing materials for other students.

The positive feelings associated with seeing ones own work available to others helped drive much of the early publication on the Web. The publication of paths can be used as an incentive for students.

Discussion

The experience we gained from applying Walden's Paths in schools suggests some additional observations to us, which perhaps are less-related to the specific characteristics of our technology and more outcomes of Web-based projects in general. In this section, we discuss some of these issues.

Technological and social solutions

Paralleling the observations that we have developed earlier in this paper about incorporation of new technology into existing practices and association with existing artifacts, we were struck by the effectiveness of combined technological-social solutions in resolving technology-introduced issues. A frequent concern expressed to us during

the development of the Walden's Paths project have been the issues surrounding identification of appropriate material for use by schoolchildren, particularly those in lower grades. The path allows the selection of suitable materials and the annotation associated with path material permits the teacher to provide contextualization of that material. However, off-path browsing remains unconstrained, as do general browser controls.

Our early assessment of the situation was that the commercial sector was likely to provide technological solutions that would ease this situation through the development of blocking software. To a good degree, this seems to be the case. However, we were impressed by the simplicity and effectiveness of the solution adopted by a middle-school teacher in one of our test sites—rearranging the classroom to place the newly-obtained computers in the center of the room, surrounded by the desks of the students.

Local and global path visibility

Addressing issues relating to intellectual property protection have been among the most interesting, challenging, and persistent topics faced by the Walden's Paths project. As we reported in a previous paper (Shipman et al. 1998), early concerns focused on reader confusion between content and container—between original source material and navigation/annotation material provided by Walden's Paths. We have carried out several redesigns of the reader's interface to make these distinctions stronger; the design shown in this paper's figures is the latest in this process. However, we have come to recognize that an interacting issue is that of path visibility.

Paths have been created for many purposes—to serve as a resource for an individual classroom, to communicate findings from a student to a teacher, to promote a class' efforts to the outside world, and to serve as a guide providing an overview of a Web site or organizational location. Implicit in each of these uses is an expectation of who the appropriate audience will be for the path—an individual, a localized group, or the whole Web. Our current path directory mechanisms do not allow the identification of the intended reader population, providing global access, but not localized access. This leads to confusion both by readers but also by content providers who notice unexpected changes in access patterns as the paths become more widely used.

One of our current project priorities, therefore, is the development of a richer directory implementation that will enable more fine-grained specification of the community of interest for paths. However a more comprehensive solution may require the development of a more flexible model of ownership and location for Web resources.

The Path Server is essentially operating as a proxy server—obtaining requests from clients and redirecting those requests to servers. The TranSend project at U.C. Berkeley (<http://transcend.cs.berkeley.edu/>), which provides a generally-available proxy service, noted an unexpected side effect of their service, namely the general availability of services site licensed to the Berkeley campus. This was because their proxy service runs inside of Berkeley's domain; special action was required to restrict access to licensed services.

In our current implementation, material is only redirected when on a path (off path material is obtained directly by the client computer and is subject to the restrictions at the client's site). Consequently we have not yet encountered a corresponding situation although the potential exists for a path author to take advantage of our architecture to allow outside access to restricted services. A comprehensive solution here may also involve reexamination of ownership for Web resources.

Conclusions

In this paper, we have described some of the unexpected uses of Walden's Paths that appeared during teacher use. Although we had specific pedagogical goals in mind when we initiated the project (Shipman et al. 1996), our current evaluation is that the tool created is relatively independent of specific pedagogy. Consequently, Walden's Paths can be incorporated into a variety of teaching practices. Furthermore, if specific pedagogical guidelines are to be supported, Walden's Paths provides an appropriate substrate for implementation of authoring filters that encourage following of those guidelines.

The Walden's Paths Web pages are located at <http://www.csd.tamu.edu/walden/>

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References

- Bush, V. (July, 1945), "As We May Think", *Atlantic Monthly*, 101-108.
- Furuta, R., Shipman, F., Marshall, C., Brenner, D., and Hsieh, H., (1997). "Hypertext Paths and the World-Wide Web: Experiences with Walden's Paths", *Hypertext '97 Proceedings*, 167-176.
- Shipman, F., Marshall, C., Furuta, R., Brenner, D., Hsieh, H., and Kumar, V., (1996). "Creating Educational Guided Paths over the World-Wide Web", *Proceedings of ED-TELECOM 96*, 326-331.
- Shipman, F., Marshall, C., Furuta, R., Brenner, D., Hsieh, H., and Kumar, V., (1997). "Using Networked Information to Create Educational Guided Paths", *International Journal of Educational Telecommunications (IJET)*, 3 (4), 383-400.
- Shipman, F., Furuta, R., Brenner, D., Chung, C., Hsieh, H., (1998). "Using Paths in the Classroom: Experiences and Adaptations", *ACM Hypertext '98 Proceedings*, 267-276.
- Trigg, R.H. (October, 1988). "Guided Tours and Tabletops: Tools for Communicating in a Hypertext Environment", *ACM Transactions on Office Information Systems*, 6 (4), 398-414.
- Zellweger, P. T., (1989). "Scripted Documents: A Hypertext Path Mechanism", *Proceedings of the ACM Hypertext '89 Conference*, 1-26.