Improving Teaching Materials: The Structuring of Learning, the Interrelationship of Information and the Search for Higher Levels Of Interactivity

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Introduction

The Contemporary History Department s experiment in teaching innovation arose from the desire to introduce changes in university teaching which would raise the quality of teaching, improve lecturers' teaching styles, and favour student learning. We agreed with the claim, published elsewhere,that traditional procedures still persist in the university setting.

The evaluation that we performed at the end of the first phase of the experiment allowed us to draw a series of conclusions which on the one hand endorsed the usefulness of continuing with our policy of introducing changes in the traditional system of teaching, and on the other obliged us to rethink some of the assumptions we had made in our initial approach.

Among the "successes" of our project was the fact that most of the students who took part in the experiment concurred in questioning the prevailing system. They were critical of a number of features of university teaching: the fact that learning was almost exclusively centred around the teacher; that the students role was essentially passive; that information was acquired by attending lectures; that certain set books were compulsory; and that their work was assessed almost exclusively by way of exercises set at the end of the course.

Practically all argued that this system required them to memorise large amounts of information, in many cases without having a clear understanding of the meaning of the material. This point is illustrated by a number of comments in the students answers to the questionnaire administered at the end of the academic year 1993–1994.

> "The usual system of teaching is centred on the transmission of knowledge and the assessment of the extent to which the information transmitted has been assimilated. So, on many occasions, the attitude of the student towards the discourse will depend on the lecturer's skills as a speaker; the student tends to be a passive receiver of knowledge. Mid–course and final exams (where one demonstrates one's ability to memorise

information) and a project (hardly ever original research) are the systems of assessment."
(reply from I.García Torrado)

"The student must memorise the information, must have a good capacity for expressing
his/her knowledge and must memorise the knowledge when the time comes to do the
exam. The lecturer is more highly valued than the student and there is no chance of
communication; there is no recognition of the effort made throughout the course; there is
no evaluation of the student as an historian; what is assessed are writing skills and the
ability to reproduce material parrot fashion. (reply from E.Valle Rebollo)

"... I've spent much more time on this subject in general than I've dedicated to other
subjects. I do not think the time has been wasted, because through this experience, I've
been able to find out about a new system of learning. Considering I'm in the fifth year, it
was about time that someone realised that the so−called traditional system of education
was of little use, since you restrict yourself to simply "recording" information and later,
in an exam, transmitting the information that you've been given by your teacher." (reply
from E.Roca i Boter)

Consequently, the desire for a change in the role of the teaching staff from the mere transmission of
information to a more dynamic role in orienting students towards learning was made clear in the
majority of students' opinions. This confirmed to us that the process we had started was headed in the
right direction.

However, as we stated above, the evaluation of the results we received from the first few years of
application of teaching innovation led us to rethink the initial focus as well. The results encouraged us to
modify our teaching model, to diversify the computer resources that supported the experiment, to attempt
a more thorough exploration of the possibilities that hypertext offers for the study of historic processes.
This would lead to improvements in the design of the CD−ROMs with the aim of achieving higher levels
of interrelation between the information contained in the hypertexts and a better interaction between the
user and the CD−ROM.

The Department's research strategy, its objectives, the changes we have introduced over time, and the
CD−ROM which we will analyse in this study have already been described in other publications. Here,
we will limit ourselves to analysing the shape that the improvements have taken in our CD−ROM based
on the events of the French Revolution.

The Teaching Model

The review of the model that underpinned our teaching activity helped us to outline the objectives that we
wanted to achieve with our activities. In order to highlight the changes we introduced in our CD−ROM,
we will explain these objectives in broad terms.

For a long time, and by and large even today, the traditional teaching model has been orientated towards
the transmission and acquisition of knowledge. The student is, in this sense, a passive subject whose role
is limited to reproducing the ideas of the teacher. We do not reject this system out of hand. However, we
think that teachers should not reproduce the bad habits inherent in this model when teaching history with
the help of multimedia tools,. Instead, they should try to take maximum advantage of the enormous
potential of these resources, in order:

− To emphasise the central role of the student and obtain maximum interactivity between

the product and the user.

– To act as a guide for the students in their exploration of the knowledge in the field that they are studying.

