

Application of Computer-Based Hypermedia in Distance Education Course Design, Using Elaboration Theory as a Framework

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Abstract

An attempt is made in this paper to establish the application of computer-based technology, specifically hypermedia, in distance education course design using Elaboration Theory (ET) as a framework. The specific area of application in distance education is that of pre-prepared courses. The conclusion of this analysis is that: 1) Hypermedia fits the Elaboration Theory framework especially because it is amenable to presenting information in segments that can be linked. ET's modular design approach and elaborations support the design of hypermedia but go further in that they provide structure. Distance education pre-produced study materials require structure that will keep students focused and interested. 2) The combination of flexibility and structure fit the notion of student control, defined as an opportunity and ability to direct the course of educational activity. 3) Hypermedia has limitations as do other technical media. It can not take the place of the teacher, especially to dialogue through two-way communication.

Introduction

The main defining feature of distance education is the separation of teacher and learner, usually in both time and space [6], [3], [9]. This separation fosters noncontiguous communication (communication that occurs between the learner and teacher from a distance), which has to be mediated. Consequently, mediated communication becomes the second defining feature of distance education [12], [9].

The need for mediated two-way communication to facilitate the educational transaction in distance education has led to innovative and creative ideas for the use of technical media such as CD-ROM, videodisc, audio/video

conferencing, computers, and more recently, the World Wide Web and the Internet.

The availability of and access to a variety of technical media calls for a careful analysis of the technical media to establish what they are capable of doing, how they can be adapted for the unique distance education situation, and also to come to terms with what they can not do. Schieman [10] suggests three areas to consider when deciding on the technology to deliver distance education programs: its delivery characteristics, its presentation, and its control characteristics. Schieman [10] further states that "the rationale for adding new technologies must be a pedagogic one rather than a technological one" (p. 75).

This paper gives an analysis of the application of computer-based hypermedia in distance education course design using Elaboration Theory as a framework. The specific area of application in distance education is that of pre-prepared course materials. There seem to be parallels in distance education, Elaboration Theory, and hypermedia that are very interesting and warrant further investigation. To that end, distance education course design, attributes of hypermedia, and tenets of Elaboration Theory are investigated and their compatibility is established.

Course design in distance education

The separation of students and teachers in space and time has led to two main systems for providing education at a distance. Both systems are mediated by communication media. One system involves the use of technology in a synchronous manner where the teacher and the learner are interacting from a distance but at the same time, e.g. audio/video conferencing, via computer, and telephone conversation. The other system is asynchronous, where the message is "pre-recorded" in print, computer, audio and/or video format for use by learners at a different time from the time and/or place of recording.

Three aspects of course design are discussed: sequencing, course structure and learner control in course materials for distance education.

Sequencing in distance education materials

Sequencing is defined as “logical and appropriate organization of critical concepts in order to best facilitate learning of new materials” [10] (p. 71). Subject matter presentation approaches, moving from the general to the particular or from the particular to the general, have been debated in distance education. According to Holmberg [3], both approaches are applied in distance education even within a single course at times. He further argues that it should be the logical structure of the learning content that should be a deciding factor in addition to didactic and psychological considerations. Another approach is the concentric method where only a part of the difficult material is given at a time for students to master before they can move on to the next part. Holmberg [3] compares this approach to the Elaboration Model of Instruction propounded by C. M. Reigeluth [8].

Modular Course Structure for Distance Education Materials

Structuring pre-prepared distance education course materials involves the division of the subject matter into parts or segments - course units. Students are expected to study one unit at a time before they move on to the next unit. Holmberg [3] explains the rationale for dividing a course into units as follows: “Students should be offered a suitable quantity of learning matter at a time so that they can always survey the material to be learned” (p. 64). For their part, Moore and Kearsley [6] state that the division is necessary to make it easier for the student to fit study into the normal, very active, adult lifestyle (p.109). A number of units on related topics are usually put together to form a module.

Learner control

Distance education is flexible and adaptable in that learners can study anywhere and at anytime. The notion of flexibility and autonomy has been seen to denote independence among distance learners. But for some, like Garrison and Shale [1], the notion of independence in the educational transaction in distance education seems to overshadow two-way communication between the teacher and the student. They state that “the educational process is dependent upon sustained dialogue and negotiation between teacher and student” [1] (p.125). For this reason the concept of “control,” defined as “the opportunity and ability

to direct the course of educational activity,” is deemed more applicable to understanding and planning distance education, than the concept of “independence.” In addition, the concept of learner control unlike that of learner independence, does not preclude the role of two-way communication in the educational transaction, because, as the authors put it, “distance education is more than simply providing a professionally packaged set of materials.” [1], (p.125). It follows therefore that pre-produced distance education materials should provide flexibility that gives or affords learners some degree of control over the educational transaction. The concept of control is related to that of self-directedness which is established in the adult education literature as a key trait of adult students, which most distance learners are.

Hypermedia

“Hypermedia is the integration of a computer and multimedia to produce interactive, nonlinear hyper environments” [4], (p. 219). A hypermedia environment contains combinations of text, graphics, sound, and video. Rezabek and Ragan’s [7] definition of hypermedia notes that 1) “hypermedia must be able to access information easily; 2) hypermedia should provide users with an interactive environment from which all kinds of computerized information can be accessed; 3) users should be able to change hypermedia systems to accommodate their individual cognitive structures” [7], (p. 61).

