

AC 2009-519: ON-LINE TUTORIALS IN ENGINEERING LIBRARIES: ANALYSIS AND DISCUSSION

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Online Tutorials in Engineering Libraries: Analysis and Discussion

Abstract

While the need for information instruction is greater than ever, academic libraries are facing the challenges of limited time, staff, and resources to afford the traditional in-person instruction. The new generation prefers to find help from the web at anytime from anywhere. In this situation, web-based instruction could serve as a good candidate to facilitate teaching and learning through easy means of access (24/7) and self-controlled training process together with multimedia features. This study focused on the application of online tutorials in engineering libraries. Data were collected to statistically analyze the application status of online tutorials and the distribution of tutorials in five instructional categories (information literacy, basic library skills, advanced library skills, course related, and others). The author then examined the status of employing active learning and auditory/visual media features to design online tutorials, discussed popular authorizing software features and applications in each category. Further, the author also tried to discover the design trends and provide suggestions for engineering librarians to develop future online tutorials.

Introduction

Academic libraries have a core responsibility to instruct patrons about information seeking abilities. Studies have shown that the Net Generation tends to acquire information through the assistance of electronic resources^{1,2}. Patrons, especially those with a background in engineering, have more exposure to technologies and could be more easily accustomed to self-paced learning habit³. New instruction and learning methods built on the underlined foundation of computer and information technologies have offered various opportunities for training and education in libraries. As self-guided training methods, online tutorials can be as interactive as they are easy to access, with 24/7 availability. These convenient features could teach patrons how to conduct research and access library resources easily. On the other hand, the need for information instruction is greater than ever because of the varieties of existing information resources. And online tutorials could help to release the challenges of shortage of staff, limited time, and resources. Hence, using the Internet to provide web-based tutorials would benefit both patrons and libraries.

According to current research, there are only a limited number of resources focusing on web-based instructions in engineering libraries. Analyzing existing online tutorial projects that were implemented in engineering libraries would facilitate teaching and learning process if librarians employed appropriate criteria to design online tutorials.

This research was to determine the current status of the implementation of online tutorials in engineering libraries. This was done by proposing research questions, gathering information regarding requirements for tutorial types, identifying the media types employed by the libraries, and determining their active learning capabilities. The purpose of this study was to help with the

building of future tutorials in selecting content, proper tools, and formatting of media rendering based on required features.

Literature Review

Computer assisted instructions appeared as early as in the 1980's. In 1987, in the paper titled "Computers and Training: Allies or Enemies?"⁴, Patricia Galagan stated that technologies remained in the developing stage at that time. Although some people had realized that computer technologies would have positive impact on providing learning services, it took time to improve software packages such as the human-machine interface and response time, so that users could control them easily and become more productive. With technology constantly advancing, articles discussing library web instruction design began emerging. In 1999, in the paper "Transporting Good Library Instruction Practices into the Web Environment: An Analysis of Online Tutorials"⁵, Nancy Dewald examined 19 web-based library tutorials using "six characteristics of good library instruction" as the measurement. Her analysis focused on how online tutorials inherited these good characteristics including Navigational Aids, Active Learning and Media, etc., which later became the basic elements to evaluate web-tutorial design performance. During the recent decade, more and more studies have been concerned with the application of these elements. Susan L. Silver and List T. Nickel reported that interactivity and graphics were identified as two major elements to design course-related web tutorials⁶. Quizzes, especially as an interactive component, were designed into the tutorial. In 2002, D. L. Cook noted that most tutorials in the study were accompanied with quizzes⁷. Later in 2005, further research conducted by Paul L. Hrycaj proved that more web tutorials employed the active learning component than Dewald's study in 1999⁸. Hrycaj also mentioned that active learning in online tutorials could be presented through quizzes and exercises designed using frames or separate browser windows. In the discussion of employing multimedia-learning theories, Tempelman-Kluit pointed out that combining audio/video and text could strengthen the effect of web as teaching tools⁹.

Previous studies have brought many aspects of online tutorials, yet not much attention had been given to summarizing and analyzing engineering tutorials. Therefore, the following research questions were asked:

- 1) How widely are online tutorials applied in engineering libraries?
- 2) What kinds of instruction do engineering libraries hope to present through the online channel?
- 3) Do the web instructions use media and active learning components to enhance teaching and learning experience?
- 4) What are the current trends of design regarding online tutorials in engineering libraries?

