Didactical Patterns for the Usage of Wikis in Educational and Learning Activities*

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Wikis have been established as primary online tools for collaborating and for gathering, sharing and organizing knowledge. Wikipedia is an overwhelming proof of this. Introducing a wiki as a learning tool in a classroom poses as a very promising idea. This paper introduces a collection of didactical patterns for the usage of wikis in educational and learning activities that intended as guidelines in the learning design for successfully incorporating wikis in a virtual classroom.

Keywords: Wiki; education; e-learning; learning design

1. Introduction

A Wiki is a web application that allows users to add content and edit the content. A wiki enables the collective writing of online documents by using a simple *markup* language using a web browser. A defining characteristic of wiki technology is the ease with which pages can be created and updated [1]. Invented in 1995 by Ward Cunningham, Wikis are widespread on the web as one of the preferred tools to create online collective documents and documental databases. The Wikis enable the practice of crowd sourcing for knowledge gathering, organizations and dissemination. The huge success of Wikipedia, the world largest encyclopedia collaboratively created and maintained by millions of users around the world, proves that the wiki based crowd sourcing model is an optimal approach to create online collaborative hypertext documents.

A wiki allows, in the simplest possible way, to collaboratively create, publish, debate and keep track of the evolution and growth of dynamic hypertext documents. Over the last 17 years the Internet has seen the proliferation of wiki based sites and software tools in a large variety of purposes.

One of the many possible applications for wikis is its use in educational activities.

1.1 A pedagogical framework for the use of Wikis with educational purposes

In eLearning a Wiki is a powerful tool for providing online contents. Using wikis we can place the student in the role of the content author, and make teams of students work together in a collaborative document in a clear practice of Social Constructionism [2]. Digging into the principles of using sound pedagogical principles in order to create effective online learning communities, [3] and more formal writings [4, 5] provide a detailed explanation of 'social constructionist pedagogy' that can be resumed in 4 points:

(a) Constructivism, people actively construct new knowledge as they interact with their environment.
(b) Constructionism, learning is particularly effective when constructing something for others to experience.
(c) Social Constructivism, when a social group is constructing things for one another, each member is learning also about how to be a part of that culture, on many level.
(d) Constructed behavior: looks into the motivations of individuals within a discussion, a 'separate behavior' tries to remain 'objective' and 'factual', while 'connected behavior' is a more empathic and subjective approach, finally the 'Constructed behavior' is sensitive to both of these approaches and is able to choose either of them as appropriate to the current situation.

All these deep pedagogical principles, taken from philosophy, sociology and psychology have been distilled by Martin Dougiamas, founder of the successful open source LMS and online community devoted to online learning: Moodle, into 5 rules that are easier to apply [6]:

1. 'All of us are potential teachers as well as learners—in a true collaborative environment we are both.'
2. 'We learn particularly well from the act of

creating or expressing something for others to see.'

3. 'We learn a lot by just observing the activity of our peers.'
4. 'By understanding the contexts of others, we can teach in a more transformational way.'
5. 'A learning environment needs to be flexible and adaptable, so that it can quickly respond to the needs of the participants within it.'

2. Wikis in education

The use of wikis in education is of a potentially huge value: wikis can be applied to foster collaborative work, to promote project based learning experiences, to open the work conducted in classroom to the world, to facilitate information exchange between groups and educational institutions, etc. The possibilities are practically endless [7, 8]. So, using wikis as environments for educational activities allows new pedagogical scenarios, which are pursued by many educators worldwide in the context of collaborative learning [9]. But since a Wiki engine is a tool, we might want to be sure that we are using the right one for the job taking into consideration if it will be a separate tool or a wiki integrated in the LMS [10].

Around the world, a variety of initiatives are having students participate in projects contributing to Wikipedia. Every year, international conferences like Wikimania bring together the community and the general public to share their experiences with knowledge initiatives. Students stand to gain important benefits from such conferences, learning the values of working in a group and how this way of working can be used to attain objectives that would be otherwise unreachable for a single individual.

