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CONCEPTUAL GUIDELINES FOR EDUCATORS

IN THE DEVELOPMENT OF THEIR FIRST EDUCATIONAL WEBSITES

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in

Education:

Instructional Technology

by

Feng-Wen Ho

December 2002

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Approved by:

Dr. Eun-Ok Baek, First Reader   Date   11-18-02

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ABSTRACT

The Internet is a revolutionary technology that is
bound to change every aspect of society and the
educational system in particular. Following the rapid
spread of the Internet, the new developments in the World
Wide Web (WWW) technology have created a high level of
interest and enthusiasm among many educators. Just like a
magical treasure chest, an educator's website not only can
provide an opportunity to present the educator's
professional knowledge, but it can also support and
compliment one's course material; moreover, websites also
provide a multiple and flexible communication channel for
both students and parents. The treasure chest is always
there, is reachable, and has the potential to grow greatly
in its usefulness. In this paper, a set of conceptual
guidelines for educators in the development of their first
educational websites will be generated, and educators will
be able to use it to appreciate the infinite power of the
WWW. In addition to this written project, a website was
created to demonstrate all of the conceptual guidelines
and checklists, which are mentioned in this project
(http://www.geocities.com/w9227/Edweb).

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ACKNOWLEDGMENTS

I would like to thank the professors of the program of Instructional Technology who help and guide me to further my experiences and knowledge. A very special thank to Dr. Amy Leh and Dr. Eun-Ok Baek for their support and encouragement.

I would like to thank my sister and her husband, Gillian and Charles, who encouraged me and stayed by my side throughout the completion of this program and project.

Finally, thank to my parents, without their unconditional love and ongoing support, this project would not have been possible.

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CHAPTER ONE

INTRODUCTION

Introduction

The Internet is continuing to advance at an

ever-increasing pace. Instructional technology is one of

the evident examples. Within the last decade, the Internet

has evolved into a major resource for teachers and

students. More than a new, high-tech blackboard or some

other simple tool for teachers, the Internet is a

revolutionary technology that is bound to change every

aspect of society and the educational system in

particular.
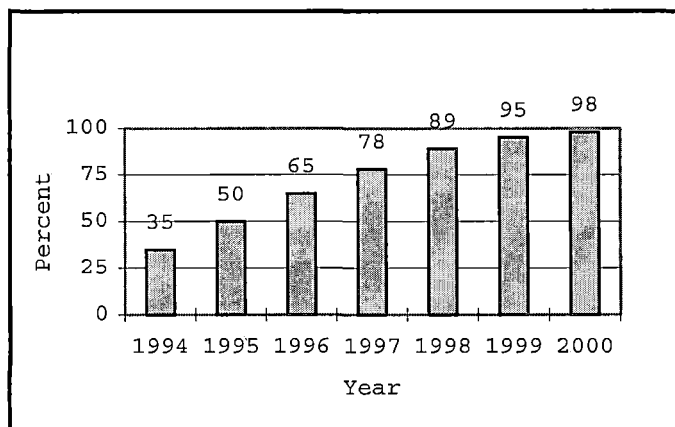
(Adapted from U.S. Department of Education Office, 2001)

Figure 1. Percent of Public Schools with Internet Access:

1994-2000

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Statistics such as those noted in Figure 1 show that by the fall of 2000, almost all public schools in the United States had access to the Internet: 98 percent were connected (National Center for Education Statistics [NCES], 2001). Following the rapid spread of the Internet, the new developments in the World Wide Web (WWW) technology have created a high level of interest and enthusiasm among many educators. While most educators view the WWW as a curriculum resource and a source of up-to-date information, it is actually an innovative community "building" in cyberspace. Just like a magical treasure chest, an educator's website not only can provide an opportunity to present the educator's professional knowledge, but it can also support and compliment one's course material; moreover, websites also provide a multiple and flexible communication channel for both students and parents. The treasure chest is always there, is reachable, and has the potential to grow greatly in its usefulness. For educators, the main issue is how to get the key to open it in order to utilize it and enjoy it.

In this paper, the key will be generated, and educators will be able to use it as a magical wand to appreciate the infinite power of the WWW. In this chapter,

the purpose and significance of the project, statement of needs, general design, limitations and delimitations, and definitions of terms will be discussed in order to offer readers a distinct blueprint of this project.

Purpose of the Project

Educational website design and creation can be fairly simple, especially if the educator has a complete idea of educational websites and possesses a full repertoire of authoring tools, but it can be time consuming and frustrating for those who do not possess a good eye for detail. Many educators have neither the time nor the inclination to master this skill. In fact, there is an even greater time commitment for educators incorporating the WWW into their daily teaching for the first time because they need to spend the time learning and mastering this new technology. Thus, the purpose of this project is to focus on generating a set of conceptual guidelines to assist educators who have no idea where to begin the establishment of their own educational websites.

In conjunction with this paper, a website project is created and loaded on the Internet entitled: "Conceptual guidelines for educators in the development of their first

educational websites," and is available at
(http://www.geocities.com/w9227/EdWeb). After a related
literature review, this website is generated in order to
demonstrate the ideas expressed in this paper and to
provide research-based guidelines and checklists for
educators in implementing their first educational
websites.

Significance of the Project

To connect every child to a brighter future by
helping educators to meet instructional goals through the
effective use of technology is the ultimate goal of this
project. Helping educators use technology effectively for
pedagogical purposes may be the most important step in
assuring that current and future investments in technology
are realized. In order to employ the benefits of the WWW,
educators must look beyond the simple issue of access.
Rather, they need opportunities to discover what the
technologies can do, to learn how to operate them, and to
experiment with ways to apply them. Fortunately, the
mechanics of using the WWW have become easier and have
increased the opportunities for educators to establish
personal websites.

How can educators benefit from educational websites? For educators, a well-organized educational website can be:

- A personal medium for self-expression;

- A multimedia database for teaching material;

- A guarded gateway/interface for assisting students in information mining;

- An effective showcase for both educators' and students' work;

- A flexible communication channel for educators, students, parents, and even for the public;

- A vivid symbol of educators' information literacy;

- An organized administrator of learning activities (Ritchie & Hoffman, 1996; Carvin, 2000; Curtin, 2002; Intel, 2002).

Over time, hopefully, as educators became more knowledgeable about creating effective websites and more experienced in addressing relative issues, the inevitable integration of technology with teaching would develop and be a natural part of the whole educational system. But,

how educators achieve this vision and what kind of assistance they need are topics for closer examination.

Statement of Needs

In a 2001 NetDay survey that reached 600 public and private school teachers nationwide by telephone between January and February 2001, three out of four teachers agreed that the Internet is a useable tool to conduct research for standards-based instruction, and 84% of the teachers said that it improves the quality of education. Despite the high comfort levels (94%) and strong positive attitudes, 67% of the teachers acknowledged that the Internet was not well integrated into their teaching [see Figure 2] (NetDay, 2001).

What are the reasons for educators' computer literacy not keeping the same pace with their pedagogies? In the same survey (NetDay, 2001), most teachers said that they had not received the technology training necessary to incorporate technologies in their classrooms, and they needed more help. Meanwhile, although most teachers were eager to use the new technologies, few were taught to teach with computers or other technological tools (Fulton, 1997; Chin, 2000).

Figure showing a pie chart with the following segments:
- Don't Know 1%
- Integrated 32%
- Not Integrated 67%
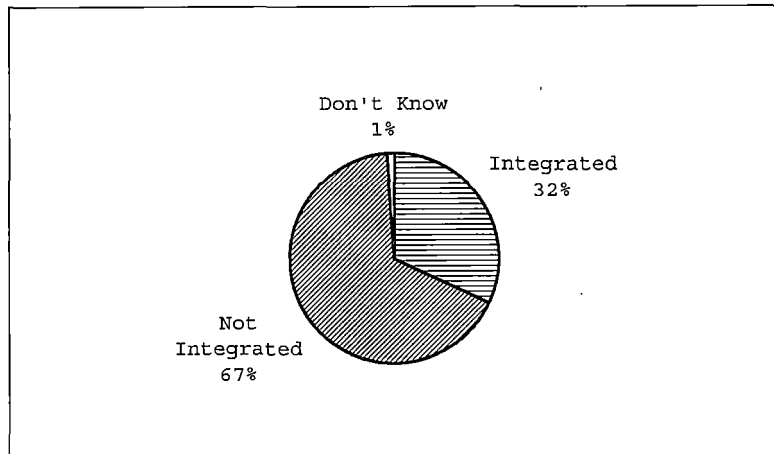
(Statistics data adapted from http://www.netday.org)

Figure 2. Despite Comfort Levels, Two-thirds Believe that
Internet is not Well Integrated into Their Classroom

Educators come to their jobs knowing the content and
the pedagogy, but when it comes to technology, the
teachers are learning along with, and often after, the
students. If students are expected to develop
technological fluency, their teachers should also possess
it. When educators pursue the higher technology in
teaching, some questions will arise, such as:

- What are the essential ideas about the
  components of an educational website?

- What are the characteristics of an educational
  website?

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- What are the matters needing attention when educators translate the ideas from minds to website context?

- How could one implement an educational website?

- How might one establish a flexible communication channel for students, parents, and other teachers?

Ideally, throughout the procedure of pursuing above answers, educators can realize the potential of WWW technology and improve their own productivity, personalize learning, and, even better, impact students' achievement.

General Design

The design model of this project brings together in one coherent whole many of the concepts that readers may have already encountered in a variety of educational situations.

In the beginning, some related issues about the WWW and teaching are elaborated from four different viewpoints: the WWW integrated in education, the WWW facilities teaching, educational website's characteristics and functions, and the general principles and considerations in educational website design.

Next, the major frame of this project is "ADDIE+M" (analysis, design, development, implementation, evaluation, and maintenance). This system model discussed by Smith and Ragan (1998) offers educators today a method for examining problems, designing solutions, measuring outcomes, and continuing development and maintenance of instructional design modules.

Further, a set of processes of each stage is based upon the Dick and Carey model (1989) and the general website development procedures (Curtin, 2002; Carvin, 2000; Williams & Tollett, 2000) that will demonstrate the effectiveness of each stage.

Finally, an evaluation will be conducted after the website is published. This evaluation will be conducted via an on-line evaluation form filled out by invited users and experts. The information collected from the evaluation will be the basis for future maintenance and revision of this website.

Limitations and Delimitations

Limitations

The lack of technical training and time are the two major obstacles influencing the use of the WWW in

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teaching; there still exist two more limitations in the implementation of this project.

First, the scope of this project is limited to the educator's computer literacy, and the current capabilities of the bandwidth of the Internet, WWW technologies, and available programs. In order to achieve the maximum benefit of this project, the educators are assumed to be qualified for the California Technology Assessment Profile (CTAP[2]), the introductory level of Internet application.

Besides the basic and prerequisite skills, this project does not attempt to predict budget cost. The appropriate spending levels for establishing a website must be determined by individuals based on their specific goals and current equipment as well as established district-level budget considerations.

Delimitations

The major delimitation of this project is that all of related information and sources are collected from related research papers or institutional statistical results instead of the process of gathering the primary source. During the last few years, different institutions such as the Department of Education, and NetDay held several nationwide surveys. The statistical information gathered

from these large-scale organizations are the basis for the reliability of this project. Additionally, numerous books and articles published by scholars and experts also are the major information sources of this project. A strong theoretical and research-based background will be established through appropriate citations from these professional studies.

Because there are so many different software packages and several different platforms to use them on, it will be a huge project if step-by-step directions are provided for every program. Therefore, conveying the crucial concepts that can apply to every program is the main idea of this paper.

Undoubtedly, different initial goals generate different types of websites. Different types of websites require different architectures, different kinds of educational content, and various WWW technical skills. The focus of this project is on the basic/general concepts of implementing an educational website; therefore, instead of addressing the higher level of programming techniques in website implementation, conveying the lasting fundamental concepts and techniques will be the principle goal of this project.

Definition of Terms

The following terms are defined as they apply to the project.

ASP: An Active Server Page (ASP) is an HTML page that includes one or more scripts (small embedded programs) that are processed on a Microsoft Web server before the page is sent to the user.

Bandwidth: Bandwidth is used to mean how fast data flows on a given transmission path.

Browser: A browser is an application program that provides a way to look at and interact with all the information on the World Wide Web.

CGI: The Common Gateway Interface (CGI) is a standard way for a web server to pass a web user's request to an application program and to receive data back to be forwarded to the user.

CSS: Cascading Style Sheets is a mechanism that allows authors and readers to attach the same style to multiple HTML documents.

DHTML: Dynamic HTML is a collective term for a combination of new Hypertext Markup Language (HTML) tags and options, that will let users create web pages more animated and more responsive to user interaction than previous versions of HTML.

Domain Name: A domain name locates an organization or other entity on the Internet.

Download and Upload: Downloading is the transmission of a file from one computer system to another, usually smaller computer system. Uploading is transmission in the other direction: from one, usually smaller computer to another computer.

E-mail: E-mail (electronic mail) is the exchange of computer-stored messages by telecommunication.

Freeware: Freeware is programming that is offered at no cost.

FTP: File Transfer Protocol is a standard Internet protocol, is the simplest way to exchange files between computers on the Internet.

GIF: Graphic Interchange Format is one of the image formats recognized by html.

HTML: Hypertext Markup Language is the set of markup symbols or codes inserted in a file intended for display on a World Wide Web browser page.

HTTP: The Hypertext Transfer Protocol is the set of rules for exchanging files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web.

Hyperlink: On the web or other hypertext systems, hyperlink is a synonym for both link and hypertext link.

Hypertext: Hypertext is multimedia with extra functionality that comes from embedded program codes and programmed interactivity. Hypertext consists of pages of documents in which links are established with other pages and documents and other computer files, such as image files, audio files, and video files.

IP Address: The Internet Protocol is basically the set of rules for one network communicating with any other (or occasionally, for broadcast messages, all other networks). Each network must know its own address on the Internet and that of any other networks with which it communicates.

ISP: Internet Service Provider.

JAVA: Java is a programming language designed for use in the distributed environment of the Internet.

JPEG: Joint Photographers Engineering Group.

Link: Text or image which, when clicked, searches for another HTML document.

Modem: A modem modulates outgoing digital signals from a computer to analog signals for a conventional copper twisted pair telephone line and demodulates the incoming analog signal and converts it to a digital signal for the digital device.

Multimedia: Multimedia is any type of information that incorporates multiple media. Since, by definition, digital video includes moving images (video and animations), graphics (still images and text), and audio, it is the quintessential "multi-medium."

Path: A progression of folders within which a file lies.

Protocol: The standards and conventions agreed upon that allow heterogeneous systems to communicate with each other.

Server: A computer that holds files that can be accessed by other computers (clients), typically operated by an Internet service provider.

Shareware: Shareware is software that is distributed free

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on a trial basis with the understanding that the user

may need or want to pay for it later.

Streaming: The simultaneous download and display of a

video or audio file.

Tags: HTML formatting codes surrounded by angle brackets

"<>".

URL: A Uniform Resource Locator is the address of a file

accessible on the Internet. The type of resource

depends on the Internet application protocol.

Usability: Usability is the measure of a product's

potential to accomplish the goals of the user. In

information technology, the term is often used in

relation to software applications and Web sites, but

it can be used in relation to any product that is

employed to accomplish a task.

WebQuest: An inquiry-oriented activity in which most or

all of the information used by learners is drawn from

the WWW.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

After radio, film, television, and the computer, the WWW has become another technology that has been hailed with the potential to transform teaching and learning (Owston, 1997). Obviously, with its increasing capacity for multimedia, multimode communication and information presentation, easy access to the ever-growing body of information, and new ways of data representation, the WWW presents educators with exciting opportunities to enhance daily teaching and learning practices.

In this chapter, how the WWW is integrated in teaching will be discussed through reviewing related literature. Then, related theories will be examined to help educators once the WWW becomes a tool in teaching. Next, the characteristics and functions of educational websites will be considered as a stepping-stone to touch the core of this project. Finally, the culminating point of this chapter is the research-based concepts and considerations in the development of educational websites.

World Wide Web Integrated in Education

In this section, how the WWW is integrated in education will be discussed from four viewpoints: history, current situation, advantages, and hindrances.

History

As is known by most people, the WWW merges the techniques of networked information and hypertext to easily access powerful global information. In their book How the web was born, Gillies and Cailliau (2000) indicate that the World Wide Web began as a networked information project at CERN (Conseil Europeén pour la Recherche Nucléires), the European Organization for Nuclear Research, where Berners-Lee developed a vision of the project in 1989. They also state that the WWW was originally developed to allow information sharing within internationally dispersed terms, and the dissemination of information by support groups.

There are several similar definitions for the WWW. According to the World Wide Web Consortium's definition, the World Wide Web (known as "WWW", "Web" or "W3") is "the universe of network-accessible information and the embodiment of human knowledge" (2001, ¶, 1). Brown and Nielson also claim that the WWW is a "wide-area hypermedia

information retrieval initiative aiming to give universal access to a large universe of documents" (1996, p. 318). In summary, the WWW has a body of software and a set of protocols and conventions. Through the use of hypertext and multimedia techniques, the web is easy for anyone to roam, browse, and contribute to.

Current Situation

At first, the WWW remained an experimental method of organizing Internet information, and only a few of the research sites around the world were capable of utilizing it. In 1993, programmers at the University of Illinois at Urbana/Champaign developed Mosaic, an easy-to-use web browser that was freely distributed over the Internet. Eventually, other browsers such as Netscape and Internet Explorer began to proliferate and made the WWW more accessible to the public than ever (Carvin, 2000).

Since its popularization in 1993, the WWW has caught on like wildfire in business, research and academics. The WWW has become an inexpensive, easily accessible way to communicate, distribute information, teach courses, and conduct research (Lan, 2001). Further, the WWW holds outstanding promise to deliver teaching programs, and it also creates enhanced learning environments. However, this

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is a challenge for educators, a challenge in which
educators must shift their move to the new technologies
from a learning perspective rather than being led by the
lures of the technology (Curtin, 2002).

According to a NCES (2001) report, since 1994, when
only three percent of instructional rooms had computers
with Internet access, public schools have made great
progress. By the fall of 2000, 77 percent of instructional
rooms were connected to the Internet (see Figure 3).
Another strong evidence of progress is that "the ratio of
students to instructional computers with Internet access
in public schools improved from 9 to 1 in 1999 to 7 to 1
in 2000" (NCES, 2001, p. 3).

