Design of pedagogical material with hyperdocuments technologies

Ana Marli Bulegon¹, Carlos Emílio Padilla Severo², Eunice Maria Musso³, Maria Lucia Pozzatti Flores⁴, José Valdeni de Lima⁵

¹ PGIE/CINTED/UFRGS, Brasil, anabulegon@gmail.com
² PGIE/CINTED/UFRGS, Brasil, emilio.severo@gmail.com
³ PGIE/CINTED/UFRGS, Brasil, emmussoi@yahoo.com.br
⁴ PGIE/CINTED/UFRGS, Brasil, milflores@terra.com.br
⁵ PGIE/CINTED/UFRGS, Brasil, valdeni@inf.ufrgs.br

Abstract: In this paper we present a design of educational hyperdocument where the concept model, a navigational model and layout are focused. This way, the navigational route concept once this is directly linked with the aim of learning. Do a comparison of the navigational context of a hyperdocument to the pedagogical working method. Finally, it shows the set up of a project of a hyperdocument which has didactic goals and is used as support for the learning process about the great navigations: “The way to India”. Making a hyperdocument, pedagogically aimed, means create and develop ways that make the student interact actively with the technology, to achieve the objective which is to generate higher learning.

Keywords: Digital-pedagogical material, design of hyperdocuments.

1. Introduction

The segmentation of virtual courses in parts is the most common approach adopted in the researches in educational technology. The educational resources should be digital, small and reusable, so that actually might be an educational resource. To make up a digital material that really plays its pedagogical role it must be taken into account some stages of it, stages that start in the theme elaboration and end up in choosing the suitable tool to write it.

A digital pedagogical material can be the only activity or a group of strategies and activities elaborated to promote the learning of a theme of conceptual content. The digital pedagogical materials are made in several ways of conceptual presentations like texts, images, cartoons, simulations and these make the student’s understanding and exploration something easy. A hyperdocument, according to its objective, might be a digital pedagogical material.
The purpose of this paper is the study of the theory and application of a hyper-document. Also, it aims to make a comparison of this material and the planning of a class. This way, it is organized in: 1. Hyperdocuments – it defines and reports the characteristics of a hyper-document, example of a digital pedagogical material. 2. Sorts of itineraries used in making a digital pedagogical material. 3. Didactic-Pedagogical Architecture – it highlights the planning of a class. 4. Application – it describes an example of making the project of a hyper-document. 5. Results and discussions – it makes an approach about the relation of choosing the structure of access and navigation of a hyper-document. It relates the making of a digital pedagogical material and the planning of a class. 6. Final considerations: it presents the conclusions of this paper and, finally, the bibliographical references, the books that were used as support to make it.

2. Concepts of hyperdocuments

A digital pedagogical material can be the only activity or a group of strategies and activities elaborated to promote the learning of a theme of conceptual content. The digital pedagogical materials are made in several ways of conceptual presentations like texts, images, cartoons, simulations and these make the student’s understanding and exploration something easy. A hyperdocument, according to its objective, might be a digital pedagogical material.

One of the possibilities of teaching supporting documents is the hyperdocuments. According to Lévy (1999), the hyperdocuments are texts structured in the form of nets being it a ‘text’ in the broad sense, not excluding the sounds or images. 11 IMS – Learning Global Consortium – is a non-profitable organization which aims to suggest patterns and models for the learning industry. It is available at: www.imsglobal.org, accessed on: 12/18th/2008.

Laurini (2001) states that the hyperdocument is a modern version of materials organized in a non-linear way. That is, electronic documents accessed directly to the information in several ways, presented in windows, accessed by a mouse click on important words or on other information.

The hyperdocument is usually composed of three distinct phases: hierarchic conceptual modeling, navigation modeling of contexts and the construction (implementation) and the test. The order of these phases is not rigid because each phase provides the feedback for the previous phases. The environment developed has an approach towards the conceptual modeling phase, where it is modeled the dominium of knowledge chosen for the hyper-document. The phase of hierarchic conceptual modeling consists of structuring the knowledge dominium through
classifying part of the theory into categories of knowledge pre-defined and establishing the relations of these parts. In this phase, the dominium is divided into three categories of knowledge: concept, result and example.

