

DOCUMENT RESUME

ED 432 254

IR 019 624

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TITLE Web-Based Instruction: Focus on Learning.

PUB DATE 1999-03-00

NOTE 8p.; In: SITE 99: Society for Information Technology & Teacher Education International Conference (10th, San Antonio, TX, February 28-March 4, 1999); see IR 019 584.

PUB TYPE Reports - Evaluative (142) -- Speeches/Meeting Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.

DESCRIPTORS *Computer Assisted Instruction; Educational Planning; Higher Education; Information Dissemination; *Instructional Design; Instructional Development; Instructional Effectiveness; Instructional Innovation; Instructional Material Evaluation; Models; Online Systems; *World Wide Web

IDENTIFIERS *Online Courses

ABSTRACT

The higher education environment is currently being revolutionized by the challenge of online course offerings. Many obstacles stand ready to confront those instructors who are faced with the task of utilizing this new instructional environment. The instructional aspects of Web-based learning are often viewed as secondary to the technical issues that require a new set of skills for most instructors. This paper suggests that it is important to apply instructional design to the many aspects of designing and delivering effective Web-based instruction. Presents a model for the design of Web-based instruction that includes these phases: analyze, design, develop, disseminate, and evaluate/revise. Each of these phases is discussed in detail. (Contains 1 figure and 20 references.) (Author/AEF)

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Web-Based Instruction: Focus on Learning

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Abstract: The higher education environment is currently being revolutionized by the challenge of on-line course offerings. Many obstacles stand ready to confront those instructors who are faced with the task of utilizing this new instructional environment. The instructional aspects of Web-based learning are often viewed as secondary to the technical issues that require a new set of skills for most instructors. This paper suggests that it is important to apply instructional design to the many aspects of designing and delivering effective web-based instruction.

Introduction

Back in the old days (before 1995) the prime concern among educators was devising a way to get students to interact with the material. Practically every journal or trade publication delved into the problem of instructional design. The articles had various names and approaches, but they surely tackled the problem of increasing student learning. The post 1995 world has embraced the Internet and its more specialized sibling, the intranet, as the instructional delivery system of the future -- and with good reason. The Web provides wide access, with the capability of providing multiple media formats efficiently and effectively. Solutions to the bandwidth problem abound and run the gamut from streaming media to various new hardware to hybrid solutions (Fryer, 1997; Reid, 1997). It seems, though, that as we charge toward more web-based instruction (WBI), we seem intent on solving the technical problems, but have forgotten about the learning problems.

Much of web-based publishing has become the purview of the technician and the content expert. This paper suggests that instructional design needs to be resurrected so that we may focus on learning as opposed accessing vast amounts of information. Instructional design presents a selection of models, each focused in a different way, all intended to enhance learning. Gufstafson (1991) classifies them into classroom, production, and systems models. Classroom models such as Kemp's (Kemp, Morrison, & Ross, 1998) generally focus on a product which is segmented into lessons of specific time intervals. Production models such as Bergman and Moore's interactive video/multimedia model (Bergman & Moore, 1990) focuses on the assembling of a coherent product. Systems models, including the prototype Dick and Carey model (Dick & Carey, 1996) focus on problem solving by a large team over a wide array of content.

For the design of WBI we would suggest a product orientation that is learning sensitive; that is, look toward getting the product on-line, but design for the learner. Simplified, this model includes the phases of analyze, design, develop, disseminate, and evaluate. Similar in design to Hannafin & Peck's model (1988) for design of computer-based instruction, the web-based instructional design model includes the steps analyze, design, develop, disseminate, and evaluate, shown graphically in Figure 1.

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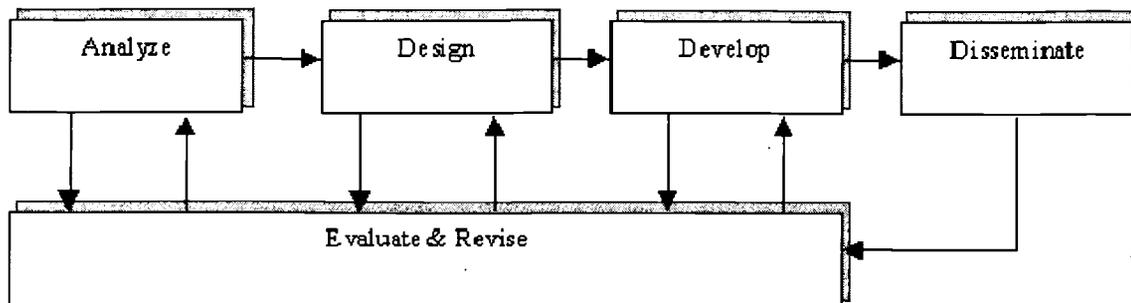


Figure 1: Web-based Instructional Design Model.

