Elementary schoolteachers' use of instructional materials on the web

Instructional
materials on
the web

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Abstract

Purpose – Studies have shown that schoolteachers are familiar with instructional materials on the web and integrate them into classroom teaching. In Taiwan, there are a number of online instructional materials, with the Learning Fueling Station being a leading web site. Using this popular site as an example, this study seeks to investigate how schoolteachers navigate online instructional materials and for what types of instructional materials they are looking.

Design/methodology/approach – A total of 30 elementary schoolteachers were interviewed in their offices using computers to connect to the Learning Fueling Station web site, and web pages were visited as needed during the interview. Participants were asked to search for any topic in which they were interested, and the interviewer observed and recorded their search behavior.

Findings – All schoolteachers reported that they use the internet prior to designing their instructional activities. The two main reasons they gave for using the internet were to refer to other teachers' materials and to obtain up-to-date information on their subjects, especially in areas related to science and technology and social studies. Source materials (e.g. photographs and video clips) and ready-to-use instructional packages were two popular items that the schoolteachers search for online. Participants appreciated Learning Fueling Station's commitment to quality but reported that the quantity of information available on the site was insufficient to meet their needs.

Originality/value – Relatively few studies have dealt with issues concerning teachers' use behavior. The findings of the study could be helpful for those who are responsible for organizing or maintaining instructional materials web sites on the internet. School librarians may have a better understanding of teachers' behavior and work out a more useful library instruction program.

Keywords Teachers, Teaching aids, Worldwide web, E-learning, User studies

Paper type Case study

Introduction

Rapid growth in the online population has been noted for quite a few years. According to a survey by Computer Industry Almanac, Inc. (2006), over one billion people worldwide used the internet in 2005, and it was predicted that this number would reach two billion in 2011. In Taiwan, regular internet users numbered 9.98 million (44 percent of the nation's population) in 2006, a growth of 3 percent over 2005 (Institute for Information Industry, 2006). Browsing and searching on the internet are clearly part of a great many people's lives.

Studies have been made investigating internet use by schoolteachers. Becker (1999) reported that nearly 90 percent of US teachers perceive internet access as either valuable or essential, while 68 percent use the internet to find material related to their lessons. Another survey by the US National Center for Education Statistics (2000) indicated that 99 percent of public school teachers reported having computers or

internet access in their schools, while 39 percent admitted to using computers or the internet a lot to create instructional materials. Chien (2003) investigated internet use by schoolteachers in Taiwan. Most teachers interviewed for this survey agreed that information found on the internet could enrich their teaching activities and that their main reason for accessing the internet was to search for instruction-related materials. Wu *et al.* (2005) indicated that the teaching load of elementary schoolteachers in Taiwan is considerably heavy, and that most of those interviewed stated that they have no time to design their own instructional materials. These teachers used search engines to find information needed but preferred specific instructional sites because they contained a variety of information types.

Instructional materials web sites for elementary schoolteachers in Taiwan can be divided into four categories: government agencies, schools, individual schoolteachers and textbook publishers. Learning Fueling Station (see <http://content1.edu.tw/>), created by the Ministry of Education, is one of the most popular web sites among schoolteachers. In the past, there have been a number of studies concerned with schoolteachers' information literacy, information needs, information-seeking behavior, and information use, but relatively few have dealt with issues concerning teachers' search behavior as it pertains to instructional materials sites. Using Learning Fueling Station as an example, this study will answer the following:

- (1) How do schoolteachers navigate online instructional materials?
- (2) How do schoolteachers use Learning Fueling Station?
- (3) Are schoolteachers satisfied with the content and interface of Learning Fueling Station?

Review of the literature

The American Library Association (2003) defines information literacy as the ability to identify, evaluate, locate and use information. For teachers, Eisenberg and Berkowitz (1990) developed the Big Six Skills, which integrate information search and use:

- (1) task definition;
- (2) information seeking strategies;
- (3) location and access;
- (4) use of information;
- (5) synthesis; and
- (6) evaluation.

