"Writing documents collaboratively in Higher education using Traditional *vs.* Wiki methodology (I): **QUALITATIVE** results from a 2-year project study"

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Three keywords

Group collaboration, Wiki, Cooperative learning.

Summary of the experience

Students currently have to invest much time doing group assignments, and it is expected that they will have to invest some more with the European credits system (ETCS). As they do not always take enough profit of their time working in group, we tried a new methodology of group work using a fairly new computer tool in teaching and learning environments, called Wiki (Cunningham 1998, Schneider 2004). After two years of use in the auspices of some projects related to innovation in teaching, we collected a list of advantages and disadvantages of the new methodology from the opinions of the teaching staff who had used it. Besides, we collected opinions from surveys to students using traditional methodology of group work and to others using Wiki methodology. Five main conclusions arose from the qualitative results of the experience: (1) Teaching staff appraised in Wiki methodology the easiness and speed of access, version control, registry of who, when and what changed in each document, even if some minor disadvantages were also noted; (2) Students from all subjects using Wiki methodology showed in surveys less negative comments than students with traditional methodology; (3) Letting others to see or modify your work is worth, even when it's not finished and you fear that others read your "work in progress" which may be messy or with important gaps; (4) The role of "Editor in chief" is very important and needed for higher final quality of the work produced, regardless of methodology followed. This task is apparently facilitated by Wiki methodology; and (5) If some "good practice" recommendations are taken into account, there are higher chances that Wiki methodology increases the efficiency of writing documents cooperatively, respect to traditional methodology.

i. Objectives

The next implantation of European credits system ECTS entails a trend to incorporate autonomous and guided work from students, linked to semipresentiality (blended learning) in teaching of university degrees (Colás, 2005). The realization of group assignments requires from a good organization of their members to be efficient on putting the information of the work in common, to argue and to solve doubts, to elaborate summaries... At present, there are not many accessible tools to enhance this kind of interaction among students or among teaching staff when they have difficulties to meet in person as frequently as desired. And many of the computer tools that exist and might be used aren't either localized to our language, or they are just proprietary software (regardless of the price you'd have to pay to get them), which does mean (or may very well mean in the mid run), among other issues, that it would be too expensive to use and improve to the budget of the public educative centers.

And beyond the specific computer tools to be used, new methodologies of group work are needed to enhance the "cooperative learning" (Johnson & Johnson 1986), and to promote cooperation more than simple competition while doing assessments.

Thus, our main goal was to test ways to improve the efficiency of students making group work (in fact, cooperative learning), diminishing the ratio of number of hours dedicated respect to the final quality assessed in that group work.

We also aimed to improve the quality of tutorship while the evolution of the group assignments from blended-learning activities.

In this first communication, we focus on the qualitative data collected from surveys to students where they could comment in free open fields whatever they thought or felt about their process while completing the requested group assignments. In a further communication (De Pedro et al. 2006) we focus more on the quantitative aspects of their results while performing those group assignments.

ii. Description of the work

Introduction

This experience is framed within the two projects (totally within the first, already finished, and partly with the second, still in active development) entitled:

1. "*Design, implementation and evaluation of experiences of collaborative work in teaching experimental sciences*"
("Disseny, implementació i avaluació d'experiències de treball col·laboratiu en la docència d'assignatures de ciències experimentals", AGAUR, Ref.: 2003 MQD 00167, also known as "UniWiki Project" - http://uniwiki.ourproject.org ; already finished).

