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Development of Web-Based Tutorials Utilizing a Case-Based Approach to Biomedical Database Searching and a Reusable Electronic Tool

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Introduction

With the exponential increase of new information in medicine, including such key clinical aspects as diagnosis and treatment, health care professionals require efficient and timely access to published information. Educating clinicians in searching for relevant information continues to grow in importance. While biomedical libraries frequently provide training of some type, new methods of information delivery require librarians to approach this need in new ways. Based on the Eskind Biomedical Library's (EBL) commitment to provide the finest and most accessible training possible to Vanderbilt University Medical Center faculty and staff, we now provide modular tutorials (knowledge modules) created to deliver 24-hour remotely accessible instruction to our primary users. The project goals are to

Deliver digitally based instruction on EBL resources to remote users.

Develop a reusable electronic tool that will facilitate further instruction and provide a consistent framework for our web-based instructional materials.

The concept of reusability is important, as it leverages on previous accomplishment, conserving additional resources. As the EBL web team recently developed a web-based interface for a pathology teaching tool (VIRGIL) developed with the Department of Pathology and utilized by Vanderbilt Medical School's second-year students, we recognized the potential of several project elements as framework for designing a flexible training tool. A team comprised of web development staff and librarians from Knowledge Management Services collaborated to address the possibilities.

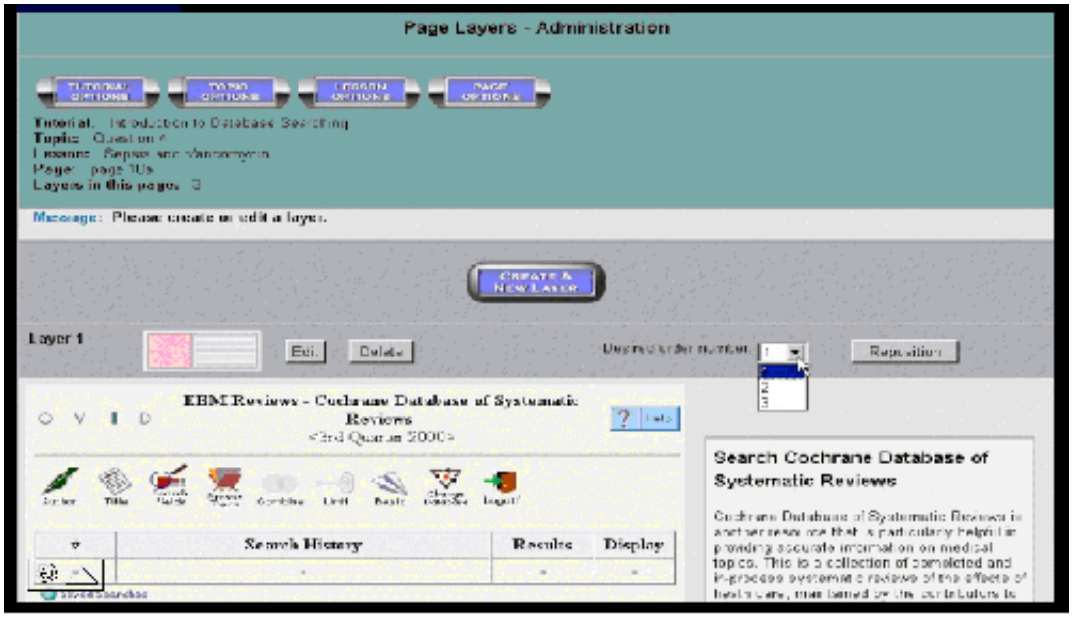
The three primary elements of the project include creation of a content entry (administration) tool, a standard developer display, and appropriate instructional content. In addressing these

requirements, we faced a number of challenges. Close communication between trainers and web team is essential for successful translation of content into an appropriate and useful design, requiring frequent meetings and working discussion groups to propose, evaluate, and revise multiple design formats. Basic requirements for the modules include a non-static, reusable system, extensive editing capability, ease of navigation, and a balance between customization and standardization. During the development phase, we frequently returned to the use of existing code and design features from the VIRGIL project to meet challenges and leverage on existing work. This proved the validity of the concept of reusability.

Entry (Administration) Tool

The content entry tool was designed to be a password-protected internet-accessible resource, allowing multiple individuals to use the tool simultaneously while permitting tutorial access only to the creator. This tool feeds material into a database through the use of templates, using a modular and hierarchical structure so that the user can manipulate several layers: tutorial, topic, lesson, page, page layer. Each level is clearly identified. Buttons promote ease of navigation. Each level can also be easily edited, renamed, re-positioned, or deleted.

Developers enter all content into the Page Layer level using a set of preformatted templates designed to allow for various placements of text, graphics, quiz questions, and multimedia. For each text box, the developer can opt to place a box around the content. In addition to plain text, the tool accepts HTML code and Javascript. This allows experienced developers to create more advanced displays while allowing success for the less-experienced as well. Graphics are uploaded and stored in the underlying database; these can be automatically set as links using a test template. The quiz structure allows developers to enter the question, the correct answer, four incorrect answers, and text responses to each choice. This allows for explanations of why a given answer was incorrect or correct. Once the developer has entered all content into the template, the system automatically generates the display. Developers can edit any content by simply clicking the edit button – all changes are instantly added to the display upon reload.