In the digital era, it is unquestionable that teachers should possess the capability to search for information on the internet and use that information in their classroom. However, Ivers (2002) indicated that although schoolteachers regard themselves as "intermediate users" of information technologies, they do not think they have the ability to apply these technologies in their teaching. To integrate the internet with teaching, Egnatoff (2003) suggested that teachers should have general knowledge of computers and computer networks. He also mentioned that teachers need to know how the internet is structured and how other teachers have used and are using it. As a study by Lanahan (2000) concluded, if teachers received adequate training and have ready access to technology support, and if classrooms were equipped with computers and an

internet connection, then teachers would be eager to use computers and link to the internet. Wells and Lewis (2006) reported that 83 percent of US public school teachers had taken professional development courses to learn how to integrate the internet into their curriculum.

A survey by Belden and Russonello (1996) indicated that teachers used the internet in order to have access to information and materials that are otherwise difficult to acquire, to obtain current information to supplement textbooks and to help in the development of lesson plans, among other things. Based on personal experience, Keane (2002) stated that the wealth of online materials could be used to bring together new ideas for lesson plans and projects. Students' capabilities in selecting and evaluating Internet-based materials were also found to be enhanced. A study by Wu *et al.* (2005) listed the reasons why teachers use the internet. Teachers agreed that new, updated and varied instructional materials on the internet make it easier for them to prepare teaching activities. Such materials were found to attract students' attention and enrich lesson content. Becker and Ravitz (1999) reported that using computers and the internet regularly has a multifaceted impact on teachers: teachers have more contact with other teachers and are willing to learn from students; and, to enrich their students' learning experiences, teachers would assign long and complex projects.

Wu and Huang (2005) indicated that many schoolteachers used the internet to search for online instructional materials. Search results, however, tended to be unusable, of low quality and often irrelevant. In addition to using search engines, schoolteachers would also refer to instructional materials web sites to browse and search for educational materials. As described by Martindale *et al.* (2001), teacher resource web sites provide lesson plans, classroom activities, teachers' guides, curricula and professional development materials. Such web sites are, therefore, convenient for teachers seeking to acquire teaching relevant materials.

Most instructional materials web sites bring together various types of resources to meet teachers' many needs. For example, The Gateway to Educational Materials (see www.thegateway.org/) contains lesson plans, study guides and tests. Users can search the full text or "title", "description", or "keywords" field to find what they are looking for. They can also browse the catalog by subject, type or grade level. Teachernet (see www.teachernet.gov.uk/), a British resource, collects over 2,000 lesson plans and resources. Fields such as "subject", "keystage", and "keyword" are provided to search for appropriate instructional materials. Educities (<http://teacher.educities.edu.tw>), a popular educational web site in Taiwan, offers lesson plans, source materials and evaluation forms. Information can be searched for by learning area and retrieved by subject and grade level.

Instructional materials should be described according to a certain metadata standard. Learning objective metadata (LOM) is popular in the education field. According to Holzinger *et al.* (2001), an increase in data without a subsequent application of metadata will seriously limit how well those data are found, managed and used.

Study methodology

In total, 30 elementary schoolteachers (12 male, 18 female) from Northern Taiwan participated in this study. The curriculum at elementary schools in Taiwan is divided into seven learning areas:

- (1) language;
- (2) arts and humanities;
- (3) integrated activities;
- (4) health and physical education;
- (5) science and technology;
- (6) social studies; and
- (7) mathematics.

Teachers were chosen from all seven learning areas. Their average teaching experience was 14.4 years, and most of the participants taught courses in two or more learning areas. All were more or less familiar with internet resources. In total, 21 of the 30 participants had previously visited the Learning Fueling Station web site. Participants were interviewed in their offices using laptop computers to connect to the Learning Fueling Station web site, and web pages were visited as needed during the interview. Participants were asked to search for any topic they were interested in, and the interviewer observed and recorded their search behavior. Each interview lasted one hour.

Findings

Internet use

All participants replied that they would use the internet prior to designing their instructional activities when necessary. When searching on the internet, most teachers said they would use search engines because they were uncertain whether they could find appropriate information on instructional materials web sites, because it was very convenient to use search engines and because they could retrieve more relevant information. "I just put in a keyword and get many results", reported one participant. Only four teachers would go directly to instructional materials web sites. Reasons given for using online instructional materials were as follows:

- to refer to other teachers' materials;
- to acquire up-to-date information; and
- to ascertain the accuracy of their teaching materials.

One participant mentioned that she would use the internet to verify that the information contained in students' assignments was accurate.

Among learning areas, participants said they would search most often for instructional materials related to science and technology and social studies. In the area of science and technology, participants especially searched for material related to animals and plants, with other topics mentioned being metrology, earthquakes and astronomy. Several participants said that the difficulty of classroom simulation and experimenting makes it necessary to obtain and view true-to-life information, such as photographs or multimedia. In social studies, local history is currently a very important subject in elementary school curriculum. However, textbooks contain little relevant material, and even fewer touch on the local community. Participants stated that they needed to look for more related materials on the internet, especially photographs, to make their teaching more interesting. A few participants reported that

they would search for materials to make a balanced presentation concerning traditional culture. "Because my students believe in different religions, I ask them to search for related information on the internet. If they do not find suitable information, I myself will conduct a search to gather more information", shared one participant.

Of course, participants also used the internet to find material pertaining to other learning areas. As quite a few participants teach courses in different learning areas, it is natural that they should be less familiar with some of the subjects. One participant mentioned that she searched for information on indigenous music because it was a new topic to her.

Among the different types of instructional materials, source materials were most liked by teachers when searching on the web. This is because there is already a great deal of printed information available, and so source materials such as photographs and video clips make their teaching come alive. "I like to use source materials. Show a couple of pictures to students and you will get wonderful feedback", one participant said. Ready-to-use instructional packages, learning sheets, test sheets and evaluation forms were also mentioned by teachers as useful. Surprisingly, only three participants replied that they most searched for lesson plans. "Lesson plans found on the internet are too specific to be applied to my classroom teaching, because my students' knowledge base is not identical to the students of the lesson plan's author", one participant said. Some lesson plans are too detailed and complex, a few participants explained, to be used without first revising them.

Half of the teachers reported that they usually spend less than one hour searching on the web. "If I cannot find what I want within ten minutes, I give up and use other sources", said one participant. Another mentioned that he only accesses the internet to search for instructional materials while at home because he enjoys surfing the internet. It may not take a long time to search, a number of interviewees shared, but it takes a relatively long time to filter through the results and find appropriate material. A majority of participants agreed they successfully found useful instructional materials on the internet most of the time. The level of satisfaction with internet searching may be dependent on a teacher's skill at conducting searches. One participant said he usually visits a certain web site and is familiar with its search interface. "I get a lot of relevant hits", he said.

Search behavior on Learning Fueling Station

To search for instructional materials on the Learning Fueling Station web site, three options are provided:

- (1) Full-text Search;
- (2) Learning Resources; and
- (3) Local Studies.

Full-text search allows a search to be performed across the entire site, including information contained in Learning Resources and Local Studies.

A total of 19 participants selected Learning Resources as the place they started their search from; nine participants selected Full-text Search; and two participants selected Local Studies. Because they found either too many or too few results, a handful of participants unsatisfied with their search results in Full-text Search and Local Studies would then turn to Learning Resources. Participants' searches consisted of five steps:

- (1) Select the search entrance.
- (2) Establish search strategies.
- (3) Execute a search.
- (4) Choose the appropriate type of instructional material.
- (5) Make a judgment about search results.

If they failed to find what they were looking for, most participants would revise their search strategies and start again from Step 2.

Teachers can use learning area, subject, topic, grade level, keywords and competence indicator to narrow down a search on Learning Fueling Station. Subject, topic and competence indicator are defined in the course guidelines issued by the Ministry of Education. Almost all participants used “learning area” as their primary search point. Only one participant used keywords. Participants usually searched for instructional materials appropriate for the learning area they were teaching. In total, 22 participants used “keywords”, while half of the participants used “subject” and “grade level” to narrow the scope of their search. A few participants reported that they did not like to use “subject” or “topic” because they would get fewer results. None of the participants used “competence indicator” because it is difficult to use correctly and is too specific.

Comments on the content of Learning Fueling Station

More than half of the participants expressed the opinion that there are not enough materials available on the Learning Fueling Station web site. Since the web site was created and is maintained by a government agency, participants assumed that it would contain some information they would be interested in. “As a benchmark for instructional materials web sites, Learning Fueling Station should include more”, said one participant after finding just a handful of items germane to a topic she was interested in. One participant even wondered whether she had used an incorrect search method when only a few results came up. Teachers’ willingness to use Learning Fueling Station is clearly affected by the number of instructional materials available. “I like to use Google because I can always find something ... I wish Learning Fueling Station was like Google”, commented one participant.