The category ‘Concept’ encompasses the characteristics, proprieties, attributes, regularities and/or observations of an object, phenomenon or event related to a dominium of knowledge. The concepts can be structured through relationships indicating that a grade ‘A’ must be presented before a grade ‘B’, reflecting a relation of pedagogical order. This relation can simply represent a preference in the sequence of presentation of grades, or also, that the sequence is pedagogically necessary for learning (pre-requisite).

The category ‘Result’ encompasses the logical consequences, obtained from the concepts of dominium and other results previously established. This category includes theorems, deductions, generalizations, consequences and solutions. The results can be structured through a relation of deduction, indicating that a result ‘A’ is deduces a result ‘B’.

The category ‘Example’ joins the individual instances, related to a concept or result identified in the dominium. The illustrations and instances of concepts and results are classified as examples.

One of the principal characteristics of the hyperdocuments is the non-linear narratives, composed by fragments inter-connected by remissions properly signaled. Besides that, they might present any kind of index of immediate access at any point of the narrative, a remission goal that allows the understanding the plan of work, or at least, the access to other remission goals, like navigation instruments.

The non-linear text, which is a basic characteristic of a hyper-media system, may bring about problems of disorientation. Bueno (2001), claims that “the non-linearity’ brings about the freedom of choice, which may lead the user to be disoriented. This dispersion may be: local, the loss of meaning by a fragment of information located outside the context; global, the difficulty of locating yourself in a space of much information.”

The making of a hyper-document is based on access and navigation itineraries. Its author might be able to structure the access and the navigation of the conceptual content in several ways: totally guided by the author, partially guided by the author or totally directed by choosing a route made by the user himself.

The choice of an access and navigation itinerary of a hyper-document depends on the objective of learning which must be well clear by the author (professor).

### 3. Types of navigation and context

A navigation context is a group of navigation entities (knot and link). The knots contain the information and the links make the connection to the knots. In the navigation model the knots are described by a group of attributes and a set of
anchors. The attributes represent the information derived from the conceptual elements (concepts, example or result) to the knot. The anchors are the links that come from the knot. The links make the connections of the knots and can only have one direction.

The navigation spaces, represented by the navigation contexts, may be explored by using the access structures (indexes or itineraries), which alone or in a combined way, establish a form of navigation through these spaces. This navigation sequence can be made in several ways, depending on the route suggested by the author: guided route, indexed route or guided-indexed route.

- **Guided Route:** these are sequences made up by the author of the pedagogical material, aiming a better learning. This kind of itinerary is intuitive and avoids the disorientation of the user and diminishes the cognitive overload. According to Nemetz (1995), in a guided route: “the access is sequential and controlled, that is, the user may go forwards to the next item or go backwards to the previous one. It may serve for one of these three purposes: to introduce the general concepts of a hyper-text in particular to new users; for the users interested in any specific theme and/or to substitute the need of navigating”.

  This route follows the hierarchic conceptual model. The components of this route are determined by the correspondent knots and contexts in the order of the conceptual elements resulting from a topological ordination of the model. This ordination may be based on the relation of precedence of the concepts. The examples and the results related to these concepts can be ordered in a sequence anterior or posterior to the correspondent concept, depending on the strategy of the presentation chosen by the author.

- **Indexed Route:** in this route the user selects the context manually through the menus of navigation. The links also can establish between a knot and a navigation context. In this case, the navigation context can only be the destiny of the link. Navigating, for a navigation context, means that any knot belonging to this context might be explored, that is, the user can explore the whole navigation space represented by the context. This may provoke problems of loss of continuity in the exposition if the previous context is not preserved (THURING et al., 1995). The decision of using this resource must be carefully evaluated.

- **Guided-Indexed Route:** in this route, the user can select the context manually through the navigation menus or can pick the next theme automatically after some time reading the slide.

