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## Library Staff Presentations and Research

### Title

NetTrail: The Evolution of an Interactive, Self-Guided Tutorial for Undergraduates

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## **"NetTrail: The Evolution of an Interactive, Self-Guided Tutorial for Undergraduates"**

by

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### **Abstract**

NetTrail is an online resource designed for University of California Santa Cruz students new to the research process, specifically lower-division undergraduates. It is a self-instructional, self-paced tutorial that covers the research process from initial topic selection to citation styles and the issue of plagiarism. Its content is organized into six modules that contain text, graphics, and interactive components. The modules are followed by a short self-administered quiz. It is not subject-specific and can be used in a variety of introductory courses.

Developed ahead of the curve, NetTrail has become an important and unique component of the Library's instruction and outreach programs. Additional uses for the tutorial have been discovered that hadn't been anticipated initially, such as incorporation of an information ethics module and its adoption as an in-house training resource for new library staff and student workers. It is now a featured resource of our research instruction program. (<http://nettrail.ucsc.edu>)

### **RATIONALE**

#### **NetTrail's origins — 1996–2002**

A University of California systemwide conference in 1996 on undergraduate education brought together a self-selected University of California Santa Cruz (UCSC) group of librarians, Computing and Technology Services staff, and faculty interested in developing a resource to provide students a solid grounding in basic online skills. Additionally, it would introduce more specialized computer resources available at UCSC, eliminating the need for faculty to teach these competencies in their classrooms.

NetTrail was intended to meet the needs of the users of 1996—specifically incoming undergraduate and transfer students unfamiliar with the then-new environment of the Internet. Its original purpose was to introduce students to, and provide basic competency in, the various components of the Internet—the World Wide Web, electronic mail, and newsgroups/Usenet—and library-specific print and electronic resources as tools to aid their academic research. The development team comprised of UCSC librarians, faculty, and programmers began work on this initial version of "NetTrail: The UCSC Computer Literacy Course" in fall 1996, and it was released in fall 1997.

In 1998, the development team wrote a grant and competed for campuswide Instructional Technology funds. Based in part on the successful introduction of NetTrail, the team was awarded a \$36,000 instructional improvement grant that made possible both upgraded

server support and further development of the tutorial itself. For example, a portion of the funds was used to hire, during the summer of 1998, an editor to give a consistent voice to all of the NetTrail modules and in 2003, a web designer to aid in renovating the Web site.

## **DEVELOPMENT**

### **A redesigned NetTrail — 2003–present**

By 2002 NetTrail was beginning to show its age. As student knowledge and experience of the Internet, particularly in secondary schools, had become more widespread in the years following the tutorial’s release, it became evident that NetTrail’s introductory, computer-literacy approach had outlasted its usefulness. Web-based abstracting-and-indexing databases and library catalogs were now taken for granted, though students’ increased familiarity with the Internet had not necessarily translated into skilled research techniques. NetTrail had to change, and change radically.

Given the amount of work that a revision of this scale would entail, remaining members of the development team recognized the need to review membership with a renewed level of commitment and expertise in mind. The recruitment effort resulted in a new team composed almost entirely of librarians, and the group began work on the new NetTrail in early 2003.

The team looked at everything from content, graphics, and interactivity to the quality of the “voice” of the tutorials. In determining overall design goals, this newly formed team decided—based on the Santa Cruz campus’s natural forest-and-pasture environment—to retain the original NetTrail’s map-and-trail motif, a metaphor for the students’ “journey” in search of research skills and the “destination” of useful information. Keeping in mind the primary audience of first- and second-year undergraduates, the “voice” of the tutorial became more informal and conversational rather than pedantic, while taking care not to slip into colloquialism. As a result, the new version retained a similar feel and flow to the original design, but incorporated changes in the librarians’ approach to instruction, as well as innovations in online technology to keep the modules current and fresh.

The revision focused on providing an introduction to the types of information—both print and electronic—useful for academic research; evaluation and ethical use of this information; and development of some key library-specific search skills for retrieval of such information. NetTrail now covers the research process from beginning to end—selecting a topic, choosing appropriate resources, database search techniques, and concluding with an overview of plagiarism and academic ethics. NetTrail was redesigned as a resource available to UCSC students as well as members of the general public. Incorporating a consistent look and feel with modifiable content, the skills presented are in the context of UCSC, though they can be easily modified with updated content or for use at other institutions. No longer just a computer-literacy course, NetTrail was transformed into an *information-literacy* tutorial.

