Boosting Wikis with Mind Maps in Collaborative Learning Environments

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Abstract

Educational communities are recently trying to find ways to supplement traditional methods of teaching and learning, by employing didactic scenarios that expose their students to web-based course materials. A web-based platform that has been widely used to support collaborative leaning is Wiki, which allows for easy creation and editing of any number of interlinked web pages with a highly collaborative manner. As a result, Wikis have proven to be of particular interest in supplementing and extending classroom scenarios. However, making the students use the classroom Wiki without further guidance has proven to produce poor results. In educational environments, pieces of knowledge must be easily located and well-structured. It has been shown that the ability of interlinking related articles to break down complex topics or articles is not a trivial task. Students are still in the process of learning how to structure their thoughts in more scientific and organized ways. Thus, a modified Wiki system is necessary and it should be based on the idea of well-structured and easily locatable hypermedia documents. In this paper, we propose the complementary usage of Mind Mapping tools to overcome the drawbacks that Wiki systems have and boost Wiki's usage in educational environments. The main goal of our work is to provide students, a way to make structured relations between topics when using Wikis. Moreover, in order to show the different levels of interaction between Wikis and mind maps, the case study of the "Greek mythology" project scenario is presented.

Keywords: Collaborative Learning, Web-based Educational Environment, Wikis, Mind Maps.

1. Introduction

Schools, universities and academies are recently trying to find ways to supplement traditional methods of teaching and learning, by employing didactic scenarios that expose their students to computer or web-based course materials and modes of interaction (Guzdial et al. 2001). Any computer-supported collaborative learning application combines a learning

activity with a collaborative environment. The collaborative environment must enable students to create an online inter-subjective space that adequately supports the student's cooperation.

A web-based platform that has been widely used to support collaborative leaning is Wiki (Désilets et al. 2005). A Wiki platform is presented as a website that allows for easy creation and editing of any number of interlinked web pages via a web browser. In addition they present highly collaborative nature. As a result, Wikis have proven to be of particular interest in supplementing and extending classroom scenarios (Hiltz & Turoff 2005), (Lamb 2004), (Morgan 2004).

The Wiki platform has several properties that are particularly amenable to building support for online collaborative learning activities. The wiki is Web 2.0 technology. It is social and collaborative and the majority of today's student population is already familiar with technologies of this sort. The modest level of skills required to use Web 2.0 technologies makes it within the technical reach for both students and teachers.

The wiki interaction style is primarily asynchronous. It is easy to co-edit documents as Web pages, which are automatically published online and thereby accessible to others at different times and places. There is a common syntax for articulation; for those who are less technically savvy, Web pages can be edited using WYSIWIG (What You See Is What You Get) text editors.

Wikis are plastic: It is easy to reformat them to support both a variety and range of collaborative learning activities. This enables the teacher to use the wiki structure as a mediating organization for how the students interact and coordinate their collaboration. By integrating scaffoldings specific to a given learning activity (Notari 2006), a wide range of learning paradigms can be implemented (Parker & Chao 2007; Duffy & Bruns 2006; Lamb 2004).

The malleability of wikis enables both teachers and students to do further adaptations to the environment so that it better aligns with the requirements of a particular class or the specifics of a given student or learning activity.

The wiki control structure is mostly non-hierarchical: There is not a centralized authority that controls the changes and additions to content. Students feel as if they work within a student-owned and centered workspace.

A platform that facilitates the construction of collaborative learning environments framed within the wiki's style of interaction has several benefits. Each new application shares the same common form of interaction making it easier for teachers and students to switch tasks within the same course. Thus, students can spend less time learning how to use the technology and more time learning the course material.

A mind map is a graph structure of keywords and their relations (Buzan & Buzan 1993). It is an effective method of note-taking and useful for the generation of ideas by associations. Association plays a dominant role in nearly every mental function, and words themselves are no exception. Every single word and idea has numerous links attaching it to other ideas and concepts. To make a mind map, one starts in the center of the page with the main idea, and works outward in all directions, producing a growing and organized structure composed of key words and key images. Mind Maps help organize information. Because of the large amount of association involved, they can be very creative, tending to generate new ideas and associations that have not been thought of before. Every item in a map is in effect, a center of another map. Mind maps are a way of representing associated thoughts with symbols rather than with extraneous words something like organic chemistry. The mind forms associations almost instantaneously, and "mapping" allows you to write your ideas quicker than expressing them using only words or phrases.

