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4. Multimedia Learning Projects: Applications

Interactive Learning Using a Videodisc Connected to a Computer Review of Seven Prototypes <i>Philippe Marton</i>	176
Discussions on Two Multimedia R & D Projects: The Palenque Project and the Interactive Video Project of the Museum Education Consortium <i>Kathleen S. Wilson</i>	186
Some Techno-Human Factors in Interactive Video Based Language Learning <i>François Marchessou</i>	197
Audiovisual, Spoken and Written Languages: An Interacting Trilogy for the Teaching of Foreign Languages in an Interactive Multimedia System <i>Martine Vidal</i>	204
Interactive Language Learning: A Multimedia Approach in Chile <i>Max S. Echeverría</i>	212
The Technological Text: Hypertextual, Hypermedial and Didactic Applications <i>Luciano Galliani</i>	222
The Training of Primary and Secondary School Teachers in Hypertext: Analysis of an Experience <i>Altamiro B. Machado and Paulo Dias</i>	226
Training Drivers to Detect Visual Indicators or The Trials and Tribulations of the Uninitiated in Interactive Video <i>Maurice Fleury and Jacques Rhéaume</i>	230
Learner Control Versus Computer Control in a Professional Training Context <i>Christian Depover and Jean-Jacques Quintin</i>	234
Author Index	248
Subject Index	249

The Training of Primary and Secondary School Teachers in Hypertext: Analysis of an Experience

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Introduction

The experience in the training of primary and secondary school teachers hypertext to use under the framework of Project Minerva is focused. Some comments on the nature of hypertext technology and in its application to the development of instructional courseware are made. The results obtained by teachers without any programming experience are described. Having in consideration the problems detected, an alternative course structure is proposed.

1. The Role of Project Minerva in the Introduction of New Information Technologies in Education in Portugal

The introduction of New Information Technologies (NIT) in primary and secondary schools in Portugal has had a substantial development since the setting up in 1985 by the Minister of Education of an official programme - Project Minerva. This programme presents several innovative characteristics and has been pointed out as a model for the introduction of NIT by international organizations such as OCDE, the European Community and UNESCO.

One of the most praised innovations of this programme has been the fact that universities and colleges of education were commissioned to implement it. Several consequences resulted from this decision, the most dramatic being the nature of the efforts made in Portugal in teachers training in NIT.

In several centres and colleges of education in Portugal this training has emphasized the educational uses of commonly available software such as wordprocessors, databases, spreadsheets, desktop publishing programmes, etc. This approach, although recently validated by the fact of being also adopted as the main strategy in the use of NIT in the new curricula resulting from the 1988 Education Reform in the United Kingdom, has deep educational foundations in the need to introduce innovation in schools in all sorts of ways.

However, the need for more educational specific tools has been present for a number of years. A variety of so-called second generation tools with a large potential use in education, such

have been tested.

2. Instructional Design and Hypertext Technology

One of the most popular of the second generation tools has been hypertext. Hypertext supports an educational environment radically different from traditional CAL. With an hypertext educational environment the user can explore and interact with knowledge in a non-linear and interactive way using several representational systems such as text, graphics, video, sound, voice and animation.

Knowledge is not just a collection of facts. Hypertext excellence in multi-representational data processing plus the autonomy that it gives the learner to grasp and restructure its contents makes hypertext an excellent instructional tool oriented to the active learning process whereby the learner discovers and restructures the information links in an interactive way.

Hypertext educational environments have already proved being excellent tools to promote meaningful learning. With hypertext the learner tends to interiorise information by means of a complex cognitive activity of interconnecting knowledge and ideas, building new links in the pre-existing information network and restructuring it.

However, the large freedom hypertext allows in the structuring and use of information is sometimes perceived as a source of difficulties in the design of hypertext products by school teachers used to a linear school curriculum design.

3. The Initial Courses in Hypertext

An extensive programme of training courses in hypertext has been offered to teachers in the framework of Project Minerva using both HyperCard for Macintosh computers and Guide for IBM compatibles.

The aim of these courses is to introduce teachers to the design of interactive instructional educational strategies using hypertext technology and to the development of courseware applications. The programme was developed for teachers with no computing programming expertise and its contents were:

- i) the fundamentals of hypertext technology;
 - ii) contents organization in HyperCard;
 - iii) Interfacing techniques in HyperCard;
 - iv) stack design; and
 - v) HyperTalk commands.
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This expertise has however shown two classes of problems. One relates to the quality of the products - HyperCard Stacks - developed by teachers in the three month period following the course.

The other problem relates to the enormous difficulties that teachers without previous programming experience face when dealing with a programming language such as HyperTalk.

A more thorough analysis of these problems reveals that an average school teacher after following these courses:

- had an extreme difficulty to organize information in a hypertext educational environment,
- had no full understanding of the need of a carefully planned specification phase in the development of life cycle of hypertext products,
- found great problems in handling, at an application level, a programming language such as HyperTalk.

Taking into accounting these considerations, alternative approaches to the teaching of hypertext to school teachers have been formulated.

4. An Alternative Approach

Different alternative approaches have been considered to restructure this training course. An active approach has been selected to encourage initially an intuitive discovery learning process.

The training course comprises two parts. The first one is a three days long and is intended to give an overall view of hypertext technology supported by HyperCard.

The second one is taught after several weeks of interval and has a normal duration of five days.

In the first part of the course a presentation of HyperCard is made by the lecturer. Then, students are encouraged to explore in an unstructured way and as extensively as possible several stacks, finding linear and non-linear access to the information and modeling the intuitive meaning of the contents links.

Finally, an analysis of the stacks guided by the lecturer is made.

The approach used in this part is based in the same educational principles of the teaching of reading skills using a global strategy.

No mention of the nature and syntax of the instructions of HyperTalk is made in this first part of the course.

In the second period of the course a different approach is used. In this part an emphasis is made to the introduction of concepts that teachers must manipulate when specifying and developing an hypertext product.

The structure of the second part of the course comprises:

- a) a theoretical phase with:
 - an introduction to the specification of information systems using concepts from the theory of relational data bases such as data normalization and entity-relationships diagrams;
 - an introduction to software development methodologies using concepts such as software life cycle and documentation using several types of graphics, etc...;
 - an introduction to the basic concepts used in object oriented programming languages;
- b) a description of HyperTalk in a formal way;
- c) the development of a project from scratch using the concepts introduced in the previous phases.

5. Conclusions

The analysis of the products developed by teachers in the three months period following the completion of the course has shown a dramatic improvement when compared with the previous course structure.

Changing the instructional paradigm from a formal one in the first course to the global one in the second course has provided a more effective awareness of hypertext technology and significant improvement in the design of instructional HyperCard stacks. We have, however, arrived to this conclusion in an informal way.

Next July a MSc. student will begin looking at this problem in a more rigorous way. Special care will be put in the specification of several different course structures.