The redesign was not without its challenges, for example the transition in the development team. A new group had been formed, comprised of some original NetTrail developers but consisting mainly of newcomers to the project. The group spent what in retrospect was a very important period discussing goals and approaches and reaching a

general consensus on a new outline before actually beginning work on the modules. Discussing and reaching agreement on these types of fundamental issues was an important part of the team-building process and gradually helped fashion a cohesive and enthusiastic group of developers.

## CONTENT

The current version of NetTrail now focuses on the six areas seen in figure 1.

**UCSC INFORMATION LITERACY TUTORIALS**  
**NET TRAIL**

**NetTrail Home**

Welcome to **NetTrail**, the University of California Santa Cruz's Information Literacy Tutorials!

Here you will discover how to find, evaluate and use information effectively and ethically. Taking NetTrail is a great way to learn skills that will help you succeed in your academic pursuits.

NetTrail contains six trails. You can follow the trails in sequence, or you can skip around if you like:

1. [Types of Info](#) — an introduction to various types of information sources
2. [Choosing a Topic](#) — broadening and narrowing a topic and discusses search concepts
3. [Library & Web](#) — looks at the comparative evaluation of Web sources
4. [CRUZCAT](#) — how to use the Library catalog effectively
5. [Find Articles](#) — what is an article database and how to use it to find scholarly articles
6. [Info Ethics](#) — why and how to use citations, and covers the topic of plagiarism

[Quiz](#) — After you reach the end of the trail, take the Quiz to test your knowledge!

**NET TRAIL** [CONTACT](#) • [ABOUT](#) • [FOR INSTRUCTORS](#) • [UCSC LIBRARY](#) • [UCSC HOME](#)

Fig. 1 NetTrail home page with outline and descriptions of individual modules.

There were many hard decisions to make as the redesigned tutorial took shape. A vexing issue was faced with the decision to eliminate live searching of external databases within some of the modules, opting instead for “canned” search examples and movies. This choice was felt to be necessary due to the increased licensing restrictions for off-campus and non-affiliated student access. The entire subject of navigation both within and between modules was a major concern during development. How far could the outdoor trail metaphor be taken and still prove an effective way to move around the Web site? How could the user’s path through the tutorial be reasonably anticipated if modules could be accessed in random order?

Latterly, based on some informal faculty comments, a final module was added that had not been considered previously, namely the information ethics section that touches on issues of plagiarism. This inclusion, late in the development process, has turned out to be one of the most-used portions of the entire tutorial and certainly one that is of great interest to UCSC faculty and instructors given the increased emphasis on copyright and issues of plagiarism in academia.

## **Creative Commons**

It is important to note that during the development process, creativity was primed by the willingness of other universities to allow the use and modification of their tutorials' text and software in the creation of the revised NetTrail. The generosity of Colorado State University and of the University of Texas System in sharing their Data Game and TILT content, respectively, was very helpful. When the time came to share NetTrail's content with other colleagues, the development team was delighted to discover the Creative Commons license. Creative Commons (<http://creativecommons.org/>) is a non-profit organization that offers "free tools for authors, artists, and educators to mark their creative work with the freedoms they want it to carry. Our tools change 'All Rights Reserved' into 'Some Rights Reserved'—as the creator chooses."

The Creative Commons license makes it very easy to offer content such as text, software, music, video, etc. as open source and provides choice as to the degree of openness of the license. It can also increase the visibility of the resource through the license metadata contained in the Web site. This metadata is utilized by Google (see the Usage Rights option on Google's advanced search page), Yahoo, and other search engines to steer developers to open-source content bearing a Creative Commons license.

