Abstract
Purpose – The purpose of this paper is to discuss customizing an open-source program called the Assignment Calculator into a tool designed specifically to serve the needs of students at California State University, Fresno, and at San José State University. The paper aims to discuss information literacy standards, students’ need for convenient access to resources, time-management and research help and the technical issues involved in such a project.

Design/methodology/approach – The paper presents how the steps and content of the open-source tool were connected to the Association of College and Research Libraries (ACRL) Information Literacy Competency Standards. Subject matter was researched and evaluated from other tutorials to find the most valuable instructional concepts based on assessment of their students’ needs. The paper discusses ways to customize, maintain and continue to revise the Assignment Calculator to keep it relevant and beneficial.

Findings – The customized online tool can help improve understanding of the library’s role in information literacy and provides opportunity for librarians and faculty to collaborate. Statistics and a survey can yield information on usage and usefulness.

Originality/value – This case study reviews current research in incorporating information literacy concepts into an online tool. It describes the process for librarians to research and customize an open source tool and concludes that while it is initially time-consuming, it is ultimately a rewarding experience which will improve students’ understanding of these concepts.

Keywords Academic libraries, Information literacy, Internet, Tutorials, Open source software, Students

Introduction
Many college and university librarians are looking at ways to move from traditional bibliographic instruction to a more comprehensive information literacy (IL) approach in working with students. IL can be defined as the ability to recognize the need for information, to find and use a variety of resources, to evaluate this information using specific standards and to be able to use these competencies in new environments and situations beyond the classroom. IL incorporates educational concepts such as critical
thinking, technological competence, evaluation skills and lifelong learning (Johnson, 2009). Librarians do not have enough time in traditional instruction to cover these IL standards and are looking at ways to reach and teach students beyond a class session.

Using online tutorials to enhance IL instruction is one way to do this. Library-related discussion groups, library conference sessions and articles in library literature all currently address how to create and use online tools in order to provide additional learning opportunities for students.

Online tools have many advantages over traditional classroom-based library instruction. They are available to students at any time, providing access to library information and electronic resources in addition to fostering IL skills.

Students can work at their convenience and at their own pace. Given the economic constraints that most libraries face these days, such as reduced funding and fewer human resources, and given the fact that most librarians are struggling to develop new programs and services while still supporting those existing, online tools are a cost-effective way to reach a large number of people outside the classroom.

Many academic librarians are now involved in this effort, resulting in a proliferation of excellent resources readily available online. But another recent trend, incorporating the increasing popularity of open source software, is the move toward librarians adapting or locally customizing existing high quality tutorials rather than creating new ones from scratch, as they are expensive to develop and require substantial preparation time (Bradley and Romane, 2007).

This article discusses how and why a group of librarians from the Henry Madden Library at California State University, Fresno (CSUF) undertook the project of customizing a popular open-source program from the University of Minnesota called the Assignment Calculator (https://tools.lib.umn.edu/ac/). Their goal was to create something that would serve better the needs of their own students and would incorporate widely-accepted IL concepts into the process. The article goes on to show how a group from the Dr Martin Luther King, Jr Library at San José State University also customized this tool and explains many of the changes they made to both the original and the CSUF version.

**Student preferences today**

Students want to use resources at times convenient to them, not necessarily during the traditional reference desk or faculty office hours. Students today expect “increased, instantaneous access and more interactive learning” (Reyes, 2006).

The recent Project Information Literacy Report research study concluded that “most students used library resources, especially scholarly databases, for course-related research and far fewer, in comparison, used library services that required interacting with librarians” (Head and Eisenberg, 2009).

There is also a growing awareness of the learning styles of students today, who are said to “prefer interactive, technology-based learning experiences” (Nixon et al., 2009). Another research study found that “online tutorials generally proved as effective as classroom instruction, and that the majority of students actually preferred online to classroom instruction” (Silver and Nickel, 2005). An online tutorial is available anytime and from any location, in a format that is useful and appealing to a wide array of learning styles.
**IL competency standards**

An important part of the process of adapting an online tool to enhance IL instruction is to connect it to the Association of College and Research Libraries (ACRL) *Information Literacy Competency Standards*. “Information literacy is the set of skills needed to find, retrieve, analyze and use information” (American Library Association, 2006a).

A quote from the “Use of the standards” section of the *Information Literacy Competency Standards for Higher Education* on the ACRL web site illustrates the value of building a tool this way:

> The competencies presented here outline the process by which faculty, librarians and others pinpoint specific indicators that identify a student as information literate. Students also will find the competencies useful, because they provide students with a framework for gaining control over how they interact with information in their environment (American Library Association, 2006b).