– To equip students with the skills which will allow them to continue learning by themselves.

– To introduce students to a particular way of thinking, one which sets the basis for soning; therefore, one should not limit oneself to describing facts. Learning is not simply about attaining a result, but is an integrated process of a combination of activities. The way in which students approach the subject and the way in which they handle the knowledge they gain are as important as the knowledge finally acquired.

– To try to put the knowledge into context. Learning has to be placed in the terrain of its objective. In short, students have to be able to apply the concepts and the methodological guidelines that they are taught.

The philosophy of this teaching model inspired the conception and design of the French Revolution CD–ROM. The ways of accessing the information and the pathways are clearly open, especially the thematic pathways, the feedback keys and the questions as well as the functions of the "intelligent" tutorial.

Some Thoughts on Hypertext as a Teaching Tool

It is not our intention here to comment on the irrefutable advantages which hypertext presents as a teaching tool, as more authoritative voices than ours have already done this.For us, hypertext can be a very powerful medium in the hands of an historian in order to structure, present, analyse, explore and help interpret historical reality, for the following reasons:

– One of the functions of an historian is to capture and establish the logic of historical situations. One of the most interesting properties of writing in hypertext is that it expresses and demonstrates in a particularly forceful way the logical relationships that exist between ideas, concepts and information. Both research and historical explanations can derive enormous benefits from hypertextual logic.

– Given that it makes the structure of the knowledge and the organisation of the information totally explicit and easily accessible, it obliges the user to organise knowledge in a rigorous and coherent way. In order to achieve a better level of interactivity, in order to facilitate the analysis of information by means of different pathways, it is essential that whoever uses this resource introduces a higher level of coherence into the structuring of the information, and that s/he should explain the basis of her/his thinking.The comprehension of the content by the students will be directly related to the degree of coherence that the teacher has attained.

– It is an excellent means of storing information, and a good system for retrieving information.

– Hypertext is extraordinarily flexible. The user can control it with relative ease, which makes personalised teaching possible. It is the reader who decides the level of depth s/he wants to go into. Each student navigates through the information to be covered but s/he can do it by different means, according to her/his capabilities and interests. What is more,

the user is in a position to handle the information beyond the limits set by the person who has structured the hypertext. Notes can be made and left at the information nodes. This allows students to describe their own ideas in relation to certain items selected from the database. It gives the option of establishing one's own links between different fragments of information and to create one's own pathways.

In spite of its unquestionable advantages as an educational medium capable of allowing students to develop their comprehension and learning, hypertext also presents many problems and limitations. In this case also the observations of the specialists in educational technology are in agreement with some of the conclusions we drew after the evaluation of the results obtained using this tool. We will highlight the points which we consider the most interesting :

– The hypertextual form of information retrieval is not interactive in itself because it does not come with any type of feedback following on from the user's actions. The existing information in the system does not change as a consequence of the user's actions. It only changes if the user modifies the system itself by altering the information it contains or of the links it includes.

– It undermines the structure of the "texts" and can reduce the knowledge to fragments of information.

– Hypertext is based on associated links of fragments of information and for this very reason it is unacceptable as a single medium for obtaining complete academic knowledge. The relationships between the fragments of information are never exclusively associated. The majority of the ideas we work with in teaching are much more complex than those that can be expressed in an associative network.

– The development of a network makes it more explicit, but does not make it more comprehensible. Students have to make a huge effort to take in its structure and to interpret its significance.

– What should interest the teacher is not so much the student's task of finding the information but the use s/he makes of it, that is, the transformation of this information into learning.

In short, in the words of D. Laurillard, "It is easy to understand the academic taste for the idea of hypertext but, up to what point is it suitable for students?"

These reflections on the teaching model on which our experiment was based, and on hypertext as a teaching tool, presented us with the opportunity to introduce significant changes to the design of the materials we were using. The objective was to improve on the level of transmission of information and develop some guiding materials which were truly interactive and which would open up possibilities for exploration on the part of the users. In short, we were trying to:

1) improve the possibilities that hypertext offers for the study of historical processes.

2) expand the interrelationship of the information contained in the hypertexts.

3) enhance the interactivity between the product and the user.