## **INSTRUCTION**

### **What do NetTrail users see?**

The user experiences NetTrail as a friendly, approachable environment that offers six short modules for self-guided exploration. The modules are offered as links in a numbered sequence on the home page and in a persistent navigation bar at the top of each screen within each module. This order arranges the topics in a progression that generally follows the research process. However, students also have the freedom to access the modules in whatever order most appeals to them or is most applicable to their immediate research needs, including the option to skip some modules altogether. So though numbering indicates a suggested sequence, the modules can be accessed randomly and the content of each module assumes no prior NetTrail experience. This capability to unbundle the modules allows instructors the option of using a single module—say, the module on information ethics—as part of a class lecture. At the end of each module users are presented with a "trail head" sign that orients them to where they are in the overall sequence, but also suggests that they can choose any of the other modules or "trails" in any order they wish.

The current appearance of the tutorial is the result of extensive discussion and user testing to determine how informal or cartoonish the graphics should be to encourage a sense of relaxation and informality within the target audience without detracting from the core lessons the tutorial was designed to impart. The modules teach through text (both static text and text in pull-down boxes that reveal their answers only after being actively "prodded" to do so), graphics (original cartoon figures and screen shots from online

sources), interactive segments, and movies, as seen in figure 2. Users progress through the modules screen-by-screen, at their own pace. User testing indicates the entire tutorial is on average completed successfully in 45 minutes to an hour.

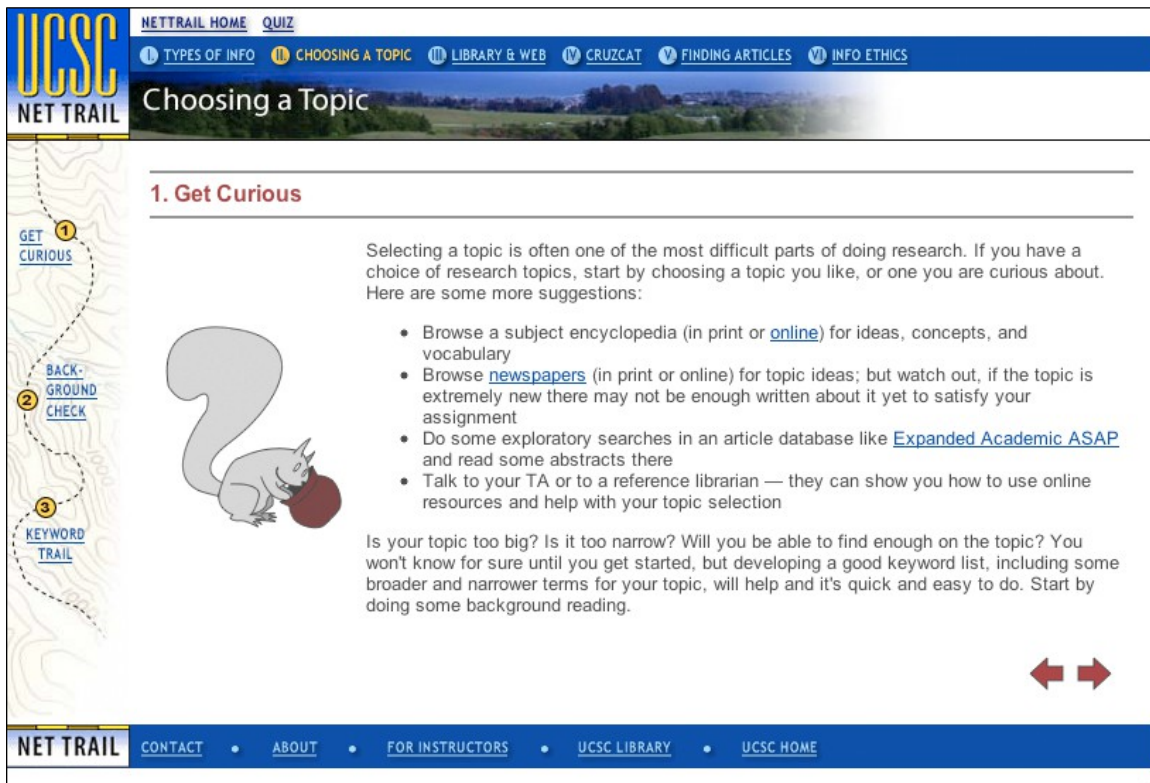


Fig. 2 Detail from Info Ethics module illustrating navigational features.