Advantages

What are the reasons that made the Internet access in
instructional rooms boom so rapidly? Basically, the WWW
enhances teachers in teaching practice by enriching
research and information mining. On the WWW, hundreds of
thousands of educators, researchers, parents, and students
are exchanging ideas and information over distances, near
and far. For instance, access to research libraries and
information databases from home or on the road is only a

fingertip away. The progress is dramatic when compared

with traditional research methods.
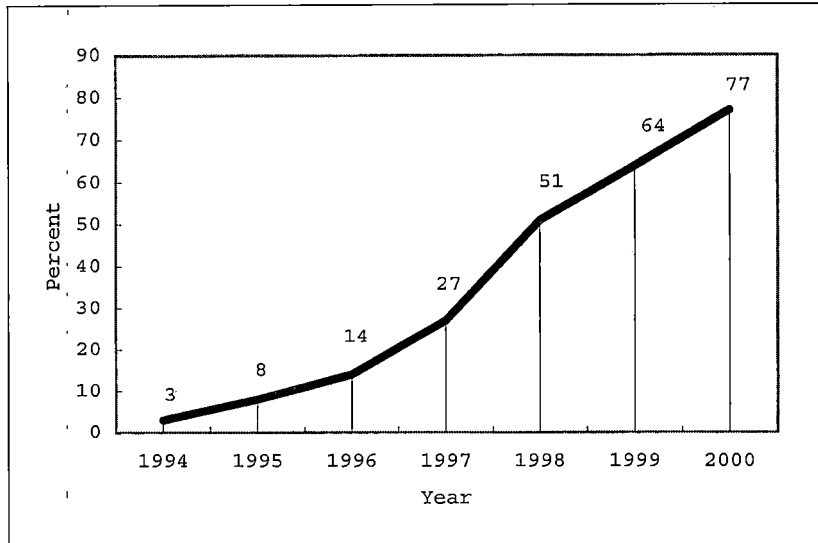
(Adapted from U.S. Department of Education Office, 2001)

Figure 3. Percent of Instructional Rooms with Internet

Access in Public Schools

More specifically, how can the WWW facilitate

educators' teaching? Bento and Bento (2000) list three

types of web usage in extending and supporting teaching.

They are (1) using a web browser to access materials and

resources, (2) using web-boards and chat rooms for

interaction, and (3) using software to create and post

one's own documents and presentations on the web. However,

the territory they focus on is the simple issue of access.

In fact, the WWW can do more in classes. In light of
Brown and Nielsen's opinion (1996), the WWW can have
substantial advantages in classes such as:

- Allowing educators and students to cooperate in
  developing stronger teaching materials;

- Increasing the possibility of peer-review
  process while accommodating multiple
  perspectives;

- Providing a flexible learning opportunity for
  students;

- Offering good opportunities for revising and re-
  publishing materials instantly;

- Reducing the cost of textbooks and printing
  handouts;

- Extending the area of relative materials by
  using links;

- Offering outstanding opportunities to "improve
  communication" among people.

Besides the advantages mentioned above, the key to
the WWW success lies in its ability to present information
in a non-linear format (Carvin, 2000). Brooks also
supports this idea by disclosing "the greatest intrinsic

power on WWW in education is that it encourages branched, non-linear instruction" (1997, p. 28). In other words, it means that students do not have to struggle with such a steep learning curve in the classroom. Rather, through the self-paced and self-regulated learning, students can obtain higher achievements compared with the traditional learning methods (College of Engineering, University of Idaho [UIO], 2001).

The WWW forces educators to organize teaching activities ahead of time, allows them to expand and add more materials to teaching, shifts face-to-face contact time from content delivery to help understanding and conceptualization, and offers an opportunity for streamlining the presentation and structuring of a large number of resources (Torrisi-Steele & Davis, 2000). Through the above phenomena, the WWW already houses a wealth of educational materials, which are easily accessible to educators and students, making the WWW one of the most important resources for education.

Hindrances

However, there exist several hindrances that educators encounter when they intend to integrate the WWW into teaching.

- Lack of time. The biggest obstacle faced by educators is finding the time required to incorporate Internet technology into their courses effectively (NCES, 2001; Kang, 2001; Zhao, 1998). Since time is a very valuable commodity for most educators, they will be limited to using components that do not take extensive time to create. This means that the educators might not be able to effectively achieve all of their established goals.

- Lack of suitable training. It also means lack of understanding and appreciation of the power of technology (Kang 2001; Zhao, 1998). In Chin's (2000) presentation to the U.S. House of Representatives Subcommittee on Early Childhood, Youth and Families, he indicates that:

  Even in areas where technology is available, software, hardware, and Internet connections often go unused because teachers lack the skills and knowledge necessary to integrate them into their daily classroom activities. Teachers often express frustration that the lack of available training makes it difficult to take full advantage of the wide range of educational technology. (Chin, 2000, ¶ 15)

- Lack of motivation. It is crucial for educators
  to understand that incorporating Internet
  technology into a course does not lighten the
  educator's traditional job responsibilities
  [i.e., teaching, research, and service] (Wan,
  1999).

- Equity of access to the Internet. It is
  pointless to create an online information center
  or other Internet components when the students
  do not have access to the Internet or the
  appropriate software to view the components
  properly. Hence, the availability of off-campus
  Internet technology to commuter students will
  have a direct impact on how effectively
  educators can incorporate the Internet into
  their teaching (Wan, 1999).

- Technical support (Zhao, 1998; Wan, 1999). This
  hindrance is not as severe as the previous
  hindrances because educators can still create
  many Internet components without the
  availability of such support. However, they will
  be limited in what they can create because

Internet components that provide certain levels

of interactivity require knowledge of advanced

computer-programming languages.

Apparently, the WWW shifts educators' roles from

dispensing knowledge to helping students construct a more

viable concept of the world. Nevertheless, what other

value can educators add to support students in this

information age? For the roles of webbed educators, March

(2001) divides the roles into three main areas: creating a

learning environment, shaping web-based activities, and

providing hands-on facilitation while students are in the

learning process. This role-shifting process not only

indicates that educators need to relinquish some authority

in teaching, but it also emphasizes the urgency of

educators' skill in manipulating the WWW (Jonassen, Peck,

& Wilson, 1999).

These implications are very problematic for educators.

They require that educators assume new roles with

different beliefs than they have traditionally pursued.

What are the reformation educators need when pedagogy

meets the WWW? Answers are disclosed in the subsequent

section.

World Wide Web Facilities Teaching

Some innovations are obvious when pedagogy meets the WWW. Constructivism, collaboration, and communication are three of those innovations, and they will be discussed in this section.

Constructivism

Constructivism has become a dominant epistemology, gradually replacing the objectivist-positivist paradigm in the last two decades. This is a theory of learning describing how people's minds create knowledge or how student's knowledge structures and deeper conceptual understanding come about (Oliver, 2000). According to Kearsley's (2002) idea, the instruction must be (1) concerned with the experiences and context that make students willing and able to learn, (2) structured so that it can be easily grasped by students, and (3) designed to facilitate extrapolation and/or fill in the gaps. It is opposite to traditional education assuming that if the learners can repeat an expert model or the instructor's model on a test, then they understand the issue. In fact, the understanding may lack internal coherence and connection to the learners' knowledge (Oliver, 2000).

In contrast to the early use of technology to aid instruction through drill-and-practice (behaviorism), some new technologies are devoted to bring constructive and collaborative concepts into learning, especially for life-long learning. On the WWW, for example, educators could assign students to work on constructionist design tasks through conducting background research into topics of interest, then write a paper or develop some other projects to interpret or teach the selected topics. In order to adopt constructionism, of course, educators will need to provide students with adequate resources and tools. Depending on the content, educators' expectation, and how students interpret and present information, the resources could include graphics, photos, or text, links to websites, books, or access to human resources via the Internet communication tools. After students interpret and critique the resources, they use development tools to construct or present information in a new format [e.g., paper, design, web page, multimedia, or program] (Educational Technologies at Virginia Tech, 2002).

As mentioned in the previous section, the success of the WWW lies in its non-linear characteristic of presenting information. In cyberspace, students move

around websites rather than work linearly, and that can get them to think and really engage in learning activities (Torrisi-Steele & Davis, 2000). For example, Webquest is a constructivist activity using the WWW. It is student-centered, open-ended, and project-oriented in order to put technology into the hands of learners to assist in their developing higher order cognitive skills and speaks of technology's power to access, store, manipulate, reflect, and understand (Dodge, 2001). In Webquest, the roles of educators are shifting to be a coach, prompting the students to consider alternative ideas or views, and suggesting appropriate ways of looking at the world (Jonassen, Peck, & Wilson, 1999).

Oliver (2000) also points out that the constructivist activity held online allows learners to perform constructivist tasks more efficiently and manageably in traditional classrooms confined by space, resources, and time. There are two categories of constructivist activity supported by the WWW. In Oliver's (2000) summary, students may construct advanced mental models by (1) connecting personal concepts with expert concepts, and/or (2) collaborating with peers. And, collaborative opportunities should be provided for students to define a complex task

and its various sub-steps on their own. In next section,

collaboration will be the issue of discussion.

Collaboration

Collaboration is another teaching topic being

generated by the WWW. It is common for educators to break

up their classes into smaller groups in which the students

are required to collaborate with others to complete an

assignment or a project. "In education, collaborative

learning and problem solving have become key instructional

strategies and recently, opportunities for online

collaboration have been featured on many educational

websites" (Harhorn & Ingram, 2002, p. 33). Collaborative

methods of study develop students' critical thinking skill

and direct them toward the construction of their own

knowledge through discussion, clarification of their own

thinking, and evaluation of their peers' ideas (Pulkkinen

& Ruotsalainen, 2001). Meanwhile, the evolution of the WWW

"continues to be driven by cooperative efforts with

large-scale, inclusive collaborations as a primary

function of the technology" (Mambretti, 1999, p. 24).

For most people, collaboration and cooperation are

synonymous. However, collaboration can be defined as the

interdependence of the group participants as they share

unique ideas and experiences. In contrast, cooperation is dividing the work and assigning a portion to each individual. According to Hathorn and Ingram's annotation, "collaboration occurs by taking advantage of the strengths of all the participants. Although it is essential for a collaborative group to work together, this is not enough to define a group as collaborative" (2002, p. 33). Therefore, simply placing students into groups, on or off-line, would not ensure that the individuals would collaborate for problem-solving and learning. Hathorn and Ingram (2002) also list several things that can assist on-line collaboration effectively. They are (1) define the group goal clearly, (2) give necessary instructions for collaboration, (3) define the process for producing the end result, (4) add accountability in the group, (5) foster interdependence, and (6) allow more practice.

For an effective collaborative learning experience, sharing is the key, and it needs to be accomplished through communication.

Communication

Undoubtedly, "the Internet is a means of communication" (Mambretti, 1999, p. 131). From a technological perspective, the Internet has revolutionized

teacher-to-learner, learner-to-learner and

teacher-to-parent communication by making these

interactions time and place independent through the use of

e-mail, discussion boards, and other Internet-based

technologies (Dabbagh, 2002). The WWW greatly facilitates

communications among people who are otherwise constrained

by the physical limitations of time and location. For

instance, busy working parents can participate in their

children's learning online when they are able. "Essential

to all types of learning communities is access to

resources and communication...in particular, the WWW can

play a vital role in the formation and successful

operation of learning communities" (Gordin, Gormez, Pea, &

Fishman, 1996, ¶ 2).

Generally, communication on the WWW, so-called

Computer-Mediated Communication (CMC), is typically

described as being either "synchronous" or "asynchronous"

(Salmon, n.d.; Hathorn & Ingram, 2002). Synchronous

technology is more like a conversation and facilitates

real-time interaction, such as chat rooms and instant

messengers (MSN, ICQ). In contrast, asynchronous

communication is unbounded by both time and place,

moreover, it can support deeper, more reflective

communications such as E-mail, forums, BBS and listserv (Warschauer, 1997).

However, the ease of online communications may seem to pose some unexpected challenges for educators. For example, educators could receive obscene E-mail messages. Young students also might unwittingly receive sexually explicit materials, or feel frustrated and abandoned because they could not receive instant and specific directions from their teachers like in a classroom (Mambretti, 1999; Friel, 2001; Kang, 2001). In fact, "technology-using educators should support meaningful learning and use technologies to engage students in active, constructive, intentional, authentic, and cooperative learning" (Jonassen, Peck, & Wilson, 1999, p. 7). Fortunately, not only will the mechanics of using the Internet become easier for educators and learners, but also new learning opportunities will be made possible by more powerful technologies (Mambretti, 1999). Shaped by the powerful technologies, educational websites are becoming an essential teaching material for educators either in or out of the classrooms. But, what is an educational website? What are the characteristics and

functions of an educational website? Those questions are

the skeleton of the next section.

Educational Website Characteristics and Functions

What are the characteristics of educational websites?

What are the differences between educational websites and

other kinds of websites? Obviously, educational websites

have the potential to be more than a compendium of

information. Just as Ritchie and Hoffman (1996) elaborate,

when properly structured, web pages can guide users

through hypertext in a series of instructional activities,

present information, afford practice, and provide feedback

to inform users of their strengths, weaknesses, and

suggestions for enrichment or remediation.

In fact, before Ritchie and Hoffman, Carvin (2000)

also catalogs four major roles for the WWW in education:

tutoring, publishing houses, forums, Lynch and Horton

(1997) make a similar point, as illustrated in Figure 4,

which is generated after plotting four major themes for

the WWW information delivery against two fundamental

variables: how linear the WWW structure of information

presentation is and how long the typical user contact time

is.

Diagram with vertical axis labeled *User Contact Time* (top: "Complex lengthy", bottom: "Concise Brief") and horizontal axis labeled *Narrative* (left: "Liner", right: "Non-linear"). Overlapping circles labeled Teaching, Education, Browsing, Training, and Reference.
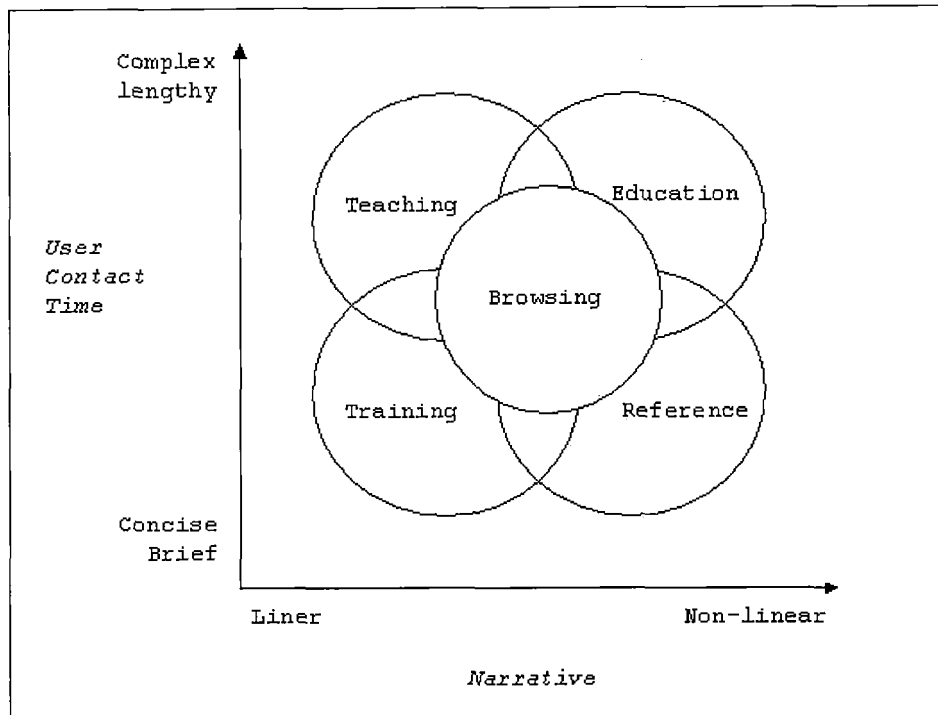
(Adapted from Lynch & Horton, 1997)

Figure 4. Diagram of Design Strategies for Websites

In a different viewpoint, Curtin University (2002) lists five different types of educational websites. They are:

1. Stand-alone sites. These sites are not only uniquely usable by students in particular units but also for any user to access it, even the units that are not being taught.

2. Course-level sites. Course-level sites are integrating the activities of a series of units and providing access to commonly used resources.

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3. Unit learning sites. These kinds of websites contain the electronic material students need to study in a unit.

4. Supplementary sites. Supplementary websites can be created to provide additions, revisions, expansion or tangible material to a unit: such sites do not allow students to complete the unit without some other forms of instruction/classes/activity.

5. Combinations sites. Combinations of the above kinds of sites, both within and across units, may suit the different goals of websites.

However, it seems all of the ideas of educational websites mentioned above are theoretical, and the boundary between educational websites and other kinds of websites is ambiguous. Novices need more specific examples to follow, such as Intel's idea. According to Intel (2002), teachers' websites will in fact be quite individual--depending upon subject matter and grade level. Yet regardless of the content and style, teachers will use websites with a common goal in mind: to communicate information to both students and parents. Therefore, content categories may include:

- Class and Student Expectations

- Class Calendar

- E-mail Contact Information

- Grading Policy

- Homework Assignments

- Homework Help

- News

- Notes

- Research Resources

- Student Work Showcase

- Teacher Philosophy

- Virtual Tour of Classroom

Hence, after the review of the previous ideas and opinions, an overall conceptual table is shown as Table 1.

It seems that these contents are all beyond the educators' reach. Some educators may be told that creating "really good" websites requires a working knowledge of HTML, java, CSS, or the ability to manipulate the photos that they scan. Actually, educational websites are different from commercial sites. Rather, the major goal of educational websites is to communicate information so that educators, students and parents can benefit from it. In

the next section, the general principles and

considerations will be discussed.

Table 1. The Three Major Categories of Educational
Websites

Role	Major Function	Contents
Instruction	Provides particular units and/or materials for instructional purposes	Syllabus, homework assignment and help, student work showcase, grading policy, class calendar, unit notes, etc.
Communication	Provides communication channels for users feedback and interactivity.	E-mail, web-board, chat room, forum, instance messenger, BBS, etc.
Supplementation	Provides additional information, materials, or external links that users may need.	News, educator's philosophy, educator's personal information, download links, etc.

Educational Websites Design:
General Principles and Considerations

In general, websites are geared toward commercial

uses, and the main purpose is to catch the web surfer's

attention to popularize their products. Educational

websites' concerns are different in that they try to

produce environments that are conducive to learning yet

attractive to the students--not to simply catch the

wandering surfer's attention. In the following section the

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six stages [ADDIE+M] (Smith & Ragan, 1998) in the development of an educational website mentioned in chapter one are discussed, combined with related development processes for each stage.

Stage 1. Analysis

Analysis is the process of gathering and comparing information about the website and its operation and use in order to improve the website's overall quality and to identify problem areas. For example, confirming that the problem can be solved with this website, discovering the nature of what is to be learned, learning more about the target audience, and understanding software performance are the major functions in this stage (Smith & Ragan, 1998).

Some educators may make the mistake of implementing their websites without first identifying what they would like to achieve. This technique focuses on the "what is" and "what should be" in a particular situation. For example, Intel elaborated that "teachers use websites with a common goal in mind: to communicate information to both students and parents" (2002, ¶ 2). Additionally, Wan groups these goals into four categories: "...improve information exchange, use new resources, develop skills

with the aid of Internet technology, and create an
alternative and/or supplemental learning environment"
(1999, p. 93). The goals are ideally derived through a
process of needs assessment that establishes rather broad
indications of a big picture.

