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EDB 518
Austin, Texas 78712
+1-512-471-4080

Contents — Volume 1

The Study of Reading Strategy of the Adult Learners in the National Open University in Taiwan	12
Ming-Yueh Hwang	
Liberating Criminal Justice Studies with Computers	129
Julienne Salzano	
Programming Strategies Designed to Help Users of Augmentative Communication Devices	132
Donald B. Egolf	
Teaching the Vicissitudes of Linguistic Genderisms via Computer-Mediated Group Discussions	135
Donald B. Egolf, Ellen R. Cohn, John W. Gareis	
What Mix-and-Match did for the Working Woman's Wardrobe, Low-End Technology can do for Your (Distance) Education Program	138
Charlotte Webb Farr, Peter W. Huntoon	
Integrating Microsoft Works into the Curriculum: Using Works to Encourage Critical Thinking	141
John F. Beaver	
Using On-&-Off-Computer Activities from Across the Curriculum to Improve Students' Critical Thinking and Problem Solving Skills	143
John F. Beaver	
Microsoft's Teacher Educator Multimedia Partnership Grants: Providing the Fuel to Launch Technology Infusion Efforts	145
John F. Beaver	
Instructional Design under Media Integration	147
Masuo J. Aiso, Ronald LaPorte, Sanga N. Kazadi, Norry Shimizu	
Rejuvenating and Revitalizing the Flip Chart as Educational Media in Multi-Cultural Education in South Africa	150
E.L. van der Merwe	
A Case Study of Hypermedia Interface Design in Education: The Influence of Visual Literacy to the Interaction with a Non-Linear Universe	153
Paulo Dias	
Partners in Rural Distance Education	156
Michael Speziale, Cheryl Guilford	
Connecting Preservice and Inservice Educators	159
Michael Speziale, Cheryl Guilford	

A CASE STUDY OF HYPERMEDIA INTERFACE DESIGN IN EDUCATION: THE INFLUENCE OF VISUAL LITERACY TO THE INTERACTION WITH A NON LINEAR UNIVERSE.

Paulo Dias*

1. The foundations of hypertext were first proposed by Vannevar Bush in 1945 with a system called *memex*. This system, that was never implemented, was described in theory as a base of information that the user may consult in a non sequential way, by associative links to the information stored in the system. Since then the fundamentals of this new approach have known a huge development.

2. The term hypertext was defined in the sixties by Ted Nelson, and the first projects, Augment and Xanadu, suggest that hypertext was a powerful literary medium, and a multidimensional one at the present. In the beginning, hypertext introduces a deep change in the way we deal with information and consequently with the interface. The notion of interface and the way we interact should be first related with the sequential process that reaches to us from printing techniques. As Lévy (1990:39) says "Hypertext recover and transform the old writing interfaces." The interface is a device that works as a common limit to several communicational agents, (Coutaz, 1990). With the interface we interact with something, an artifact or a book. And printing had quickly developed a normalized interface to its materials that one can find at the newspaper layout or the book one, among others. This is a basic structure with which we are so familiar with that is just intuitive to everyone when opening a book. However we needed to learn how to deal with it specially when looking for something in the dictionary. We needed to have a textual literacy to use the literary interface.

3. Current hypertext interface deals not only with text segments, but also with images and sounds. This is the hypermedia document, which Nielson (1990:5) defines as *multimedia hypertext*.

Interact with this system means to develop a communication process within several dimensions of the hypertext representation. These communicational dimensions are developed by text, graphics, video and sound in the nodes of the hypertext network.

We understand multidimensionality as an approach to the communication process with and mediated by the computer, that is described as a way to represent and think about the world with the system. This approach is based in the non sequential principle of hypertext and its particular capacity to support the context of the communication and involving it in the construction of the meaning within the interaction.

Hypertext is a universe of communication where the context is distributed by the nodes and the links that the user may follow or create during the interaction. This web of interconnected information is the stage for the negotiation of the meaning of the user's interaction. The user need to follow or recreate this contextual hypertext web to define a transitory meaning in order to execute an action or to understand the message.

4. The system provides a surface representation of the enlarged context, which we may find in the hypertext network, and of the reduced one on the

* Instituto de Educação, Universidade do Minho, 4700 Braga, PORTUGAL.
e-mail pdias @ ci.uminho.pt

node. This last surface representation is a minimalist object called button. However the button is more than an interface object, it provides the user with the possibility to interact with the system and create the environment of information as a plastic world designed by him, when he negotiate the meaning of the complexity of the hypertext network.