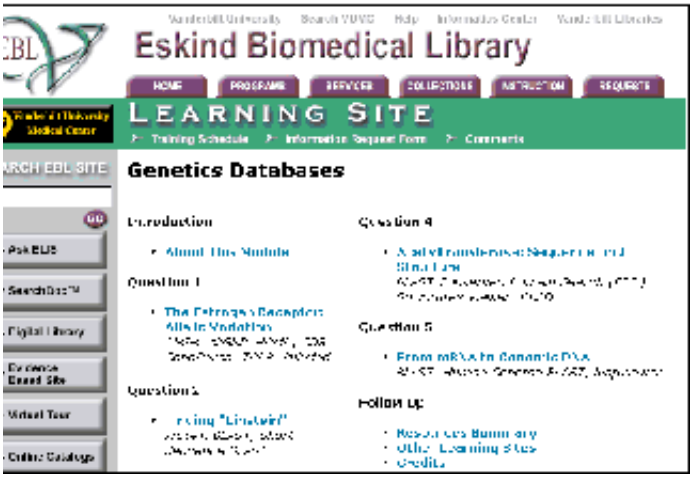


The User Display

Key requirements for the user display include consistency and ease of navigation. The overall look

of the display was adapted from the VIRGIL project, presenting content in a central frame with colored side frames containing navigation buttons and location information. Buttons labeled Next and Previous allow the user to move forward and backwards within the knowledge module. Another button allows immediate return to the table of contents (TOC) for the tutorial. The TOC contains a structured view of the tutorial contents with links to all lesson sections. Therefore, users can choose to view the entire tutorial sequentially or link instantly to internal sections.

The color of the side frames, font sizes and styles, and several other display features can be manipulated through the 'edit tutorial' option in the administration tool. This feature allows an experienced developer to upload style sheets to adjust the look of the individual tutorial. Defaults allow inexperienced developers to create a consistent and attractive tutorial without knowing how to write the code for a style sheet.



Module Content

Our fundamental approach to the development of instructional content is contextual and case-based. EBL-provided user education, whether classes or knowledge modules, introduce resources within the context of specific questions, using them to demonstrate and train in multiple resources. Sample user questions, commonly actual questions received by EBL librarians within the clinical or research setting, are discussed in detail and serve to demonstrate the process of finding the answer. This approach positions resource instruction within the context of practical user needs and provides examples of common types of questions.

The key features of this case-based approach address several objectives in user training, including

Analysis of the components and context of a clinical or research question.

Selection and combination of relevant search terms.

Recognition of the strengths and weaknesses of different resources.

Evaluation of results retrieved.

Modules include quizzes and practice questions; a link to a librarian-provided answer accompanies each practice question, allowing users to compare their chosen strategies with an expert strategy. Both demonstration and practice questions provide models which users can use in addressing new

queries of a similar nature.

The first module provides a broad overview of searching the biomedical literature. Five questions are included; EBL librarians received three of these during clinical rounding. The remaining two were selected to illustrate specific types of questions related to molecular biology research and public health statistics. The introduction addresses basic concepts of database structure, analysis of the components of a question, choice of resources, and evaluation of results. A summary of all resources mentioned in the question-based sections, including their strengths and weaknesses, appears in the conclusion, accompanied by a set of practice questions. EBL developers continue creating new modules which focus on specific resources, including genetics databases. In each module, the focus is on teaching resource utilization within the context of answering a specific question.

Evaluation Process

EBL staff reviewed this project extensively prior to its online release, scrutinizing content in detail and considering such factors as navigation and appearance. Developers then made changes made based on librarian suggestions. The team also created an online comment form for feedback. Medical center clinical teams were encouraged to provide user feedback, with the incentive of entry in a raffle: all users who evaluated the module and submitted the electronic comment form were entered into a drawing for EBL T-shirts or a free lunch. A dozen responses followed, all of which were positive.

As we create additional modules, we plan to track usage statistics for the module pages and for the module-based links to database resources. In addition, all librarians who use the administration tool to develop instructional materials are expected to communicate suggestions and concerns to the module development team. Based upon such comments, we continue to refine the administration tool and user display, including options for adding lesson descriptions to main menus, additional templates, and choices of frame colors. Eventually we expect to provide use of the tool to other divisions of the medical center and will use their feedback to further refine the system.

To date, the only technical issue causing concern to module developers is the difficulty of resizing web page screen shots without loss of clarity. This is not truly a problem with the tool itself, but rather one of content preparation for entry. We are presently investigating improved software tools for capturing and resizing screen shots in order to solve this problem.

Conclusion

We have created a reusable electronic tool for quick and consistent creation of online instruction modules characterized by easy navigation, consistent display, and case-based content. To date, seven knowledge modules are available, providing instruction in the use of various electronic resources, including citation databases, genetics databases, and our online catalog. Each module provides twenty-four hour desktop-accessible instruction in a format which models the process of answering specific questions, with links to sources of additional assistance from EBL librarians provided. Additional uses for the module development tool include the creation of staff training materials and the display of digital text collections. This efficient and highly flexible method of providing instruction in a digital environment provides an accessible approach to training which crosses barriers such as location and scheduling, increasing the EBL's ability to educate our users in resource access and utilization.

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