

# Use of Wiki as a Postgraduate Education Learning Tool: A Case Study\*

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Web 2.0 tools have redefined the meaning of learning. Students do not need to learn in the same place at the same time, listening to a teacher. This paper explores an innovative educational use of wiki as a learning tool: during the week, outside the classroom, students have to read and investigate terms and concepts, publishing the wiki what they have learned and read and comment other classmates posts. In the classroom we work in little groups or collectively debate different points of view. A full quantitative and qualitative analysis of the outcomes of this case study is presented, as well as some recommendations to improve its use in future courses.

**Keywords:** wikis; flipped classroom; knowledge building; postgraduate education

## 1. Introduction

Communication technologies connect us together across time and space in ways we couldn't imagine just some twenty years ago when Tim Berners-Lee invented the www. Wikipedia and other web 2.0 tools have redefined the meaning of learning. Now we have two main challenges: first, '*we do not need more information, we need more understanding*' (Charles Leadbeater, *Living on Thin Air*, 2000) and second, we are going to need teams of experts from complementary fields working together.

This project is a response to understanding that 21st students need much more than basic literacy's with ICTs in order to be able to choose what they want to be and to do in the highly informational, networked environment of the society where they will live. Collaboration is the rule, not the exception: working effectively in teams across disciplinary boundaries is being an essential skill in the 21st century. Today students must acquire collaborative and creative skills and must be able to critically assess the information surrounding them. This observation points to a set of critical, collaborative and creative ICT literacy's which Bruns & Humphreys [1] call the CCC literacy's.

But, how are we to first develop this literacy's and skills in our teachers in order to allow them to teach effectively in these new environments? This challenge requires a flexible learning environment where students can learn wherever they are and when they have time, beyond the bounds of time and classroom walls. Web 2.0 applications (blogs, web-forums, wikis, rss . . . ) are suitable for these new learning needs.

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Wiki (in Hawaiian means fast) was developed by Ward Cunningham in 1993 'as the simplest on line database that could possible work' [2]. It is a website whose visitors can edit its content. Therefore, wiki technology allows students to extend content.

In this paper we explore how wikis can be employed in a postgraduate course for future teachers to encourage learning and to let them know wiki's strengths and weaknesses as a learning tool and how they might be addressed in the future.

This paper is structured as follows. Section 2 reviews related work in using wiki as a learning tool and related theories on how learning happens; section 3 outlines the research method for this case study; section 4 presents the analysis results and, finally, section 5 provides conclusions.

## 2. Literature review

Theoretical foundations for this work are based on the fact that researches on using a wiki as a learning tool carried out during last ten years revealed that wiki seems to be an effective tool for cooperative, constructivist and lifelong learning.

**Cooperative learning** is a learning—teaching strategy in which students are grouped in small teams mixing different levels of ability to achieve a specific task. The main idea is each student has grouped responsibilities as well as individual responsibilities: each one is responsible not only for learning, but also for helping teammates learn.

According to Johnson and Johnson [3], there are five elements of cooperative learning: positive interdependence (to achieve group goals contributions from each of the teammates are needed), promotive interaction (everything a teammate thinks, talks

and acts toward the others will affect how the group achieves its goals), individual accountability (though teammates can help each other, everyone has the responsibility of an assigned task that will shape his/her grade), group processing (the team has to assess together what they're doing), and social skills (every teammate needs to improve her interpersonal skills to work together as a team).

According to Lin and Hsieh the key pedagogical assumptions of cooperative learning are: (a) knowledge is created as it is shared—therefore the more students share information the more they learn—(b) students have prior knowledge they can contribute to the group; (c) participation is critical and; (d) students will participate if given optimal conditions [4 p. 379].

Lipponen [5] poses a technology tool like a wiki can be used for collaborative knowledge building as it supports learners' cognitive activities offering different ways to structure discussion and it can build community relationships among learners. Computers and internet is the frame where peer interaction and group work happens.

**Constructivist learning:** This kind of pedagogy builds new knowledge on existing knowledge of the learner as well as interaction with the environment: students are presented with opportunities to build on prior knowledge and understanding in order to construct new knowledge and understanding. Lin & Hsieh pose that to get success this model must be learner-centred: the tutors have to provide learning materials that help students to self-discover what they have to learn [4].