Analyze

Production models typically do not focus on needs assessment, but in this case, it may be the most important part of the process. Institutions must resolve the “Why do we want to do this?” issue before moving on and they must come up with some realistic answers to that question before embarking on any design and development program. Individuals must ask personalized versions of the question as well. The answer will drive the institution’s or individual’s approach to responding to many related issues. Possible institutional answers to this key question include:

- To provide more convenient access to education.
- To serve a previously unserved / underserved population.
- To protect the share of the instructional market.
- To expand the share of the instructional market.
- To become a national leader in the web-based instructional market.

Faculty answers may include:

- To provide more convenient access to education for their students.
- To develop personal skills and expertise.

Another important issue is the identification and commitment of resources to the project. WBI, like any multimedia project, requires significant development time. According to Golas (1993) up to 600 hours is required to develop one nominal hour of multimedia instruction with costs being up to \$500,000 per nominal hour of instruction. Additionally, Golas stresses the need for commitment and planning to the project or the project faces increased risk.

Once the faculty and administration identify the need for web-based instruction, the next step is to establish the instructional goal. For most, this involves choosing the content and is a relatively straightforward task - maybe even one that has been predetermined. However, it is essential to understand the impact of the use of web-based instruction as a delivery system as you evaluate the content to be presented.

It is important first, to analyze the learning task to determine the most appropriate means of delivery. An obvious example of inappropriate content would be a course in which the content is primarily psychomotor in nature. The delivery of the content would require an emphasis on motion, most likely through video, which requires increased time and technical skills to convert to a web-based format. Often psychomotor training demands constant and immediate feedback from the instructor. Therefore, not only would the delivery of the content be problematic but also authentic assessment of student performance would be challenging at best. At this fundamental step of the design process, care must be taken not to assume an automatic fit of content to delivery medium. This is a primary concern if an institution is attempting to offer entire programs of study through the Web.

Internet attributes that differ from traditional methods of delivering instruction include level of interactivity and the ability to link both people and content. Success of any technological innovation is usually dependent on a solid match between and appropriate use of the unique attributes of that medium. An initial assessment of the content should identify how the Web will be used. According to Brandt (1997) possibilities include: simple delivery of content similar to an electronic manual, delivery of instruction that is supplemented by other content on the Web, utilizing instruction such as tutorials that already exist on the Web, or some

combination of these. The best use of the advantages of the Web is to maximize the potential for interactivity and linking. Instructors can take advantage of these options by carefully analyzing the content in conjunction with these unique Web elements.

In addition to defining the content, the learner of the WBI must be analyzed. The most important element in the instructional design process is the learner. Dick and Carey (1996) describe the need to determine the learner's attitudes toward the content and the delivery system. The impact of the Internet as a delivery system creates a need to identify specific characteristics that learners need to possess. Web-based instruction includes characteristics that inherently make demands on the learners. This may cause problems, because many times it is almost impossible to define the target audience. Careful analysis of the need for web-based instruction may help to better define the learner. Still, the designer is faced with designing for an ill-defined audience.

One skill that must be taken into consideration is reading ability. While the Internet has the option of incorporating graphics, audio, and video, the primary delivery mode is still printed text. The learner must have the skill to read at the level at which the information is presented and be able to rely heavily on reading as the primary mode of gaining information. For students whose preferred modality of learning is other than reading, WBI might present particular challenges. In traditional classroom instruction, auditory lecture or auditory group discussion augments print information. Audio information in web-based instruction is usually limited and will not simultaneously provide the learner with additional channels of communication.

Web-based learning requires that the end user assume responsibility for control of many aspects of the course. The learner can no longer be a passive recipient of instruction; instead web-based courses require active student participation (Ebersole, 1997). In a traditional classroom, a student might "show up" for class and not actively participate but still be viewed as present. In a web-based course, the student must actively engage in on-line dialogue in order to be an active participant (Harasim, 1996). This dimension might be problematic for those learners who avoid risk-taking behaviors in the traditional classroom environment. However, Harasim points out that the asynchronous nature of bulletin boards, listservs, and e-mail can be a positive attribute that allows learners time to prepare prior to participation in an on-line discussion or activity.