Although about half of the participants praised the quality of the Learning Fueling Station, a few reported that they always question the quality of instructional materials they find on the internet. They double-check the accuracy of such content before using it. As one participant described, “The quality is OK, but I think the Station’s review process should be stricter. I wonder why resources seem not to have been screened”.

Metadata concerning instructional materials comprised 16 fields:

- (1) grade level;
- (2) time assigned for the unit;
- (3) keywords;
- (4) instructional design concept;
- (5) learning area;
- (6) subject;

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- (7) topic;
 - (8) competence indicator;
 - (9) learning time;
 - (10) creator;
 - (11) prerequisite knowledge;
 - (12) related subject;
 - (13) objectives;
 - (14) teaching procedure;
 - (15) related material; and
 - (16) related web sites.

Most participants reported that the metadata information was succinct and sufficient. However, four participants said the descriptions were somewhat unclear. All metadata fields were determined by the creator of the resource, causing a lack in consistency. A few participants suggested that the description for “teaching procedure” could be more detailed. “For example, to follow the activity described in the lesson plan I found, I would like to know how to divide students into groups”, explained one participant.

Among the 16 fields, which did participants view first in order to judge the appropriateness of an item? A total of 19 participants preferred “grade level”, 13 preferred “objectives”, 11 preferred “instructional design concept”, and 11 preferred “teaching procedures”. “Learning time” was also mentioned by some participants. Other fields were rarely used. Participants often judged the usefulness of an item by viewing its description in several fields. One participant said that she viewed the grade level field first, then the learning time field and the objectives field. Another shared: “I viewed the grade level first. Then, I looked at instructional design concept to learn the designer’s motive and why he or she had those ideas”. In addition to these 16 fields, some participants suggested that the “equipment needed” field would be useful because it could help determine whether they would be able to use the instructional material in their own classroom. Eight participants mentioned that the field “outcome” should be added. “If a demo video were included, it would help me to understand whether the designer’s teaching activities would be usable in my classroom”, explained one participant. Another field, “evaluation type”, was also recommended by some participants.

Participants did not apply the materials directly in their classroom teaching. They would first make modifications to meet the instructional time available or to bring the material in line with students’ knowledge base. “It is really hard to find materials that completely match my needs”, explained one participant. Some participants reported that they always revised textual materials and also made minor changes to pictures and video clips.

Elementary schoolteachers in Taiwan teach 20-25 hours a week. Many teachers have other responsibilities on top of this, such as Class Advisor or holding an administrative position. Most do not have the time to design their own instructional materials, and so it is very helpful for them to be able to refer to and apply what other teachers have done, having first made appropriate modifications.

Comments on the search interface of Learning Fueling Station

Users may browse or conduct an advanced or full-text search on Learning Fueling Station. In total, 18 participants reported that they preferred to conduct an advanced search. The advanced search includes fields such as learning area, subject, topic, grade level, keywords and competence indicator. A drop-down menu is provided in all fields except “keywords”, making it convenient to conduct a search. “I use advanced search because I can narrow the scope and obtain more relevant results. It is time-saving, too”, explained one participant. Four participants preferred to browse because the interface is simple to use. Here, material is categorized by learning area. Teachers clicked their preferred learning area, and search results were displayed on the screen. Four participants preferred full-text search because it searches across multiple resources. Full-text search searches not only within Learning Fueling Station but also across the internet. One participant suggested that there should be some indication as to whether information that shows up on the “search results” page was found within the site or externally.

Are all the available search fields necessary? All 30 participants agreed that “learning area” is necessary, 28 stated that “keywords” was important, 25 liked “grade level”, 19 favored “subject”, six “topic”, and five “competence indicator”. These results make sense, as all but one participant started their search by using “learning area” and most then used “grade level” to limit their searches. The “keywords” search was also very popular because teachers could input any word or word string in the search field. “I think ‘learning area’ and ‘keywords’ are necessary because they make my search much more precise”, said one participant. Another stated similarly, “‘Learning area,’ ‘grade level’ and ‘subject’ define my search scope”. “Subject” and “topic” are listed in the curriculum guidelines promulgated by the Ministry of Education. “Topic” was not highly rated by participants because it lacks precision. Although “competence indicator” is included in the drop-down menu, very few participants regarded it as necessary because a topic usually covers some ten indicators. Searching by competence indicator yielded few results.