Although NetTrail’s map-and-trail navigational metaphor evokes a world of its own, the intent was not to create a separate community where research or even the learning of an entire semester takes place—as, for example, some WebCT environments do. This motif was, instead, used to create a non-imposing space where individual students could get a foundation in the research process, its vocabulary, and some of its basic tools in about the time it takes for a single class lecture. NetTrail is designed to be a portal or entrée to the real world of research, rather than a separate community where students would spend a lot of time. After taking the NetTrail tutorial, students should be less intimidated by the actual library or by consulting with live librarians so that the research conversation could then move out of NetTrail to the reference desk or to the e-mail reference service.

### Multimedia

Two of the modules end with interactive Flash segments that engage the user with hands-on decision-making, asking them to apply the skills or information acquired while taking that particular module. These interactive tasks provide instant feedback to reinforce what was learned. In the Choose a Topic module (<http://nettrail.ucsc.edu/choosing/keyword.html>) users type in their choice of keywords for a provided topic and receive an immediate response in which their words are compared to those selected by the tutorial’s developers. In the Types of Info module

(<http://nettrail.ucsc.edu/types/youchoose.html>) the multiple-choice Flash segment instantly informs students if their selection of the particular type of information (book, article, or Web site) is most appropriate for the research questions presented. The user must choose the correct answer (each incorrect choice is explained) before proceeding to the next question.

Several of NetTrail's modules contain one or more movies, for a total of three original movies (two for searching the catalog, one for linking to full text from an citation within an article database) and an open-source animated movie that explains the copyright implications of downloading music from the Internet (<http://nettrail.ucsc.edu/ethics/copyright.html>). Each of these are helpful in conveying longer multiple-step processes, such as the mechanics of catalog searching, without being text-heavy and while holding the user's interest. User testing has shown the movies are well-liked by students but their drawback is that they are time-consuming to create and any specific database examples must be updated as changes occur. Although Camtasia software was initially used to create animated content, newer software such as Adobe Captivate makes it easier to create and update movies. Incorporating movies, however, still requires a significant investment of time and effort.

### **Feedback for Users**

NetTrail provides two types of feedback for users: the self-assessments at the end of each module, which are included in the activity sections, and the multiple-choice quiz that covers material from the tutorial as a whole. The active assessments within the modules are exclusively for the student's benefit and are not recorded. The final page that confirms the successful completion of the quiz can be printed out and submitted to their instructor as proof of completion. If the student entered their name at the start of the quiz the completion certificate will include their name.

The development team decided to make all of the NetTrail assessments pass-fail and in all cases a perfect score is required to continue, including a perfect score on the quiz. If a student scores less than 100 percent on the final quiz the software informs them which questions were answered incorrectly and lets them try again. The quiz can be taken as many times as necessary in order to answer all the questions correctly. A 100 percent score for the overall quiz was made a requirement for several reasons. The tutorial as a whole is not very long; it covers very basic core competencies, all of which are important for student success in future research and it would be advantageous to urge students to review their incorrect choices, reinforcing the correct ones.

Communication with students is effected by the instant feedback that the assessments provide. Should they wish to do so, students can also communicate with the NetTrail team via the library's Ask a Librarian e-mail request form, links to which are provided at the end of each module.

## **PROGRAM ASSESSMENT**

### **Assessment during development**

A modest amount of user testing was conducted during development of the revised NetTrail. For the first assessment, two modules were chosen for focused usability testing: the Types of Information module, which includes an interactive section, and the longest module, Finding Articles, which includes a movie. These modules also differed in tone, the former being casual and the latter more formal. Five students were asked to navigate through the two modules, and to “think aloud” as they did so. They were each observed by two NetTrail team members who kept track of start/stop times, thoughts expressed, body language, and links clicked. Two additional students were asked to take the entire tutorial (which took them each about 45 minutes to complete). They were then asked a series of questions about the content and their perception of their experience. These tests did not uncover anything startling and were reassuring overall; the casual tone of voice was not too juvenile and all participants mentioned that they learned something new. Navigation between pages within modules was, however, refined. Comments from user testing included:

- “What’s a database?” “I usually find articles on the Internet using Google.”
- “I never thought about the difference between magazines and journals—that was helpful.”
- “I like this [module] because it’s like a game.”
- “I thought [NetTrail] was good...broken into chunks so you don’t have to read the whole thing at once.” “This stuff is a good start.”