Data Collection and Analysis

This paper focused on web-based tutorials generated by engineering libraries in the United States. The list of libraries came from the American Society for Engineering Education, Engineering Libraries Division website ("Guide to Engineering Libraries" in the United States, December 15, 2008 <<http://depts.washington.edu/englib/eld/libraries.php#us>>). Since the list also included comprehensive libraries that provided services and resources in other subjects in

addition to engineering fields, to better address the study, only engineering libraries were selected. Finally 39 libraries were collected in this paper.

At the beginning of the research, Excel spreadsheets were used to collect the data. Further study required granular information in each individual online tutorial, whereas maintaining Excel spreadsheets were not efficient enough when querying tutorials across different libraries with composite conditions. Therefore, the Excel spreadsheets were imported into tables in Microsoft SQL Server database. Transact-SQL, the query language supported by SQL Server database, could make efficient and accurate queries, especially when involving composite conditions like in our case. The data collection process started in December 2008 and completed in March 2009.

To better analyze the applications of online tutorials in engineering libraries and answer the above proposed questions, based on literature review and extensive research conducted by the author, the study identified five aspects to evaluate/analyze online tutorial projects:

1) The Application Status of Online Tutorials in Engineering Libraries

This study only included open online tutorials with links hosted on engineering library websites that can be accessed freely by public users. Online tutorials created within the academic e-learning system were restricted by institutional ID and Password and therefore were excluded from this study.

The types of development of online tutorials can be broken into four situations: library-created only, library and third-party created, third-party-created only, and no implementation.

Table 1. Online Tutorial Development Status

Types of Development	Libraries	Percentage
Library-created only	19	48.72%
Library and third-party created	8	20.51%
Third-party-created only	0	0%
No implementation	12	30.77%
Total	39	100.00%

Twenty-seven out of 39 engineering libraries (69.23%) provided open online tutorials (see Table 1). Nearly half the libraries chose to develop their own tutorials. The data also indicated that none of the libraries used only third-party resources with online tutorials development.

The paper collected a total of 166 tutorials created by 27 libraries. The maximum number of tutorials developed in a given library is 20 and the minimum number is 1. The average number of tutorials developed in each library is approximately 6.

2) Tutorial Categories

Based on the functionalities served and information covered, online tutorials may be classified into the following categories: Information Literacy, Basic Library Skills, Advanced Library Skills, Course Related, and Others.

“Information Literacy” in this study refers to the process to improve information and basic research skills, which may include topics like scholarly article vs. popular articles, evaluating resources, citations; “Basic Library Skills” discusses particular library resources and services, such as navigating the library website, querying online catalog, finding books, articles, getting full-text articles, searching database, and using interlibrary loan; “Advanced Library Skills” is targeting intermediate or advanced level users with complicated information exploring tools, for example, tutorials may teach how to use citation software or set a search alert. This category of tutorials helps to transfer deeper and broader research manners over to the patrons; “Course Related” involves tutorials that help with course study.

In some cases it’s difficult to draw a clear line to distinguish these categories from each other. For example, one tutorial may include finding journal articles from electronic resources, which should be categorized as “Basic Library Skills” according to the definition, yet it also teaches how to identify popular vs. peer reviewed articles, which is grouped under “Information Literacy”. When this kind of conflict exists, the corresponding online tutorial was counted in each category.

Figure 1. Categories of Online Tutorials (Library-created)