Traditionally we used to consider the button as a predefined message, and we did not consider that is by the message that we adjust and precise the context that the hypertext system can share with the user like we do in the human communication process. The system message needed to share its hypertext network with the user in order to gain the sense of the interaction.

Direct manipulation paradigm assumes that the object, with which the user interact, is a direct representation of the world system. Brennan (1990) refers that DM will be fine for small worlds, and the button is the proper metaphor to the users interaction task. However, in the hypertext universe, the non linearity is the engine in the development of the complexity of the information network. And that complexity develops towards a non hierarchic design. Attributes as flexibility and distribution at the hypertext network are conditions to the development of the interaction with the user under this design. When the user is interacting with hypertext universe he should be able to go further than the exclusive relation between the object, which is watched as the emergence of the node network, and the concept. The meaning is distributed by the network, and when the user interacts with a button he is starting a relation with a hypertext pattern of representation.

This is a collaborative approach to the development of the interaction by which system and user may generate common representations. By this way the interaction is the collaborative or cooperative process to the construction of the meaning of the button than a reception of that meaning.

5. Interface hypertext objects in general are icon or verbal buttons that open the user pathway through the network of inter-related information. Both categories of visual and verbal objects should be a representation of the task or information to be done or interpreted by the user. Based in the approach that stresses the construction of the meaning during the interaction process we develop an experimental hypertext interface design. We assume that in the hypertext environment clicking at an interface button is a communicational move that implies a negotiation with the context related to it.

To observe this interaction process we create some experimental buttons based in the communicational users moves through the related contextual network. The core of the moves was previously defined to a specific task and we demand to an enlarged population of final users to create visual representations for that network of information based in their visual knowledge.

Visual literacy is a focal basis to define the final icon button and also to evaluate the influence of the invisible contextual information related to that button. We stress that context was previously explored by the user to define the visual representation of the button and its meaning. We also assume that they have previously negotiated the meaning to the icon to be used in the document to a specific task, providing by this proceeding a collection of interface objects.

According to this protocol we have prepared an experimental document to observe how students aged ten to twelve develop the interaction within an hypermedia environment where have been applied two different typologies of interface buttons.

The first one was developed with the icons created by the population of final users and the second one was based in the standard icon and verbal button that are provided with the application.

The goal of the interaction with the hypermedia content in this document was to search for requested information. This task implies that students are able to understand the message of the button through the related contextual information.

6. To the experimental proceeding was selected an aleatory sample from the population that was involved in the development of the icons. This sample was divided in two groups (A and B) working the first one with the users based icon prototype and the second with the standard buttons.

We are interested in seeing how this sample of users develops the interaction with the two type of interface objects to execute the task. A test was applied to the sample in two moments of the experimental session: i) before the session as a pre test ; and, ii) during the session.

6.1 The group (A) working with the users based icon prototype evidence the best performance as we see in table 1. The interval between pre-test and test indicates de degree of familiarity with the information and task execution.

	Correct answers %	
	Pre-test	Test
A	11.0	92.0
B	13.5	76.5

Table 1

6.2 The correct answers performance between groups A and B to the test was evaluated with t-test and there is evidence to conclude that the interaction with the users based visual interface objects is significantly different from the interaction with the standard interface buttons (to $P < 0.05$). It is also significative the difference between the number of buttons used to search for information in both groups. Analysing it we observe that group A evidences a best oriented performance when looking for information. The control group has developed more effort to have access to the correct pattern representation in the hypermedia network to the same task perform.

7. We have a concise description of the influence of users based visual interface objects in the interaction process oriented to the development of a hypermedia document. We have observed as visual knowledge from the interface icons starts out as a contextual knowledge in the hypertext network of the document when users are asked to search for information.

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References:

- Lévy, P. (1990). *Les Technologies de l'Intelligence*. Paris: La Découverte.
- Brennan, S. (1990). Conversation as Direct Manipulation: An Iconoclast View. In Laurel, B. (Ed.) *The Art of Human-Computer Interface Design*. Reading, MA.: Addison-Wesley Publishing Company.
- Coutaz, J. (1990). *Interfaces Homme-Ordinateur*. Paris: Dunod
- Nielson, J. (1990). *Hypertext and Hypermedia*. San Diego, London: Academic Press