Web-based instruction also requires that the learner be self-directed and possess the initiative to work at a steady pace. The student who is used to arriving in a classroom setting at a particular time, having the instructor structure and guide the learning process, leave class at a particular time, and have assignments due at a set time, will need to adapt to the different organization of web-based instruction (Wulf, 1996). Courses are more flexible and offer students more options. The end user will probably control the pace at which the course is approached and will have more opportunity to select meaningful course content. They can set the pace at which they proceed through the course and can go back and refer to difficult sections. The course content allows the learner the flexibility of moving through the course in different sequences. While that is certain to appeal to many individuals, the reality of this responsibility might be foreign for those who are used to the structure of a traditional classroom environment.

Learners must possess a degree of technical savvy and have access to computers and software capable of supporting on-line technologies. The end users must know how to utilize various aspects of the technologies including navigating on the Web, sending e-mail, and participating in listserv discussions, and bulletin board groups, to name a few. For those learners that possess some technology background, one option might be to engage them in on-line training (Brandt, 1997). However, for the students that lack computer experience, other forms of initial training might be required. Regardless of the learner's technology skills, the instructors of WBI should anticipate some lag time between the beginning of a course and the class participants' readiness to engage in on-line activities (Boettcher, 1997).

Design

Williams and Papprock (1993) made the critical observation that the intent of instruction is to have the learners involved in the learning process rather than merely learning to use or adapting to the technology delivering the instruction. Because web-based instruction has so many variables that differ from traditional instruction, consideration must be given to approaches framing the design of the instruction so that successful learning can occur.

Behaviorism has been central to the system process since the inception of instructional design. More recently, constructivism has been viewed as an essential component of the learning process. Norman (1997) recommends a hybrid approach utilizing both behaviorism and constructivism for designing web-based

instruction. This approach is necessary to provide structure and sequence as well as a meaningful learning environment. Web-based instruction demands that the learner take an active role in the learning process with an increased emphasis on constructing knowledge (Harasim, 1996). As Ebersole observed, "The learner must be actively engaged in the learning rather than merely 'receiving' some message" (1997, p. 21).

Muffoletto (1997) observed the need to design on-line instruction that is student-centered rather than teacher-centered. Parker (1997) recognized that the role of the student is changing from the passive learner to "an active, autonomous developer of personal knowledge" (p.7). This change of focus in responsibilities requires reevaluation of any existing course design. As Parker observed, merely adding material to an existing traditional course will not provide the solution for successful on-line courses. Course design must force involvement and interaction among the students. Parker suggested that student participation should be framed in real-world problems that require higher-level thinking skills.

The design and structure of the course content should be based on the use of terminal and enabling objectives (Bernstein, 1998; Ebersole, 1997). One advantage to WBI is that learners do not have to move through the learning process sequentially. This advantage might be a limitation for content that requires a building of skills or knowledge for the learner to proceed through the instruction. Using terminal and enabling objectives, the designer provides structure and sequences that serve as a road map to guide the learner through essential skills. This approach also provides the learner with a sequence to refer to for the purposes of remediation or enrichment. The use of sequence is also an important consideration for keeping the student focused and on task. The option of having immediate access to unlimited information is a fundamental quality of the Internet, which is not characteristic of any other medium. With the limitless links available on the Web, it could be easy for the student to wander off the intended course of instruction.

Develop

The presentation of the content itself is very important. Initially, the learner must choose to interact with the material. The material must be presented in a logical and motivational manner using a layout that will provide consistent clues and procedures for the learner. For example, the overuse of links can provide the learner with overwhelming options. Because of the dynamic quality of the Web, design options range from linear-sequential to learner directed paths. Attention should be given to the relevance of content that requires the user to link to other sites to insure that the content is essential to the learning. Once the decision has been made that another site contributes to the instruction, it is important to help the user know where they are headed, with clear distinctions between different types of links. Ebersole (1997) suggests identifying links that will take the user to another site and differentiate those links from ones that will link the user with another location within the current site.

Page layout should be approached in a manner that is instructionally sound and at the same time motivational because the learner will be using the Web for a major portion, if not all, of the instruction. With any form of visual instructional media, it is important to follow basic guidelines for visual message design. The primary consideration is to keep each page simple enough for the learner to feel capable of managing the information presented. Each page should be designed with the instructional objective as the main focus considering the most effective manner of presenting the information. Options include text, graphics, animation, audio, and video. These basic media selection decisions have implications throughout the design and development phases because each medium requires additional support which could include: instructional designer, Web master, content researcher, graphic designer, and development and production producer (Boettcher, 1998).