The Improvement of the Teaching Materials

The French Revolution CD–ROM is the result of these reflections. As we said, it seeks to achieve higher levels of interrelationship between the information contained in the hypertexts and interactivity between user and the CD–ROM; to equip the students with the skills which would allow them to study the subjects; and, lastly, to introduce the students to historical reasoning.

One way to achieve these objectives was to incorporate a system of intelligent tutors into our product. As we already knew, one of the reasons for the development of this type of computer systems was the conviction of a part of the teaching community that certain learning tasks could be entrusted to the area of information technology. Given their potential for responding to the expectations created, their full incorporation into the teaching activity would be justified.

A tutor is a programme which constantly follows a cycle consisting of the following phases: a) presentation of content, b) evaluation of the student, c) reparation. Starting from a set of objectives, pedagogical methods and content, the tutor presents this content, follows the progress of the student, and modifies the progression and the presentation of the information depending on the level of assimilation.

The design of systems experts and the accomplishment of the tasks described above present significant difficulties when applied to areas of knowledge that are difficult to define. In the field of history, these programmes are still in embryonic form, more a promise than a reality.

To a certain extent, our efforts in this direction have been disappointing. It goes without saying that the tutor we have produced is not very "intelligent". It limits itself to acting as a guide to the user; it can interpret whether a student does not know how to study the subject or detect an interest on the part of the student in a certain thematic area of the CD–ROM.

Although we had intended to include these functions as areas of interaction between the tutor and the user, the capacity for interaction is, in the present version, fairly poor. It is our intention to make the tutor more sophisticated, and are working on increasing the actions it is capable of carrying out, including:

1) Selecting the fragments of information on the CD–ROM which the user has not consulted, although they formed a part of the dimension s/he had shown interest in.

2) Complementing the information with that found in databases in servers controlled by the tutor. This function requires the CD–ROM to have a connection to the Internet.

3) Showing links based on previous pathways.

4) Integrating the interactive multimedia tutorial, which has already been in operation for many years, into the tutor function. This will allow for a more in–depth assessment of the student, in the analysis of the errors s/he makes, and ultimately in the "intelligent" answer of the tutor.

Our assessment of the results we obtained is not negative overall. We think that they make a significant contribution to improving the levels of interactivity that the CD–ROM makes possible. In addition, the extraordinary complexity of historical reasoning is now clear to us, and we have been forced to reflect on our work as historians, which has led to a greater need for analysis and criticism. Secondly, we have had to rethink our teaching role: the analysis of our objectives, the teaching strategies, and the selection and structuring of information. In short, the research which initially started with strictly pedagogical preoccupations (improving the quality of teaching) has now been diverted towards epistemological concerns.

The Thematic Pathways, Aid to the "Intelligent" Tutor

This section attempts to explain in more depth one of the aspects we consider to be the most interesting part of the French Revolution CD, the so–called thematic pathways, the key part of its architecture and of the operation of the "intelligent" tutor. To do so in an ordered way which facilitates both understanding as well as criticism, we will organise our description around five points:

1) What are the thematic pathways?

2) What is interesting about them?

3) How have we developed them?

4) How were they integrated into the architecture of the CD?

5) What are their limitations?

What Are the Thematic Pathways?

Each thematic pathway is an analytical framework referring to one concrete aspect of the process being studied. In this case, history, and therefore individual actors, social groups and structural elements are presented   made up by way of hypertext links to different pieces of information on the CD. The pathways have been conceived as tools to further understanding of the process under study but also to make clear the complexity of the operations that are involved in the creation of a discourse, stimulating critical reflection on these type of exercises. In this way, underlying the thematic pathways is a conduct which reflects three fundamental aspects:

1) To achieve a coherent interrelation of pieces of information which, when explained sequentially, appear separately.

2) To structure the discourse, since the thematic pathway as a whole follows a line of argument.

3) To highlight the autonomy of decisions, albeit within a limited framework, at three levels of the creation of discourse. First, choosing the subjects from those we are provided with in the pathway; second, establishing how we structure the discourse; third, deciding what to include.

What Is Interesting About Them?