2. "*Analysis of the advantages and disadvantages of the use of Wikis to improve the quality of the evaluation and tutorship of the blended learning and teaching*"

("Anàlisi dels avantatges i inconvenients de l'ús de Wikis per millorar la qualitat de l'avaluació i tutoria de l'ensenyament i aprenentatge semipresencial"; ICE-UB, Ref.: REDICE04, also known as "UniWiki-Redice Project" - http://uniwiki.ourproject.org/REDICE0406 ; still under development)

New tools of collaborative work have been experimented in these projects (De Pedro 2004), with several subjects and degrees, mainly from experimental sciences (Table 1). The degree of adequacy of the new tools and methodologies employed to writing up documents in group has been evaluated later on (De Pedro et al., 2005a), in order to improve the performance and yield of the students that they have used them, with respect to those that have used traditional methodology, considering many factors that may affect them while learning at university (Figure 1).
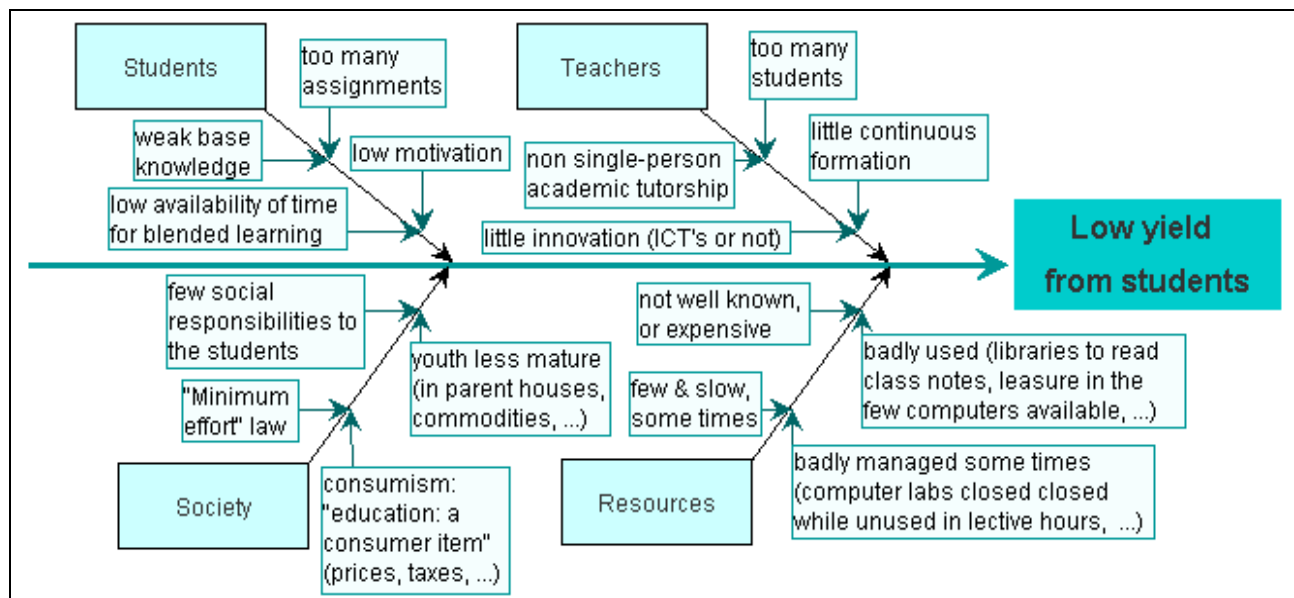

Figure 1. Some possible factors affecting low yield from students at university level (adapted from De Pedro, 2005b)

After a pilot experience, TikiWiki CMS/Groupware collaborative portal web site (http://tikiwiki.org) was chosen as the main environment to enhance asynchronous communication and cooperative learning among students, as well as the basic environment of work for lecturers (Figure 2). Some courses were offered for training students on the tools and methodologies used, but unluckily only a few students joined them from the ones that would participate in the subjects later on. On the other hand, other students joined also the courses, and they were highly satisfied with them, according to the *Students' Evaluation of Educational Quality* (*SEEQ*) survey they had to fill at the end of each one of them.

Figure 2. Main web site for coordination of the UniWiki project, where optional training for students and teachers was held a total of 10 times along the two years of the project.

In this communication, qualitative results from the cited projects are shown, whereas most of the quantitative results are shown in another communication (De Pedro et al. 2006).

