DESIGNING HYPERMEDIA LEARNING MATERIALS

By Uthman T. Alturki

Teachers’ college – King Saud University

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Abstract

Hypermedia is computer-based applications for consulting multimedia information resources. The access of new information is by clicking on relevant areas such as texts, pictures, and video, animation, and sound fragments. It gives a better concept on how to utilize multimedia resources. Hypermedia implicitly supports how to access information elements and how to crisscross in information space.

This figurative space is typical for the complexity that arises in creating and using hypermedia. Orientation and navigation are the costs that emerge from the desire to interconnect information elements and from the ambition to browse freely between semantic elements that users would normally find at different locations in books, different books, different libraries, and so on. In this paper, I will try to discuss the design of a hypermedia material: theory and practice.

INTRODUCTION

Learning is a continuous process of acquiring knowledge, skills, attitudes, or values, through study, experience, or teaching, that causes a change of behavior that is persistent, measurable, and allows an individual to formulate a new mental construct or revise a prior mental construct.

Often, learning is synonymous with education. Education is the conscious attempt to promote learning in others. The primary function of "teaching" is to create a safe, practical, and productive learning environment. Teaching is managing of the total learning environment to promote, enhance and motivate learning.

Learning environment is the place, which is usually physical, where teaching and learning occurs. The learning environment can have both positive and negative effects on the mentor’s ability to teach and the student’s ability to focus on the learning task. A constructive learning environment puts open powerful resources in student to develop their problem-solving skills (Jonassen 1999), provides spaces for student privacy (Moore, 1986) and encourages the active use of knowledge and skills of the learners (Perkins, 1991).

As the technologies develop, so does the learning environment. And with the development of the hypertext, hypermedia, Multimedia, the Internet and the World Wide Web, a new kind of learning environment developed, such as the Virtual Learning Environment (VLE); Learning Management Systems (LMS); Course Management System (CMS); Managed Learning Environments (MLE); and education via Computer-mediated Communication (CMC) or Online Education.

HYPERMEDIA AND CONSTRUCTIVISM

Many researches found Computer programmed instruction an effective and enjoyable method to motivate and reinforce student learning. Maddux, Johnson, and Willis (1997) say that programmed instruction was more
effective than traditional teaching methods for three reasons: it has immediate knowledge of results; it is an individualized learning; and it is an expert’s instruction. While the behavioral models of computer programmed instruction has some weaknesses for example: information and learning are isolated, content has a linear structure, and lack of flexibility and user-friendliness.

Based on human cognition, the innovative educational computer programs, like hypermedia, are developed on constructivist learning theory. Constructivist models of computer programs have emerged from the work of developmental theorists such as Jerome Bruner, Jean Piaget, and Lev Vygotsky.

The theorists of cognitive constructivist stated that learners construct their own knowledge of the world through assimilation and accommodation, while the theorists of social constructivist placed more emphasis on the social context of learning.

Environmental experience is the key concept in Piaget's cognitive theory and Dewey's learning principles. Piaget's theory has two processes that form the basis of environmental and experiential theories: assimilation and accommodation. Assimilation is the incorporation of new experiences into existing experiences. Meaning, accommodation develops new cognitive structures with the same subject or content with the existing structures. This means, the child's existing cognitive structures are modified and adapted in response to her/his environment.

Meanwhile, according to Dewey (1938), the two learning experiences are situation and interaction. Situation represents experiences of an environment affecting the child, which is similar to Piaget’s assimilation, while interaction is concerned with the current transactions taking place between the person and their environment, which is similar to Piaget’s accommodation.

Based on above theorists, constructivist-learning environments should have the following characteristics:

- It involves learners to construct their own knowledge by connecting previously assimilated knowledge to their new ideas.
- It requires the learners to construct their own meaning, not to repeat others’ meaning.
- It is effort centered rather than ability centered, and denies the notion that learner passively absorbs information that provided by the teacher or textbook.
- It encourages collaborative learning and social interaction among students.
- It puts open powerful resources in student hands to develop their problem-solving skills.

THE HYPERMEDIA-BASED LEARNING THEORIES

The concept of the hypermedia-based learning environment can be examined from three different learning theory’s perspective, and these include Bruner's three-form theory; dual coding theory; and cognitive flexibility theory.

Bruner (1996) posits that individuals can represent the real world in three ways, and these are through forms of action, icons and symbols. Action would include enactment and demonstration. Icons include images and pictures, and symbols include words and numbers. The active form, which is based on stimulus-response theory, is the state of doing. The summary image or a mental picture of a path or pattern is the iconic form. The symbolic form, mainly consists of language, is an abstract form since the word is a disconnection from the
reality it represents. As Bruner had pointed out, it is possible to modify instruction according to the nature of
the subject and to the nature of the learner when instructors lean more heavily toward the abstract, symbolic
form for advanced students. Indeed, the hypermedia tool can create a positive and integrating learning
environment for acquiring knowledge that combines enactment, icons, and symbols.