Another design issue is determination of the context in which learning will take place. Learning can either be a solitary experience or it may include group interaction (Wulf, 1996). If there is no need for the learner to interact with others during instruction, communication might be limited to receiving e-mail or downloading information from the Web. However, if learning will be enhanced via group interaction, options include email and listserv discussion groups, bulletin boards, downloading, interactive tutorials, and real-time conferencing (Wulf). Group interaction is further enhanced by web-based instruction because learners have the option of selecting collaboration because of "shared interests rather than shared geography" (Harasim, 1996, p.207).

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Disseminate

The history of the field of instructional technology is filled with examples of new delivery systems that at the time were viewed as a panacea for education. For each, there was a moment in which a large portion of instructional content was being converted for application via that delivery system. Hindsight, of course, has shown that these trends have been short-lived and largely unsuccessful. The primary issue has been the desire to force all content to fit the latest technological innovation. Therefore, any discussion of designing web-based instruction should assess the fundamental consideration of fit.

Online education shares some attributes of traditional classroom education such as the need to identify the course content and to create opportunities for students to experience learning. However, there are many differences from traditional education. The traditional classroom model relies on the instructor delivering and managing all aspects of instruction. Because of the absence of an uninterrupted on-line instructor who can continuously monitor student learning and modify classroom activities, there is a need to evaluate pedagogical issues. Online education actually involves reevaluating the communication model as the primary form of education.

Lyman (1996) suggests that while the Internet is technically identified as a network of networks, the real characteristics of this new form of communication are largely unknown. Communication has been the model in the center of learning symbolized by the sending and receiving of a message through some form of transmission. Harasim (1996) points out "In this model, a body of knowledge external to the learner (such as information in a lecture or textbook) is transmitted to the learner, and the responsibility for optimal transmission is on either the message, the message source, the transmission conduit, or the receiver" (p. 205).

This concept of learning focuses on the transmission of information to a receiver. Certainly, the successful design of WBI relies on the ability to transmit or send the essential information that the learner will need in order to acquire the skills or knowledge required of the content. The challenge for the designer becomes one of facilitating the delivery of the content to maximize the potential of the Internet so that the majority of learners successfully acquire the skills or content.

Evaluate and Revise

This is a critical phase for the WBI development process. It provides designers and developers the opportunity to "fine tune" the instruction, making sure that it is focused in the right direction. We would recommend a modification to what has become a "standard" three-phase model for formative evaluation (Dick & Carey, 1996). The five phases are:

- Design review,
- Expert consultation,
- One-to-one,
- Field trial, and
- Maintenance.

We suggest that formative evaluation be carried out continuously, as is shown by our model in Figure 1. Then each phase is subject to continuing internal review as it is being designed and these changes impact other phases. As those impacts are felt, the designer continuously and iteratively changes affected phases. Expert advice and analysis is critical to good design, therefore they need to be included. Most products are designed by teams and so are made up of individuals with widely ranging talents -- from content expertise (so called subject matter experts or SMEs) to learner specialists to graphic design and others. Each expert will bring his or her own perspective to the design. The source of the expertise may be internal or external to the design team. When experts are available from within the design organization but external to the design team, they would serve as a good source. They tend to provide less bias-- perceived, or actual.

One-to-one evaluation provides the designer a way to test the product with learners similar to the target audience. Using a think aloud protocol, the designer may observe the learner use the instruction noting learner problems and tendencies. This would be a very interactive session. Learners of various types and especially aptitudes should be observed.

Following this, the course could be used in a test market with a limited number of learners to determine how the instruction performs in the instructional environment. Changes in the instruction will be less likely because of the extensive formative evaluation proceeding this phase. Designers should expect,

though, to modify the transmission and distribution system. Finally, maintenance evaluation provides the WBI team an opportunity to continuously update and improve the instruction as feedback from the users and results of assessment instruments show a need for change.

Conclusion

The increased use of the World Wide Web has created a unique environment for offering courses that will undoubtedly continue to become a force in education. The success of the use of this technology relies on the instructional designers' abilities to incorporate the unique attributes of this delivery system and utilize these characteristics in a manner that focuses on successful learning.

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