Mind mapping software tools are used to create electronic diagrams of relationships between ideas or other pieces of information. It has been suggested that the mind mapping technique can improve learning efficiency up to 15% over conventional note taking (Farrand, et al. 2002). Mind mapping tools can extend the usefulness of the theoretical mind maps, by attaching on every mental object any kind of multimedia material (web page, image, video, file, sound).

When using mind mapping in a class, students often want to see the relations between nodes explicitly, as it is very rare that every student shared the same picture in mind of the topic covered. If students have mapped their knowledge by means of a mapping tool they may use this map to inspect their own knowledge (Boechler & Dawson 2002). Maps may also be used as navigational tools to help students visually searching knowledge and learning resources.

2. Problem Background

In educational environments it has been shown that Wikis have many drawbacks. We can summarize these in four major dimensions that should be taken into consideration. Figure 1 illustrates these dimensions, ordered according to their increasing degree of technicality.

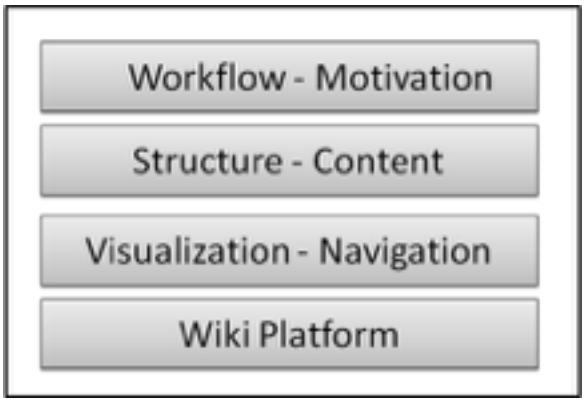

Figure 1: Problem dimensions in an ideal educational collaborative environment

Workflow and Motivation are influenced by the necessities imposed by the classroom environment. Two questions that typically arise are: *how to ensure an adequate level of quality* and *how to motivate students to contribute?* Making the students use the classroom Wiki in the exact same manner as they would Wikipedia, on a voluntary basis and without further guidance, has proven to produce poor results in some instances: the level of participation is often low, the quality of both articles and discussion often lacks focus and depends solely on the students. This is particularly true for larger classroom settings.

Structure and Content are issues that arise based on the generalized approach of most standard Wiki implementations as such. Many classroom environments have an interdisciplinary setup, and participants often have quite diverse levels of technological knowledge, as well as differing ideas of how to structure their own hypertext documents. Any concept that adapts a Wiki system must work under these assumptions. Moreover, pieces of knowledge must be easily located and well-structured, especially considering the potentially overwhelming amount of information. Although the Wiki is a collection of Web pages, which are familiar to most users, it has shown that the notion of interlinking related articles to break down complex topics or articles is not a trivial task. Students are often still in the process of learning how to structure their thoughts in more scientific and organized ways. A modified Wiki system should be based on the idea of well-structured and easily locatable hypermedia documents.

Visualization and Navigation in Wiki systems are generally based in the hypertext paradigm. They are, essentially, collections of Web pages, which are connected by means of hyperlinks. While the Web has indubitably proven to be a somewhat adequate and efficient mechanism for browsing and searching hypertext documents, it should be taken into account that more elaborate visualizations often simplify the understanding of relationships between elements, and can reduce the complexity of navigation. While the default ‘text and

hyperlink' approach is often adequate and sufficient for loose browsing through a Wiki, document collections that are used for purposes of in-depth studies of specific topics could benefit greatly from improved or adapted visual representations. In a learning environment, however, it is particularly important to have the ability to quickly relate pieces of knowledge to each other.

3. Boosting Wikis with mind maps

Based on the issues raised in the previous section, we propose here the complementary usage of Mind Mapping tools to overcome the drawbacks that Wiki systems have and boost Wiki's usage in educational environments.

In Figure 2, we can see how mind maps can act as an integration layer that can overcome the drawbacks mentioned in Section 2.

Figure 2: Mind mapping tools, as an integration mechanism for an enhanced wiki system.