The final quiz underwent a larger-scale assessment. This quiz alone was administered to 150 undergraduates who had not seen the tutorial. This phase of user testing produced the most interesting development to arise prior to launching NetTrail: the discovery that the initial version of the final quiz was much too easy to be a good assessment of knowledge gained from the tutorial. Seventy-eight percent of the students tested answered all but one of the questions correctly. As a result of this assessment, the number and specificity of the quiz questions were increased.

### **Analyzing usage**

Anyone who has attempted to analyze Web usage statistics will be familiar with the difficulties the NetTrail team has encountered in this area. Ideally it would be most useful to know the number of unique visitors to the site and the sequential path those visitors took so that we could determine where they entered the site, where they went page-by-page, how much time they spent on each page, and where they left the site. However, currently the log analysis software used on the Santa Cruz campus only tracks hit counts for pages. We have ascertained that the graphics on each page are not being counted separately, a factor that can inflate usage statistics, so these numbers represent actual page hit counts. Although not ideal, these counts provide some sense of NetTrail’s usage.

Usage of the NetTrail website has increased over time. The NetTrail homepage has received 10,515 hits in 2006. Approximately 13 percent of hits to the entire web site were due to crawling by robots and search engines. We observed that usage was spread throughout the site, not just concentrated on the home page of each module.



We also looked at weekly on-campus usage statistics throughout the 2005-06 academic year and found they mirrored the campus's activity pattern, with increased usage during the busy research weeks of each academic quarter and a corresponding decrease in usage during the quieter periods between quarters and over the summer. We verified that 12.5 percent of hits to the entire web site (8562 hits) in 2006 originated from on campus hosts with the remaining majority of NetTrail users originating off-campus. The most visited module in 2006 was "Types of Information" and the least used was "Library & Web".

The team met with frustration in its unsuccessful attempt to determine how much off-campus use was by the target audience of student researchers. The Library is currently evaluating two examples of log analysis software—Sawmill and WebTrends—to replace an inadequate existing application. This will not only improve traffic analysis of the library's Web site, but can also be employed for the same purpose by NetTrail.

As the development team attempted to interpret NetTrail's statistics, it became clear that it would be helpful to have a way to share usage statistics with developers of similar Web-based tutorials. Particularly useful would be a shared resource that collated these statistics using metrics standardized across tutorials (thereby assuring that everyone counted a "visitor" the same way)—admittedly a huge effort to construct and maintain. Short of that, a resource providing an annotated list of Web-based literacy tutorials that included links to the publicly available statistics of each would be of considerable use.

### **Faculty feedback**

Informal feedback from faculty indicates that NetTrail is helping to meet their needs in terms of both content and delivery mechanism. The tutorial helps bring their students who are new to the research process up to speed and all the instructors who have contacted the team have been pleased to see the Information Ethics module included. NetTrail also addresses a need to efficiently reach the hundreds of students enrolled in their large introductory classes, whose large numbers make individual hands-on instruction within the library unworkable. Faculty are also pleased that the tutorial can be taken independently and thus doesn't impede class time. We noted that the "For Instructors" page that outlines how NetTrail can be used in classes (<http://nettrail.ucsc.edu/admin/instructors.html>) was heavily used in 2006.

Although no evidence of plagiarism has been reported, the team received a request from an instructor to make the quiz more plagiarism-proof. As a first step towards plagiarism prevention, the order in which the questions appear will be randomized each time the quiz is generated, making it more difficult for students to develop their own "answer keys." Additionally, a request has been made for a module covering the Web of Science database. The design goal for Phase One of the project was to avoid resource-specific instruction except in the case of the library OPAC, enabling the tutorial to be used by the widest possible audience. Subject-specific module development is on the agenda for the next phase. However, as database vendors increasingly provide their own movies highlighting the features of their products, any future modules need to be planned to complement, rather than duplicate, what the vendors already provide.

### **Librarian and staff feedback**

Instruction librarians are particularly grateful to have NetTrail for very large classes that were previously underserved by library instruction. As is true for any library instruction, the team's sense is that if the tutorial were to be required by faculty, rather than optional, it would more likely be completed by students.