Wikis are a very particular stage for open knowledge and for this we are proposing a collection of patterns for the didactic application of wiki technologies that can be applied throughout most of the education phase of learners, starting from elementary school, all the way to university, graduate studies and encompassing even life-long learning.

However, in order to fully take advantage of the potential of the wikis and to improve the teaching process, the professor needs to play an active role. Setting up a wiki and expecting the students to automatically start participating, collaborating and learning is utopic to say the least.

3. Didactical patterns for the usage of Wikis in educational and learning activities

This section introduces a collection of didactical patters for the usage of wikis in educational and learning activities that intended as guidelines in the learning design for successfully incorporating wikis in a virtual classroom. The majority of these patterns have been developed from the ones proposed during a now defunct project called eduwiki.org while the rest are original proposals we have experimented with during our research: including educational experiences with 20 courses in the Universitat Politecnica de Catalunya, Universitat de Barcelona and Universitat Oberta de Catalunya[11] during the period 2003-2008; and the process of design and development of the nWiki Module for Moodle 1.X and the Wiki module for Moodle 2.0 http://code. google.com/p/moodle-nwiki/, process in which a public debate was held with teachers interested in using wikis on the Moodle.org forums with more than 2000 entries.

The didactical patterns we are presenting are like the patterns used to sew clothes. They provide particular solutions to particular problems but they can be manipulated to adapt to the particular necessities of a given environment. The following patterns apply wiki technologies to educational scenarios.

These patterns affect the terms of use of a wiki when used in an educative context with fixed, specific rules. Once the students have been introduced to the usage of wikis and have overcome any initial apprehensions to participate in collaborative scenarios, the results are really impressive, as far as work quality, initiative and motivation are concerned.

3.1 Common pattern considerations

The following actions corresponding to the professors are required prior to any successful wiki incorporation into an educational activity.

3.1.1 Installation

The wiki application needs to be correctly configured on a reliable server that will guarantee a smooth working experience. Security backups should also be frequent to prevent any important loss of student activity. The version of the wiki platform should be a stable one and updates should be avoided during the course.

These simple precautions will help guarantee a smooth working experience for the students, making them more willing to participate and be active during longer periods.

3.1.2 Integration with the working environment

Access to the wiki should be as transparent as possible for the students. Ideally, the wiki should be integrated into the virtual campus of the teaching institution, providing a familiar interface. If such integration is not possible, it is vital that all potential

users have access to the required information to access the wiki and work in it.

3.1.3 Facilitate the first steps

Students need to be able to use the wiki. Wikis were conceived as easy to use tools without unnecessary complexities. Students can attain an expert user's level for a wiki, but only if the teacher makes sure to introduce them to a beginner's level.

The wiki must be in a language familiar to the students, the students need to have access to the necessary documentation and good planning is required to ensure that a critical mass of users starts working with the wiki and creating pages. Once the first few pages have been created, it tends to be a cascade from that point onward.

3.1.4 The rules of the game

The professor needs to establish the rules of the game and communicate them clearly to the students. It will be impossible for the students to work efficiently if they do not know what is expected of them.

3.1.5 Feedback

A wiki activity is a continuously evolving one, so regular reviews are needed on behalf of the professors. Page access statistics help control if students are using the wiki, which are the most popular and useful pages, which parts of the wiki are accessible or not, and whether there are pages that are never visited.

Important feedback can be had from the way the contents evolve. Comments and modifications to the various pages provide useful feedback on whether the students are working correctly or not.

3.1.6 Continuous attention and minimal intervention

Wikis can be environments that tend to chaos. The professors need to control the evolution of the wiki and take all necessary measures to steer the progress towards order, all the while making sure to do it with as much discretion as possible. It all needs to be transparent to the students so that they feel that they carry all the initiative.

3.1.7 Concurrency

Since all wiki access is done via web, the danger of two or more users editing the same page and overwriting each other's changes is always present. Usually, wiki engines provide mechanisms to control such accidents, but the teachers need to be well informed and take specific steps to avoid such situations.

3.1.8 Readers and writers

All participants in a wiki are readers and writers. Both roles have to be promoted and encouraged in order to avoid cases of students participating because they are supposed to. An analysis of each student's statistics can show whether a particular student is actively participating or just accessing pages in order to register visits. Time spent per page and the ratio between pages read and pages written, usually offer a good indication of a student's contribution. For example, if the pages edited are less than 20% of the pages read is a suspicious sign. Also an edit of 20 lines in 5 seconds is a good indication of a copy-paste operation.

3.2 Didactical patterns, at last

We have defined a number of wiki patterns that cover the use cases of wikis in educative scenarios. For each of these patterns we explain the functionality, its application within a course and the role of each participant.

3.2.1 Editable notes

Functionality: The professor creates (or migrates) the teaching material (notes, textbook, slides, etc.) in a wiki instead of handing out printed copies or pdf files or similar. In a wiki, the students can edit the contents, extend them or take notes on top of the existing content.

When to use it: This pattern can be used whenever distribution of documentation is required, especially when said documentation is incomplete or comes from various sources. In such cases, working with a wiki can help complete and extend the documentation as part of a class assignment.

Role of each participant: The professor provides the students with the documentation organized in one or more pages.

The students can extend the documentation, add notes and comments, or create additional pages clarifying contents or asking questions and expressing doubts. They can use the discussion pages of the wiki and work individually or in groups. Each individual or group can have access to their particular version of the notes and work on that.

Variants: In environments such as Moodle that permit various group modes, we can have one wiki per student and as such the elaboration of the documentation wiki can be considered as a graded activity.

In wikis with support for discussion pages (a special wiki page associated to a regular page wherein discussion of the evolution of the normal page can be held), such a page can be used for debating the evolution of the wiki and promote

dialogue and participation among the various students.

The documentation can start empty at the beginning of the course, with the students slowly adding what they consider important from the professor classes and from the bibliography. This can be done either at an individual or at a group level. In the case of individual wikis, the wiki takes the role of the student's notebook.

Feedback: One course's wiki can serve as a starting documentation for the next course. This way, the documentation gets progressively more complete and better adapts to the needs of the students.

3.2.2 Micropedia

Functionality: This pattern consists in elaborating a glossary for a course using a wiki. In other words, developing a reduced and focused 'Wikipedia' for the course. This is a process that has to closely controlled to avoid cases of copy-pasting entries from other existing sources. Tools like CopyScape (http://copyscape.com/) can be used to detect such plagiarism cases.

The content has to be restricted to a predefined knowledge domain. In this pattern, every wiki page corresponds to a glossary (or Micropedia) entry with the exception of special pages like the index.

When to use it: In a course, a Micropedia can be used to organize the student's thematic research and act as reference material once it has achieved a certain size and quality. A Micropedia could also extend to cover from one certain subject to the entire education center. It could evolve into a medium of transfer of knowledge for the entire center useful even for the professors.

Making a wiki public is also an option to be considered. It is an option that contains some risks due to legal and privacy subjects, but can offer significant advantages like the promotion of the center (direct or indirect) and the dissemination of knowledge beyond the boundaries of the institution.

Role of each participant: Participants may contribute by adding new entries or by editing existing ones. The data for the pages can come from outside sources or students can use their own knowledge and experience.

As the size and scope of the Micropedia grows, someone will have to come forward and take the responsibility to keep everything organized and under control. If this responsibility falls on the students, the teaching experience will be even more extensive to their benefit.

Variants: The teachers can choose whether to start with a blank Micropedia each semester or to keep evolving the one from the previous semesters. When the Micropedia is already rich with content, it

is a greater challenge for the students to add new entries. They will have to use all their resourcefulness and imagination and this can lead to better (or worse) results. Other possible tasks are the definition of style guidelines, translations to different languages, adding references and restructuring contents in sub-pages.

3.2.3 Consensual document

Functionality: In this pattern, the wiki serves to create a collaborative document that reflects the consensus of participating members that share different points of view and diverging objectives. This is a usage of wikis that applies to tasks like the definition of laws and specification documents. Within an education environment they present a great tool to carry out role playing games.

Role of each participant: The professor has to propose a script describing the role of each student or group of students.

The students create drafts where they describe and rationalize their point of view. Then, they read the drafts of the other members and edit them trying to reach a consensus after a series of back-and-forth editing. Discussion pages can be extremely useful during such a process, just like tools for tracking the latest changes.

Variants: Bound only by the imagination of the professor and the students.

3.2.4 Adaptive story

Functionality: An adaptive story consists in writing a story that can transform into many different variations. This pattern is based on the 'branching stories' that were a literature trend of the 80's. In these books the readers were frequently asked to make decisions on behalf of the protagonists and were subsequently directed do a different page depending on their choice.

When to use it: These wikis can be used to focus studies in a certain historical period or to develop creative writing.

Role of each participant: Participants generate pages from a starting point. This can starts with bigger groups that branch out to smaller ones with each sub-group being in charge of a branch of the story.

3.2.5 FAQ (Frequently asked questions)

Functionality: The wiki is organized around questions and answers. It is similar to a Micropedia in the sense that the theme that is covered is usually tightly defined.

When to use it: This pattern is useful for organizing and synthesizing complex concepts or knowledge that is not uniformly dispersed among the participants. It can also be used to organize inves-

tigation activities for self-education. Another use is for consulting the professor, in place of having visiting hours or using email conversations. An additional benefit to this would be the gradual creation of a knowledge repository that could be used by all students.

Role of each participant: The participants of these wikis usually generate both the questions and their respective answers. The questions usually need to be reviewed and changed accordingly as the knowledge level of the topic rises.

3.2.6 Simulation tree

Functionality: This is structurally similar to the adaptive story pattern with the difference that the main elements of a story do not exist (conflict and resolution). The main objective is the exploration of possibilities.

When to use it: Simulation trees can be used to study the choices made by individuals in complicated situations with multiple possibilities. As examples we have reactions during an accident, socio-political situations and inter-personal conflicts. It can also be used within the context of knowledge management for modeling and representing taxonomies.

Role of each participant: The participants generate options starting from a certain state by speculating over the possible consequences. They have to design non-trivial options so that others may be able to play with the resulting simulation as an education environment.

3.2.7 Ant farm

Functionality: This pattern is a simulation of a space and time with a number of actors. It is like an adaptive story but with multiple protagonists. It is a kind of role playing game with groups that play all possible or plausible games.

When to use it: It can be useful when trying to understand aspects of a culture, era or situation and as a tool of possibilities research.

Role of the participants: The participants have to develop a series of options and their consequences for a single actor. In parallel, they have to coordinate with other participants that work on other actors.

The professor has to make sure that the various branches intertwine to a degree.

3.2.8 Group

Functionality: The wiki in this pattern is used to form the work groups of a class (presence-based or virtual).

When to use it: This pattern works very well when there are various subjects or data sets.

Role of each participant: The professor creates a wiki page with a list of all available tasks with their presentation data.

The students have to write their names next to the task of their choice in order to become members of the corresponding workgroup.

Additional advantage: The use of this pattern forces the students to visit the wiki and edit their names in the first page. This functions as a great first introduction to the world of wikis.

3.2.9 Freestyle

A wiki can be used in a wide variety of ways. The patterns that have been explained until now are just a sample. However, the most interesting uses of the wiki are the ones that combine some of the above, or even ones that dynamically evolve from one to another. A wiki that starts like a brainstorming session can transform into an ant farm, a role playing game, and adaptive story, a FAQ or a glossary. The creativity of the students is limitless and it is up to the professor to adapt to it and use the dynamic nature of the wikis to the advantage of all involved.

4. Conclusions

This article presents a collection of didactical patters for the application of wikis in educational learning activities. This collection is intended as a didactical asset during the process of learning design

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