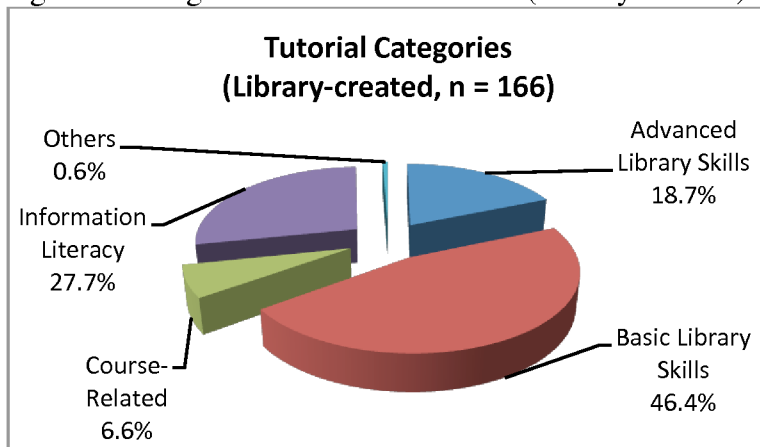
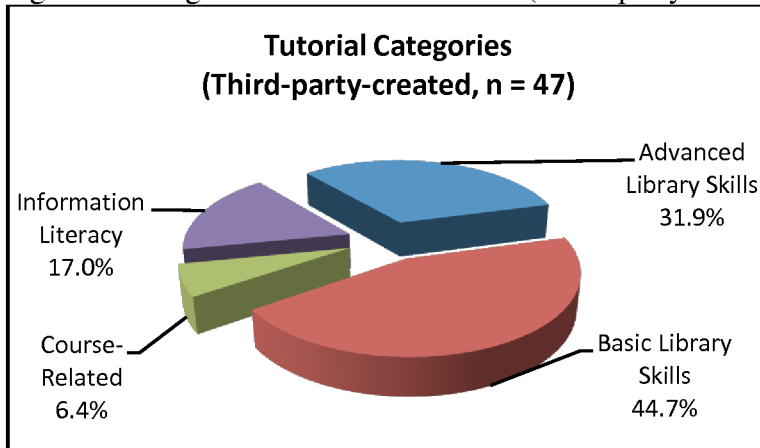


Figure 2. Categories of Online Tutorials (Third-party-created)



The collected samples included both library-created and third-party-created tutorials. Figures 1 and 2 show the analyses for each situation.

Both figures indicate that tutorials in “Basic Library Skills” category were the most developed. Figure 1 shows that 46.4% of the tutorials were about Basic Library Skills. This number exceeded the second category (Information Literacy) by 18.7%. Course-related tutorials shared a small percentage for both library-created and third-party-created tutorials. It could be because that some libraries put course-related tutorials within their e-learning systems which were not visible to the general public.

Engineering specific online tutorials, including library-created and third-party-created, are listed in Table 2. Ten of 14 topics were introducing engineering databases.

Table 2. Engineering Specific Tutorials

Tutorial Topics	Number
Web of Science	7
PubMed	4
IEEE Xplore	3
Scifinder Scholar	4
Patent Information and searching	3
Standards & Specifications	2
Compendex and Inspec	5
Knovel	1
NTIS	2
Energy Citation Database	1
Engineering Web Resources	1
Aerospace and High Technology	1
NetLibrary	1
Engineering Staff Training	1
Total	36

3) Active Learning

The paper only included library-created tutorials when analyzing active learning. The reason why active learning was considered in this study is because not only is it one of the important approaches of learning, but it is also one of the most important characteristics of online tutorials according to Dewald’s study⁵. Active learning helps beginners store new knowledge by actively practicing, instead of passively memorizing new information.

This study defined active learning as: “when patrons join the learning process and think actively, hands-on experiences are required and feedback is provided to allow further self-evaluation”.

Fifteen out of 27 libraries provided active learning features (55.6%). Total number of online tutorials collected with active learning was 42. Active learning was mainly presented through

interactive quizzes (62.8%). Quizzes and exercises with frames were the only types of interactive learning found in this study.

4) Audio/Video

Studies have shown that learning is often achieved best by combining different types of media. Web resources are normally rendered via multiple media types, such as movies/videos, audio, animations, and graphics, etc. Since graphics are widely employed on the Internet platform, this paper discussed only the applications of audio and video media types.

Fourteen of 27 libraries (51.9%) offered tutorials with audio and video, of which eleven libraries (78.6%) used screencast flash videos.

At the tutorial level, 87 of 166 tutorials (52.4%) utilized audio/video media. The flash videos were mostly as short as approximately 2 to 3 minutes and the file sizes were relatively small, maintaining a good balance between attractive appearance and network bandwidth bottleneck.

5) Authoring Software Packages

Online tutorials were generated by some kind of authoring software. The analysis of the popular development software packages applied in engineering tutorials would provide recommendations to the librarians to select the best tool according to their feature requirements and budget.

Tutorials were generally presented in the form of websites or audio/video files. The authoring software could be embedded in the files or indicated on the websites. Tutorials presented with plain HTML format (website) were not counted because the available HTML editors were too diverse. The confirmed software packages used in engineering libraries were as follows: Camtasia Studio (7 libraries), Adobe Captivate (5 libraries), Macromedia flash (2 libraries), articulate (1 library).