During the past two years in its current incarnation, NetTrail has also started to be used extensively and very effectively as a basic instructional tool for the training of student workers in the Reference Unit, and of staff at the library assistant (LA) level, known as "reference aides," who volunteer in an ongoing program to assist patrons at the reference desk. In December 2006 a sampling of six reference aides and two student workers were formally interviewed using a set of uniform questions. The profiles of the interviewees are quite diverse—ranging in age from early 20s to early 50s, long-time library employees to students with less than two years' experience, undergraduate students with no special knowledge of library research to an LA with a master's degree in library science and another in the midst of an MLS program.

Of the eight employees interviewed, five said that NetTrail helped them better understand the concepts of library research, six said NetTrail helped them convey research concepts to patrons, and six said that taking the tutorial helped them to conduct their own library research. When asked "*On a 1-to-5 scale (1 lowest, 5 highest), how would you rate NetTrail for effectiveness in conveying library research concepts?*" six respondents ranked it a 5, one LA ranked it 4.5 and one student ranked it a 4. Both students added their opinions that the tutorial was "really straightforward" and "couldn't be more informative," though it was good that it was "brief" and "doesn't attempt to teach *everything*." Despite rating NetTrail very highly in terms of effectiveness, when asked to rank the tutorial on a 1-to-5 scale for level of difficulty, all those responding ranked it as quite easy (3 was the highest rank, six respondents ranking it at 2 or below). When asked, however, if they thought NetTrail could be more effective by making it easier or more difficult, many offered suggestions for improvements and additions but most felt the tutorial should probably remain at the same level of difficulty.

Overall, reaction to NetTrail in its current form was overwhelmingly positive amongst those interviewed, and although there were many suggestions for additions to the tutorial, all seemed to indicate that the right balance of basic research concepts, level of difficulty, length, and mood or atmosphere in the interface had been struck. All of those interviewed would recommend NetTrail to others.

## **LESSONS LEARNED**

### **Advice and Recommendations**

The NetTrail development team has grown over the years as interested and technologically innovative colleagues have joined the group. The success of the tutorial

can be attributed to several key concepts and developmental decisions. Some of the most important recommendations we make include:

- Create a development team with a range of skills and backgrounds, including Web development. Bringing together both science and social-science/humanities librarians was a real plus in expanding the mindset of both groups as to the level of research skills possessed by their respective patrons.
- Actively seek funding, look for grant opportunities, and allocate time and energy to grant writing for current as well as future development. Securing adequate funding was a crucial factor in providing the ability to obtain resources as they were needed. For example, funding allowed the incorporation of interactive features to replace text-heavy explanations—an expensive yet extremely well received change to several modules.
- Share ideas and approaches with others via Creative Commons and open licensing. This can save much planning and development time and improve the quality of your final product. Return the favor by making your own work available with a Creative Commons license.
- Dedicate time and resources for marketing on a continuing basis to ensure that new users are aware of this resource. Turnover in faculty and student populations as well as new features added to the tutorial makes this an essential outreach activity.
- Integrate user testing into the entire development process early on. Ideally, dedicate a portion of your team to user testing so that by a third of the way into the development process they are ready to conduct user testing in parallel during the remainder of development.
- Communicate with library colleagues, keeping them informed and involved during all aspects of development and assessment. Though never NetTrail’s intention, concern over automated instruction replacing in-person instruction led to some misconceptions about the purpose of the tutorial. Keep all colleagues, especially those not involved in the project, continually informed and reminded of the goals of the tutorial.
- Build flexibility into your tutorial. Keeping components modular within sections of the tutorial makes it easier to replace parts, rather than a whole unit. On a larger scale, allowing users to experience the tutorial in a non-linear manner and avoiding an inflexible, sequential path makes it easier to incorporate changes without having to “adjust” the entire tutorial to preserve continuity.
- Think in terms of both short and long-term development. Keep a current wish list of future revisions and be prepared to take advantage of opportunities as they arise. Changes in technology may make some previously complex operations easier or cheaper to implement. But be sure to anticipate obsolescence, and think ahead to major reviews and revisions.

Developed ahead of the curve, NetTrail is currently a featured resource of the Library's research instruction program and continues to evolve to meet the changing needs of our undergraduate researchers.