Methodology

In the experience reported here, Wiki methodology was tested compared to traditional methodology (see below). A Wiki (Cunningham, 1998), in brief, is a simple tool that allows writing documents in web pages, easily editable by anyone of the group just with a simple web browser, plus it keeps a history of versions from the document, and it allows easy markup and access control. Wikis have been introduced in teaching and learning scenarios fairly recently (Schneider 2004, Prendes 2006).

Big and small groups of pupils have been used, in subjects of 1st and 2nd cycle, of several university degrees, and with several types of collaborative writing assignments or works (Table 1). In total, they have participated in the experience (in either way) more than 230 pupils, 10 teachers, 10 subjects among the first and second period of four months of the year and among the 5 different university degrees being implied, of two universities and an ascribed center.

Subject	Code	Degree and cycle	Cycle	Students	Type of group assignment
Applied Ecology (Bio-UB)	EAUB	Biology	2nd	24	Synthesis and critical thinking
Applied Ecology (CCAA-UAB)	EAUAB	Environmental Sciences	1st	60	Synthesis and critical thinking
Applied Vegetal Physiology	FVA	Biology	2nd	69	Writing a report from practical classes
Evaluation of Environmental Impact	AIA	Environmental Sciences	2nd	60	Report writing; synthesis and critical thinking
Functional Ecology	EF	Environmental Sciences	1st	50	Information gathering and synthesis
Health and Environment	SIMA	Nursery	1st	25	Information gathering and synthesis
Metabolism Regulation	RM	Biology	1st	300	Writing a report from practical classes
MultiMedia	MM	Documentation	1st-2nd	80	Writing a report from practical classes

Table 1. Subjects, degrees and cycles, students, type of work

"Traditional" vs. "Wiki" methodology

In our experience we defined "Traditional methodology" as the process in which students:
- create individual documents in computers not connected among themselves (for example, computer labs of teaching institutions are not in an intranet with individual houses)
- exchange documents in paper, and/or magnetic support (diskette, CD, USB...), and/or by e-mail
- manually watch that there are not simultaneous editions of the same version of the same sub-document, which would hamper the work of combining the sub-documents later on
- make a manual management of document and sub-document versions, as well as of the changes that each one has introduced, and when he has introduced them.

And we defined "*Wiki methodology*" as the process in which students:
- create individual documents in a web server with Wiki technology, which makes documents commonly accessible to all the members of the work group. This allows to be able to see and, in case it ¡s agreed, modify the documents of the other members of the group, as they keep on elaborating their documents, and not just in the final phase of joining the sub-documents of the work. It requires that no member fears that other members of the same work group have the ability to see or modify his/her document (all versions are saved and

any modified or deleted information can be rescued).

- do not have the need to exchange versions of documents among themselves; they are all accessible to all the work group at any time through a simple web browser
- do not have the need to take special measures of security for avoiding the simultaneous editions of a same sub-document, since the tool itself (Wiki) warns when there is an attempt at simultaneous edition, and who is currently working on that document.
- do not have the need to manually join changes together in the same document, since the changes are always integrated into the last version that is accessible in the server

Opinion from lecturers was collected through meetings in person, and opinions from students was collected through individual surveys, which included closed questions (answers ranging from 1 to 5) and empty spaces every several questions to allow extra comments. Students had to hand in the answered surveys to their teachers at the end of the term inside a closed envelope labeled with their name on it, and they were not opened until the grading of the group work was completely finished.

iii. Results and Conclusions

Results

Lecturers

The opinion from the teaching staff about the advantages and disadvantages of the Wiki methodology compared to the traditional is summarized in Table 2.