The answer to this question is the same as to the question of why this type of resource was incorporated. It lies in showing how, starting from a set of coherent, apparently self–contained information (as synthetic approaches usually do), alternative pathways can arise. These pathways are characterised by their transversal nature and enjoy a relative independence; they delineate the field of play. We can say, therefore, that there is a double objective:

Epistemological: we face a new process of creation of knowledge which implies interrelationships, coherence, autonomy of decisions, and the beginning of discourse.

Pedagogical: showing clearly that the nucleus of information can be viewed from different perspectives, with different interests, with different intentions, which permits the analysis and criticism of itself and invites reflection and creation beyond the acquisition of erudite knowledge.

That is to say, the point is to question not only the actual content of learning but also the very process of creation of what must be learnt.

How Have We Developed Them?

The design of these thematic pathways up to their definitive version presented a number of difficulties. We feel that explaining them may help to guide other groups who find themselves in the situation of developing a product with these characteristics, so we will try to summarise the process of development, putting special emphasis on the key decisions taken. The process underwent two major phases:

I) In the first phase there were three key decisions, the first of which was to agree on the central subjects of the thematic pathways: in our case there were 13:

A) The king

B) The clergy

C) The nobility

D) The lower class

E) The bourgeoisie

F) The peasants

G) The world of the urban populace

H) The counterrevolution

I) Culture and revolution

J) Women and revolution

K) The economy and revolution

L) War and revolution

M) The Jacobeans

The second decision was how to break these down into a set of key concepts which were analytically significant; the third was to determine this set of words. To give a concrete example, to develop the pathway "the clergy" the set of terms was the following:

The Anti−clergy movement, Atheism, National Properties, Cahiers de doléances, Catholicism, Chancery, Concordat, the Civil Constitution of the clergy, Counterrevolution, Christianity, Worship, Tithes, De−christianisation, economy (participation in the economic life), Emigration, Education, Social Classes, General States, Feudal, Judicial constitution, La Vendée, Order, The Pope, the First State, Privileges,

Refractary, Religion, Nobility.

The main problem that arose in our evaluation of the results of this area of work was that the pathways were very long and appeared to be totally unstructured. One obtains a wealth of information that is very difficult to follow or to give meaning to, which impedes, rather than aids, the assimilation of the objectives we had put forward.

II) The second phase started with the review of these unsatisfactory results. We began with the belief that we had a good tool in our hands, but that it needed refining to achieve maximum performance. So the first step was to revise the informational content of the different pieces which appear together in the pathway obtained through the key words. The second was to try to regroup them, establishing an organigram. Thus the explanatory structure arose, which we have called analytical breakdown of the pathway. We then started a process of restructuring and revision of the hypertext in its set, which involved a fourth decision when the time came to provide the pathways with a definitive structure. An explanatory diagram had to be established to direct navigation, provided with an organigram of sub−pathways and a floating window which would indicate the situation at any given moment. To continue with the example of the clergy, the final result after this set of revisions was the following:

B) THE CLERGY

B.1 The clergy and the society of the Ancien Régime

The class society and the socio−economic framework

A divided class

Sources of wealth

Privileges

Duties

Women and the Church

The clergy and the crisis of the Ancien Régime

B.2 The clergy throughout the revolutionary process

1789: the outbreak of revolution

The restricted monarchy

General overview

The constituent assembly

The legislative assembly

Revolutionary government and terror

General overview

The Girondins convention and its collapse

The dictatorship of the committee for public salvation

Thermidor

The Republic

General overview

The First Republic

The Second Republic

The Third Republic

B.3.Consequences of the revolution

At that moment we introduced a new idea. To analyse the new pathway, it might be interesting to compare the above breakdown with the later result:

A) THE KING

A.1 The absolute monarchy in France.

The socio–economic framework of the 18th century

The limits of royal power

Royal administration

Ideological framework

The crisis of the Ancien Régime

A.2 The monarchy and the revolution

1. The outbreak of revolution and the end of absolutism

2. The restricted monarchy

– General overview

– The constituent assembly

– The legislative assembly

3. The Republic, monarchism and counterrevolution

The revolutionary government and terror

General overview

The Girondins convention and its collapse

The dictatorship of the committee for public salvation

Thermidor.