Educators' websites will in fact be quite individual--
-depending upon subject matter and grade level.
Understanding whom it is that educators are providing
information for will guide every aspect of the websites'
presentation--from the way in which educators design the
information, to the voice being used when presenting that
information, right on through to the visual design of
websites (Holzschlag, 1998). For example, elementary
school teachers may use more graphics or animation in
their websites in order to attract students to their
websites. On the other hand, for some high school teachers,
more textual information would be more acceptable. However,
in a Nielsen (1997) article, the audiences of website,
including any kind of websites, have several common
characteristics in browsing websites, such as:

- Most users do not read, they scan for
  information;

- Web users are impatient;

- Users often print out pages;

- Download factors are critical;

- Animation and wild backgrounds are almost always annoying;

- Many users do not go beyond the first screen;

- Users want sites to work and are no longer tolerant of those that do not.

In fact, except for some particularly focused users, most users keep the same attitude in browsing websites, no matter what kind of websites they are browsing.

Afterward, educators initially list all items and/or activities needed in order to achieve the website goals. All of the items will be further evaluated individually for relevance and importance. As each item is further evaluated, certain relationships between information topics begin to group together into related categories (Holzschlag, 1998). Ways of grouping menus are to:

- Create groups of logically similar items;

- Form groups that cover all possibilities;

- Make sure the items are non-overlapping--use familiar terminology, but ensure that items are distinct from one another.

All pages on the WWW are created using HyperText Markup Language (HTML). By using this common language, computers are able to read and display websites, regardless of the Operating System (OS). HTML uses hyperlinks and markup text to define the formatting for the heading styles, numbered lists, insertion of images, and so forth. There are essentially three main ways to gear information into HTML format: write HTML source code, use web-authoring software, or use an online service for creating websites. For most educators, in order to make web pages without writing any source code, web-authoring software will be the better choice. The WYSIWYG (What You See Is What You Get) software, such as Microsoft FrontPage ® and Macromedia Dreamweaver ® are powerful enough to develop web pages, and visual enough to do so quickly and easily (Dabbagh, 2002; Williams & Tollett, 2000). Certainly, before creating a homepage and web pages, educators need to install the authoring software they select, and know how to use it.

Ideally, after the processes in the analysis stages: determining the website's goal, analyzing the audience, figuring needs and selecting tools, educators could be prepared for entering the design stage.

Stage 2. Design

Design is the process which educators work to meet the website specifications (website goals, target audience's characteristics, needs, and the software functions) and to make decisions about how website components will accomplish the website's objectives. Educational website designers should keep in mind that the design strategies should be learner-centered and address the learners' style of learning, rate of learning and motivation for learning (Smith & Ragan, 1998).

The key of how to move from a collection of materials and needs to the creation of website is to organize all of the information in a hierarchy model. Based on Academic Technology for Learning [ATL] (2002) and Lynch and Horton's (1997) opinions, there are four basic steps in organizing needs into a hierarchy structure.

- Divide it into logical units--Be flexible and rely on educators' common sense when subdividing and organizing that information.

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- Establish a visual hierarchy of importance and generality--Usually, the priority of information most important to users should be located within two to three levels.

- Draw a website architecture to structure relationships among information chunks. The main jobs of drawing a website architecture are: (1) clarify the mission and vision for the website, (2) determine what content and functionality the website will contain, (3) specify how users will find information in the website and (4) map out how the site will accommodate change and growth over time (Rosenfeld & Morville, 1998).

- Analyze the functional and aesthetic success of websites. Effective grouping and precedence assignment can help to simplify the overly complex and make for a more approachable browsing structure for users (Sano, 1996).

After the website design, web page design is the next issue in the design stage. Regarding this technique, Williams and Tollett (2000) list four basic principles in web page design:

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- Alignment--choose one alignment and use it on the entire page;

- Proximity--refer to the relationships that items develop when they are close together, that is, in a close proximity;

- Repetition--throughout a project, the author repeats certain elements that can tie all the disparate parts together;

- Contrast--if two elements are not the same, try to make them very different. However, sometime educators do not want to contrast on a page; this happens most often when educators just want to present continuous text such as certain articles. In this case, keep the page very bland and uninterrupted and let readers' eyes just start at the beginning and continue to the end; let the words simply communicate.

In essence, the focus of these four basic principles is the arrangement of screen components. However, the users' outcome is the major expectation of using an educational website. That is, it needs instructional objectives providing an indispensable framework upon which

to build the learning environment. ATL (2002) makes a list of the ways that learning objectives can be used to structure instructional pages:

- Depending upon the audience of the website, try to include objectives that involve higher order learning and attitudes;

- Develop and sequence the instructional content to match the objectives;

- Select instructional strategies, media and communications technologies consistent in the web pages with the objectives;

- Match practice activities and students assessment to the objectives;

- Inform students of the learning objectives as a way to guide their study.

In summary, the final web page presentation should be cohesive, interesting, easy to navigate, and most importantly, it should satisfy users' expectation and educators' goals.

A website's interface is the first thing visitors will react to when they visit an educator's website. User interface design can be broken down into five essential

areas, according to Holzschlag's (1998) ideas in making

websites accessible when users are browsing the websites:

- Metaphor--A metaphor is the symbolic

  representation of the structure the author is

  attempting to build, and it is usually strongest

  when employing very concrete, familiar concepts.

  For example, in the Windows operation system the

  icon means an opened folder and means a

  closed one;

- Clarity--Every element on a web page should have

  a reason for being there;

- Consistency--Consistency is gained by using the

  website's metaphor, keeping graphic elements

  compatible, maintaining at a same color palette,

  arranging navigation options uniformly, and

  keeping same point size through the whole

  website;

- Orientation--In order to ensure that all users

  are well oriented within the websites, educators

  should title each page within the websites,

  identify pages' header clearly and use footers

  to convey additional information;

- Navigation--The issues involved with creating
  navigation including: website structure,
  navigation location, navigation media and
  management of growing data.

Schwier and Misanchuk's (1993) echo these five
essential areas with another five principles in designing
computer-based multimedia instruction. They are:

- Simplicity;

- Consistency;

- Clarity--Pare the message down to the absolute
  essentials the learner needs to know;

- Balance--When a screen design is not balanced,
  it will create a feeling of tension, and make
  the user unwilling to read;

- Harmony and unity--Visual identity can be very
  important in a harmonic and unified site design.
  It ties a site together and gives the site a
  feeling of wholeness.

Well-designed pages display the information clearly
to the users, rather than forcing the users to search for
it on an overly crowded page. Even though a pretty face

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cannot mean everything, a "comfortable" user interface can win a lot more acceptance and work more efficiently.

In short, in order to achieve the goal of design, this stage could be accomplished through three processes: website design, web page design and user interface design.

Stage 3. Development

While in the design stage, educators have concentrated on thinking and reflecting via analysis and design, in the development stage educators will add doing to the thinking and reflecting mix. As educators move further into the development stage, they need to pay special attention to instructional design. Therefore, the focus will be on producing the website, media selection, management of learners and the project (Smith & Ragan, 1998). Once the website and web pages' blueprints (storyboard) are decided, the development stage enables all that thinking the educators did at the beginning of the term to become reality.

The first process of this stage is creating the home page and web pages based on the results of previous stages. Lynch and Horton (1997), and Curtin (2002) provide the following advice for educators in this process:

- Ensure web pages' readability;

- Think about page length and scrolling;

- Use a good writing style;

- Work with simple, efficient multimedia;

- Make web pages cross-platform compatible--Even though every web page is written by HTML, not every browser interprets HTML in the same way. Tables, forms, graphic positioning, and alignment tags will all work a bit differently in each brand or version of browser, such as Microsoft Internet Explorer ® and Netscape Navigator ®;

- Consider the necessity of providing printout function;

- Think in screens of information, not in pages;

- Add page footers.

Moreover, Lynch and Horton (1997) also recommend that the following items should be present on every page of a site to aid in user orientation:

- The title;

- The author;

- The author's institutional affiliations;

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- The revision date;

- Links on each page which will move the user to the next or previous page of a sequence;

- A link to the local home page.

Educational web pages need clarity, order and trustworthiness in information presentation. A deliberate web page can engage the users with visual impact, direct the users' attention, prioritize information, and make the users' interactions with educators' websites more enjoyable and more efficient. Multimedia can be the catalyst.

Collecting, scanning, and saving multimedia for use in web pages can be accomplished using very simple software, some of which educators already own (Ko & Roseen, 2001). The following are some general guidelines to consider when using multimedia in websites (Curtin, 2002; The Illinois Online Network [ION], 2002):

- Make sure that graphics look good in low resolution (640*480);

- Design for the lowest common browser types;

- Every component should support the message and be of a good quality at low resolution;

- Using the same graphics can reduce the download time;

- Graphic links should be clear and have text link backups, and previous pages or sections should be easy to return to;

- Do not "over-do" it.

In some cases, educators may make the graphics by themselves. There are two major graphic file formats: GIF and JPEG. Based on the Williams and Tollett's (2000) suggestion, the specifications for graphics on the website are:

- If the graphics are made from illustrations, type or images with flat color are best saved in GIF format;

- If the graphics are made from photographs, scans of paintings with vivid color gradations, pastel drawing, charcoal or pencil drawings are saved in JPEG format.

Link is the distinct factor of the WWW in supporting the non-linear characteristic. Generally speaking, there are four different kinds of links available for educators:

- Internal links--jump to other pages in the same website;

- External links--jump to pages outside of a particular website;

- Email links--do not take the user to another, but instead open up email form or program;

- Anchors--jump to somewhere else on the same page (Williams & Tollett, 2000).

Use links wisely. They can enhance the website if used well. They also can be frustrating and time consuming.

On the WWW, instead of the complicated mechanisms of human expression--facial expression, voice intonation, body language, or even eye contact, the contextual and stylistic conventions are the new way of communicating in cyberspace (Ko & Rossen, 2001). According to Holzschlag's (1998) viewpoint of interactivity, the interactivity can be categorized into functional (machine-based) and progressive (community-oriented or human) interactivity. Similar to the two types of computer-mediated communication (synchronous and asynchronous) mentioned previously in this chapter, functional interactivity can best be thought of as any type of interactive engagement

with web media that serves a function such as feedback, suggestion form, and E-mail. On the other hand, the progressive interactivity focuses on online interactivity such as BBS, chat rooms, forums and newsgroups.

It is essential for educators and students to address copyright and fair use issues early on--while the site building work is in progress. In the UCLA Office of Instructional Development's website (n.d.), copyright issues for academics, and the summary of the Multimedia Fair Use Guidelines are listed. It is a summary of what educators may or may not do if educators follow the Multimedia Fair Use Guidelines. UCLA (n.d.) also lists some bottom lines in order to protect educators in the copyright issues:

- First, educators may freely use a work if it lacks originality, is in the public domain, is Freeware, is US Government work, is a known fact, or is an idea, process, method, or system described in a copyrighted works;

- Second, if the work is protected, educators can not make a copy, use the work as the basis for a new work, electronically distribute or publish

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copies of the work, publicly perform the work, or publicly display an image on a computer screen or otherwise;

- Third, and most important, is that the Multimedia Fair Use Guidelines does not exempt educators from the basic provisions of the Copyright Law.

If educators think the work they are using does not qualify for the fair use exemption, they should write the owner and ask for permission (Ko & Rossen, 2001).

Therefore, through the above opinions, the development of educational websites could be divided systemically into five processes: creating homepage and web pages, inserting multimedia, adding links, considering interaction and feedback, and examining copyrights.

Stage 4. Implementation

According to Smith and Ragan (1998), implementation is a phase giving educators' instruction to learners. Moreover, development must along with implementation enable all that thinking work educators did at the beginning to come to reality. So, after the instruction has been designed and developed, the instructional event is ready to be implemented. And, the purpose of the

implementation process is to prepare the learning

environment and facilitate the delivery of instruction.

Applying Smith and Ragan's (1998) opinions into the

implementation of educational websites, it is time to

introduce the website to potential users.

On the WWW, user should always know where they are on

the website, so as not to become confused or lost. "By

simply providing obvious location cues, the usefulness of

the website is immediately increased" (Sano, 1996, p. 145).

A good educational website full of resources for students

will not be used unless it is obvious how to move from one

place to another. Students who become lost trying to

navigate through a web site are not likely to learn much

(ION, 2002). Therefore, based on ION's suggestions, there

are several methods to create effective navigation.

- Help users create a mental image of an
  educator's website. For example, a site map, the
  educator can create graphics that show all pages
  as small page icons (thumbnails) and show how
  pages are branched and are linked to each other.
- If it is necessary to use long page of HTML, put
  links at the bottom and at sections throughout

the page, which return users to the top or other
place.

- Be consistent with navigation. Using the same
graphics repeatedly in a website can save
downloading time since browsers cache graphics.
To label the navigational links and to place the
navigation aids in the same location on every
page, also helps the users to navigate within
the website more effectively.

- Provide variety of navigation. Not everyone uses
the website in the same way. Build it for as
many different kinds of users as possible.

After the efficiency of navigation is ensured, the
next step involves the actual hosting of the website on a
server so that it can be accessed. When it comes to
hosting, there is a wide range of options available in the
form of hosting companies and Internet service providers
(ISP). To choose one, educators need to look at various
factors, including the price, the size of storage space
provided, and services the provider offers, including the
kinds of access provided, server-side programming support

(ASP, CGI-bin, etc.). Basically, there are three elements that need to be considered.

- Make sure that the company has a fast connection to the Internet, and the servers are sufficiently fast, so that they will not be weighed down by other traffic.

- Evaluate the details and costs involved with storage space of the website. Generally, if educators want their own domain name, they need to pay extra costs.

- Look for redundancy. Make sure that service providers have multiple connections to the Internet so that the website will always be up.

- Ensure the company can offer statistics on the website. This data is very important for educators to know how many people have accessed the website and which pages they have visited (Williams & Tollett, 2000).

Also, there are numerous free hosting website services are offered in the Internet. These websites allow users to upload their websites onto remote servers for free. In return, these hosting companies often post

advertisements at the top of site pages. Be sure to check the advertising and privacy policies before uploading and publishing the website since some of the annoying popup advertisements may not be appropriate, or may even be harmful to users.

After choosing a hosting service, the next step is file transaction. The most common transaction a web designer will have with a hosting server is the uploading of web documents, graphics, and other media files. Files are transferred between computers over a network via a method called FTP (File Transfer Protocol). Most WYSIWYG web-authoring software packages include a feature for transferring (uploading/download) educators' websites. On the other hand, free FTP programs are also available on the Internet. For example, Fetch ® is the FTP program for Macintosh users, and WS_FTP ® is the program for Windows users (Williams & Tollett, 2000).

Hence, in the implementation stage, once educational websites are ensured the efficiency of navigation, then they require an appropriate publishing approach: hosting and transferring website files in order to be accessed by potential users via the Internet.

Stage 5. Evaluation

Evaluation is a way to systematically determine if the intended results are achieved. It is also a way to gather information to work toward continual improvement. The goals of evaluation are to determine effectiveness, appearance and efficiency, and to improve what educators do to assist with learning (Smith & Ragan, 1998).

Generally, there are five basic criteria in evaluating a website: download speed, usability, appearance, structure and navigation, and content (Curtin, 2002; ION, 2002; Carvin, 2000; Ritchie & Hoffman, 1996).

Speed is the biggest factor in the website evaluation. The performance and price differences between a high-end and low-end connection are dramatic. For educational websites, the home user market is the most important audience. Therefore, the websites should avoid using large elements to delay the download speed.

Nielsen (1997), a well-known writer about the usability of web sites, shares the full weight of his wisdom and experience in website usability. His usability heuristics are:

- Visibility of the system status--inform users about what is going on through appropriate feedback within a reasonable time;

- Match between system and the real world--use the users' language, words, phrases and concepts;

- User control and freedom--provide "emergency exit" for users to leave the unwanted state instead of having to go through an extended dialogue;

- Consistency and standards;

- Recognition rather than recall--make objects, actions, and options visible or easily retrievable;

- Flexibility and efficiency of use--allow users to tailor frequent actions;

- Aesthetic and minimalist design;

- Help and documentation--provide help and documentation if necessary.

Although these heuristics are not based on educational websites, they can offer educators some useful cues of how to evaluate the usability of websites.

Because users can enter and leave any website just in a fingertip click, how to catch users' interest and enough to explore the educator's website is an important issue. An appropriate appearance is the key. In general, a good screen design should fulfill the following expectations:

- Focus users' attention on important information;

- Attract and maintain users' interest;

- Promote the integration of new information with users previous knowledge;

- Help users find and organize information easily by making it easy to navigate through the information (Hannafin & Hooper, 1989).

Navigation systems need to allow choices, but only in ways that assist the users to get the most from the website and which are alert to the problems with hyperlinks. Based on Nielsen's (1997) suggestions, educators can evaluate the structure and navigation functions of their websites by following these criteria:

- Every web page includes a website identifier;

- Websites make it easy to go to landmark pages such as the home page;

- Web pages emphasize the structure of the website by making each page show which sub site it belongs to;

- Websites provide sitemaps or use some other devices to illustrate the relationships between the working page and websites.

At the same time, it is important that educators write web pages with a sense of how people read on the web. Curtin University (2002) lists the principles when educators write web pages:

- Brevity--few words, short paragraphs and less ideas;

- Readability--main point first, meaningful subheadings, helpful dot-point lists and judicious use of color;

- Using hyperlinks on secondary information pages in order to support the main narrative or argument (footnotes, examples, etc).

Morkes and Nielsen (1997) conducted three similar studies that checked the way people read text on the web. Their findings could be used as a reference for educators when they write their web pages. Those findings are:

- Users like summaries and the inverted pyramid style used by journalists, where the most important information is presented first in an article;

- Users appreciate headings which help them scan and locate the information they are interested in;

- Users do not appreciate flowery web page writing and want it to be concise;

- Simple and informal writing is preferred over formal writing styles.

Through these criteria, educators can evaluate the quality of the educational websites and assess the performance of the users.

Stage 6. Maintenance

Maintenance is another ongoing process. Portions of the instructional design must be tweaked based on new information received, time changes, financial changes, etc.

Therefore, in the development of educational websites, it is important to make sure all the linked websites contain up-to-date information. If they do not, the links

should be replaced or removed. The linked resources must be reviewed periodically to make sure the websites they point to have not moved. Some software packages, such as Microsoft FrontPage ®, can check a website for links that no longer exist. Keeping the lines of communication open or getting feedback from users are also good methods of keeping the website fresh.

This stage is often be left out of many instructional design and website development models; however, it is of critical importance. Without periodic or scheduled check-- ups or follow-ups, the newly acquired skills and knowledge of users can begin to decay rapidly.