On the other hand, the dual coding theory, emphasizes that two separate systems can work independently or
together for verbal and imagery processing (Butler & Mautz 1996). It suggests that pictures are easier to
remember than words. Moreover, when information coding in both systems, it is easier to be remembered than
when information coded only in the verbal system. For example, it was found that text materials that are lacking
pictures are more difficult to understand and recall than the same text materials presented with an organizing
image (Burton et al., 1995).

Finally Cognitive flexibility theory, emphasizes the complexity and ill – structure of many knowledge
domains of the real world (Spiro et al., 1991). In general, this theory has the following characteristics: 1) Random access; 2) the major learning activity is a nonlinear exploration of the learning environment; And 3) multiple representations of the content are presented (Maddux et al., 1997).

Cognitive flexibility theory points out those traditional instructional designs, like textbooks, lectures,
computer-based drill, are inadequate for implementation within ill-structured domains because they depend on
organized and linear techniques.

DESIGNING A HYPERMEDIA LEARNING MATERIAL

Designing a hypermedia-based learning material consists of the following phases: Preparation; Development; and Evaluation.

Phase 1: Preparation

Determining the users' characteristics. Learner characteristics are one of the most important factors
affecting the design of hypermedia learning material. Specifically, it is necessary to examine the level of prior
knowledge that the learners have on the subject. If the learner has prior knowledge, it is easier to integrate the
new knowledge into the existing knowledge structure and decide on meaningful learning steps in the
instructional tool. In addition to this, the age and maturity of the users are other important aspects to be
considered.

Identifying the objectives of the units. Before one develops a hypermedia learning material, one should
identify the objectives of the units. In other words, what he learners should ought to achieve after taking these
units.

Conducting content analysis. Content analysis should be conducted and concepts, interrelated concepts,
and procedures should be determined based on the objectives of the units determined. Systematic relationships
between the concepts should be organized. A subject-matter expert should be called to evaluate the semantic
relationships of the concepts determined.

Determining the learning strategies. According to Schunk (1996), meaningful learning involves gaining
ideas, concepts, and principles, and then relating new knowledge to existing knowledge.
This means one should first provide general and simple knowledge, then detailed and specific knowledge. At the beginning of each unit, a short video episode that explains the units overall can be used as advance organizers to help users relate new knowledge to the existing knowledge in their memory.

Identifying the knowledge organization approaches that best suit the learning strategies. One should manage the issues of knowledge organization and linking nodes to each other at this point. One is suggested to use hierarchical links in the material, by first presenting the basic concepts, and then subordinate concepts related to the basic concepts. In addition to this hierarchical links, one should elaborate to explain the concepts from simple to complex and from general to specific.

**Phase 2: Development**

**Concept mapping.** To ascertain interrelations between concepts determined in content analysis, one should construct concept maps of the units. This stage is important because this shows each node and links between the nodes.

**Story-boarding.** Story boarding is the last step before the programming stage. Story boarding involves showing each navigation window on a page. This includes active keys, the names of linked windows, links, text, visuals, video, sound, and graphics of the page.

**Programming.** One can use any hypermedia program available in the market, such as Microsoft FrontPage, an HTML editor

**Phase 3: Evaluation**

After the material is developed, seek an instructional technology specialist, a subject-area expert, and three subject-area teachers for evaluation. Then revise and improved the material according to the feedback received from those experts.

**ADVANTAGES AND DISADVANTAGES OF HYPERMEDIA-BASED LEARNING**

**Advantages**

In the building hypermedia-based learning instruction, four advantages of this learning environment can emerge: 1) multiple perspectives, 2) collaborative learning, 3) learner-orientation, and 4) interdisciplinary learning.

**Multiple perspectives**

Hypermedia-based learning instruction offers multiple linkages and contextual learning environments. Owing to its having multiple perspectives, hypermedia provides an environment that goes beyond the traditional instructional approach rather than settling for a single dimension (Yang, 1996).

From a constructivist point of view, individuals using their experiences as a foundation can construct knowledge personally from internal representations. In this kind of learning activities, knowledge is based on individual constructions that are not tied to any external reality, but rather to the learner's interactions with the external world (Lacy & Wood, 1993).

**Collaborative learning**

Hypermedia learning instruction offers interactive communication and creates a potentially collaborative learning environment. In this system, learners can engage in side-by-side and online discussion, debate,
negotiation. In addition to this, this simultaneously synchronous and asynchronous nature provides a productive environment for group problem-solving activities for the generation and testing of new ideas. Moreover, this feature of the networking process for collaborative learning is a democratic environment where all learners have an equal opportunity to share their views.