Before starting a learning activity, educators can provide to students a mind map that can explain graphically the proposed workflow. In addition, at every step of the proposed workflow educators can include in the given mind map, electronic material, motivating students to participate more productively in the current activity.

In order to help students organize their thought and give them a quick overview of the proposed activity a complete structured mind map can also be created. In this map, the key components of the activity and their relations can be included. Moreover, by using such a representation the global structure of the activity is revealed and the students can quicker understand how to interlink their articles by using the basic wiki platform. Educators can easily attach in this structured map any multimedia resource that can be used by the students as a helping material for articles constriction. Importantly, a hyperlink from the mind map to an empty wiki page can be created in order to help students clearly understand where exactly to put their articles and how to interlink them.

At the final stage, where the students have complete their writing activity thought the wiki platform, the navigation in the created pieces of knowledge can also more easily be done, with the constructed mind map. Any wiki page can represent a node in the map and all the hyperlinks can be represented as edges in the same map.

In the next section we will show how in practice this integration mechanism, can efficiently boost Wikis.

4. Case study

To show the different levels of interaction between Wikis and mind maps, the case study of the "Greek mythology" project scenario is presented. Students were encouraged reading each other's writings, after creating a Wiki on Greek mythology. Each student had to describe one or more ancient Greek gods and relate them with the rest.

A sample page of the implementation of this scenario using the "Wikiwig" wiki (available at http://sourceforge.net/projects/wikiwig) is given in Figure 3. Wikiwig is a free, open source wiki, equipped with a WYSIWIG text editor for making easy article creations. As we can see from this figure, the description of the gods is given as a plain text, and the relation between them is hidden behind hyperlinks. Thus, it is quite difficult for any student to focus on the created relations.

For example, the questions: *who is the father of Artemis* or *does Artemis has any brother?* need an additional effort to be answered.

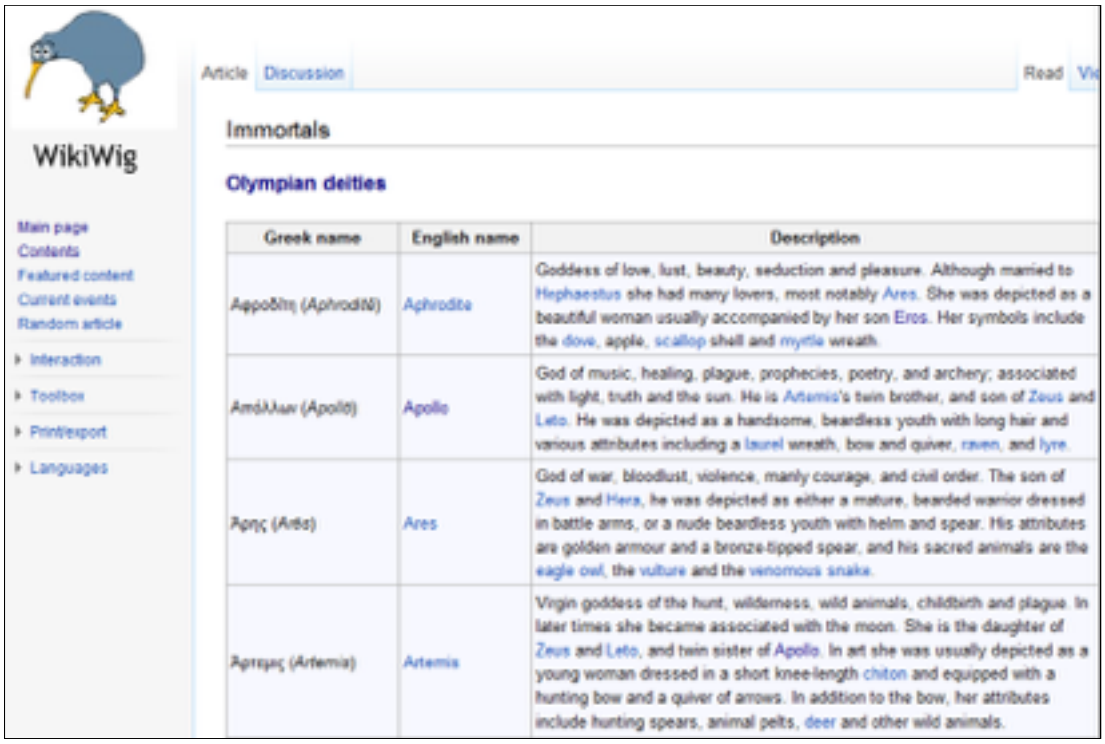

Figure 3: Creating an ancient Greek gods scenario using the open source "Wikiwig" wiki platform.

Mind mapping tools, like "EdrawMax" (available at http://www.edrawsoft.com) can be used to boost the performance of the basic wiki platforms. In Figure 4, we can see a subset of a constructed mind map that can be used to facilitate the description of the ancient god "Zeus".

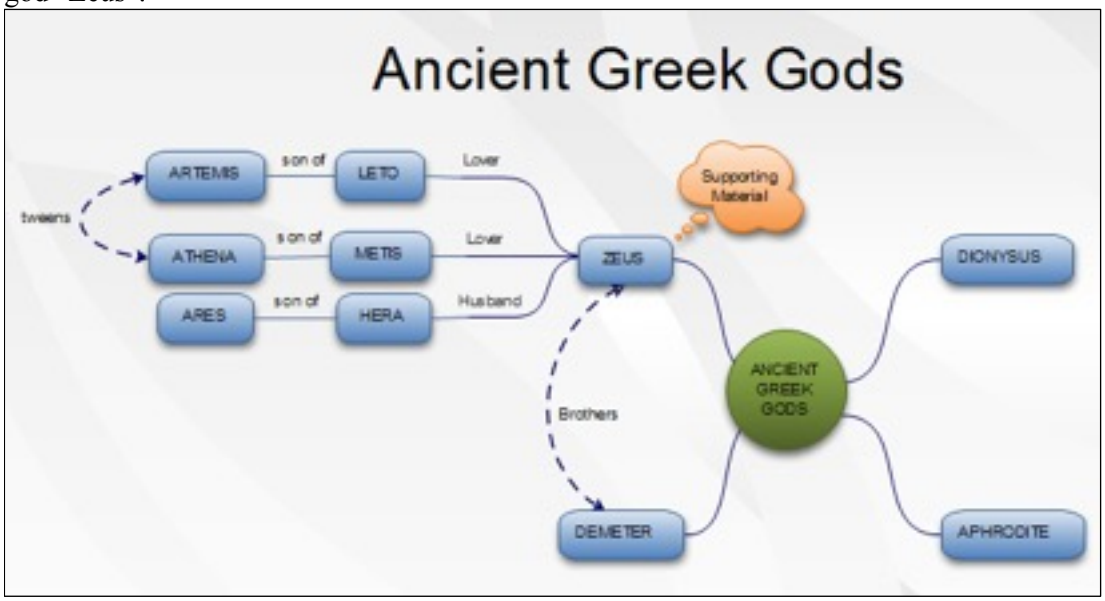

Figure 4: A subpart of a mind map that can be used to describe the ancient Greek god "Zeus"

In this mind map, the ancient Greek gods are depicted as rounded rectangles and their relations are given us edges that connect them. For example, we can graphically recognize all the necessary relations that are needed to be described in order to create an article for the "Zeus". By giving to students such a map, they can easily understand what other ancient gods must be referred. Behind its rectangle, a complete multimedia repository with supporting material can be is attached. This material can be used by the students as a data source in order to create their articles. The given mind map, can also guide them how to create hyperlinks in their articles.

The connection between mind map and the corresponding article in the wiki platform is done by a hyperlink that is included in its rectangle of the mind map. The students, by clicking on it, they can easily be transferred in an empty wiki page that must be completed me them, in order to create their articles.

5. Conclusions

In this paper, after the description of the disadvantages of using basic wiki platforms as collaborative learning environments, we propose the complementary use of mind mapping tools in order to boost wiki's efficiency for educational purposes. The main goal of our work is to provide students, a way to make structured relations between topics when using Wikis.

To show the different levels of interaction between Wikis and mind maps, the case study of the "Greek mythology" project scenario is presented. Each student had to describe one or more ancient Greek gods and relate them with the rest. The analysis given demonstrates the usefulness of our approach.

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