### 4. Didactic-Pedagogical Architecture

Teaching a class so that the students really learn and get its meaning requires that the teacher knows much more than simply the conceptual content. To do so,
planning is needed. This planning includes choosing clear objectives of a teaching method (action plan), strategies (how the class is structured) and pedagogical resources (material containing information) suitable to the purposes in order to make the students develop an effective and long-lasting learning.

According to Machado (2000), the teaching methods are forms through which the teachers will work on the several contents in order to reach their proposed goals. It encompasses the strategies and procedures adopted in teaching by the teachers and their pupils. The methods are characterized by aware, planned and controlled actions and aim to achieve, besides the general and specific objectives, a certain level of generalization.

When picking a linear method, where the contents are worked in accordance with a logical sequence of knowledge, it may lead the students to create a routine that does not make them critical and autonomous people. In the meanwhile, when they choose a non-linear method, they can be taken to a complete chaos and their goals are not reached. A balance of these two methods seems to be the best option. In this sense, the teaching method should contemplate the usage of linear and non-linear strategies where the students can make their choices and guide their own knowledge so that they can learn more.

For a long time, the most mentioned pedagogical resources were the classroom board and the chalk. Nowadays, as the new technologies of information and communication (TICS) as well as the internet are in constant advancement, the education context has changed and has used the resources now found on the computers to make the learning process something easier for the students. These resources are important tools for teaching and have made learning easier. They are made in accordance with several navigation structures and accesses, from linear to non-linear structures.

To plan a class and intend to make use of these available computer resources it is necessary that the teacher verifies what the objective of the class is and in what context he will work so that he is able to use a digital pedagogical material as a didactic resource.

Once the internet has been widespread worldwide, a hyper-document can be used as a digital pedagogical material and be structured in order to develop the teaching-learning process, depending on the choice of the structure and the navigation access.

Next, it is elaborated an example of the making of a digital pedagogical material that uses an access and navigation itinerary in a guided-indexed way.

5. Proposal of an application

The theory exposed above was used in the project of a hyperdocument called “The way to India” which is shown below:
5.1. Planning and Analysis

5.1.1. The product: hyperdocument
- Theme: the history of the great navigations.
- Sub-theme: the history of the way to India.
- Objective: showing how the maritime way to India was carried out and its importance for the commercial trading.
- Target public: ‘EAD’ students.
- Usage of the product: as an online resource to support learning how and why the navigation to India was carried out. It is aimed that, at the end of the study of this object, the student has acquired knowledge about the history of the maritime way to India.

5.1.2. The resources
- Available time for its elaboration: two months.
- Hardware: notebook Core 2 duo; 4GB ram; 320 GB of hard disk; DVD recorder; 14-inch screen.
- Used technologies: HTML, CSS and JAVASCRIPT.
- Contents: The way to India: introduction; antecedents; the trip; the return; the arrival.

5.2. Conceptual Modeling

5.2.1. Objectives
- Capture the dominium: hyperdocument that reproduces the history of maritime navigations to India in order to expand and commercialize spices.
- Diminish the cognitive overload: written text, pictures and sound.
- Avoid the disorientation: the contents will be worked in chapters and sections put in a sequence in the time line but they can be studied at random.
- Basis for the visual identity: written text and image.

Organized in classes: tutorial, credits, chapters, sections, questions. Associations in the classes: buttons between the chapters; buttons for the next and the previous section; button to start, to end, to question and to credit. Resources: text, image, video, sound.
5.3. Navigation Modeling

- Defining the access structures: index in the initial Page of the tutorial.
- Guided routes: sequences in relation with the time line (it is intuitive and avoids the user’s disorientation as well as diminishes the cognitive overload)
- Guided-indexed routes: the sequences have linear navigation and allow the user to choose the way to be followed.
- Navigation contexts: presentation, chapters (1, 2, 3, 4 and 5), questions and credits.
Figure 2 The application navigational model.

5.4. Interface Model

The layout of this Project screen, where:

- Work and chapter identification.
- Navigation control between the chapters – general menu.
- Helping to navigation: sequential navigation between the pages.
- Navigation to get the assessment result, the credits and to finish it.
- Contents.