Summary

In summary, the development of educational websites can be divided into the following stages and phrases:

- Analysis
  - ✓ Determining website's goals
  - ✓ Analyzing the audience
  - ✓ Figuring needs
  - ✓ Selecting tools

- Design
  - ✓ Website design
  - ✓ Page design
  - ✓ User interface design
- Development
  - ✓ Creating homepage and web pages
  - ✓ Inserting multimedia
  - ✓ Adding links
  - ✓ Considering interactivity and feedback
  - ✓ Examining copyrights
- Implementation
  - ✓ Creating effective navigation
  - ✓ Publishing, hosting and transferring website
- Evaluation
  - ✓ Download speed
  - ✓ Usability
  - ✓ Appearance
  - ✓ Structure and navigation
  - ✓ Content
- Maintenance
  - ✓ Keeping website fresh
  - ✓ Checking links regularly

Probably one of the most important aspects of the WWW in education is that the ever-growing number of web resources, tools and materials are not for the exclusive use of technology experts but can significantly enhance teaching and learning for the majority of educators and students who have only limited Internet skills. However, the question is not whether to use the WWW technology in teaching, but how to use them effectively. This chapter, through a series of literature reviews, indicates the essentiality of the educator's information readiness in the contemporary classroom, the shift of the educators' pedagogical beliefs, the basic concept of educational websites and the research-based approaches in implementing an educational website.

This project will be a website that incorporates both the particular and the general concepts mentioned previously in this chapter. In order to show a complete flow of the website development, the following chapter will give detailed descriptions of each stage of this website implementation.

CHAPTER THREE

DESIGN AND DEVELOPMENT

Introduction

Breadth and depth of content are two important considerations for the author in the creating this project. In this project, much attention has been given to the construction of conceptual ideas about the development of educational websites because of the importance of correct fundamental concepts and the diversity and high revision rate of related software packages. In order to achieve this, the methodology involves a systematic design approach (ADDIE+M) that contains six continuous stages mentioned roughly in Chapter One.

In this chapter more detailed information will be provided. First, details will be given about how the design model is formed, and what the processes are those will be followed in developing each stage. Then, explanations containing every process in each stage will be presented in sequence in order to demonstrate how the author implemented this project. Finally, an evaluation will be given, and the results will be elaborated for further revision.

Design

In this section, design model and principles of this project are listed in detail so that educators can realize the relationship among the web page elements.

Design Model

The design model of this project involves six ongoing stages and several processes based on three resources: a systematic instructional design model (ADDIE+M), the Dick and Carey model, and the general website development procedures elaborated on in the related literature review.

First of all, the ADDIE + M (Analysis, Design, Development, Implementation, Evaluation + Maintenance) system model discussed by Smith and Ragan (1998), offers educators today a method for examining problems, designing solutions, measuring outcomes, and continuing development and maintenance of educational modules. This model is not a linear one—as design is not necessarily a linear process. In fact, this model has been widely used for many years even though some of the systematic approaches may be varied. Hopefully, based on this framework, users can easily engage themselves in the design model of developing educational websites.

Besides the systematic idea of instructional design, the Dick and Carey model (1989) helps in organizing the development processes in each stage. One of the strengths of this model is that it is based on interactivity (entry behaviors and performance objectives, etc.) between the designer and the students. Because of the interactive nature of the design model, this project follows an input-process-output procedure in every stage. The users are allowed to give input elements before the next stage begins and to take an active role when browsing this website. Another strength in the Dick and Carey model (1989) is that its approach is similar to that of an information system. Thus, this approach could make the model more compatible with the development of an educational website.

Furthermore, according to Dick and Resier (1998), the learning theory behind the development of the instructional strategy is independent of the design model application. The model gives the designer flexibility to adopt the learning theory deemed to be the most beneficial to the learners. As mentioned in the previous chapter, constructivism is the major learning trend in contemporary instructional technology. Therefore, based on the

constructivist learning theory, users are allowed to choose their own paths and to control the pace at which they access the information within the website. Users should be constructors and producers of knowledge rather than passive receivers of inert knowledge. The learning results should be more memorable, meaningful, and applicable. For example, users can edit and modify the guidelines and checklists, depending on their particular requirements, not just browse this website, passively accepting the information they read.

Eventually, combined with a series of general website development procedures indicated in the literature review, a set of conceptual guidelines and checklists are generated, not only in the forms of Microsoft Word ® files and web pages, but also are applied in the development of this project website (Curtin, 2002; Carvin, 2000; Williams & Tollett, 2000; Lynch & Horton, 1997).

As the basic design of the website for this project has been established, this website will follow the ADDIE+M model along with indicating what needs to be done, and when it needs to be done at each stage. The description of each stage includes the following items:

- Overview

- Input--Which entry criteria are needed

- Processes in each stage

  ✓ Which purposes needs to be reached

  ✓ Which consideration and/or actions need to be launched

  ✓ Which key practices need to be considered

  ✓ Which results need to be generated in this process

- Output--Which exit criteria are needed to be in place at the end of this stage (products, or results) in order to provide output for the next stage

After the systematic description of every stage, a list of guidelines and a checklist will be generated. Users can either download or edit them based on user need. Then, they could print them out if they wanted to. All of the guidelines and checklists are in Appendix A and B.

Design Principles

According to the two of the literature reviews in Chapter Two (Holzschlag, 1998; Schwier & Misanchuk, 1993), there are four principles not only can make websites

accessible, but also can increase the usability of multimedia instruction. These four principles this project follows are: uniformity of page layout, efficiency of navigation, simplicity of elements, and clarity of communication.

Uniformity of Page Layout. In order to achieve the uniformity of page layout, five different templates have been created. Three templates for the main page, the major submenu pages, and the content pages are created using Microsoft FrontPage ® that include the author's logo (created using Adobe Photoshop ®), the website title, and a pull-down menu navigation bar, which links to all major submenu pages and/or content pages. Two Word file templates are created for organizing guidelines and checklist files. The layout of the pages is similar in order to keep consistency and, most importantly, to reduce the download time.

Efficiency of Navigation. One of the important goals for the design of this website is for users to navigate throughout the website and utilize the results efficiently. In order to achieve this, the website's title is located at the top of every page, and immediately beneath the

title follows a navigation bar; the major submenu title is at the top left followed by page content. A graphical background watermark shows users where they are within the website. Also, a text navigation bar is placed at the bottom of each page. Users always know where they are on the website so as not to become confused or lost.

Simplicity of Elements. Based on Morkes and Nielsen's study mentioned in Chapter Two, the most of web users scan for information instead of reading the full-text explanation. Hence, in order to obtain the maximum usage outcome, the author's approach is to simplify the design elements used so that users with different screen resolutions, graphics setting, and browser types can view, use, and draw on the information they require from this website. For example, in the first screen of every major submenu or content page, a summary of content is posted first and linked to a detailed exposition so that users can decide whether to read it or not.

Clarity of Communication. The author believes that effective communication is best achieved through clarity. Every element on the web pages has a reason for being there, and it performs the function for which it is intended. In order to convey a clear idea, an

input-process-output table was shown first on each

guideline page to indicate what kinds of information are

provided. Furthermore, some of the links are presented

with metaphorical icons. For example, Icon (▣) means

printout function and (ᴳ) means linked to the guidelines

page.

<div align="center">Development</div>

In this section, based on the design model and

principles, the development of this website is described

from two categories: the homepage and the submenu pages

which include the six stages of the ADDIE+M model.

Homepage

The purpose of the home page is to be an entry point

where visitors can grasp the concept of the website and

become familiar with the content that they will read. In

this website, the major colors are black in content, green

on the page title, and whatever system default link color

exists on the user's computer is seen throughout the rest

of the website. Moreover, the home page is divided into

five major categories to accommodate the author's needs

listed in the first stage (analysis). According to the

summary of Chapter Two, the five categories in this project are:

- Title and navigation area;

- Instruction area--the main issue of this project, the six-stage development cycle of an educational website;

- Supplementation area--related information regarding this project;

- Communication area--announcement, contact information, and the allowance of some interactivity;

- Author's information--author name and institution, last updated date, and copyright declaration, etc.

Since the mission of this website is to convey the conceptual ideas of the development of educational websites, the instructional area--the development cycle graphic, which could link to every stage by a direct click--is placed on the center of the screen to contrast with other components and attract the users' attention. So far, the components of communication and supplementation areas are also placed on the home page because of the

limited items and for the efficiency of navigation. However, in a long-term view, while these components are increased, the items may need to be placed under a major submenu link so that educators can maintain a good website structure.

Submenu Pages

Stage 1. Analysis. The analysis stage describes the process of taking educators' requests and turning them into a fully defined project. During this stage, educators' requirements are gathered, refined, and documented; then, the scope of the website is defined. This stage is divided into determining the website's goal, analyzing the audience, figuring needs, and selecting tools.

First, educators need to determine the goal of the website. Educators can begin with a clear picture of exactly what the educators' desired outcome is and how the educators hope this website will enhance learning for users, including students, parents and other educators. The key practice is trying to make the goals or purposes as specific as possible. Therefore, the goal of this website could be described thusly to generate a systematic

set of conceptual guidelines and checklists for educators in the development of their first educational websites.

Analyzing the audience is the second process in this stage. Refining audience's characteristics and their possible attitudes should be the considerations of user interface design in the following stage. The key practice of this process is not to reach too broad of an audience in order to establish a clear direction for website design. In this website, the target audience is the educators who are attracted by the amazing power of the WWW but have no idea how to begin their own educational websites. Theoretically, the target audience, educators, is computer literate and already posses the basic skills in computer and Internet manipulation (also assumed to be qualified for the introductory level of the Internet application in CTAP[2]). Therefore, the website should be more textual, professional, and basically designed for the public home users (the low-end connection, dial-up modem users).

The third process in this stage is figuring needs. Based on the website's goals and target audience definitions, educators should list the specific information, communication, or activity the website will support, and list the only objectives they can

realistically meet in the beginning. They are encouraged to refer to other educational websites that may stimulate them with different ideas. At first, the author lists all items and activity initially, and then creates some groups of logically similar items covering all possibilities. Hence, based on the author's needs and the summary of educational websites in Chapter Two, the grouped items of this website are:

- Supplementary information:
  - ✓ Definition of educational websites
  - ✓ Mission statement
  - ✓ Glossary
  - ✓ References
  - ✓ Useful links
- Communication:
  - ✓ For new users
  - ✓ About this project
  - ✓ Site map
  - ✓ E-mail
  - ✓ A feedback form

- Instruction--the six stages of an educational website development:
  - ✓ Analysis
  - ✓ Design
  - ✓ Development
  - ✓ Implementation
  - ✓ Evaluation
  - ✓ Maintenance

Suitable software can make an educator's idea come true smoothly and efficiently. Web-authoring software could assist educators in making pages quickly and easily without writing any source codes. Educators should also choose graphic software if they want to create and modify graphics by themselves. Microsoft FrontPage 2000 ®, a popular WYSIWYG web-authoring software, is used to create all of the web pages in this website. Meanwhile, Adobe Photoshop ® is the tool for the author in the graphic creation and modification.

Table 2. Summary Flow of Analysis

Input	Process	Output
✓ Educators' expectation ✓ Prerequisite computer skills (CTAP2) ✓ Gathered relative instructional information	1. Determining website's goals 2. Analyzing the audience 3. Figuring needs 4. Selecting tools	✓ Website goals ✓ Website needs ✓ Audience's characteristics

Stage 2. Design. The design stage makes decisions about how web components will accomplish the website's goals. The website's goals, needs, and audience's characteristics are given from the previous stage.

During the design stage, three outcomes should be generated: website architecture, page layout sketches, and interface design principles.

Based on the grouped items listed in the previous stage, the website is presented with a hierarchy of information architecture in a long-term view, avoiding being too deep or too shallow. The purpose of it is to address the relationships among information chunks or web pages. For example, the hierarchy architecture of this project is shown in Figure 5.
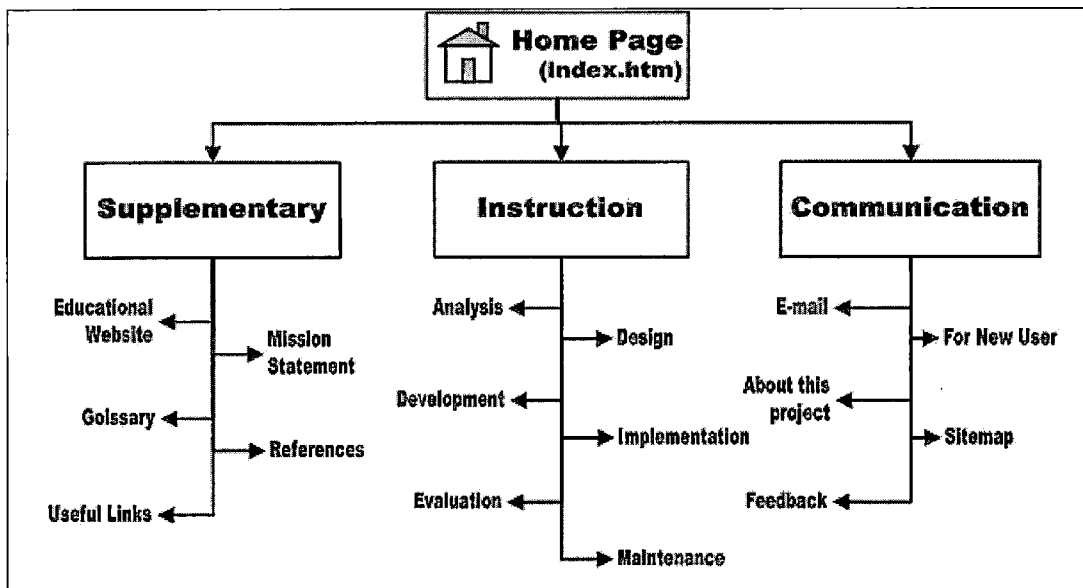
Figure 5. Website Architecture Map

After organizing a website architecture map, page

design is the next crucial process in this stage. The

purpose of this hierarchy is to make the final web page

presentation cohesive and interesting.

In page design, this website is divided into three

general sections: home page, major submenu pages and

content pages, including the web pages for presenting

guidelines, checklists and references for each stage.

Except for the website title and navigation bar

placed on the top of each page, the most important

additions to the major submenu pages are the guidelines

and checklist of every stage. These two items are

logically placed at the right side of the stage title in

every major submenu page and marked with distinct

metaphorical icons in order to stand out as important

links but as not to overshadow the content on the same

page. Additionally, guidelines and checklists are links

that provide not only a web page format, but also a

downloadable, editable, and printable Microsoft Word ®

file format.
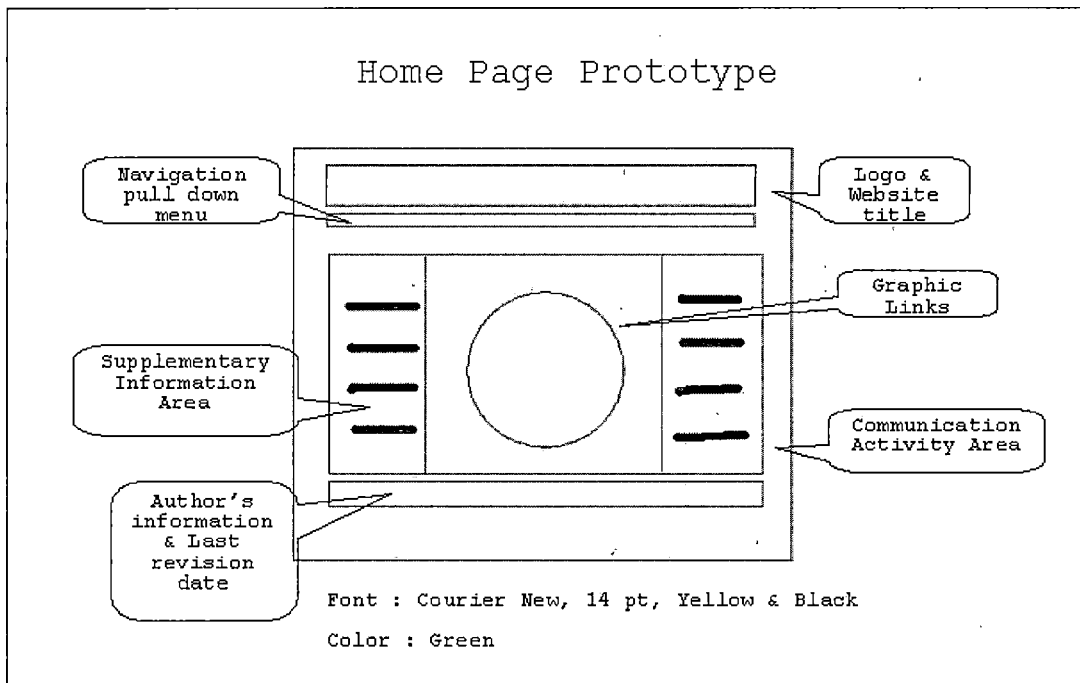
Figure 6. Homepage Prototype

Web Page Prototype

Logo & Website Title

Shortcut to Homepage

Navigation Bar

Stage

G   C

Icons link to Guidelines & Checklists

Font:Courier new, 24pt, Bold, Green

•Process 1
    Summary
•Process 2
    Summary
        :
        :

Background graphic: development cycle

Link to previous and next stage

<- Prev   Next ->
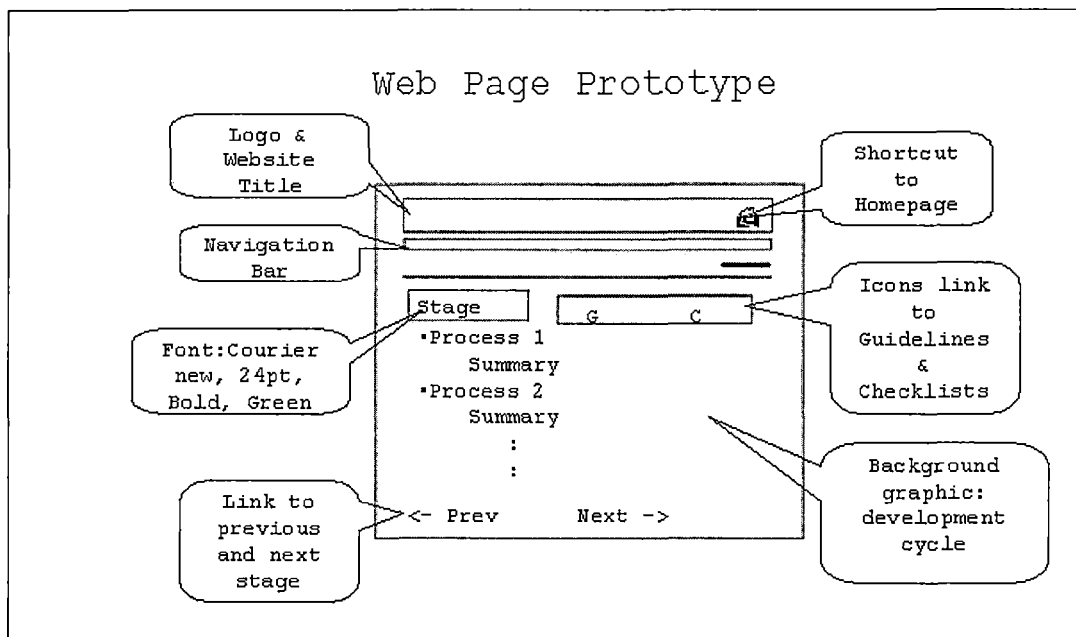
Figure 7. Web Page Prototype

Web pages should be easy to navigate, and satisfy users' expectation and educators' goals. Web page prototypes are sketched by following Williams and Tollett's (2000) four principles: alignment, proximity, repetition, and contrast. The web pages of this website intend to keep a consistent look and feeling for users; therefore, all of the information has been separated into several manageable page-sized chunks when possible. Moreover, all of the pages provide multiple clues for users about the website's information structure and contents, context, and navigation by using links to connect pages along the routes of use and user thought.