**Learner-orientation**

Hypermedia provides a "high learner control" environment. These learner control systems enable learners to make decisions about which paths to follow through instructional materials, the scope and extent of inquiry into different domains and contents that will be followed. In fact, increasing learner control can aid learning by individualizing the instruction and making it more motivating (Steinberg, 1989). The Web system, based on hypermedia and hypertext linking, facilitates student-centered instructional settings and creates a motivating and active learning environment (Backer & Dwyer, 1994).

**Interdisciplinary learning**

The characteristics of hypermedia facilitate interdisciplinary learning through its massive information database, multiplicity, multiple linkages, multiple mixed media, and responsive interactive navigation tools (Yang, 1996). The hypermedia-learning environment, based on non-linear and interactive communication, encourages learners to explore related knowledge and information to promote interdisciplinary learning activities. When hypermedia is integrated with the Internet, this web-based hypermedia system allows all individuals with a browser to transfer files and information from thousands of possible real-life sources to themselves (Gilbert, & Moore, 1998).

**Disadvantages or Limitations**

There are four limitations of hypermedia-based learning, and these are: Learner's background discrepancy, Disorientation, Over-rich information, and Ineffective user-interface.

**Learner's background discrepancy**

Unlike structural computer-assisted instruction (CAI), hypermedia provides loose structure and more interactive learning circumstances. Many users of hypermedia systems have found that they could not take advantages of this medium if they lacked the required computer skills (Oliver et al., 1998). Making learners lacking the necessary basic skills and self-discipline may do better in a traditional delivery mode of learning. Although a hypermedia-learning environment provides a transformable relationship among the learners themselves, their collaborators, their teachers, and the information base, learners' self-regulated skills are still a crucial factor to build a successful implementation and integration of hypermedia learning instruction into the curriculum (Yang, 1996). Before engaging in a hypermedia-learning environment, one should ask what the teacher and the student’s attitudes towards hypermedia.

**Disorientation**

Although the characteristics of hypermedia of providing nonlinear and learner-controlled instructional environment match human metacognitive skills and assist users to understand what needs to be done in a particular situation and to navigate and process information (Reed & Giessler, 1995), one drawback of this structure is the potential for users to become disoriented or "lost" in hyperspace (Heller, 1990).
To avoid losing learners in hyperspace, a potential approach might be developed using the "big picture" at first (Beasley & Waugh, 1996). This means that learners first focus the majority of their attention on the structural aspects of the instructional lesson. Once learners have a grasp of the main structure, then they could be instructed to focus more attention on the details of important concepts and ideas. Another approach would be is to create more user-friendly interfaces to assist learners to control their directions, and this is beginning to happen in the field.

**Over-rich information**

The problem of over-rich information is one of the typical issues with hypermedia instruction in Internet systems. This situation presents users with cognitive overload. Typically, in a hypermedia environment, users are no longer merely consumers of information; they are also expected to create and add their own knowledge to this instructional system. Therefore, the information sources become increasingly varied (Ayerson, & Reed, 1998).

From a sociocultural viewpoint, knowledge cannot be divorced from learners' historical and cultural backgrounds (O'Loughlin, 1992). This means that learning is the interpretation of knowledge by learners, and learning best occurs in the context that it will be used (Leidner & Jarvenpaa, 1995). When information overloading occurs, learners find it more difficult to select and interpret information into their own knowledge. Moreover, they may become frustrated searching endlessly in cyberspace.

**Ineffective user-interface**

User-interface, or the information landscape, refers to the way information is organized and the interface through which the users have access to the information. Today, the problem is not so much in finding information but sifting through the huge amount that is readily available and locating the particular pieces that are of most interest now. Therefore, the quality of user interfaces has a great deal to do with whether a new media program is easy to use and helpful or frustrating and irritating (Maddux et al., 1997).

User interface design is a crucial role in hypermedia systems. Commonly, tools like browsers, search engines, concept maps, guide tours, and metaphors are all user interfaces in hypermedia instruction. Owing to individual differences, educators should pay more attentions in users' attitudes while designing hypermedia-learning environments. An effective user-interface is a key factor to provide users with an ability to arrange the information in nonlinear ways.

**CONCLUSION**

Hypermedia learning environment may help students learn course-related knowledge in several ways. This environment should be used not only for distance learning but also as instructional aid in traditional learning to help students enhance their learning, and provide an interactive rich environment. Still, further studies should be made for the future of hypermedia learning, such as combining it with other type of software. In addition, different cognitive styles might also affect knowledge acquisition and retention in hypermedia learning environments and this should be studied.
BIBLIOGRAPHY:


