Complement Contents in Virtual Learning Environments with Interactive Conceptual Maps to reinforce training and learning processes. An Experience in Management Degree

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Abstract:

Thousands and thousands of electronic contents have been developed in e-learning models and platforms to support the student learning process. The e-contents are not enough to achieve the chased targets, sometimes despite the contents are complete, well design and correct the students are not able to deal with them to acquire the knowledge presented in them. In this contribution we shall introduce several reflections, suggestions and advices about how should the e-contents be? and propose the use of interactive conceptual maps to support these contents in order to transmit the knowledge to the students and so achieve the target chased by the designers of e-contents for e-learning. Eventually, we shall present the results of an experience developed following this model and its tools that has been carried out in the Management degree to support the students in the subject of Computer Science Applied to Management in the University of Jaén.

1   Introduction

The end of the 20th century and the beginning of the 21st century have been witnesses of the deep change produced for the huge development of the Information Technologies (IT) due to the growth and advance of Internet and its services [1]. This growth has done that all the areas and topics related to our lives such as economy, commerce, employment, learning, leisure, etc. have been affected for these technologies in order to improve their traditional services [2-4].

One topic that has been deeply affected, modified and improved by the web based technologies has been the *Learning*, because the use of Internet allows to overcome the time and place limitations that were an obstacle in the classical classroom-based learning. Many e-learning environments offering new services and functionalities [5-7] have been developed in order to improve the learning and training processes, such that they are able to manage just-in-time learning content [8] as well as pedagogical aspects related to the training process [9].

The e-learning environments provide a mean to manage and delivery the contents and recently they have Authoring tools as part as the integrated e-learning environment to develop them. Contents reusability is a key factor for effectiveness of an e-learning process. Therefore during its design the reusability must be taken into account. Usually in these environments the theoretical concepts are shown by means of digital documents not very interactive, sometimes they contain links to navigate through the document but this type of navigation is not very

helpful to the reader in order to have a better understanding. Therefore, to improve the understanding of this type of contents some hypermedia and visual tools as conceptual maps have been utilized.

In this contribution, we shall focus on the use of tools that can complement contents of virtual learning environments to make easier the students the acquirement of the knowledge. Our proposal consists in once the contents have been developed by means of authoring or other type of tools to design *interactive conceptual maps* to help the students to understand these contents. The maps offer the possibility of representing in a synthetic and intuitive way a complex network of relationships between concepts. Indeed *visualization provides context and orientation for readers and it helps the reader see a larger pattern in which to place the object before him* [10].

This contribution is structured as follows: Section 2 presents our proposal to develop *Interactive conceptual maps* to support e-contents in learning and training e-learning environments. Section 3 shows an experience carried out in the Management degree in the University of Jaén with this type of e-contents and in the Section 4 the contribution is concluded.

2   Interactive Conceptual Maps

The use of conceptual maps have been used since several years ago to support the theoretical contents in e-learning environments, these maps have been useful in some aspects but presents several drawbacks and limitations related to its dynamism, navigation and interactivity. In this section we review in short the classical conceptual maps pointing out its advantages and drawbacks. Afterwards we present our proposal to overcome these drawbacks by means of *Interactive conceptual maps*.

2.1   Conceptual Maps

Due to the fact that in the virtual learning environments there exists big amounts of documents the complexity of knowledge acquisition and the continuous increasing of documents in such environments make that the students suffer cognitive overload and conceptual and navigation disorientation. Therefore it is clear that the students need some guidelines in order to acquire the knowledge from those amounts of data but usually the students don't have strategies that allow them an effective learning from the resources [11].

In learning processes are suggested the use of visual representation techniques to help the students to deal with the complex task of knowledge acquirement. These techniques help the students to develop strategies to structure and organize the knowledge in order to facilitate its acquisition. Visual methods may help the students to map, elicit, search, structure, and restructure, elaborate, evaluate, locate and access, communicate and use ideas and thoughts [12, 13].

The idea of the use of these methods and tools is that the cognitive complex processes are improved if the relevant concepts are well organized and pre-processed to facilitate an easy navigation through the knowledge or documents that the students must study.

Conceptual maps are a visual tool that has been used in the educational context since many years ago. It comes from psychological research in which it is depicted human knowledge ideas, convictions and beliefs [14].