Advantages	Disadvantages
Possibility of individual evaluation of the participation in group work, thanks to the easy and fast accessibility to each others' part of the work	The used Wiki tool did not generate a report of the individual activity of each student, and thus, many hours of manual work from the teacher were needed. *[with Tiki 1.8-1.9, by the time of use of the tool; currently, already fixed, in Tiki 1.10]*
More availability of the group document that allowed the easy and fast follow-up by the teaching staff of the development of the work	Existence of other better known tools at everybody's reach of easier handling and being WYSIWYG (visual editing; "What You See Is What You Get"), even though they lack some features to ease collaboration in big groups and they can be slower than Wiki
Retrieval of erased parts or former versions	Difficulties of connection to Internet and lack of computers, sometimes
Historical record of the writing of the work (who, when, what, ...)	Novelty of the Wiki methodology that is not very well known yet by the educative community and that has to learn to use it
Chance to get immediate and automatic notification by e-mail when changes are made in the document	Possible saturation of the e-mail
Simplicity and speed to apply markup styles to the text	Texts with very complex format are difficult or impossible to be made with Wiki

Table 2. Advantages and disadvantages detected by the teaching staff after using a work methodology based on Wiki

In first cycle students (for example, "Functional Ecology"-ECOFUN, "Health and Environment"-SIMA), we have detected that:
- They have difficulties to organize themselves in work groups.
- They have difficulties to synthesize the information, since it is easier for them including information from digital sources than adapting it to their context and synthesizing the sometimes too long texts.

- First cycle students learn quicker and accept better the new methodology than those of the second cycle, even if this varies among degrees.

On the contrary, in second cycle students (for example, "Evaluation of Environmental Impact"-AIA, "Applied Ecology-UB"-EAUB, "Applied Vegetable Physiology"-FVA), we have detected that:

- In general, they can organize themselves much better than first cycle students and they have previous experience in working in teams (distributing work, assuming roles inside the team and taking profit more efficiently of the effort and time invested).
- Many of the teams have not been of new formation but the members already knew each other and had collaborated or are collaborating in other assignments or subjects of the degree
- They are people with resources that tend to know already how to 'move' themselves at university and use the available resources quite efficiently
- Depending on the details of size and type of assignment for work groups, the Wiki methodology has been little or very accepted:
    - In some cases, the grade of acceptance of the Wiki methodology has been very low (subject FVA) partly attributable to the fact that they are in their last year of the degree (their priority is to finish, they take many subjects in some cases, and they don't have time to learn novel methodologies, especially if they have other tools that they manage well enough, even if they lack some of the needed features for group work that Wiki technology includes)
- In other cases of subjects in last course, they found positive and negative aspects (subject "Applied Ecology, Environmental Sciences, UAB" - EAUAB). In the positive part resides the facility of distance interaction among them and the fact that, at all times, there is only one "good" copy of the document. It is also positive the fact that the students manage to learn the new technology with little training and information (expressly) given by their lecturer, since their handling of the Web technologies seemed enough for this type of applications. In the negative part resides the fact that they were not too used the Web environment of work, and that the final format for the document was not Web format but paper format.
- Nevertheless, in the case of "Evaluation of Environmental Impact"-AIA, of third course, the students have accepted very well the new Wiki methodology, since for the type of work that they had to do and for the big size of the work groups (15 persons), they were foreseeing that it would facilitate very much the work to them. This way, Wiki has meant a tool and methodology very well valued by students for the comments in class at the end of the course (from both those who could use it, and also from those who had to use the traditional methodology).

Lecturers have the impression that if students could have work at an standard Office software environment (either Microsoft or OpenOffice, for example) which could work agile and quick enough for the group work, the success had been much more important. However, the speed of using standard office documents combined with Web folders (Webdav protocol) was not good enough for students nor lecturers, after a pilot experience that was deployed at the early stages of UniWiki project, besides many other handicaps for the web office methodology use in educational scenarios with the current development of technologies (De Pedro 2005a).

On the student side, there where a total of 229 surveys and 223 self-recording tables collected of invested time (divided in methodologies and subjects in Table 3).