Considering the potential effectiveness of hypermedia, Hoffman [2] suggests that it requires a macro-level instructional theory. To this end the author suggests that ET is appropriate because it emphasizes relevance to knowledge that is interrelated. Hypermedia provides appropriate links within such content. As Rezabek and Ragan [7], (p. 62) put it, “ET provides the prescriptions that determine the framework for building structures to model knowledge, while hypermedia provides the perfect tool for putting the theory into action.” ET provides the design specifications for the development of the instruction, while hypermedia provides the delivery vehicle for the content

Elaboration Theory (ET)

Elaboration Theory is a macro strategy of instructional design. It focuses on the organization and sequencing of subject matter content. Elaboration Theory’s basic strategies include: organizing structure, within-lessons sequencing, summarizers and synthesizers for each lesson, analogies, cognitive strategy activators, and learner-control format [8]. Summaries of three of the basic strategies of Elaboration Theory that are most pertinent to this discussion are given below.

Organizing Structure (Elaborative Sequence)

ET recommends a simple-to-complex sequence. It uses the zoom lance metaphor, where one starts with a wide-angle view of the object and then progressively zooms in to individual parts that compose the whole. Individual components or sub-parts are studied in detail, yet in relation to the rest of the parts.

The starting point, the wide-angle view, is called the *epitome*. The operational definition by Reigeluth [8] is that to epitomize is to "present a few of the most fundamental and representative ideas at a concrete, application (or skill) level" [8], (p 248). After the epitome, which gives the general overview of the course, subsequent lessons take a part or an aspect of the epitome and elaborate on it, thus providing details. Each elaboration is an extension of what has been presented, but it also gives progressively specific and more complex information on the particular part or sub-part.

Within-lesson sequencing

Sequencing within the lesson follows the overall organizing structure of the course, which is based on the type of content. If content is conceptual, the easiest, most familiar organizing concepts are presented first; if it is procedural, the steps are presented in order of their performance; and if it is theoretical, content moves from the simple to the complex [13], [8].

Learner-control

Learner control constitutes choices made at two levels. At the content level the student may choose to study the content for which she/he has prerequisite knowledge. Secondly, at the level of instructional strategies she/he may choose examples, practice items, and alternative representations in order of preference.

Hypermedia and Elaboration Theory.

How, then, can hypermedia and ET work together to benefit distance learners? This analysis follows Schieman's [10] three points of selecting technology for delivering distance education programs: the delivery characteristics of the medium; its presentation; and its control characteristics. A history course is used to illustrate some aspects of the design.

Delivery Characteristics

How would a distance education course on the Colonial History of Botswana appear if it were designed based on the Elaboration Theory framework and offered through the medium of computer-based hypermedia? The overall structuring of the course will follow the chronological occurrence of events from those that led to the declaration of the Protectorate by the British Crown in 1885; to the events leading to the declaration of independence in 1966. The course will be divided into a number of modules and units such as Pre-colonial, Colonial and Pre-independence periods.

Hypermedia is well suited to the presentation of information in chunks, units or nodes, with connecting links among them [5]. The progressive depth of treatment of ideas by elaborations, of the module on Pre-colonial Period for instance, could move concentrically by links from the overview of the pre-colonial period; to the Scramble for Africa by European powers; to the activities of individual European powers such as Britain, Portugal, and Germany; to the different interest groups in those nations such as missionaries, traders, etc; down to individuals' interests such as those of Cecil John Rhodes, King Leopold II of Portugal, and others. The units or nodes linked, for instance, to activities of groups such as missionaries can be linked to activities of local kings, with details for each group provided separately thereby showing relationships among content sub-topics.

Presentation

Shale and Garrison [1] suggest that the medium for the transmission of information or distribution of content to the distance learner is separate from the medium for negotiating meaning. The medium for distributing content is one-way, learner to content, while the medium for negotiating meaning should have the capacity for two-way communication. A major delivery characteristic for hypermedia is that it is an information-accessing medium that can be used for distributing content to distant learners. For distance education the factor of interactivity is important because the need remains to represent the teacher even from a distance [11]. Distance teachers do more than present content; they also facilitate interactions for the distance learner: with the content, the distance teacher, and other students. Although hypermedia does not inherently provide two-way communication, its flexibility and interactivity contribute to active learning by the users.

Learner Control

In distance education the issue of learner control is critical because students are on their own and this by itself

put demands on the learner that call for them to take responsibility for their study. Learner control is listed as one of the basic strategies of Elaboration Theory and it is linked to the choices that are available to the student. In hypermedia/hypertext, learner control means 1) "greater control over the user's access to the hypertext's content by way of the links provided by the designer; 2) greater control by users because they are free to follow the path-ways of their choice." [5], (p. 628) Hypermedia is ideally suited to learner control. In a distance education course, learner control may involve the student starting the course at different levels, following the outcome of a diagnostic test built into the course. Instead of starting with the unit that gives information on the pre-colonial period which is designated unit one, for instance, the student might start with unit two, the Colonial Period or even at some point within the larger unit. The course could also have supplementary study materials related to some weaknesses identified through the diagnostic test, which the learner might choose to access [3]. This is highly learner-centered and supports the concentric approach to subject matter presentation.

Conclusion

Hypermedia need not be seen as necessarily better than other media, but rather as a convenient way to deliver or distribute content in distance education by putting in place a number of media, pulled together in a way that is most convenient to the learner, following the concept of ET. Hypermedia fits the E T framework especially because it is amenable to presenting information in segments that can be linked, and even go further in that it provides structure. Distance education pre-produced course materials require structure that will keep students focused and interested. All in all, the modular design for hypermedia based on the framework of Elaboration Theory fits the requirements of distance education course design.

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