These ACRL standards have been effective at giving librarians and other educators a common language through which to discuss expectations for students at all levels of higher education.

The ACRL *Information Literacy Competency Standards for Higher Education* were approved by the ACRL board in 2000 (American Library Association, 2006a). Since then librarians have incorporated IL concepts into their research in many different ways. In some recent examples, IL has been used as a framework in understanding the impact of meta-searching/federated searching on programs for students conducting research (Cox, 2006; Labelle, 2007), in promoting and marketing IL initiatives (Germain, 2007), in online teaching (Buchanan et al., 2002), in comparing in-person versus online instruction (Burkhardt et al., 2008), in problem-based learning (Holler, 2009), and in the relationship of IL to knowledge management (Ferguson, 2009), to name a few. There is still a lively discussion at community colleges regarding how to use the standards to change bibliographic instruction (Johnson, 2009).

The idea of promoting IL in online instruction is not a completely new. In 2002 the literature was beginning to discuss the importance of incorporating IL standards into online courses (Buchanan et al., 2002). Improved and increased access to technology has altered the way that students study, and the variety and volume of electronic information available to students continue to increase as well. These developments have reduced the amount of in-person instruction taking place in the library and the need to actually visit the library building for help. It also means that librarians need to alter the way they plan and deliver IL instruction (Orr et al., 2001).

As a result, all library services, including instruction, must evolve to meet new user expectations in a virtual university environment. The College and University Systems Exchange (CAUSE) Current Issues for Higher Education Information Resources Committee (1997) defines a virtual university as:

> [...] an institution or set of institutions engaged in a delivery of degree granting programs in higher education, using technology and methodology outside a traditional classroom.

With the ever-increasing number of online courses and classes with online components being offered at colleges and universities, it is vital that academic librarians develop additional ways to meet the needs of these learners.
As Hricko points out in Buchanan et al. (2002):

[...] students that have a greater intellectual framework for using information will most likely be the individuals that have the greatest success in completing distributing [sic.] learning courses.

Research also indicates that the development and team-teaching of online courses by librarian-faculty teams is likely to increase, as more faculty become aware of how integrating IL into their courses can help students learn about the issues surrounding information and its use.

Even though IL standards can be applied to many different areas in which libraries serve students, recent research continues to focus on their application to online instruction. Burkhardt et al. (2008) discuss their effectiveness in online and in-person instruction, and Nixon et al. (2009) state that “online tutorials are designed to organize information into small chunks that can be absorbed at a learner’s own pace”. Both the IL standards and the Assignment Calculators described in this article complement and support this idea. Somoza-Fernandez and Abadal (2009) discusses Dewald’s seven indicators for an effective tutorial, which state that a strong tutorial must directly support the subject being taught, include active learning, involve collaboration, contain more than one medium, teach objectives and concepts, and include contact information for a librarian. The open-source code for the Assignment Calculator tool provides the perfect platform for all of Dewald’s effective tutorial indicators.

The initial project

The original Assignment Calculator from the University of Minnesota Libraries (2009) is a free open-source program (http://sourceforge.net/projects/assign-calc/) (Sourceforge.net, 2005), which helps students manage time and organize the steps of a research and writing project. The open source code creates a timeline based on due dates provided by the user. Each step in this timeline then provides links to a variety of web sites created by different colleges and universities.

The librarians at CSUF actually did not begin with searching online to find a tool to meet their instructional needs, but rather came across the Assignment Calculator and were intrigued by its possibilities for their own instruction program. In other words, they discovered the tool first, and then began investigating how to adapt it to their students’ needs. They recognized the value of this popular tool, but knew they could expand on its potential for students and faculty on their own campus.

These librarians drew on years of professional experience in reference and instruction to assess the concepts they wanted to cover, taking into account the variety of needs of their students. They wanted to help students improve time management skills, recognize what information is needed and where to find it, evaluate and use this information effectively and ethically, and help improve students’ writing. Each campus has a unique student body and the librarians looked carefully at demographic information about their students. This included data such as ethnicity, retention and graduation rates, first-generation status, income and full versus part-time status. All of this information resulted in a better understanding of their students and how library instruction could better relate to them and to current campus issues and goals. (California State University, Fresno, Institutional Research, Assessment, and Planning, 2009). They began by pointing the links in the Assignment Calculator directly to their
own library and campus resources, referring to their own staff and services, and focusing the steps on the information that they knew their students needed.