Subject	Surveys					Self-recording tables of time invested				
Code	Wiki	Trad.	?	Total collected	Total students	Wiki	Trad.	?	Total collected	Total students
AIA	26	33		59	60	30	27		57	60
EAUAB	11	11		22	60	11	11		22	60
EAUB	7	13		20	24	7	13		20	24
EF	39	0		39	60	39			39	60
FVA	2	11	2	15	69	2	6	2	10	69
MM	13	7		20	32				20	32
RM				32	300	26	6		32	300
SIMA	9	14		23	25	9	14		23	25

Table 3. Surveys and self-recording tables handed in, for each work methodology and subject

A count of the extra comments voluntarily written by the students in their surveys in the blank fields is shown in Table 4, classified by type of methodology and feeling.

Methodology			
Traditional		Wiki	
Positive	Negative	Positive	Negative
3	16	12	6

Table 4. Total number or positive and negative extra written comments declared in empty spaces on the survey by the students

The extra comments voluntarily written by the students in their surveys in the blank fields (Table 4) show that, the students value very positively the collaborative writing methodology based on Wiki because:
  • it allows them cooperating without traveling to meet,
  • it allows them observing the development of their mates' work,
  • it is a dynamic communication tool,

Some of them point out their interest in knowing new tools or the security to have their data on the Internet, (apparently) "free from accidents or viruses".

The negative valuation of Wiki methodology, usually comes from connecting problems to Internet o from the lack of time to learn the specific Wiki markup. Most of the negative valuations correspond to problems in organization: too big or disperse groups, or work organized inadequately. A group declared that they lacked time to deepen at the same time in the three activities:

1. the writing work itself
2. learning the methodology of working in group
3. learning the Wiki technology

In order to illustrate some precise examples, three literal comments are shown of each type below, among the total number of those comments collected

Three examples of POSITIVE comments expressed after working with WIKI methodology

1. *"The time that you devote to it is minor than if it was traditional methodology and can be coordinated with many more people"*
2. *"It has not been necessary to meet out of the university since we could make it through wiki"*
3. *"In FVA I do not use the Wiki because my colleague of work is not very in favor, so we let it be. Anyway, I have to say that the idea is very good, I think that for the works in group (especially when they are mass groups, of 4 people, for instance, I mean) it is a great thing. I always thought, and here the question is already personal, that four persons in front of a computer, once everybody successfully get to meet a day (one of the most usual handicaps), it is very little productive. I find it more "efficient" if we create general ideas when we meet in person, and then being able afterwards to work each one at his/her home. The fact of sharing files and seeing what the others have been changing is perfect, and if we add up that the forum already goes very well for the hourly incompatibilities of the members of the group, then we have a good combination."*

Three examples of NEGATIVE comments expressed after working with WIKI methodology

1. *"I believe that working with the Wiki can serve to facilitate the exchange of information but that it is necessary that the people of the group meet in person to argue how to do it..."*
2. *"I have lost a lot of time on reworking lost texts (6 or 7 occasions), suffering because you cannot make a backup while you work"*
3. *"I think that the Wiki can only be useful if all the members of the group have daily access to Internet and the habit of using it"*

Three examples of POSITIVE comments expressed after working with the TRADITIONAL methodology

1. *"I have not had any problem to communicate with the members of the group since that we are together in the class and taking profit of the same spare hours is very helpful"*
2. *"I think that the meetings in person improve the work much more, they are an enrichment for the person"*
3. *"All the possible doubts that we have had, have been able to ask directly to the teacher and this is also well"*

Three examples of NEGATIVE comments expressed after working with the TRADITIONAL methodology

1. *"I think that we were too many people and that we have not been enough identified among ourselves. Perhaps it is that I am not used to make works in big groups"*
2. *"Too big working group, so that it is very difficult to be able to meet altogether or even simply a representative of each group"*
3. *"Difficulty in organizing the work, lack of spirit of group"*

"Good practices for Wiki methodology" proposal

The methodology for writing documents collaboratively and cooperative learning based on Wiki ("**Wiki methodology**") comprises two aspects to allow sharing information, and following changes with an always ready available copy of your merged version (or any previous version, if needed): (1)a Wiki-like philosophy or conception of the way of working (what e called "**Wiki philosophy**", from now onwards), as well as

(2)a Wiki-like computer technology ("**Wiki technology**", according to definition and initial prototype of Wiki from Ward Cunningham, 1995).

The "**Wiki philosophy**" means that:

1. . people need to lose the fear of that the other people see the non-finished working documents of everyone, and that they could contribute changes. Every person allows that his document of work should be read and modified by other persons of his/her group of work, along the whole process of writing
2. . people is encouraged to participate with their colleagues work (making a proposal of changes already modifying the other person's document), at any time and at any part.

The "**Wiki technology**" allows that:

1. it is possible to apply the most common markup to a document in a simple and quick way (here it comes its name, since "Wiki-Wiki" means "quick", in Hawaiian language), without having to raise the hands of the keyboard
2. any person could see and/or modify the information of the document. Permissions can be granted easily for documents and groups of users, so that many scenarios of collaborative work can be configured
3. it is possible to get notice by e-mail (or RSS feed syndication) when someone comments or does changes on a page of the document, emphasizing first the specific changes made to the previous version
4. changes introduced between any pair of versions of a document can be easily visualized later
5. content that has been modified or erased (by oneself of by other people) can be recovered, if needed

Thus, a "**Good practices with Wiki methodology**" proposal can be suggested, after the experience acquired in [UniWiki](#) project, including 3 generic plus 7 more TikiWiki-related items (even if other similar Internet platforms, such as Mediawiki, dfWiki, eWiki, etc, would need similar procedures to perform these common tasks when editing documents through "Wiki methodology"):

1. It is convenient to prevent students from aiming to define the structure of his work through telematic means (forums, Wiki, e-mail). **It is necessary to define concisely an initial structure of the work**. This can be due to teachers suggest an initial concise structure to start working as well as help distributing tasks and tentative work calendar, or due to students define it in meetings in person in front of a blackboard, or similar.

2. **Big work groups need Wiki technology Wiki**. Some groups of 4 people each have taken profit out of Wiki methodology, but others have not. Work groups from 8 people onwards did take profit of Wiki methodology indeed (Functional Ecology'05, Evaluation of Environmental Impact'05; De Pedro et al. 2006).

3. Initial structure of the document can be modified or even lost as time passes, and redundancies of information can appear, etc. There is needed **periodic work of restructuring and synthesizing** of the introduced information. It can be thought (*a priori*) that any person might take part in this task, but the experience in this project has indicated that **the figure of "Editor in chief" for the joint work is crucial**.

Then, some additional recommendations can be given (more Tiki-related, in this case):

4. It's advisable to define a structure of pages Wiki (book-like collection of Wiki pages, with the featured named "Structures" in Tiki).
   - Make single Wiki pages to be as small and divided in sub-pages as possible, in order to avoid the attempts of simultaneous editions of the same content (remember that, up to present date, no Wiki engine can cope with merging the changes from simultaneous edits of the same page; a "Concurrent Versions System" -like tool would be needed instead). In case of attempt of simultaneous edition of Wiki pages of TikiSheets, Tiki would warn the user that another using is editing this content before him/her, and haven't saved or canceled edition yet.

5. In case of small tables, include them directly in the text with the proper Wiki format, so that these tables are created and will be editable directly within the body of the Wiki page.