In addition to the five fields mentioned above, a few participants mentioned a need for a field “textbook version”. Such a field could help to find instructional materials related to the textbook used. A field for file type (e.g. PowerPoint, Word, MPEG, MP3) was also recommended. “When doing a search, I like to define the type of material that will come out in advance, because I don’t want to end up with search results that are not applicable to my teaching activity”, explained one participant.

If search results are arranged logically, it is easier for teachers to find suitable instructional materials. For example, if a teacher prefers to use only recent materials, search results sorted by date would be helpful. However, participants reported that they could not figure out how search results were displayed on Learning Fueling Station. Almost all participants made suggestions concerning how search results should be sorted. A few proposed that results be sorted by number of page views, because that is a good indication of a resource’s popularity. Two participants mentioned that when a search is not performed by “subject”, then results sorted by subject would cluster related material. Some participants said that there should be options regarding the sorting of search results.

Other comments were made concerning the search interface. A few participants mentioned that they did not like the drop-down menu as they needed to drag down the

bar in order to view all items, which they found bothersome. Participants would have preferred that all items be listed on-screen, meaning they would simply have to click on the result they wanted to view. One participant suggested that instead of clicking on a drop-down bar to view search results, results should be displayed on the upper part of the screen. The three search buttons on the advanced search interface confused many teachers, with two suggesting that one button would be sufficient. An older participant complained about the size of the text used to display search results.

Other comments

Many instructional materials on Learning Fueling Station provide links to other related resources. A few participants mentioned that they found that some links were inactive and suggested that there should be a mechanism to determine whether links had been removed or URLs changed. Simply listing a site's name and URL was found to be insufficient and, as one participant put it, "a brief description of the material would be helpful".

Participants suggested that Learning Fueling Station have a discussion board to allow teachers to share their experiences in utilizing instructional materials. Participants said that although many elementary schoolteachers had heard about Learning Fueling Station, it needed to be promoted further to get more teachers to use it.

Conclusions

Elementary schoolteachers view the internet as a valuable resource for finding instructional materials. While most teachers prefer to use Google or other search engines, this method forces them to filter among hundreds or thousands of web pages to find useful information. To find material relevant to their needs, it is recommended that teachers visit instructional materials web sites such as Learning Fueling Station instead of surfing aimlessly.

However, this study indicates that teachers are concerned about the quantity and quality of instructional materials available on web sites. We suggest that instructional materials web sites have some reward mechanism to encourage teachers to submit their work for reference. In addition, a survey of teachers' needs should be undertaken. For example, in this study, teachers stated that they wanted more resources related to science and technology and social studies. Teachers use metadata to filter through to appropriate instructional materials. Therefore, detailed and accurate metadata are required and must include the key fields teachers use most. In addition to existing fields, information that may be helpful in sifting through material should also be added. To ensure the quality of materials included, review criteria should be both easily accessible and easy to understand.

Many web sites employ new information technologies to provide an easy, efficient, effective and personalized search interface. The ability to conduct cross-database and comprehensive searches allows users to easily search through widely distributed resources. It would also be useful if users could select a word or term and be shown all places on the web site where that word or phrase is found. Links to reference materials such as dictionaries, glossaries and curriculum guidelines would help users to find information more quickly when conducting a search. An alert service, such as RSS feeds, would provide users with up-to-date information. However, most instructional materials web sites like Learning Fueling Station are slow in adopting those new

information technologies. They should be encouraged to utilize these technologies to build a user-friendly search interface, which is a cardinal principle in designing a web site.

This study investigated how schoolteachers in Taiwan searched for instructional materials on the internet and what types of instructional materials they looked for. This study's findings could be useful to those responsible for organizing or maintaining instructional materials web sites to improve them. Considering that students, rather than teachers, are usually the major target of library instruction activities in most elementary schools, more efforts should be made to improve teachers' abilities to search effectively in the library or on the internet. This study showed how schoolteachers search instructional materials web sites and explained their expectations in using web sites. Thus, it is beneficial for school librarians to have a better understanding of teachers' use behavior in order to work out a useful library instruction program for teachers. This study also suggests that there is room for improvement in the search interface of instructional materials web sites. Library and information science professionals, with experience in library catalogs and other information retrieval systems, may help in designing a more effective and user-friendly web sites for teaching-related purposes.

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