The prototypes of web pages are shown in Figure 6 and

Figure 7.

An appropriate user interface design could provide

the needs of the potential users, adapt the WWW technology

to their expectations, and maximize the efficiency of

using this website. Metaphor, clarity, consistency,

orientation, balance and navigation (Holzschlag, 1998) are

the basic ideas the author followed.

Figure 8. Screenshot of Website Homepage

```
┌──────────────────────────────────────────────────────────────┐
│  ╲╱        Conceptual Guidelines for Educators In      ┌────┐  │
│  ╱╲        The Development of Their First Educational Websites  │    │  │
│ ┌──────────────────────────────────────────────────────┴────┘  │
│ │Analysis      Design       Development   Implementation  Evaluation      Maintenance│
│                                                                │
│  Home->Analysis                                                │
│ ─────────────────────────────────────────────────────────────│
│                            ┌─┐          ┌─┐                    │
│   Analysis                 │G│ Guideline │ │ Checklist          │
│                            └─┘          └─┘                    │
│  • Determining website's goal                                  │
│    The objectives educators want to achieve through this website. The │
│    reason why educators implement this website.                │
│                                                                │
│  • Analyzing the audience                                      │
│    Understanding who it is that educators are providing information for │
│    will guide every aspect of websites' presentation.          │
│                                                                │
│  • Figuring needs                                              │
│    List all items and activities and group them into logical units. │
│                                                                │
│  • Choosing tools                                              │
│    Choose appropriate software for authoring web pages and/or multimedia. │
│    Web authoring (WYSIWYG) software are recommended.           │
│                                                                │
│                                                                │
│  ←Home←                              →Stage 2: Design→          │
│                                                                │
└──────────────────────────────────────────────────────────────┘
```
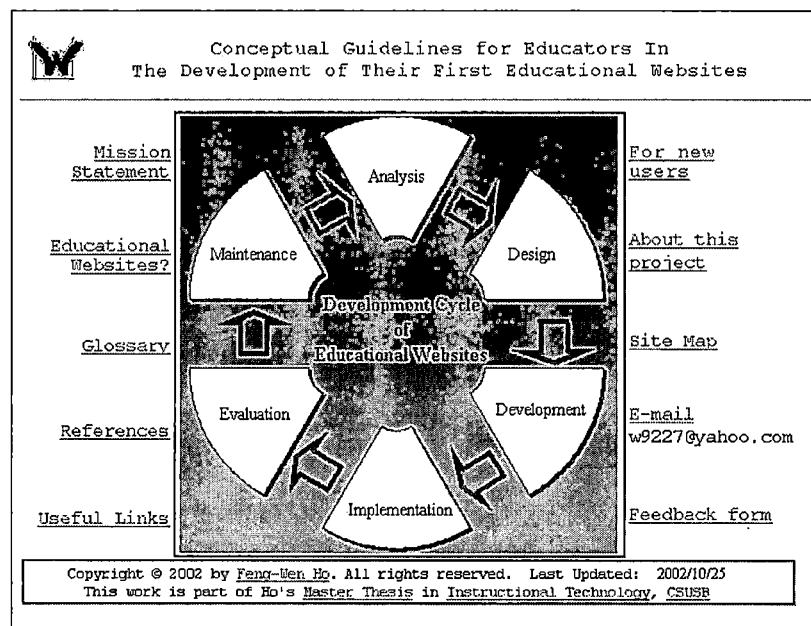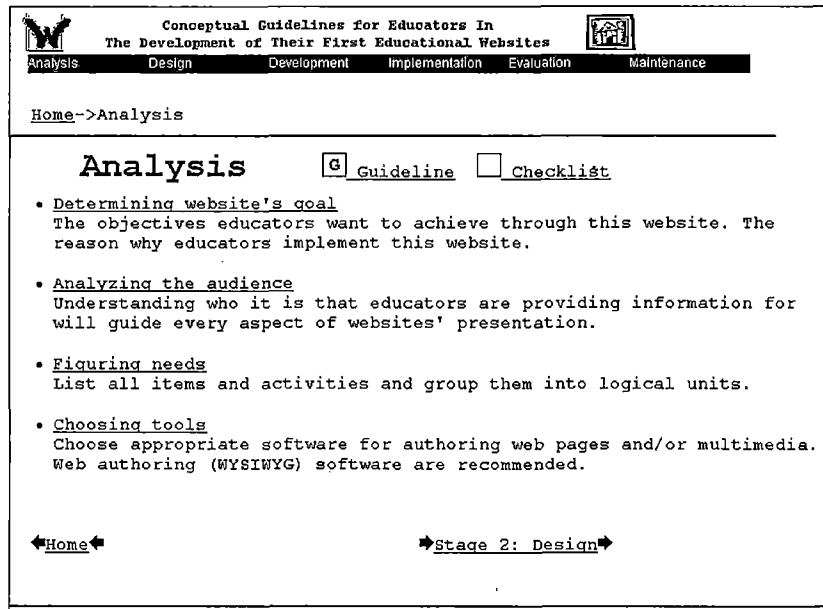
Figure 9. Screenshot of Web Page

In this process, a navigation bar containing a series

of pull-down menus is placed at the top of every page

except the home page (see Figure 8) to maintain a

consistent user interface. It also provides an extra

efficient navigation path for sophisticated users. In both

the submenu pages and content pages, a summary table will

be posted first, which provides users with the option to

decide whether to browse the detailed information or not

(see Figure 9).

Table 3. Summary Flow of Design

Input	Process	Output
✓ Website goals ✓ Website needs ✓ Audience's characteristics	1. Web design 2. Page design 3. User interface design	✓ Website architecture map ✓ Home page and web pages sketches ✓ Principles of user interface design

Stage 3. Development. The detailed page prototypes and the principles in interface design inherited from the previous stage will be the entry criteria of this stage. Creating the homepage and web pages, inserting multimedia, adding links, considering interactivity, and examining copyrights are the processes in this stage.

In creating the home page and web pages, the spatial organization of graphics and text on the web pages engages the users with graphic impact, directs the user's attention, prioritizes information, and makes the users' interactions with the website more enjoyable and more efficient. Ensuring web pages' readability, thinking about page length and scrolling, using a good writing style, working with simple, efficient multimedia and making web pages cross-platform compatible also are the basic considerations in this process (Lynch & Horton, 1997; Curtin, 2002).

Certainly, multimedia can increase user interest, raise the readability and, even pique user curiosity, compelling user to enter the website and explore it. However, since multimedia comes with a high price tag in terms of bandwidth, it should be used sparingly and judiciously. It should be friendly and support the messages properly.

Following the main practices for inserting multimedia and the target audience's definitions mentioned in the previous chapter, the majority of multimedia being used in this website is graphics (saved as .GIF or .JPEG) in order to raise the readability and to enhance the page download speed, especially for the dial-up modem users.

Links can enhance the website by efficiently leading users to find a specific unit of related information. So, links should be identified clearly and easily. The pages linked should be worth jumping to. It is also necessary to provide a distinct back path when users open an external link. In this website, three kinds of links are used and shown as Figure 10, 11 and 12.

- Hypertext links:

| | Home | Analysis | Design | Development |
| Implementation | Evaluation | Maintenance |
Copyright © 2002 by Feng-Wen Ho. All rights reserved.
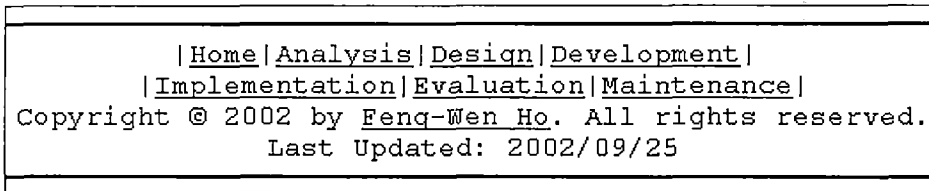Last Updated: 2002/09/25 |

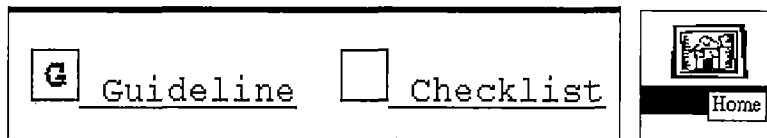Figure 10. Hypertext Links

- Icon links:
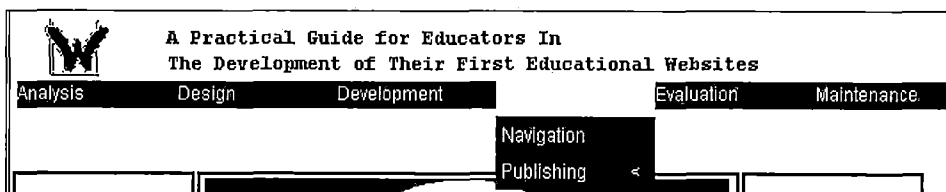

Figure 11. Icon Links

- Pull-down menu links:

Figure 12. Pull Down Menu Links

Links within the content pages are the last elements in the website. For example, some items or words require additional information, such as references or terminologies. Therefore, the links which provide brief additional information with pop-out windows are provided through the whole website (see Figure 13). Links

connecting to Internet resources also provide additional

resources beyond the scope of the website for the users

who desire to pursue more advanced information.

effectively for pedagogical purposes may be the most important step in
assuring that current and future investments in technology are realized.
In order to employ the benefits of the WWW, educators must look beyond the
simple issue of access. Rather, they need opportunities to discover what
the technologies can do, to learn how to operate them, and to experiment
with ways to apply them. Fortunately, the mechanics of using the WWW have
become easier and have increased the opportunities for educators to
establish personal websites.

How c   sites? For educators, a
well-orgai

> **Reference**
>
> Intel Corporation. (2002). Teaching
> with Technology. Retrieved February
> 20,2002 from
> http://www.intel.com/education/teacht
>
> Close This Window

- A p
- A m
- A g   dents in information
  min
- An   students' work
- A f   rs, students, parents,
  and
- A v   racy
- An organized administrator of learning activities (Ritchie &
  Hoffman, 1996; Carvin, 2001; Curtin, 2002; Intel, 2002)

Over time, hopefully, as educators became more knowledgeable about
creating effective websites and more experienced in addressing relative
issues, the inevitable integration of technology with teaching would
develop and be a natural part of the whole educational system. But, how
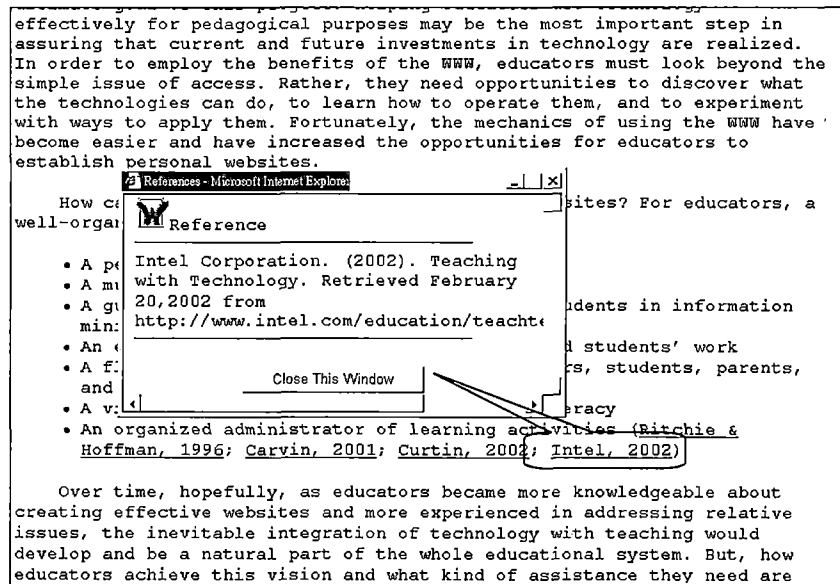educators achieve this vision and what kind of assistance they need are

Figure 13. Reference or Terminology Link

The Internet is a way to communicate (Mambretti,

1999). In order to use the website as a bridge of

communication, educators need to consider what the

interactivity elements are that they want in the website.

Undoubtedly, modern technology makes web interactivity

diverse; however, educators should apply the objectives

that they can meet well and understand that some of the

interactivity may require extra service (e.g., CGI, ASP)

from the hosting server. Therefore, considering the needs

of the target audience of this project, the interactivity of this website includes three information links (for new users, about this project, and a site map) and two feedback links (E-mail and a feedback form). All of the links are presented with text and placed in the communication area on the home page.

Examining copyrights can protect educators from the violation of copyrights. The two major laws regarding the development of an educational website by the educators--the Multimedia Fair Use Guidelines and the Copyright Law--need to be adhered to individually and do not exempt the educators from each other. Educators can download or copy royalty-free or free web objects from the Internet or write the owners and ask for permission, in order to keep from violating copyright laws. In this website all graphics are made by the author or copied from Microsoft Clip Gallery ®. The external links are permission-free or already permitted by the website owner through a linking permission request E-mail.

Table 4. Summary Flow of Development

Input	Process	Output
✓ Website architecture map ✓ Home page and web pages sketch ✓ Principles of user interface design	1. Creating homepage and web pages 2. Inserting Multimedia 3. Adding links 4. Considering interactivity 5. Examining copyrights	✓ Homepage and web pages files ✓ Multimedia files ✓ Linking Permission

Stage 4. Implementation. This stage introduces the website to potential users. After the development stage, a rough website is generated. The next process educators need is to create effective navigation for the whole website. Effective navigation can provide users clear clues to let them know where they are within the website and to move from one place to another easily. It can be achieved by offering a website map, putting links at the bottom and at sections throughout the pages, and providing redundant navigation for various users (ION, 2002).

In this website, every page includes a pull-down menu navigation bar. It will help users go to landmark pages easily. In addition, a browsing track is also shown on every page. As mentioned previously, the navigation of

this website is flexible for users to move from one page
to another.

Table 6. Geocities Hosting Service

Price	
Monthly service fee	$4.95
One-time setup fee	$10.00
Personalized Domain Name	
Domain name	Yes
Matching email accounts	No
Matching website subdomains	No
For Your Visitors	
Data transfer (bandwidth)	5 GB
Ad-free site	Yes
Web Site Management	
Disk space for storing files	25 MB
FTP for putting files on the server	Yes
Remote loading of the website files on another web site	Yes
Free Page Builder and PageWizard tools	Yes
Site Wizard tool - templates	No
Customer Support	
Online Help site	Yes
Priority email	Yes

(Adopt from http://www.geocities.com)

Now it is time to publish, host, and transfer the
whole website to a hosting server so that it can be
accessed by users. In this website, the author chooses
Geocities as the website hosting service based on the
considerations elaborated in the Chapter Two. The detailed
services and cost are shown in Table 6.

Meanwhile, the author uses WS_FTP95 ® as the tool in
transferring files because it is not only a popular FTP
program, but also is a user friendly program in
transferring files via the Internet.

Table 5. Summary Flow of Implementation

Input	Process	Output
✓ Homepage and web pages files ✓ Multimedia files ✓ Linking Permission	1. Creating effective navigation 2. Publishing, hosting and transferring website	✓ Hosting company server IP address ✓ A clear idea of how to transfer website files to hosting server ✓ An accessible website

Stage 5. Evaluation. The evaluation stage refers to
the process of researching the quality of the results
achieved by the users. In this stage, educators offer
themselves the chance to fine tune the website, and that
increases the probability that they will be useful to
users. Also, educators are sure to learn from the activity
of evaluation, and such learning will help educators the
next time they create website.

Based on the criteria elaborated in Chapter Two, this
website will be evaluated according to five issues:
download speed, usability, appearance, navigation and

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structure, and content (Nielsen, 1997, Williams & Tollett, 2000).

After determining the evaluation criteria, the next step is to carry out these activities with the aid of some tools, or instruments, such as checklist, document analysis, logbook, observation scheme, panel discussion, questionnaire, interview scheme, or test (University of Twente, 2000). Therefore, the evaluation of this project is carried out through an on-line evaluation form and posted on the project website in order to employ the efficiency of the WWW.

The evaluation form is created with 16 qualitative questions: 15 multiple-choice questions and one comment form. These questions are combined experimental and qualitative approaches to assess the website in terms of the five criteria. The detailed evaluation procedure and results will be the issue of the next section.

Table 7. Summary Flow of Evaluation

Input	Process	Output
✓ Hosting company server IP address ✓ A clear idea of how to transfer website files to hosting server ✓ An accessible website	Evaluating 1. Download time 2. Usability 3. Appearance 4. Structure and navigation 5. Content	✓ Evaluation result

Stage 6. Maintenance. As a rule, the development of a

website is never finished. Maintenance is the process of

continuously improving the usability and quality of the

website to meet and exceed user expectations. Keeping a

website fresh and checking links regularly are the two

critical processes in this stage.

The educators should make sure the linked sites

contain up-to-date information that remains relevant.

Meanwhile, they can check the links regularly to ensure

that they are working properly. Both of these processes

will enable educators to get the maximum benefit from this

website. Further, based on analysis, user evaluation, and

focus groups, this stage also involves finding creative or

unique ways to improve the elements of the website.

The author plans a schedule of updating once per

month. This will aid in organizing the information for the

updates. In addition, Microsoft FrontPage ® will be

utilized to check links and to ensure they are working

well. Be on the lookout for advancements in the WWW

developments and be ready to consider other ways of

thinking and refining the website are the two major

strategies in maintaining the website's attraction. An

open communication channel will be provided for users to

report dead links or errors so that the quality of the

website can be maintained.

Table 8. Summary Flow of Maintenance

Input	Process	Output
✓ An accessible website ✓ Evaluation result	1. Keeping website fresh 2. Checking links regularly	✓ Revised website ✓ Future plan

Website Evaluation

Four participants are selected and invited to visit

this website for evaluation. The participants' portfolios

are organized in Table 9. They are present teachers or

graduate students who are involved in related subject

areas.

The author has implemented an on-line evaluation form

for participants to submit their evaluation results and

comments. All the communications between the author and

participants are via the online evaluation form and E-mail. The participants are anonymous. Information of participant gender, occupation and the related experience in instructional technology are collected. Except for this background information, they do not need to present any other personal information on the evaluation form.

All the evaluation results are saved directly to the hosting server of the website, and only the author can access these data.

Table 9. Participant Demographics

No.	Gender	Occupation	Experience in Instructional Technology
1	M	Middle school Computer teacher (Master in instructional technology)	5 years
2	M	College electronics teacher (Master in vocational education)	8 years
3	F	Elementary school teacher (Certificated in educational computing)	3 years
4	F	Graduate student (Software Programmer)	3 years

The on-line evaluation form was adopted and posted on the website. It is a set of questions around each of the five website evaluation criteria, and it contains fifteen multiple-choice questions and a comment form. In order to

obtain a non-biased result, questions are arranged
randomly instead of following the sequence of the five
criteria (Table 10).

After the evaluation process, the results are:

1.   Download speed (Question 1)--Each of the four
     educators agreed that the homepage downloads
     efficiently. The efficient download speed
     provides the first positive impression on the
     users. For example, the home page takes about 8
     seconds to download with a 56k dial-up modem.

2.   Usability (Questions 6,8, and 12)--3 of the 4
     educators agreed that the author contacting
     information is readily available, and the links
     are well organized and usable. That means
     educators can control their browsing actions,
     and they do not require additional orientation
     when using this website. One participant
     suggested that adding contact information on
     each page would be better for encouraging users
     to respond.

Table 10. Website Evaluation Form

Website Evaluation Form			
	Yes	No	NA
1.The homepage downloads efficiently.			
2.The homepage is attractive.			
3.You can tell where you are easily.			
4.The content achieves this website goals effectively.			
5.There is an index, table of contents, or some other clear indicator of the contents of the site.			
6.Information/method for contacting author is readily available.			
7.Copyright or last updated date is easy to determine.			
8.The information in this site is easy to understand.			
9.You are able to quickly determine the basic content of this website.			
10.You can move around within this website with ease.			
11.Directions are clear and easy to follow.			
12.Lists of links are well organized and easy to use.			
13.The same basic format is used consistently throughout site.			
14.This website is equally effective with a variety of browsers.			
15.Latest revision date is appropriate to material.			
Comments and Suggestions			

3.   Appearance (Questions 2 and 13)--A "comfortable" and "friendly" screen design is a key factor in appearance. All participants agreed that the layout of this website is well done and was

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consistent throughout the whole website. Simplicity was a positive element for ease of navigation.

4. Structure and navigation (Questions 3, 10, 11, and 14)--Each participant checked "Yes" for these four criteria except one, who used a Macintosh Computer, checked "No" on question 14. He/she explained that the website title is overlapped by the navigation bar in the Macintosh system. It is obvious that the author will need to research how to solve this problem. Moreover, one participant said that the website could not be accessed in his/her school because of the firewall setting on the campus server. However, one participant commented, "I really like the layout/graphic portal...It makes it very easy to navigate and understand."

5. Content (Question 4, 5, 7, 9, and 15)--Three participants agreed that the content achieves the website's goals effectively, and the content is well organized. However, one educator found several awkward sentences in content web pages. And, he/she also suggested that the author

revise the content carefully, which the author

has done.

On the comment and suggestion question, one

participant said, "After the browsing, I would like to

have more in-depth knowledge of how to manipulate the

software, and be provided with more information on the

theory of instructional design if possible."

Taking the survey results into consideration, this

evaluation has provided needed input for a realistic

implementation of this project, making it a valuable

resource for educators interested in educational website

development. The overall conclusions and recommendations

to improve resources for the development of educational

websites will be discussed in the following chapter.

CHAPTER FOUR

CONCLUSIONS AND RECOMMENDATIONS

Introduction

Probably one of the most important aspects of the WWW in education is that the ever-growing number of resources, tools, and materials are developed not only for the exclusive use of technology experts, but also to significantly enhance teaching and learning for the majority of educators who have only limited web skills.

In this project, the author intends to explore the educational website development principles from four aspects: how the WWW is integrated in education, how the WWW facilitates teaching, what its characteristics are, and what the general design principles of educational websites are. Next, an ADDIE+M model intends to guide users through the process of incorporating the WWW into their teaching (Smith & Ragan, 1998). Afterward, based on the principles gathered from the related literature review, a set of conceptual guidelines and checklists was generated and posted on the project website (http://www.geocities.com/w9227/Edweb).

Conclusions

The WWW is proliferating at an incredible rate. As it grows and matures, many different communities and individuals will customize it and shape it to meet their specific needs. For educators, the question is not whether to use these resources, but how to use them effectively. Some answers have been explored in this project.

An educational website can operate as a tutor, a publishing house, a forum, and a gateway for users in cyberspace to help educators prepare themselves and their teaching (Carvin, 2000). Summarily, it generally consists of three components: instruction, communication, and supplementation in order to manifest the educational function.

Moreover, an educational website should be able to do more than an electronic edition of the educator's teaching material. Rather, it should apply the non-linear links and computer interactivity to demolish the physical and social barriers for those have traditionally limited communication between individuals and groups.

Third, an educational website is a combined product of the WWW techniques and the instructional design theory and is not intended to be a fancy commercial website. It

requires thoughtful analysis and investigation of how to use the WWW potential in concert with instructional design principles. If these two forces can be integrated, it may produce a distributed, instructional medium with useable characteristics. Therefore, a systematic approach is required but may vary depending on the educators' needs. Certainly, leading users to a constructivist learning outcome will be the ultimate goal of an educational website.

Finally, the list of issues and creative solutions of an educational website are endless. It is always a work-in-progress job. That means a responsible educational website should be worked on by educators continually. The content on the WWW changes fast; therefore, it is crucial for educators to revisit the ADDIE+M development model whenever they encounter changes that affect any of the six stages.

Of course, an educational website following the guidelines and checklists generated in this project does not ensure it is a good website, but the more of them a website does meet, the more likely it is to be a worthwhile place for users to spend time.

Recommendations

Although this project provides a set of conceptual, systematic guidelines for educational website development, it is not enough. The content of educational websites is quite complex; there can always be more ideas added, especially considering the instructional design integrated with the WWW. This can be resolved by periodically updating content through additional research and by utilizing the feedback shared by users.

For educators, teaching online could be the next step in incorporating the higher WWW technology into their curricula. In the world of teaching online, almost all of the traditional teaching activities are virtualized, and transformed through the Internet technology, especially the WWW techniques. Hopefully, once educators have experienced this project and have become more familiar with the WWW environment in teaching, the implications for the next step could be the exploration of teaching online, the relatively new trend in contemporary education.

For instructional designers, even though the non-linear structure of hypertext encourages the users to consider the information based on its context, ironically,

the infinite WWW sources make users less patient in reading on-line information (Nielsen, 1997). Actually, scanning is the common attitude of the WWW users. How to catch user attention and motivate them to pursue further information will be one of the major issues when the WWW becomes the major instructional technology tool in education. Screen layout and typography method, theories of color and graphics, ergonomic theory, and multimedia design theories (animation, audio and video) could provide the power for educators for further achievement.

The development of this project represents one of many attempts to translate the technological possibilities of the WWW into more effective learning and teaching. It is extendable, and needs more in-depth research in every stage if educators intend to upgrade their technique in order to connect every child to a brighter future by integrating the WWW technology with pedagogical purposes.

APPENDIX A

GUIDELINES

Guidelines — Analysis

Input	Process	Output
✓ Educators' expectation ✓ Prerequisite computer skills (CTAP^2) ✓ Gathered relative instructional information	1. Preparing basic information 2. Determining website's goals 3. Analyzing the audience 4. Figuring needs 5. Selecting tools	✓ Website goals ✓ Website needs ✓ Audience's characteristics

Basic Information Preparation

* Name of Website:
* Last Update Date:
* Author's Name:
* E-mail address:
* Author's instructional affiliations

Website's Goal

* Enhance contact with students, parents and teachers
* Provide a timeless feedback path
* Encourage collaboration among students and teachers
* Encourage active and/or constructional learning
* Support students' learning
* Provide a showcase for teachers and students
* Enrich educator's technology knowledge
* Improve information exchange
* Or, others?

Analyzing the Audience

* Age of Audience

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```
| Younger                    |                    Elder |
|◄──────────────────────────────────────►|
| Colorful                   |                  Textual |
| Graphics                   |              Information |
```

- Portions of audience

```
| Public                     |               Particular |
|◄──────────────────────────────────────►|
| General Security           |            High Security |
| Everyone can access        |            ID & Password |
```
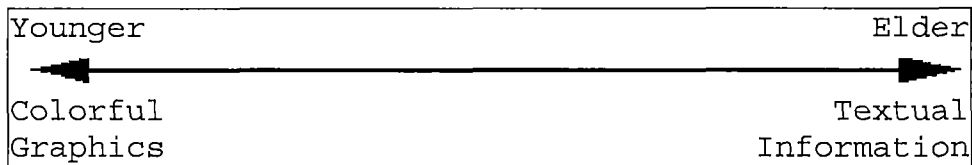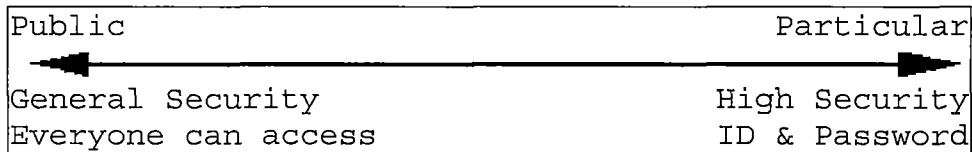
- Audience connection speed

```
| Low-end                    |                 High-end |
|◄──────────────────────────────────────►|
| Dial-up               DSL              T1 |
| Less multimedia            |          More multimedia |
```
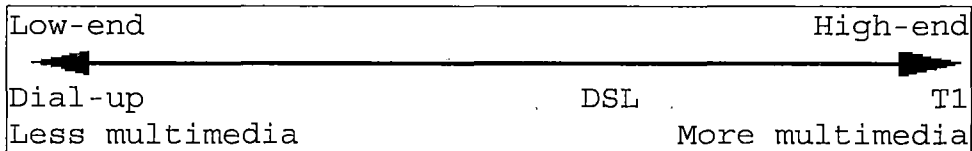
- Specialization of audience