By reworking the original steps, writing their own content for each step, and using screenshots and links from their own databases, web pages, and resources, they began the process of making this tool more meaningful to their students. A stronger focus was placed on the writing process in connection with the research students need to do for a paper or project. And finally, they provided information everywhere about all the additional help available to students, with links to the reference desk, IM chat service, email, individual appointments with librarian subject liaisons and to other campus services.

The tool created at CSUF is called the Assignment Research Calculator (ARC) (http://ios.lib.csufresno.edu/arc/), and it introduces library services within the context of the research and writing process, providing both students and faculty with a better understanding of the library's role in IL. As described in a previous article (Fusich et al., 2009) it helps students navigate through the steps in writing term papers, developing speeches, or working on other assignments requiring research, while aiding faculty in determining due dates in a syllabus or assigning deadlines for portions of a project. The ARC can allow librarians and faculty to collaborate, resulting in more opportunity to advance the library's IL initiatives. With a more in-depth understanding of the research and writing process, students are better prepared to participate in the community of scholars in higher education and eventually in the community of colleagues in their chosen professions (Fusich et al., 2009).

The CSUF librarians decided at the very beginning of the project that the ACRL IL standards would be used as the framework for building the most useful content for students. The standards were divided into main and sub-points, and positioned into each of the ten steps of the ARC. Now that there was an outline, the research began. One librarian took over the responsibility of in-depth research into what other libraries and institutions have included in their online instructional materials. All forms of online materials were investigated, using the Internet Public Library and the Librarians' Internet Index to search (www.ipl.org/). Using keywords from every point in the IL standards, these search results were evaluated for content, educational value, and effectiveness in delivering the concepts. Then the top choices were presented to the other librarians for discussion. All of the points in the IL standards were found in one or more pieces of research.

This research process was very time-consuming, but proved very interesting. In looking at first at what others had done with online assignment calculators, they did not find much adaptation from the original open source tool. So they expanded the research to include other forms of library tutorials, instruction modules, and interactive learning units which covered the concepts and competencies they wanted to include. They reviewed and evaluated a great deal of material in order to get a clear idea of what was currently being written for college students in the areas of library instruction, researching information, and writing. The material consulted during this evaluation is listed in a bibliography on the ARC web site.

This material was discussed at length and the librarians selected what they felt were the most valuable instructional concepts for students to learn from the ARC. These decisions resulted in reworking and renaming the steps and reducing the
number from 12 to ten, which required that the time percentages allotted to the steps be recalculated. They continued this customization by composing their own narrative content for everything, and ultimately correlated each step to the IL competency standards.

By creating an outline of the standards, performance indicators and outcomes, and matching these directly with one or more steps, they were able to make the ARC as a whole reflect all of these widely accepted standards. This same outline helped in writing the content of the steps themselves and helped ensure that every competency standard was included in an appropriate section of the ARC. All of the research and writing concepts that students need to understand in order to successfully complete an assignment are covered in the ARC.

Technical issues, promoting and assessing use
In order to make the process of customizing an open source tool more effective and efficient, it was important to have a representative from IT or a librarian with similar technical knowledge as part of the team. Downloading the open source code was just the first step, and someone with at least intermediate knowledge of PHP script and CSS was needed to generate the Assignment Calculator and to recalculate the time percentages allotted for the completion of each step. It was also beneficial to have someone with scripting experience to implement the e-mail reminder feature for each step. The team should ideally also have access to a portion of the server in order to make timely corrections, updates and adaptations when necessary.

The ARC has been promoted in a variety of ways. Demonstrations in class by instruction librarians show students how it can help them with time management and research. It has been prominently placed on the library homepage, included in many subject and course-specific LibGuides™, presented at orientations to new faculty and advertised in the student newspaper.

Monthly statistics are kept, which record unique visitors, number of visits, page hits and hits by step. Data show how heavily the ARC has been used since it was implemented, with highest use in March and May corresponding to midterms and the end of the semester. One interesting finding was that the steps that deal predominantly with the writing process (including citing of sources) showed a high number of hits compared to the steps dealing with research (Fusich et al., 2009). There are plans to continue to monitor these findings, perhaps adding other categories, and use this information for ongoing revision and improvement. There is also a survey, located on both the landing page and the final page, asking for demographic information as well as feedback on the usefulness of the ARC. An assessment tool is being created to add to the final step, to be e-mailed to each user, which will give additional information on the usefulness of the ARC in the entire research process.