The Republic

General overview

The First Republic

The Second Republic

The Third Republic

A.3 Consequences of the revolution

As quickly becomes apparent, the two present very similar analytical breakdowns almost identical in fact, apart from the introduction of some specific details related to each subject. Underlying this coincidence there is more than a purely explanatory formality: if we go into the pathway in more depth we can appreciate how a whole series of fragments of information appear not just in one or two pathways but in practically all of them. This explains why, for the designers, these pieces constitute the principal nodes of information, those which must be visited to obtain a correct analysis of whatever subject we want to study at any given time. To establish the nodes is the fifth of the decisions which we referred to previously.

As a recapitulation of what we have noted so far, the decisions we have been discussing throughout the explanation of the design process of the thematic pathways are:

1) The choice of the subjects

2) The choice of media used to provide them with content

3) The choice of specific tools which shaped the content

4) The choice of type of presentation of the pathways

5) The choice of principal nodes of information which will form the strong points of the hypertextual network which unite the pathways

How Were they Integrated into the Architecture of the CD?

In this section we will describe the two means of access to the thematic pathways, which show some of the general pedagogical principles which are behind the spirit of the project.

If we observe the initial screen and the menu from which interaction with the CD commences, we see how the thematic pathways do not figure as one of the main entry points. Instead, combined with other resources questions explanatory keys they are located in the framework of the toolbar. Put briefly, it is a tool which, to be used to its full advantage, requires (on the part of the user) a certain level of knowledge of the general theme of this CD.

This approach is reinforced when the second mechanism to enter the pathways appears, the intelligent

tutor. When activated, it guides the user towards one of the pathways. After a period of interaction with the user, it detects a specific interest in one of the subject matters, which are organised transversally. What does this mean, theoretically? After a period of exploration of the product, the user has directed herself/himself systematically to the search for a type of well–defined information. With this as our starting point, we seek on the one hand to facilitate the search and on the other hand, to complicate it, given that we oblige the student to critically review the information which we have grouped together in the pathway.

In short, we want to highlight that this resource is designed for those who now consider themselves sufficiently mature enough to study the subject in depth. And not only from a point of view that is subject–specific, but also in the study of the epistemological processes which have led to its appearance in a specific form of discourse.

What Are their Limits?

To conclude, we will outline some of the limitations which became evident in our plan for subject pathways. With this exercise in self–criticism, we aim to initiate a fruitful interchange of ideas with all those who feel interested in the incorporation of resources similar to our own, in order to encourage better future projects. So, very briefly, we will introduce three critical considerations on the technical, epistemological and pedagogical aspects of the thematic pathways, which form the backbone of the information about the French revolutionary process, as we have structured it in the CD.

I) as far as technical aspects are concerned, we note that perhaps the floating windows guiding each of the sub pathways were not sufficiently integrated with the rest of the screen. Another problem was that it was impossible to maintain the structure of the breakdown as it moved forward through the thematic pathways. A final problem was the unavailability of information about the number of screens that make up the complete pathway.

II) At the epistemological level, we would highlight two major points of controversy which are in fact closely related. The first is that the process of decision making in the design is totally arbitrary, restricted by the epistemological conditioning of the designers. This means that everything could have been designed in another way. The second refers to the associations that are made in the pathways now that they are totally interrelated. This leads to a criticism that appears to be inherent in hypertextual approaches as a whole. How can this be overcome? This is for us the biggest deficiency that we encountered. Only a clear, explicit description of the epistemological assumptions of the designers, setting out clearly the precise intentions behind the relationships (contextual, processional, causal, etc.) would allow the limits of the mere interrelation to be overcome.

III) Finally, regarding pedagogical aspects, the first problem presented by the pathways derives from the above situation. The weight of the view of the designers appears to impose on the users, closing more doors than it opens, thus undermining, in part, the general philosophy of the enterprise.

Can these limitations be overcome using the product in its present state? Here we want to concentrate on the deficiencies which we consider to be the most serious, those of an epistemological and pedagogical nature. The epistemological problems cannot be resolved. Only the explicit response of the designers to questions regarding this aspect can help to allay this inconvenience. As for the pedagogical problems, we can be moderately optimistic, given that the CD already possesses sufficient resources to overcome the apparent straightjacket of the designers. In this regard, the possibilities offered by the personal bookmarks and the note pad are considerable. It will be necessary for the teaching staff to use them themselves to find out how to extract the maximum benefit.

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