```
| Amateur                    |             Professional |
|◄──────────────────────────────────────►|
| Lively                     |                  Serious |
| Relaxed                    |              Responsible |
```
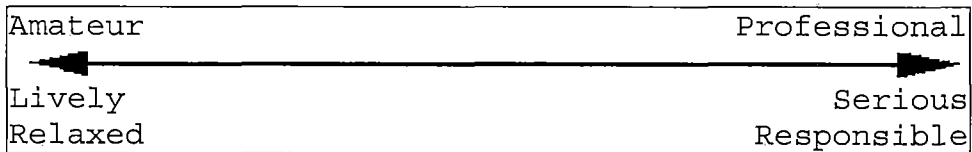
Figuring Needs

- List all items and/or activities
- Evaluate the necessity of each item
- Create groups of logically similar items
- Form groups that cover all possibilities
- Make sure the items are non-overlapping

Selecting Tools

Chose at least ONE of following tools:

- Write HTML source code
- Use online service
- Use web-authoring software [Recommended]

[End of Stage 1. Analysis Guidelines]

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Guidelines — Design

Input	Process	Output
✓ Website goals ✓ Website needs ✓ Audience's characteristics	1. Web design 2. Page design 3. User interface design	✓ Website architecture map ✓ Home page and web page sketches ✓ Principles of user interface design

Web Design

- Divide all needs into logical groups, and be flexible and rely on educators' common sense.

- Establish a visual hierarchy of importance--the priority of information most important to users should ideally be located within two to three levels.

- Draw a website architecture to structure relationships among information chunks.

- Analyze its aesthetics and the practicality and efficiency of your organizational scheme--Keep balance, not too deep or too shallow.

Page Design

- Draw page layout sketch using the following:
  - ✓ Alignment
  - ✓ Proximity
  - ✓ Repetition
  - ✓ Contrast
  - ✓ Balance
  - ✓ Clarity
  - ✓ Consistency

User Interface Design

- Create a user direct environment by following:
    - ✓ Utilize metaphors to lead users such as ⊠ to indicate an E-mail function.
    - ✓ Provide clarity information, that is, every element on a web page should have a reason for being there.
    - ✓ Use the same metaphor and graphics, or maintain the same color palette to keep page layout consistent.
    - ✓ Entitle each page within the website, identify page header clearly, and use footers to provide enough information to assist user orientation.
    - ✓ Offer efficient navigation directions based on a well-organized website structure.

[End of Stage 2. Design Guidelines]

Guidelines — Development

Input	Process	Output
✓ Website architecture map ✓ Home page and web pages sketch ✓ Principles of user interface design	1. Creating homepage and web pages 2. Inserting Multimedia 3. Considering interactivity 4. Adding links 5. Examining copyrights	✓ Homepage and web pages files ✓ Multimedia files ✓ Permissions

Creating the Homepage and Web Pages

- Create web pages based on the page prototypes.

- Ensure web page readability.

- Think about length and scrolling of information chunks.

- Think in screens of information, not in pages.

- Use a good writing style.

- Make web pages cross-platform compatible (such as Netscape and Internet Explorer).

- Consider the necessity of providing printout function.

- Add page footers.

- Every page should have at least one link.

- Provide the necessary elements of every page:
    - ✓ Page title
    - ✓ Author's name and author's institutional affiliations
    - ✓ Revision date
    - ✓ Links on each page which will move users to another page
    - ✓ A link to the local home page
    - ✓ Other elements

Inserting Multimedia

- Make sure that multimedia look good in low resolution (640 * 480).

- Design web pages for the lowest common browser type.

- Ensure that every piece of multimedia serves a clear purpose and makes a significant contribution to the website.

- Use same graphics to reduce the download time if possible.

- Label multimedia links with text link backups for some text-only users.

- Save the graphics in .gif or .jpeg format if educators make graphics by themselves.

- Do not "over-do" it.

Adding Links

- Write the sentence as one normally would, and place the link anchor on the most relevant word in the sentence. Do not create a sentence around a link phrase, such as "Click here."

- Beware of too many links in one screen.

- Choose colors that closely match the text color if using custom link colors.

- Put only the most salient and interesting links within the main body of text. Group all minor links at the bottom of the information chunks where they are available but not distracting.

Considering Interactivity

- Consider the components of interactivity based on the website needs.

- Use the interactivity that the educators can deal with. High technology is not suitable for every educator.

- Provide at least one activity for users to communicate.

Examining Copyrights

- Obey Copyright Law and Multimedia Fair Use Guidelines

- Be aware that educators may freely use a work if it lacks originality, is in the public domain, is Freeware, is US Government work, is a known fact, or is an idea, process, method, or system described in a copyrighted work.

- Remember that if the work is protected, educators cannot make a copy, use the work as the basis for a new work, electronically distribute or publish copies of the work, publicly perform the work, or publicly display an image on a computer screen or otherwise.

- Write the owner and ask for permission if educators think the work they are using does not qualify for the fair use exemption.

[End of Stage 3. Development Guidelines]

Guidelines — Implementation

Input	Process	Output
✓ Homepage and web pages files ✓ Multimedia files ✓ Permissions	1. Creating effective navigation 2. Publishing, hosting and transferring website	✓ Hosting company server IP address ✓ A clear idea of transfer website files to hosting server ✓ An accessible website

Creating Effective Navigation

- Create an effective and a well-structured navigation based on the web architecture.

- Provide redundant navigation, either textual or graphical, for various users.

- Be consistent with navigation format.

- Put links at the bottom and at sections throughout the page that can return users to the top or other pages.

- Make sure every link and navigation is working properly.

Publishing, Hosting and Transferring Website

- List all of the services educators demand.

- Analyze hosting company or ISP:
  - ✓ Connection speed
  - ✓ Cost
  - ✓ Multiple connections
  - ✓ Extra services
  - ✓ Limitation of data transfer
  - ✓ Disk space for storing files
  - ✓ FTP for putting files on the server

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   ✓ Remote loading of files on another web site

   ✓ Free page builder and page-wizard tools

   ✓ Free website templates

   ✓ Online help site

   ✓ E-mail account

- Choose a hosting company or ISP.

- Beware that if using a free hosting service, the advertising should be appropriate to the intended audience and should not overshadow the content.

- Transfer whole website to a hosting company or ISP's server.

- Register the website information in search engine websites.

- Inform the target users about this website.

[End of Stage 4. Implementation Guidelines]

Guidelines -- Evaluation

Input	Process	Output
✓ Hosting company server IP address ✓ A clear idea of transfer website files to hosting server ✓ An accessible website	Evaluate 1. Download speed 2. Usability 3. Appearance 4. Structure and navigation 5. Content	✓ Evaluation result

Download Speed

- Avoid using large elements to delay the download speed.

- Keep the website components and layout consistent to reduce the download time.

- Consider the home user (low-end connection) market to be the major audience.

Usability

- Inform user about what is going on, through appropriate feedback within a reasonable time.

- Use the user language, words, phrases and concepts.

- Provide control and freedom for user to leave the unwanted state.

- Keep consistency and standards.

- Make objects, actions, and options visible or easily retrievable.

- Allow users to tailor frequent actions.

- Try an aesthetic and minimalist design.

- Provide help and documentation.

Appearance

- Focus user attention on important information.

- Attract and maintain user interest.

- Promote the integration of new information with things users have learned before.

Structure and Navigation

- Ensure every web page includes a website identifier.

- Make it easy to go to landmark pages, such as the home page.

- Emphasize the structure of the website by making each page show which sub site it belongs to.

- Provide a sitemap or use some other device to illustrate the relationships between the working pages and websites.

Content

- Use few words, short paragraphs and concise ideas.

- Make the main point first; use meaningful subheadings, helpful dot-point lists and judicious use of color.

- Use hyperlinks to the secondary information pages in order to support the main narrative argument.

[End of Stage 5. Evaluation Guidelines]

`Guidelines` _ Maintenance

Input	Process	Output
✓ An accessible website ✓ Evaluation result	1. Keeping website fresh 2. Checking links regularly	✓ Revised website ✓ Future plan

Keeping Website Fresh

- Make sure all of the linked websites contain up-to-date information.

- Remove or replace outdated materials.

- Label clearly the date of the last revision.

- Update content frequently

Checking Links Regularly

- Make sure links, both internal and external, are current and working properly.

- Remove or replace dead links.

- Provide a feedback channel for user to report dead links

- Utilize software's link-checking function to detect dead links (FrontPage 2000).

[End of Stage 6. Maintenance Guidelines]

APPENDIX B

CHECKLISTS

Checklist -- Analysis

Determining Website goals

☑	Goals	Table of needs
☐	Enhance contact with students, parents and teachers	2 3
☐	Provide a timeless feedback path	4
☐	Encourage collaboration among students and teachers	2 3
☐	Encourage active and/or constructional learning	2 3
☐	Support students' learning	2 3
☐	Provide a showcase for teachers and students	2 3 4
☐	Enrich educator's technology knowledge	4

Analyzing the Audience

☑	Age
☐	Grades K-9, more graphical, less textual exposition
☐	Grades 9-12, moderate graphical and textual exposition
☐	Adult, less graphical, more textual exposition

☑	Objective Population
☐	Students
☐	Teachers
☐	Parents
☐	Public

Table 1. Expected Style of Website

Components	Scale (0:Low 5:High)
Graphical	0 1 2 3 4 5
Textual	0 1 2 3 4 5
Tone	0 1 2 3 4 5

Figuring Needs

Table 2. Instructional Components

☑	Items
☐	Subject Materials
☐	Syllabus
☐	Class Calendar
☐	Grading Policy
☐	Homework Assignments
☐	Homework Help
☐	Notes
☐	Supplementary Resources
☐	Showcase
☐	Lesson Plans

Table 3. Communication Components

☑	Items
☐	E-mail
☐	BBS
☐	Announcement
☐	Chat room
☐	Forum
☐	News
☐	Guest Book

Table 4. Educator's Information

☑	Items
☐	Educational Philosophy
☐	About the Author
☐	Mission Statement
☐	Personal Interests
☐	Tool box: download links
☐	Favorite Websites

Selecting Tools

☐	A) HTML
	Learn HTML and put in the Tag Use HTML editing software._____
☐	B) Online service
	Utilize hosting website's tools. http:// _____
☐	C) Authoring Software
	Purchase Authoring Software 1. Software name: _____ Function: _____ 2. Software name: _____ Function: _____
	Download editing software 1. Software name: _____ From http:// Function: _____ ☐Freeware ☐Trial ____ days ☐Shareware ☐Others 2. Software name: _____ From http:// Function: _____ ☐Freeware ☐Trial ____ days ☐Shareware ☐Others

[End of Stage 1. Analysis Checklist]

Checklist -- Design

Web Design

☑	Web design
☐	The website needs are divided into logical units.
☐	Each need is evaluated carefully and logically by its importance.
☐	A balanced website architecture map is generated.

Page Design

☑	Page Design
☐	The home page and web page prototypes are sketched.
	The page design is attractive and has a strong eye appeal, and follows the principles below:
	☐Alignment
	☐Proximity
	☐Repetition
	☐Contrast
	☐Clarity
	☐Balance
	☐Consistency
☐	Users can tell where they are immediately (clear title, description, image captions, etc.).
☐	There is an index, table of contents, or some other clear indicators of the contents of the website.

User Interface Design

☑	User Interface Design
☐	Metaphor is used to lead the users.
☐	Every element on a web page has a reason for being there.
☐	Consistency is maintained through the whole website.
☐	Users are well oriented within the website.
☐	The navigation is clear and well structured.
☐	The messages are concise.
☐	Screen design is balanced.
☐	A harmonious and unified visual identity is established.

[End of Stage 2. Design Checklist]

☐ Checklist — Development

Creating The Homepage and Web Pages

☑	Creating the homepage and web pages
☐	The homepage downloads efficiently.
☐	The homepage can convey the website goals clearly.
☐	The web pages are created following the page prototype.
☐	The author information on the website is clearly identified.
☐	The website is equally effective with a variety of browsers.
☐	The same basic format is used consistently throughout the whole website.
☐	Every page has at least one link.
	Every page has:
☐	Page title
☐	Author's name and author's institutional affiliations
☐	Revision date
☐	Links on each page which will move users to another page
☐	A link to the local home page

Inserting Multimedia

☑	Inserting Multimedia
☐	The website looks good in the low-resolution screen.
☐	The website works fine in the lowest common browser types.
☐	Every piece of multimedia serves a clear purpose and makes a significant contribution to the website.
☐	The website uses the same graphics in order to reduce the download time.
☐	Multimedia links are labeled with text link backups for text-only users.
☐	Graphics are save as .gif or .jpeg format.

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Adding Links

☑	Adding Links
☐	The website uses meaningful phrases to link components.
☐	The quantity of links in one screen is proper.
☐	The link colors closely match the text color.
☐	The most salient and interesting links are found within the main body of the text.

Considering Interactivity

☑	Considering Interactivity
☐	The component of interactivity is suitable for the educator's computer literacy.
☐	The interactivity is based on the website needs.
☐	The website provides at least one component of interactivity.

Examining Copyrights

☑	Examining Copyrights
☐	The website obeys the Copyright Law and the Multimedia Fair Use Guidelines.
☐	The website needs are divided into logical units.
☐	The website has obtained permission from owners if necessary.
☐	The website indicates the source of the components.

[End of Stage 3. Development Checklist]

☐Checklist☐ -- Implementation

Creating Effective Navigation

☑	Effective Navigation
☐	The implementation of the website is based on an effective and a well-structured navigation.
☐	The website provides redundant navigations, either textual or graphical, for various users.
☐	The website has a consistent format.
☐	The website has put links at the bottom and at sections throughout the page that can return users to the top or other locations in a long page.
☐	Every link and navigation function properly.
☐	The user is able to move around within the website with ease.
☐	Directions for using the website are provided if necessary.
☐	Directions are clear and easy to follow.
☐	The links to other pages within the website are helpful and appropriate.

Publishing, Hosting and Transferring Website

☑	Publishing, hosting and transferring
☐	The hosting company or ISP can provide all of the service that educators demand.
☐	List the information of the hosting company or ISP as follows:
	Connection speed:
	Cost:
	Multiple connections:
	Extra service:
	Limitation of data transfer:
	Disk space for storing files:
	FTP for putting files on the server:
	Remote loading of files on another web site:
	Free Page Builder and PageWizard tools:
	Free website templates:
	Online help site:
	E-mail account:
☐	It is the best choice among available hosting companies or ISPs.
☐	The transfer procedure is done.
☐	The website is registered in search engine websites.

[End of Stage 4. Implementation Checklist]

Checklist -- Evaluation

Download Speed

☑	Download Speed
☐	The homepage and web pages download efficiently in low-end connection.

Usability

☑	Usability
☐	The content achieves the website goals effectively.
☐	Information/method for contacting the author is readily available.
☐	The website is equally effective with a variety of browsers, such as Netscape and Internet Explorer.
☐	The content appears to be complete (for example, no "under construction" signs).
☐	The information in this website is easy to understand.
☐	This website offers sufficient information related to user needs/purposes.
☐	This website provides interactivity that increases its value.

Appearance

☑	Appearance
☐	The user is able to quickly determine the basic content of the website.
☐	The user is able to determine the target audience of the website.
☐	The homepage and web pages are attractive and have strong eye appeal.

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Structure and Navigation

☑	Structure and navigation
☐	The users can tell where they are immediately (clear title, description image captions, etc.).
☐	The users are able to move around within the website with ease.
☐	Directions for using the site are provided if necessary.
☐	Directions are clear and easy to follow.
☐	The links to other pages within the site are helpful and appropriate.
☐	Internal and external links are working properly (no dead ends, no incorrect links, etc.).
☐	Information is easy to find.
☐	Lists of links are well organized and easy to use.
☐	Links to other useful websites are provided.

Content

☑	Content
☐	There is an index, table of contents, or some other clear indictors of the contents of the site.
☐	The revision date and copyright information are easy to determine.
☐	There is sufficient information to make the website worth visiting.
☐	The content is free of bias, or the bias can be easily detected.
☐	The information is clearly labeled and organized.
☐	The same basic format is used consistently throughout the whole website.
☐	Grammar and spelling are correct.

[End of Stage 5. Evaluation Checklist]

☐ Checklist — Maintenance

Keeping Website Fresh

☑	Keeping website fresh
☐	The date of the last revision is clearly labeled.
☐	Outdated material has been removed.
☐	How often will the website be updated?

Check Links Regularly

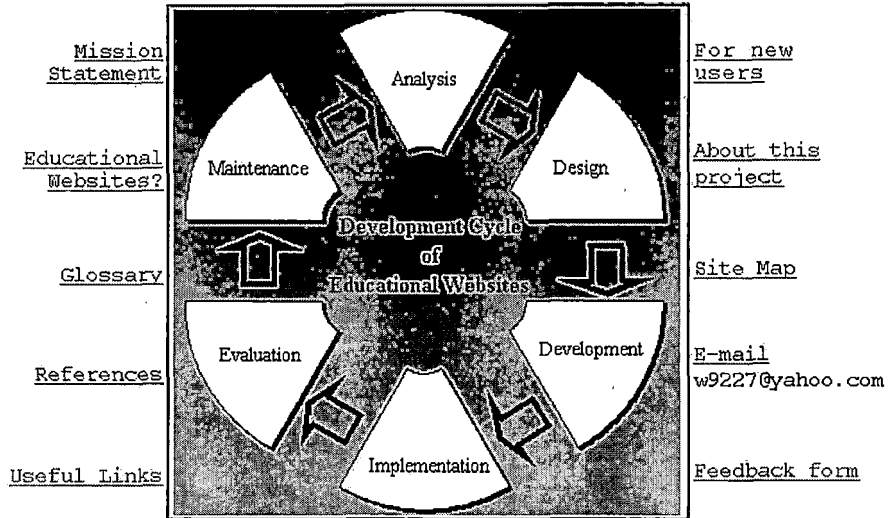| ☑	Check links regularly
☐	Links are working properly.
☐	Dead links are removed or replaced.
☐	There is an open feedback channel for users to report any dead links.
☐	All of the links are checked by particular software.

[End of Stage 6. Maintenance Checklist]

APPENDIX C

HOMEPAGE

Mission Statement	For new users
Educational Websites?	About this project
Glossary	Site Map
References	E-mail w9227@yahoo.com
Useful Links	Feedback form

Analysis

Maintenance · Design

Development Cycle of Educational Websites

Evaluation · Development

Implementation

APPENDIX D

WEB PAGES

| Analysis | Design | Development | Implementation | Evaluation | Maintenance |

Mission Statement

- Introduction

- Purpose of this project

- Significance of this project

- Statement of Needs

- General Design

- Limitations and Delimitations

Introduction

The Internet is continuing to advance at an ever-increasing pace. Instructional technology is one of the evident examples. Within the last decade, the Internet has evolved into a major resource for teachers and students. More than a new, high-tech blackboard or some other simple tool for teachers, the Internet is a revolutionary technology that is bound to change every aspect of society and the educational system in particular.

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institutional statistical results instead of the process of gathering the primary source. During the last few years, different institutions such as the Department of Education, and NetDay held several nationwide surveys. The statistical information gathered from these large-scale organizations are the basis for the reliability of this project. Additionally, numerous books and articles published by scholars and experts also are the major information sources of this project. A strong theoretical and research-based background will be established through appropriate citations from these professional studies.

Because there are so many different software packages and several different platforms to use them on, it will be a huge project if step-by-step directions are provided for every program. Therefore, conveying the crucial concepts that can apply to every program is the main idea of this paper.

Undoubtedly, different initial goals generate different types of websites. Different types of websites require different architectures, different kinds of educational content, and various WWW technical skills. The focus of this project is on the basic/general concepts of implementing an educational website; therefore, instead of addressing the higher level of programming techniques in website implementation, conveying the fundamental concepts and techniques will be the principle goal of this project.

⬇Home⬇   ⬆Top⬆

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Educational Websites?

What are the characteristics of educational websites? What are the differences between educational websites and other kinds of websites? Obviously, educational websites have the potential to be more than a compendium of information. When properly structured, web pages can guide users through hypertext in a series of instructional activities, present information, afford practice, and provide feedback to inform users of their strengths, weaknesses, and suggestions for enrichment or remediation (Ritchie & Hoffman, 2001).

- 3 major categories of Educational Websites
- More information....

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The Three Major Categories of Educational Websites

Role	Major Function	Contents
Instruction	Provides particular units and/or materials for instructional purposes	Syllabus, homework assignment and help, student work showcase, grading policy, class calendar, unit notes, etc.
Communication	Provides communication channels for users feedback and interactivity.	E-mail, web-board, chat room, forum, instance messenger, BBS, etc.
Supplementation	Provides additional information, materials, or external links that users may need.	News, educator's philosophy, educator's personal information, download links, etc.

◆Home◆   ↑Top↑

| Analysis | Design | Development | Implementation | Evaluation | Maintenance |

Glossary

The following terms are defined as they apply to the project.

Bandwidth	Browser	CGI	CSS	DHTML
Domain Name	Download & Upload	E-mail
Freeware	FTP	GIF	HTML	HTTP	Hyperlink
Hypertext	IP Address	ISP	JAVA	JPEG
Link	MIDI	Modem	Multimedia	Path
Protocol	Server	Shareware	Streaming
Tags	URL	Usability	WebQuest

Bandwidth: Bandwidth is used to mean (1) how fast data flows on a given transmission path, and (2), somewhat more technically, the width of the range of frequencies that an electronic signal occupies on a given transmission medium. Any digital or analog signal has a bandwidth.

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Usability: Usability is the measure of a product's potential to accomplish the goals of the user. In information technology, the term is often used in relation to software applications and Web sites, but it can be used in relation to any product that is employed to accomplish a task.

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WebQuest: An inquiry-oriented activity in which most or all of the information used by learners is drawn from the WWW.

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References

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A-E

- Academic Technology for Learning, University of Alberta. (2002) Guide to distributed learning environments. Retrieved August 15, 2002 from http:// www.atl.ualberta.ca/dleweb/index.html

- Barba, R. H., San Jose State University. (Spring, 2002) Events of Instruction (Robert Gagne). Retrieved February 22, 2002 from http://www.sjsu.edu/depts/it/edit186/gagne.html

- Bento, R., & Bento, A. (2000, Dec) Using the Web to extend and support classroom learning. College Student Journal, 34(4), 603-609.

- Brown, C., & Nielson, D. (1996) Enhancing business classes with the World Wide Web. Journal of Education for Business, 71(6), 317-323

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Procedure for incorporating Internet technology into a course. In L. Lloyd (Eds.), Teaching with technology: Rethinking Tradition. (pp. 91-108). Medford, NJ: Information Today.

- Warschauer, M. (1997) Computer-mediated collaborative learning: Theory and practice. Modern Language Journal, 81(2), 470-481.

- Williams, R. & Tollett, J. (2000) The non-designer's web book (2nd). Berkely, CA: Peachpit Press.

- World Wide Web Consortium [W3C]. (2001) About The World Wide Web. Retrieved July 20, 2002 from http://www.w3.org/WWW

- Zavala, C. (2002) Enhancing multiple intelligences through multimedia. Retrieved August 10, 2002 from http://coe.sdsu.edu/eet/Articles/mimultimedia/start.htm

- Zhao, Y. (1998, Spring). Design for adoption: the development of an integrated Web-based education environment. Journal of Research on Computing in Education, 30(3), 307-328.

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| Analysis | Design | Development | Implementation | Evaluation | Maintenance |

Home->Useful links

Useful Links

Education

- http://ed.gov U.S. Department of Education.

- http://school.discovery.com/ A website provides fresh ideas to enhance learning and teaching.

- http://www.thegateway.org The gateway to educational materials.

- http://edweb.sdsu.edu/webquest/webquest.html A WebQuest website which is hosted by Educational Technology Department at San Diego State University.

Website Design

- http://edwebproject.org Exploring technology and school reform by Andy Carvin. <Link Permission>