Table 3. The Application of Software in Online Tutorials

Online Tutorials (Library-created Only)	Online Tutorial Authorizing Software Packages			
	Camtasia	Captivate	Flash	Articulate
Information Literacy (n = 46)	15.2%	15.2%	6.5%	4.3%
Basic Library Skills (n = 77)	48.1%	15.6%	-	-
Advanced Library Skills (n = 31)	35.5%	16.1%	-	-
Course Related (n = 11)	-	-	-	-
Others (n = 1)	-	-	-	-

Software packages used to generate the online tutorials in each category are provided in Table 3. It clearly indicates that online tutorials in “Basic Library Skills” category had a high ratio in employing authorizing software.

Discussion

The purpose of this study was to help with the building of future tutorials. To answer the proposed research questions regarding the application of online tutorials in engineering libraries, the author conducted research based on collected data and the following results were determined:

- 1) About 70% of the studied libraries published online tutorials to the public. The average number of tutorials developed in each library is approximately 6. Compared with the study by Hrycaj⁸ who found 58.56% of the ARL sites had web tutorial services in 2005, this could serve as a piece of supporting evidence that online tutorials were widely used in engineering libraries.
- 2) The analysis revealed that helping patrons to search resources and find available services offered by the library is one of the most important tasks of library web instructions. As can be seen from Figures 1 and 2, where library-created and third-party-created tutorials were separated, “Basic Library Skills” was the most developed category. This could be due to the increasing needs in learning basic search skills with more and more library electronic resources and services available online. While considering both library-created and third-party-created tutorials, Information literacy (25%) and advanced Skills (22%) categories were similar.

In engineering specific tutorials, most attention was given to introducing engineering databases. However, they occupied only 16.9% (36 out of 213, the total number of tutorials collected). This number was relatively low. Actually, engineering databases, such as Scifinder Scholar and Knovel, have particular search criteria compared with other general databases. Online tutorials aiming to emulate these kinds of database should be emphasized in future tutorial development.

- 3) The collected data indicated that 55.6% of the libraries applied active learning and 51.9% of the libraries employed audio/video features in their tutorials. In Hrycaj’s study, he reported that 60% of libraries “employed active learning”⁸. This study indicated similar results.

This research also found that Camtasia Studio and Adobe Captivate were popularly used in generating online tutorials which contained audio/video component. However, most of the tutorials only applied their audio/video features, the active learning features, such as multiple-choice quizzes, were not frequently utilized. Adobe Captivate and Camtasia Studio have many features in common and both support video presentation, training demonstration, quizzes, Microsoft PowerPoint, and allow tracking the learning scores when accessing to a SCORM-compliant learning management system. Captivate supports quiz types including multiple-choice, short answer, fill-in the blank, and matching. The questions are customizable and can pop up randomly. Camtasia Studio allows question types of multiple-choice, fill-in the blank, and short answer. Captivate’s function of simulation could generate

highly interactive software simulations including mouse click, text input areas, and user feedback. This feature makes it a good candidate for guided online instructions. When properly used, active learning could help to engage users in the learning process.

- 4) From the above analyses, the author found that trends in designing online tutorials in engineering libraries follow four main tendencies:
 - a) A majority of libraries chose to develop online tutorials instead of using third-party resources
 - b) “Basic Library Skills” was the dominant category in engineering library tutorials
 - c) HTML based websites were mainly used in online tutorials
 - d) Most of the audio/video files used in current tutorials were generated by Camtasia Studio and Adobe Captivate

In addition, there are several suggestions that could be made about the future of tutorials. First, Information literacy tutorials which cover the general knowledge or skills are not changing dramatically. Modifying existing tutorials or simply linking external tutorials developed by other libraries and vendors could reduce duplicated design efforts. Second, since active learning is one of the most important components of online tutorials, librarians should keep this feature in mind when searching for software tools to develop future tutorials. As an option, open source software tools offer more opportunities to e-learning technology and have become strong contenders in online training and e-learning. For example, eXe uses pre-built templates and controls (iDevices) including quizzes to generate websites based on the text, multimedia documents embedded by the users. It has different versions running on Windows, Mac OS and Linux. Lastly, according to the current study, the types of active learning were still limited to interactive quizzes and exercises. Implementing more active features, such as using Games, could help to make the tutorials more attractive and therefore bring the patrons a pleasant learning experience.

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