A conceptual map is a special array that represents elements of knowledge by means of nodes and links that can be labelled or directionally named. The nodes represent ideas, concepts and beliefs and the links relations among them. The nodes can be represented by means of different shapes (rectangles, circles, etc.) with different colours that stand for different meanings. An example of a conceptual map is showed in the Figure 1.
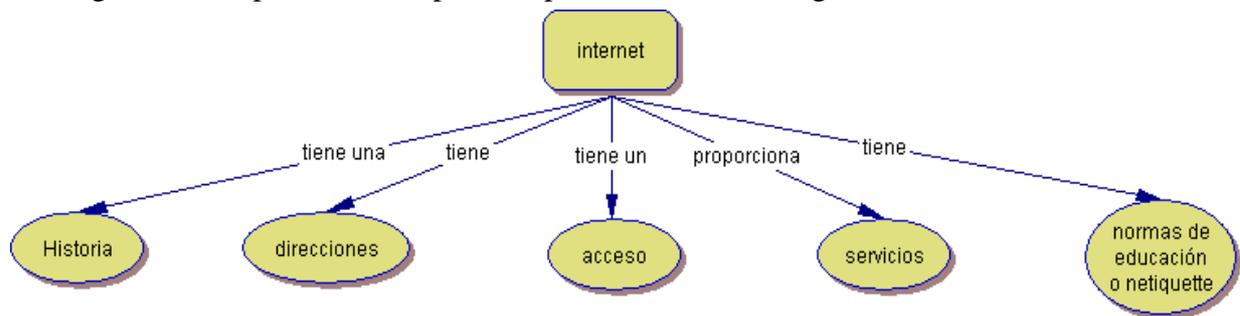

Figure 1. Example of Conceptual Map

Conceptual maps are suitable for representing networks of concepts. The relations among the nodes can be directional or non-directional, in Figure 1 the relations are directional with a hierarchical structure.

There exist many computer-based concept mapping tools to develop conceptual maps easily, such as Inspiration (http://www.inspiration.com/), IHCM Cmap tools (http://cmap.ihmc.us/), free-mind (http://freemind.sourceforge.net/wiki/index.php/Main_Page), etc. All of them provide facilities to represent different types of knowledge.

Even though the conceptual maps, such as the one showed in Fig. 1, are a good tool support the learning process for the students its development as a static special element presents several limitations to be totally effective for the students, such as:

- *Static:* although the maps represent relations among the concepts these relations are static and sometimes the visualization of many static relations cause that the student makes confuse.
- *Navigation*: the use of these elements should facilitate the navigation through the concepts in order to allow the students understand in a better way these concepts.
- *Non-interactivity*: a static conceptual map does not allow interactivity with the students, so sometimes it is not effective enough because the student does not pay attention because they get to use current the visualization.
- *Size*: when the map presents many concepts is not easy to obtain a clear idea of the relationships that exist among them neither a global vision of the concepts presented.

2.2   Interactive Conceptual Maps

Once we have seen that the use of traditional conceptual maps present some limitations we propose to overcome them by means of providing some features to develop interactive conceptual maps.

Therefore we propose taking advantage of hypertext and hypermedia technology develop conceptual maps as an interactive navigational interface that overcome the above limitations.

To do so, we have developed conceptual maps similar to the one presented in Fig. 1 with Inspiration and following we have transformed them into a *Interactive* conceptual map using HTML and some additional elements to the map (see Fig. 2):
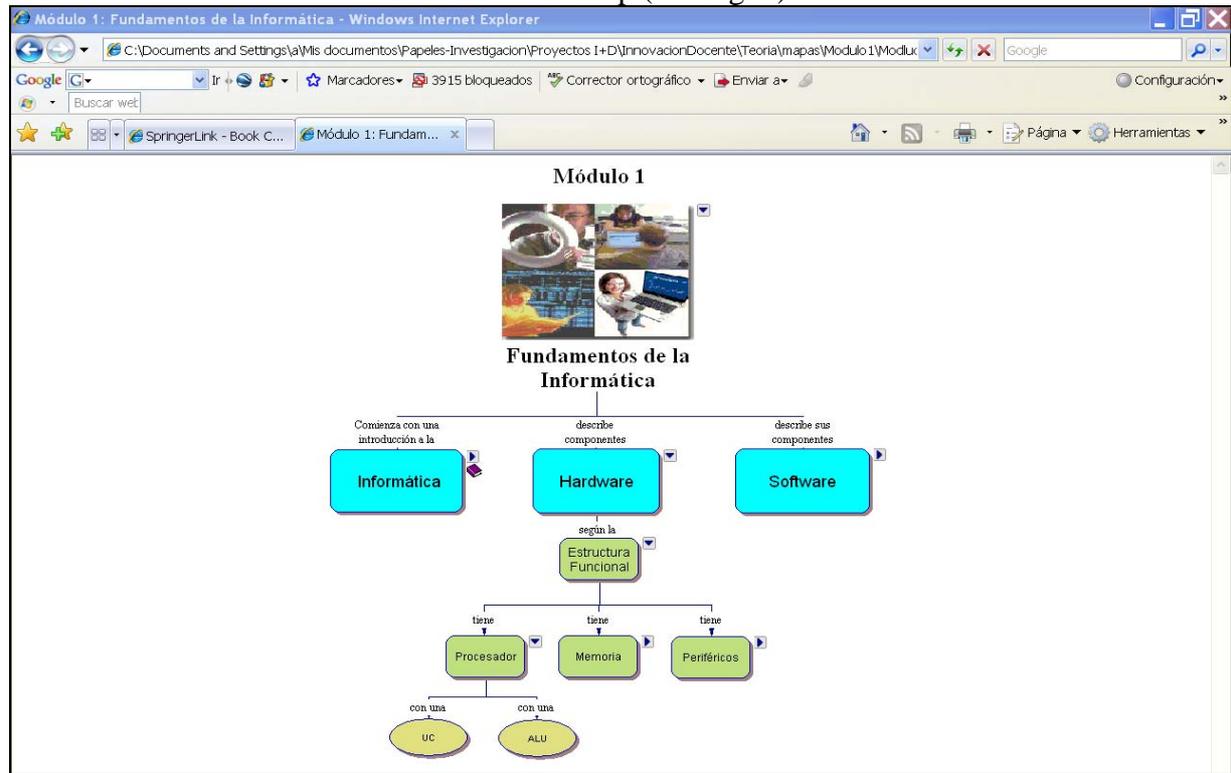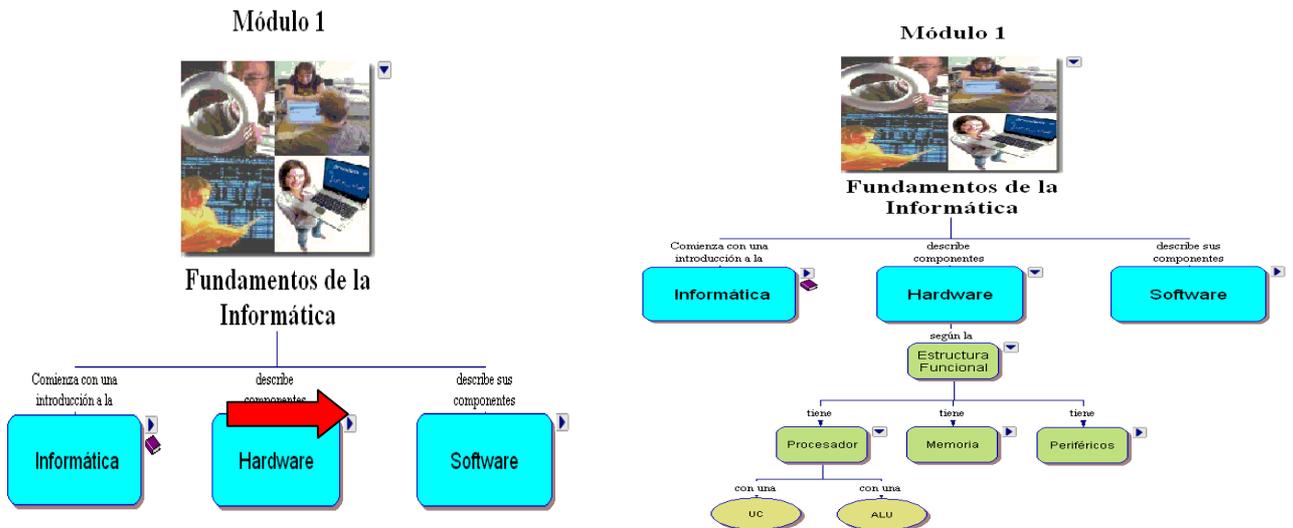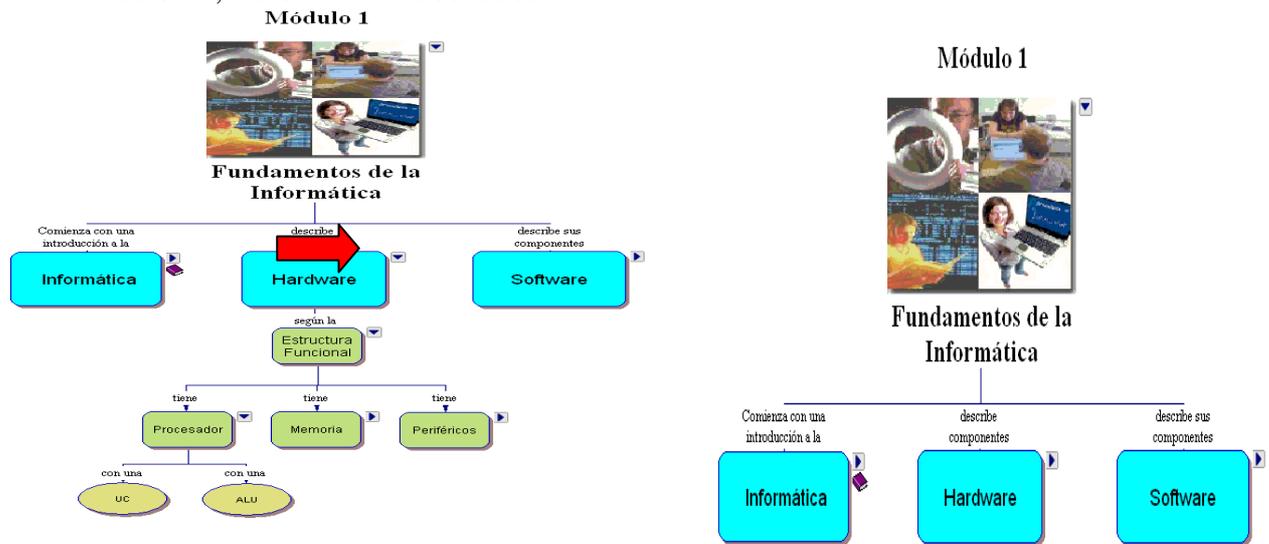

Figure 2. Interactive Conceptual Map

The *interactive* conceptual map is developed in HTML including similar elements to the initial conceptual maps but with some additional features and icons:

- ▪ ▶ : This symbol indicates that this node contains a drop-down branch that will be shown when the user click on it.

- ▼ : This symbols means that the drop-down branch is being currently shown and if it is clicked on it, the branch will be hidden.

- 📕 : The book icon means that if the user clicks on it some textual information related to the concept will be showed.

Therefore with these new elements we have increased the features of the conceptual maps to increase their interactivity, navigation and dynamism in order to overcome the limitations exposed in the above subsection and improve the capabilities of this visual tool to facilitate the cognitive acquisition by the students.

3   A Real Experience in Management Degree

Once we have showed our proposal to support the learning process of theoretical contents in virtual learning environments we are going to show a real experience using these tools in the University of Jaén applied to the Management degree in the subject of Computer Science Applied to Management.

In this subject we have around 300 students each semester and the main problem is that this is the only subject in the degree related to computer science so the students are not very familiar

with its contents and show some rejection towards it. So the lecturers decided several years ago to develop digital contents that the students can achieve through the ILIAS e-learning platform available in our Institution. At the beginning we though that these contents improved the final results because the easy access and other advantages related to e-learning will help to the students to understand in a easier way the contents of the subjects, but after three years we detected that the digital contents were not enough to improve the results so we decided in the courses 2005-2006 and 2006-2007 to include interactive conceptual maps to support the learning process and following we can see in the Figure 3 the obtained results:
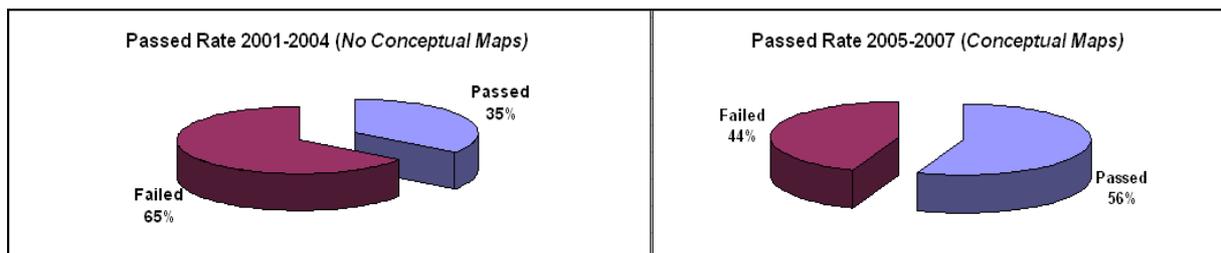

Figure 3. Comparative results

Of course the only reason of the results have not only been the conceptual maps, but we though the use of the *Interactive* conceptual maps have helped to the students to obtain better results in our subject.

4   Concluding Remarks

The virtual learning environments have been created and developed in many education institutions to improve different aspects of the learning processes. In this contribution we have focused on the efficiency of these environments to help the students to the knowledge acquisition.

Usually in these environments the lecturers leave a big amount of documents that the students should study, but usually the students have not a structured and ordered strategy in order to acquire the knowledge proposed by the lecturers. So the use of visual tools like conceptual maps have shown themselves as a useful tool to guide the students in their learning process. However the use of static conceptual maps presents some limitations to achieve the efficiency chased by the lecturers due to some limitations. Therefore, we have proposed the inclusion of some new features to the conceptual maps to overcome those limitations.

Finally we have presented how the efficiency of using this tool have produced a remarkable improvement of the results obtained by the students in Management degree in our University

5   Acknowledgements

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