- http://info.med.yale.edu/caim/manual/ A website for a book named "Web Style Guide: Basic Design Principles for Creating Web Sites."

- http://wdvl.internet.com Web developers' virtual library. <Linking Permission>

- http://www.w3.org/ --The World Wide Web Consortium

- http://www.atl.ualberta.ca/dleweb/ Academic Technologies for Learning, University of Alberta.

|Home|Analysis|Design|Development|
|Implementation|Evaluation|Maintenance|

Last Updated: 2002/10/26

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For New Users

WELCOME!

The purpose of this website is to focus on generating a set of conceptual guidelines and checklists in order to assist educators who have no idea where to begin the establishment of an educational website.

In order to achieve the maximal benefit of this project, the educators are assumed to be qualified for California Technology Assessment Profile (CTAP2), the introductory level of Internet category.

To begin, please enter "What are educational websites?"

Or, you can jump to the six stages of developing an educational website directly. Each stage provides a guidelines summary and a checklist. All of the guidelines and checklists save as a Word format. Users can click the ⌂ icon to open, edit and print out these files.

This website is a dynamic work-in-progress, and numerous changes and additions occur on a regular basis.

This work is part of Ho's Master Thesis in Instructional Technology, CSUSB

Home->Project Proposal

Project Application Proposal

Table of Contents

- Title page
- Project Object
- Target Audience
- Significance
- Methodology
- Project structure map

A Practical Guide for Educators In Development of
Their First Educational Websites

Project Application Proposal
for the Degree
Master of Arts

:

:

Literature review. (2) Current situation. (3) Website implementation.

An on-line tutorial website will be established. It contains all relative materials and results of this project — a set of guidelines and checklists. This website will assist educators to establish educational websites which facilitate their teaching activities. The map of this project structure is attached.

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Project Structure Map
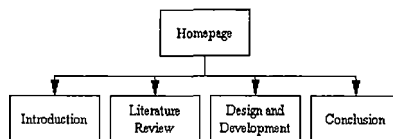
```
                    ┌──────────┐
                    │ Homepage │
                    └──────────┘
        ┌──────────────┬───────┴──────┬──────────────┐
        ▼              ▼              ▼              ▼
  ┌────────────┐ ┌──────────┐ ┌────────────┐ ┌────────────┐
  │Introduction│ │ Literature│ │ Design and │ │ Conclusion │
  │            │ │  Review   │ │Development │ │            │
  └────────────┘ └──────────┘ └────────────┘ └────────────┘
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Site Map

```
                        Home Page
                        (Index.htm)
          ┌─────────────────┼─────────────────┐
          ▼                 ▼                 ▼
   ┌──────────────┐  ┌──────────────┐  ┌──────────────┐
   │ Supplementary│  │ Instruction  │  │Communication │
   └──────────────┘  └──────────────┘  └──────────────┘

 Educational ◄                Analysis ◄              E-mail ◄
 Website                                                              ► For New User
              ► Mission          ► Design
                Statement                             About this
                                                      project
 Goissary ◄           Development ◄                                 ► Sitemap
              ► References           ► Implementation
                                                      Feedback ◄
 Useful Links ◄          Evaluation ◄

                                   ► Maintenance
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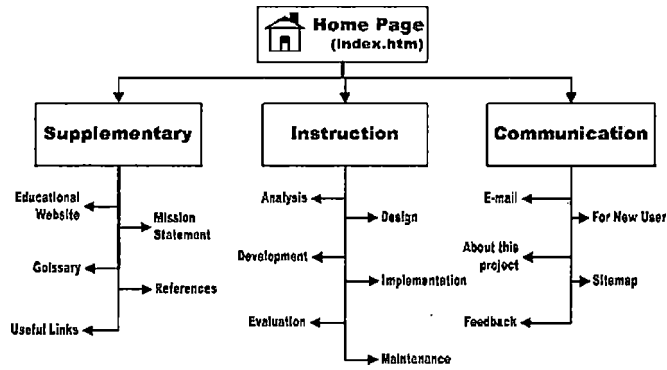
Website Evaluation Form-1

Thank you for participating in this website evaluation survey. The purpose of this survey is to see whether the website is usable for educators in the development of their educational websites. It is anonymous and implemented via an online evaluation form.

The results of this survey will be organized and listed only on my thesis titled "Conceptual Guidelines for Educators In The development of Their First Educational Websites." If you have any questions or you would like more information about this project, please contact me, Feng-Wen Ho (w9227@yahoo.com). Thank you very much.

Feng-Wen Ho

Participant Information

- Gender   ⌐Male ⌐Female

- Occupation   [   ]

- Experience in Instructional Technology (Years) [—]

1. The homepage downloads efficiently.
   ⌐Yes ⌐No ⌐NA

2. The homepage is attractive.
   ⌐Yes ⌐No ⌐NA

3. You can tell where you are easily.
   ⌐Yes ⌐No ⌐NA

4. The content achieves this website goals effectively.
   ⌐Yes ⌐No ⌐NA

5. There is an index, table of contents, or some other clear indicator of the contents of the site.
   ⌐Yes ⌐No ⌐NA

6. Information/method for contacting author is readily available.
   ⌐Yes ⌐No ⌐NA

7. Copyright or last updated date is easy to determine.
   ⌐Yes ⌐No ⌐NA

8.The information in this site is easy to understand.

        ○Yes ○No ○NA

9.You are able to quickly determine the basic content of this website.

        ○Yes ○No ○NA

10.You can move around within this website with ease.

        ○Yes ○No ○NA

11.Directions are clear and easy to follow.

        ○Yes ○No ○NA

12.Lists of links are well organized and easy to use.

        ○Yes ○No ○NA

13.The same basic format is used consistently throughout site.

        ○Yes ○No ○NA

14.This website is equally effective with a variety of browsers.

        ○Yes ○No ○NA

15.Latest revision date is appropriate to material.

        ○Yes ○No ○NA

Comments and Suggestions

Submit Reset

Back to Home Page

Analysis   [G] <u>Guideline</u>   [ ] <u>Checklist</u>

Analysis is the process of gathering and comparing information about the website and its operation and use in order to improve the website's overall quality and to identify problem areas.

- <u>Determining website's goal</u>
  The objectives educators want to achieve through this website. The reason why educators implement this website.

- <u>Analyzing the audience</u>
  Understanding who it is that educators are providing information for will guide every aspect of websites' presentation.

- <u>Figuring needs</u>
  List all items and activities and group them into logical units.

- <u>Selecting tools</u>
  Select appropriate software for authoring web pages and/or multimedia. Web authoring (WYSIWYG) software are recommended.

◄<u>Home</u>◄   ►<u>Stage 2: Design</u>►

:

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Selecting tools

All pages on the WWW are created using HyperText Markup Language (HTML). By using this common language, computers are able to read and display websites, regardless of the Operating System (OS). HTML uses hyperlinks and markup text to define the formatting for the heading styles, numbered lists, insertion of images, and so forth. There are essentially three main ways to gear information into HTML format: write HTML source code, use web-authoring software, or use an online service for creating websites. For most educators, in order to make web pages without writing any source code, web-authoring software will be the better choice. The WYSIWYG (What You See Is What You Get) software, such as Microsoft FrontPage ® and Macromedia Dreamweaver ® are powerful enough to develop web pages, and visual enough to do so quickly and easily (<u>Dabbagh, 2002</u>; <u>Williams & Tollett, 2000</u>). Certainly, before creating a homepage and web pages, educators need to install the authoring software they select, and know how to use it.

Ideally, after the processes in the analysis stages: determining the website's goal, analyzing the audience, figuring needs and selecting tools, educators could be prepared for entering the design stage.

▼<u>Next Stage: Design</u>▼   [G] [ ]   ▲<u>Top</u>▲

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| Analysis | Design | Development | Implementation | Evaluation | Maintenance |

Home->Design

Design   G Guideline   ☐ Checklist

Design is the process which educators work to meet the website specifications (website goals, target audience's characteristics, needs, and the software functions) and to make decisions about how website components will accomplish the website's objectives.

- Web Design
  Drawing a balanced website architecture map, not too deep or too shallow. (Site Map)

- Page Design
  Sketching paper-prototype (Homepage and Web pages) sketches.

- User Interface Design
  Arrange a friendly and comfortable layout.

◄Stage 1. Analysis◄   ►Stage 3: Development►

Educational website designers should keep in mind that the design strategies should be learner-centered and address the learners' style of learning, rate of learning and motivation for learning (Smith & Ragan, 1998).

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~~website schedule, navigation location, navigation model~~ and management of growing data.

Schwier and Misanchuk's (1993) echo these five essential areas with another five principles in designing computer-base multimedia instruction. They are:

- Simplicity
- Consistency
- Clarity: Pare the message down to the absolute essentials the learner needs to know.
- Balance: When a screen design is not balanced, it will create a feeling of tension, and make the user unwilling to read.
- Harmony and unity: Visual identity can be very important in a harmonic and unified site design. It ties a site together and gives the site a feeling of wholeness.

Well-designed pages display the information clearly to the users, rather than forcing the users to search for it on an overly crowded page. Even though a pretty face cannot mean everything, a "comfortable" user interface can win a lot more acceptance and work more efficiently.

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Development [G] Guideline [ ] Checklist

While in the design stage, educators have concentrated on thinking and reflecting via analysis and design, in the development stage educators will add doing to the thinking and reflecting mix.

- **Creating homepage and web pages**
  Educational web pages need clarity, order and trustworthiness in information source.

- **Inserting multimedia**
  A web page with appropriate multimedia components can engage the user with visual impact, direct the user's attention, prioritize information, and make the user's interactions with educators' websites more enjoyable and more efficient.

- **Adding links**
  Use links wisely. They can enhance the website if used well. They also can be frustrating and time consuming if not.

- **Considering interaction and feedback**
  The concepts of interactivity presented to the quality, effectiveness and engagement of human-computer communications.

- **Examining copyright**
  Educators should protect themselves from the violation of Copyright law by knowing it.

◄Stage 2. Design◄   ►Stage 4: Implementation►

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fair use issues early on—while the site building work is in progress. In the UCLA Office of Instructional Development's website (2002), copyright issues for academics, and the summary of the Multimedia Fair Use Guidelines are listed. It is a summary of what educators may or may not do if educators follow the Multimedia Fair Use Guidelines. UCLA also lists some bottom lines in order to protect educators in the copyright issues:

- First, educators may freely use a work if it lacks originality, is in the public domain, is Freeware, is US Government work, is a known fact, or is an idea, process, method, or system described in a copyrighted works.
- Second, if the work is protected, educators can not make a copy, use the work as the basis for a new work, electronically distribute or publish copies of the work, publicly perform the work, or publicly display an image on a computer screen or otherwise.
- Third, and most important, is that the Multimedia Fair Use Guidelines does not exempt educators from the basic provisions of the Copyright Law.

If educators think the work they are using does not qualify for the fair use exemption, they should write the owner and ask for permission (Ko & Rossen, 2001).

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Analysis	Design	Development	Implementation	Evaluation	Maintenance

Home->Implementation

Implementation [G] Guideline [ ] Checklist

Implementation is a phase giving educators' instruction to learners. So, after the instruction has been designed and developed, the instructional event is ready to be implemented. The purpose of the implementation process is to prepare the learning environment and facilitate the delivery of instruction. Applying this opinions into the implementation of educational websites, it is time to introduce the website to potential users.

- Creating effective navigation
  "By simply providing obvious location cues, the usefulness of the website is immediately increased" (Sano, 1996).

- Publishing, hosting and transferring website
  This step involves the actual hosting of the website on a server so that it can be accessed.

◄Stage 3. Development◄   ➤Stage 5: Evaluation➤

Creating effective navigation

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:

connections to the Internet so that the website will always be up.
- Ensure the company can offer statistics on the website. This data is very important for educators to know how many people have accessed the website and which pages they have visited (Williams & Tollett, 2000).

Also, there are numerous free hosting website services are offered in the Internet. These websites allow users to upload their websites onto remote servers for free. In return, these hosting companies often post advertisements at the top of site pages. Be sure to check the advertising and privacy policies before uploading and publishing the website since some of the annoying popup advertisements may not be appropriate, or may even be harmful to users.

After choosing a hosting service, the next step is file transaction. The most common transaction a web designer will have with a hosting server is the uploading of web documents, graphics, and other media files. Files are transferred between computers over a network via a method called FTP (File Transfer Protocol). Most WYSIWYG web-authoring software packages include a feature for transferring (uploading/download) educators' websites. On the other hand, free FTP programs are also available on the Internet. For example, *Fetch* is the FTP program for Macintosh users, and *WS_FTP* is the program for PC users (Williams & Tollett, 2000).

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Home->Evaluation

Evaluation . G Guideline ☐ Checklist

Evaluation is a way to systematically determine if the intended results are achieved. It is also a way to gather information to work toward continual improvement. The goals of evaluation are to determine effectiveness, appearance and efficiency, and to improve what educators do to assist with learning (Smith & Ragan, 1998).

- Download speed
  For educational websites, the home user market is the most important audience. Therefore, the websites should avoid using large elements to delay the download speed.

- Usability
  Usability is the measure of a product's potential to accomplish the goals of the user.

- Appearance
  An appropriate appearance can catch users interests and stay around educator's website.

- Structure and navigation
  Navigation systems need to allow choices, but only in ways that assist the user to get the most from the site and which are alert to the problems with hyperlinks.

- Content
  It is important that educator write web pages with a sense of how

          :
          :

- Readability—main point first, meaningful subheadings, helpful dot-point lists and judicious use of color
- Using hyperlinks on secondary information pages in order to support the main narrative or argument (footnotes, examples, etc).

Morkes and Nielsen (1997) conducted three similar studies that checked the way people read text on the web. Their findings could be used as a reference for educators when they write their web pages. Those findings are:

- Users like summaries and the inverted pyramid style used by journalists, where the most important information is presented first in an article
- Users appreciate headings which help them scan and locate the information they are interested in
- Users do not appreciate flowery web page writing and want it to be concise
- Simple and informal writing is preferred over formal writing styles.

Through these criteria, educators can evaluate the quality of the educational websites and assess the performance of the users.

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| Analysis | Design | Development | Implementation | Evaluation | Maintenance |

Maintenance [G] Guideline [ ] Checklist

Maintenance is another ongoing process. Portions of the instructional design must be tweaked based on new information received, time changes, financial changes, etc.

- Keeping website fresh
  Make sure websites contain up-to-date information.

- Checking links regularly
  Review linked resources periodically to make sure the websites they point to have not moved.

**Keeping website fresh and
    checking links regularly**

In the development educational websites, it is important to make sure all of the linked websites contain up-to-date information. And if not, educators should replace or remove them. They also should review linked resources periodically to make sure the websites they point to have not moved. Some software packages, such as Microsoft FrontPage ®, can check a website for links that no longer exist. Keeping the lines of communication open or getting feedback from users are also good methods of keeping the website fresh.

This stage is often be left out of many instructional design and website development models; however, it is of critical importance. Without periodic or scheduled check-ups or follow-ups, the newly acquired skills and knowledge of users can begin to decay rapidly.

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REFERENCES

Academic Technology for Learning, University of Alberta. (2002). Guide to distributed learning environments. Retrieved August 15, 2002, from http://www.atl.ualberta.ca/dleweb/index.html

Barba, R. H. (2002). Events of instruction (Robert Gagne). Retrieved February 22, 2002, from http://www.sjsu.edu/depts/it/edit186/gagne.html

Bento, R., & Bento, A. (2000). Using the Web to extend and support classroom learning. College Student Journal, 34(4), 603-609.

Brown, C., & Nielson, D. (1996). Enhancing business classes with the World Wide Web. Journal of Education for Business, 71(6), 317-323

Carvin, A. (2000). EdWeb. Retrieved August 5, 2002, from http://edwebproject.org

Chin, J. (2000). Testmony of Jeffery Chin. Retrieved August 13, 2002, from http://edworkforce.house.gov/hearings/106th/ecyf/edtech3800/chin.htm

College of Engineering, University of Idaho. (2001). Distance education at glance guide #11. Retrieved December 6, 2001, from http://www.uidaho.edu/evo/dist11.html

Curtin University. (2002). Internet-based learning construction kit. Retrieved February 28, 2002, from http://www.curtin.edu.au/home/allen/we3/igm/030102.html

Dabbagh, N. (2002). The evolution of authoring tools and hypermedia learning systems: Current and future implications. Educational Technology, 42(4), 24-31.

Deitel, H., Deitel, P., & Nieto T. (2001). Internet & World Wide Web: How to program (2nd ed.). Upper Saddle River, NJ: Prentice-Hall.

Dick, W., & Carey, C. (1989). Systematic design of
    instruction (3rd ed.). New York: Harper Collins
    Publisher.

Dick, W., & Reiser, R. (1989). Planning effective
    instruction. Upper Saddle River, NJ: Prentice-Hall.

Dodge, B. (2001). The WebQuwst page. Retrieved October 1,
    2002, from http://webquest.sdsu.edu

Educational Technologies at Virginia Tech (2002).
    DisignShop: Lessons in effective teaching. Retrieved
    June 6, 2002, from
    http://www.edtech.vt.edu/edtech/id/index.html

Friel, L. (2001). Using technology appropriately: Policy,
    leadership, and ethics. In J. LeBaron & C. Collier
    (Eds.), Technology in its place: Successful
    technology infusion in schools (pp. 125-137). San
    Francisco: Jossey-Bass Inc.

Fulton, K. (1997). Learning in a digital age: Insights
    into the issues: the skill students need for
    technological fluency [Electronic version]. Milken
    Exchange on Education Technology, 45-46.

Gillies, G., & Cailliau, R. (2000). How the Web was born:
    The story of the World Wide Web. New York: Oxford
    University Press Inc.

Gordin, D., Gomez, L., Pea, R., & Fishman, B. (1996).
    Using the World Wide Web to build learning
    communities in K-12. Journal of Computer-Mediated
    Communication, 2(3). Retrieved July 29, 2002, from
    http://www.ascusc.org/jcmc/vol2/issue3/gordin.html

Hannafin, M. J., & Hooper, S. (1989). An integrated
    framework for CBI screen design and layout. Computers
    in Human Behavior, 5(3), 155-165.

Hathorn, L., & Ingram, A. (2002). Online collaboration:
    Making it work. Educational Technology, 42(1), 33-40.

Holzschlag, M. E. (1998). Web by design. San Francisco:
    Sybex.

The Illinois Online Network. (2002). Guidelines for academic web sites. Retrieved August 20, 2002, from http://illinois.online.uillinois.edu/IONresources/web design/academguidelines.html

Intel Corporation. (2002). Teaching with technology. Retrieved February 20, 2002, from http://www.intel.com/education/teachtech/index.htm

Jonassen, D., Peck, K., & Wilson, B. (1999). Learning with technology: A constructivist perspective. Upper Saddle River, NJ: Prentice Hall.

Kang, S. (2001). Toward a collaborative model for the design of web-based courses. Educational Technology, 41(2), 22-30.

Kearsley, G. (2002). Constructivist theory. Retrieved August 8, 2002, from http:// www.gwu.edu/~tip/bruner.html

Ko, S. S., & Rossen, S. (2001). Teaching online: A practical guide. Boston, MA: Houghton Mifflin.

Lan, J. (2001). Web-based instruction for education faculty: A needs assessment [Electronic version]. Journal of Research on Computing in Education, 33(4), 385-399.

Lynch, P., & Horton, S. (2002). Web style guide: Basic design principles for creating web sites (2nd ed.). New Haven, CT: Yale University Press.

Mambretti, C. C. (1999). Internet technology for schools. Jefferson, NC: McFarland.

March, T. (2001). Theory and practice on integrating the Web for learning. Retrieved August 8, 2002, from http://www.ozline.com/learning/theory.html

Morkes, J., & Nielsen, J. (1997). Concise, scannable, and objective: How to write for the Web. Retrieved August 19, 2002, from http://www.useit.com/papers/webwriting/writing.html

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NetDay. (2001). The Internet, technology and teachers executive summary. Retrieved June 28, 2002, from http://www.netday.org/anniversary_survey.htm

Nielsen, J. (1997). Changes in web usability since 1994. Retrieved August 19, 2002, from http://www.useit.com/alertbox/9712a.html

Oliver, K. (2000). Methods for developing constructivist learning on the Web. Educational Technology, November-December, 5-17.

Owston, R. D. (1997). The World Wide Web: A technology to enhance teaching and learning? Education Researcher, 26(2), 27-33.

Pulkkinen, J., & Ruotsalainen, M. (2001). International on-line learning: cultural issues for educators. In J. LeBaron & C. Collier (Eds.), Technology in its place: Successful technology infusion in schools (pp. 73-86). San Francisco: Jossey-Bass.

Ritchie, D. C., & Hoffman B. (1996). Using instructional design principles to amplify learning on the World Wide Web. Retrieved February 22, 2002, from http://edweb.sdsu.edu/clrit/learningtree/DCD/WWWInstr design/WWWInstrDesign.html

Rosenfeld, L. & Morville, P. (1998). Information architecture for the World Wide Web. Sebastopol, CA: O'Reilly & Associates, Inc.

Salmon, G. (n.d.). Communication technology. Retrieved July 25, 2002, from http://www.atl.ualberta.ca/dleweb/Pages/ /Implementation/IMP_CommunicationsTechnologies.htm

Sano, D. (1996). Design large-scale web sites: a visual design methodology. New York: John Wiley & Son.

Schwier, R., & Misanchuk, E. (1993). Interactive multimedia instruction. Englewood Cliffs, NJ: Educational Technology Publications, Inc.

Smith, P. L., & Ragan, T. J. (1998). Instructional design. Upper Saddle River, NJ:Prentice Hall.

Torrisi-Steele, G., & Davis, G. (2000). A website for my subject: The experiences of some academics' engagement with educational designers in a team based approach to developing online learning materials. Australian Journal of Educational Technology, 16(3), 283-302. Retrieved June 29, 2002, from http://www.ascilite.org.au/ajet/ajet16/torrisi-steele.html

UCLA Office of Instructional Development. (n.d.). Copyright issues for academics. Retrieved August 26, 2002, from http://www.oid.ucla.edu/fnmc/fairuse.htm

University of Twente. (2000). Cascade-sea. Retrieved October 25, 2002, from http://project.edte.utwente.nl/cascade/seasite/eval.h tml

U.S. Department of Education Office of National Center for Education Statistics [NCES]. (2001). Internet access in U.S. public schools and classrooms: 1994-2000. Washington, DC: Author.

Wan, P. (1999). Asking the right questions: A five-step procedure for incorporating Internet technology into a course. In L. Lloyd (Ed.), Teaching with technology: Rethinking tradition (pp. 91-108). Medford, NJ: Information Today.

Warschauer, M. (1997). Computer-mediated collaborative learning: Theory and practice. Modern Language Journal, 81(2), 470-481.

Williams, R., & Tollett, J. (2000). The non-designer's web book (2nd ed.). Berkely, CA: Peachpit Press.

World Wide Web Consortium [W3C]. (2001). About the World Wide Web. Retrieved July 20, 2002, from http://www.w3.org/WWW

Zhao, Y. (1998). Design for adoption: the development of an integrated Web-based education environment. Journal of Research on Computing in Education, 30(3), 307-328.