6. In case of big tables, on the other hand, include them through the "wysiwyg" tables that are included in the Spreadsheets feature in Tiki starting in 1.9 version onwards (http://doc.tikiwiki.org/Spreadsheet - also known as *TikiSheets*)

7. In order to include graphs:
   - In case of common graphs (pie chart, multi-line, multi-bar, stacked bars), TikiSheet[?] feature can generate graphics (figures) directly from the web spreadsheet in Tiki, and you can dynamically include them inside Wiki pages (changes in spreadsheet data will automatically update the figures shown in Wiki pages).
   - In case of need of more complex or different graphs inside Wiki pages: Generate them with your favorite software (there are very nice free software tools to create them), and you need to convert them to bitmap images (like photos; formats *.jpg, *.png, or *.gif), either by exporting the graph as such through your software, or by taking a computer screen capture shot when the image is viewed and cropping it to

your needs (different procedures depending on the operating system in the computer). Once the image is in the hard drive, then select it and press "Upload picture" from within the Wiki page edit form.

- In order to include many graphs generated from external software programs, an easy procedure to convert all of them from graphs in OpenOffice Calc or MS Excel (for instance), into single images on disk could be to save the spreadsheet as html - Web page. Image files should be either in the same directory as the generated html file, or in a folder of the same name as the html file, depending on the program). Then they can be uploaded as images or photos to the Wiki page as previously described.

8. The powerful "Category system" in Tiki can be used if some dynamic information and coordination is desired regarding the pages that are in on-going process, or just need to be polished, spell checked, improved markup, etc. (or already finished). Even if this would require some more training from students since they may not be used to categorizing content (web or desktop content). Each single object in Tiki can be categorized into one or many of the defined categories (http://doc.tikiwiki.org/Categories).

9. Once the edition of all the pages is finished, it is possible to export ("print" in Tiki language) at once the whole structure of Wiki pages in html. This can be done with the option "Wiki > Print", in the main menu, through selecting the "structure" of pages to print. This would be the equivalent procedure of working with a master document and sub-documents with standard Office software programs.

- Saving as web page on hard disk from Internet browser is needed again, selecting as "Full Web page" (or similar option, depending on the browser).
- Then a conversion of the html document on hard disk to common office document format is needed. From OpenOffice (OOo) , an extra step is needed and thus it will be explained here to illustrate a possible procedure. Open the html document with OOo (everything will be inside a single-cell long table). Select the whole content from inside the single cell of the table (the full contents of your document), copy it and paste it into a new (blank) OOo Writer document. Save this new document as text document (either ".sxw" or ".odt"). Then you can already edit the document as wished in that Office suite with normality (modifying styles and formats if needed, including a paginated initial index, header and footer, numbers of pages, etc.).

10. Before printing the final version in paper, the tasks from the " Editor-in-chief " figure/s are very recommended, as previously reported:
- synthesizing ideas,
- deleting repetitions,
- unifying styles and markup (that will be the minimum, thanks to the unified ".css" stylesheet employed by web portals such as Tiki does)
- improving the spelling and grammar of the text. A good dictionary (online or paper) and standard office spell check tools may help the editor in chief for this final review, specially when the most of the students didn't pay attention to this issues. Some help for the editor in chief could be to to his/her duty load at the end by promoting single users to take care of it. Spell checking tools while still editing online through the web forms in the Wiki exist. These could be, for instance, the "Konqueror" Web browser for spell checking almost any language at real time (only for GNU/Linux), or through the "Google toolbar" for any operating system, in case your language is supported.
- make a copy of the document in ".pdf" (there are nice free software tools which produce them, such as OpenOffice, PdfCreator, for instance.

Conclusions

- Teaching staff stated positive items of Wiki methodology (easiness and speed of access, version control, registry of who, when and what changed in each document, ...), even if some minor disadvantages were also noted.

- Students from all subjects using Wiki methodology showed in surveys less negative comments regarding the difficulties of the methodology to accomplish the group work, than students with traditional methodology

- Letting others to see or modify your work is worth, even when it's not finished and you fear that others read your "work in progress" which may be messy or with important gaps.

- The role of "Editor in chief" is very important and needed for higher final quality of the work produced, regardless of methodology followed. This task is apparently facilitated by Wiki methodology.

- If some "good practice" recommendations are taken into account, there are higher chances that Wiki methodology increases the efficiency of writing documents cooperatively, respect to traditional methodology.

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