A work in progress
The ARC requires some routine maintenance, such as checking for broken or outdated links, replacing screenshots of databases and web sites when necessary and adding alternative text to describe images and multimedia for compliance with a campus’s own web accessibility guidelines. Usage statistics and assessment results must be compiled, maintained and evaluated. Publicity and promotion should be ongoing.
Anecdotal evidence from students in classes and at the reference desk indicates that they are impressed initially by the timetable/reminder features of the ARC, but later discover and appreciate the wealth of information found in each step. The CSUF librarians feel it has helped to foster awareness of the library and the many services to students and hope to be able to document this in the future through various feedback and assessment measures.

The San José State University project
After finishing the project at CSU, Fresno, one of the authors went on to work at San José State University (SJSU). Recognizing that students at this CSU campus have similar needs for time management and research assistance, a group was formed there to work on another customized Assignment Calculator. It was a great opportunity to apply this librarian’s previous experience in researching and creating the ARC to a new project at a different university (http://tutorials.sjlibrary.org/tutorial/calculator/).

The SJSU team consisted of three librarians, one graduate student assistant and one web programmer. They started with the material from both the University of Minnesota Assignment Calculator and the CSUF Assignment Research Calculator, but soon agreed that every aspect of their project needed to be re-evaluated with SJSU’s own students in mind. Each step was reviewed and new material was created where necessary for use with students on their campus. They decided to use some of the existing material without change, but adapted other areas to strengthen and highlight different concepts, and ultimately developed completely new portions in order to serve their target population best. They started with the original open source code but decided to change some of the approaches to the creative process. Instead of only one person researching all the steps, each team member took two or three steps to research, create the outlines and write the content. Then the whole group evaluated the outlines and edited the material together.

There are many ways in which the SJSU team altered and customized their Assignment Calculator. The order of the steps was reviewed and changed to address the concept of the “thesis statement” closer to the end of the research process. Kuhlthau’s (1997) information search process was incorporated into the text to address how students might be feeling throughout the entire process, the goal being to acknowledge these feelings and to reassure students that it is alright to be confused about their topic at some point.

After it was introduced, a graduate department showed interest in using it in one of their two-year programs, so the maximum number of days allowed for a project in the open source code was increased to two years. Two class assignments were used as examples throughout, one in English literature and one involving an environmental issue, in order to bring students through the entire research process using concrete examples. SJSU is currently in the process of creating short online videos in a variety of library subjects, including how to search the library’s catalog by a subject area, retrieving a specific article and searching Google Scholar. Many of these videos have been incorporated into the tutorial to supplement and break-up the written content.

The interface was dramatically changed from the original University of Minnesota code and the CSUF ARC, so that the look and feel of the pages became unique to SJSU.
A toolbar was added on the left side of every page so that the information found within each step is available separately from the calculator tool. Any of the information can be easily accessed anytime without having to set up a due date for an assignment and the content can be more easily incorporated into other tutorials, learning modules, and faculty syllabi or assignments, including BlackBoard or other course management systems. An email option to send reminders for each step was implemented and assessment and improvement will continue.

Back to Fresno
When the CSUF librarians saw the impressive tool that SJSU had customized, they decided it was time to revise and update their ARC. They incorporated many of the same improvements, including separating all the steps from the calculator tool, adding much more graphic material and photographs taken of CSUF students in the library, breaking up the text-heavy pages into shorter segments, and adding graphics, headings and colored fonts to make the text more readable.

There are plans to create another online tool aimed at masters or doctoral students, which would go into more depth with content of interest to the graduate student. It would address topics such as undertaking the literature review, using a bibliographic management system such as EndNote™, and would focus on a more scholarly writing process. Another potential project for the future is to create course- or subject-specific tools to showcase resources and databases in particular areas and to address discipline-specific research and writing issues.

Conclusion
Customizing any tool to meet the focus and needs of a particular campus is time-consuming, but it usually involves far less time, staff involvement and cost than designing and creating something original. When librarians and staff work together to incorporate IL concepts into an online tool that helps students with research and addresses their needs and preferences, the result is definitely worth the time spent. The project can also be a great opportunity to be creative and collaborate with colleagues. Both of the libraries discussed in this article have plans to continue to revise and enhance the usefulness of these tools and both assignment calculators continue to receive very positive feedback from campus administration, faculty and students.

References


Further reading


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