The application metaphor is a book, where:

- 1st screen: presentation – title of the hyperdocument, identification of the institution and authors.
- 2nd: identification of work and general menu, credits and users.
- 3rd, 4th and 5th screens: chapter 1 (section 1, 2 and 3, respectively). It presents the introduction and reports the project for the maritime way to India through the text, pictures and sound.
- 4th, 5th and 6th screens: chapter 2 (sections 1 and 2). It shows the antecedents in India, rich in spices, through a written text, image and sound. The questions are at the end of sections.
- 8th and 11th screens: chapter 4 (sections 1, 2, 3 and 4). It presents the trip, showing the time line, maps of the route and its adversities through a written text, image and sound. The questions are at the end of sections.
- 12th and 14th screens: chapter 5 (sections 1, 2 and 3). It presents the return, showing the time line, the ships that came back and the rewards
Design of pedagogical material with hyperdocuments technologies, IFIP WCCE 2009

through a written text, image and sound. The questions are at the end of sections.

- 15th screen: chapter 6 (section 1). It presents the arrival in Calecute (India), through a written text, image and sound. The questions are at the end of section.
- 16th screen: identification of the Institution, the course and the authors.
- 17th screen: result of the evaluation.

5.5. Implementation

- Media (production and digital process): production of a hyper-document on the maritime way to India.
- Technologies used: HTML, CSS and JAVASCRIPT.

6. Results and discussions

Like in the digital pedagogical material, the production of a hyperdocument needs the creation of well-defined didactic-pedagogical strategies, with coherent resources that lead to an effective learning. This way, the alternative and/or production of any digital material to be used as a pedagogical resource needs to be questioned about the contents which are about to be worked on, like the content will be organized and how it will be approached as well as the methodological subject it encompasses.

The navigation context of a hyperdocument is equal to the method of a pedagogical paper once choosing a teaching method may lead the student to be critical and autonomous or not. The same happens when choosing a route to elaborate a digital pedagogical material.

Nowadays, as the education computing advances, it might be said that a pedagogical resource and a teaching method are somewhat autonomous but they behave in a determined way by the objectives and contents. The choice of a pedagogical resource, a hyper-document, to be used successfully in the teaching-learning process needs to be chosen according to the objectives and to the method objectives used by the teacher.

So, when choosing a digital pedagogical material that was made by using a guided itinerary, the linearity of the conceptual approach is being chosen. In this situation, the conceptual content developed has a logic sequence and the student does not need to interact with the machine. He is in the audience and, once there is lack of interactivity, it presents to the student a limited view of reality.

On the other hand, the digital pedagogical material that was elaborated from an indexed route, allows the student has its own way of learning. In this route there are several option ways. The digital pedagogical material respects a context with the guided-indexed route but it allows the user make choices during the interaction. The student chooses the way and the digital pedagogical way provides navigation options in the research subject.
6. Conclusions

Making a hyperdocuments represents creating and developing messages for a new learning paradigm in which, by means of text resources, audio and video instead of listening and understanding only, he interacts actively with the technology.

Like preparing a class in order to maximize learning, the making of a digital pedagogical material requires the observation of certain ways to reach the goals in order to generate learning. These ways need clear objectives and suitable ways of work.

Clear information, objectives, content, interaction and interactivity are some of the many factors that must be worked to prepare the routes and they consist of a basis for a good development of a digital pedagogical material.

Each stage of making a digital pedagogical material has its specific role but it is not an isolated activity and it is not developed out of a context. The conceptual structure needs a coherent analysis of the approached contents aiming the teacher’s political and ideological options and the context where it is in the school. The navigation structure, with its navigation routes, will influence directly in the objectives chosen by the teacher and, finally, the interface structure must show suitable images to the developed content, leaving this motivating pedagogical material for the student.

The importance of this paper is in the search of theories that can guide the work of those people who use hyperdocuments in his/her pedagogical practice as well as those who plan and use these resources focusing the Education.

References