The main features of constructivist learning can be summarized as follows:

1. All knowledge is constructed through a process of active learning in which sensory inputs are transformed into meaning by reflective abstraction.
2. Hands-on experience is necessary but not sufficient for learning. Learner has to create cognitive structures. Learning happens in the mind.
3. People learn to learn as they learn, building those cognitive structures in a continuous process of development.
4. It takes time to learn. The methods of teaching must agree with this understanding of learning.

Quoting Wang, 'Wiki collaboration systems encourage student-centered learning environments, because they encourage students to be co-creators of course content' [6 p. 1]. Parker & Chao note that constructivist learning has been 'approached from a variety of perspectives in wiki research, including reflective activity and communal or social constructivism' [7 p. 59].

**Lifelong learning:** Wiki is a social, interactive, collaborative learning tool that encourages and enables learning in ways that many other Web-based tools fail to do. Its dynamic features include also understanding the inherent instability of knowledge [1].

### 2.1 Educational use of wikis

A survey on the popular technology site Slashdot showed Wiki systems are used for a wide variety of purposes, including: encyclopedia systems, software development, project knowledge management, personal knowledge management, collaborative writing, and as content management system (CMS).

Wikis present themselves as an interesting tool for enhancing cooperative, constructivist and lifelong learning. Tonkin [8] suggests that Wiki use falls into four broad categories:

1. Single-user. This allows individual students to write and edit their own thoughts and is useful for revision and monitoring evolution of thought processes. The use of Wikis as e-portfolio is a particular single-user case.
2. Lab book. This enables students to peer review notes kept on line by adding, for example, commentary or annotations to existing lecture notes or seminar discussions.
3. Collaborative writing. This can be used by a team for joint research such as a group project, essay or presentation. As Morgan poses, the openness of the wiki encourages and supports collaborative or associative rhetoric over a monological, authoritative, single-voiced rhetoric and makes it difficult to lock it down to a final version [9]. Faculty can use wikis to collaborate on projects list or as an ideal vehicle for soliciting ongoing community input for research [10].
4. Creating a topical knowledge repository for a course syllabus. Through collaborative entries learners create course content that supplements and extends teacher materials.

Furthermore, Bruns holds that learning in a wiki environment enhances digital literacy. Students learn content creation, collaboration and ideas communication through a networked environment [1].

Yet, there are some properties of traditional wiki systems that are not desirable in the context of the classroom: all content is modifiable by any user, all content is public and the wiki is forever evolving.

### 2.2 The flipped classroom

The flipped classroom model of learning was first named in 2007 by Jonathan Bergmann and Aaron

Sams [11]. Some years before Lage et al. called it ‘the inverted classroom’ [12].

In a flipped classroom, students watch, read or listen to the lecture at home and ‘do homework’ and other educational activities in the classroom. It is reversed teaching model that delivers instruction at home—students can choose when and where ‘take the lesson’—and transforms the classroom into a much more interactive one.

Inherent in flipped classroom model is the student responsibility for learning, which must be active rather than passive. There should be an engagement from the learner in the process.

Though the more known flipped classroom is based on video recorded lectures, like those of Khan Academy, this model has evolved into asking learners to search for information about a topic, regardless the media it is offered. Sams says ‘*Yes, I use video to deliver instruction; no, students are not required to watch MY videos; yes, students can learn the objectives of the class in any way they want*’ [13].

### 3. Research method

**Questions and objectives.** The primary focus of the research is to assess the utility of a wiki as a learning and assessment tool. These have been the research questions:

1. Can a Wiki be used to create meaningful course content suitable for assessment?
2. What if we ‘flip the classroom’, asking students to read and reflect about the documents at home and reserve classroom time for discussion and debates? Will students take the responsibility of learning?

**Course description.** This report is a case study in *Instructional Design Fundamentals* module of ‘*Master en Profesor*’ at the University of Zaragoza. 30 students took the course of Technology and ITC speciality during last academic year. There were two periods of 60 mins. classes per week during ten weeks. In previous years we used the university Moodle platform to make available course materials. Last year students were asked to write their assignments using the Wiki tool in Moodle.

#### 3.1 Why a wiki?

The usual linear teaching style is unsuitable here for three main reasons. First, technology and ICT fields have an important social and educational aspect which is far more complex to be treated in a linear approach. Second, we were looking for a model of instruction that meets the learning needs of our ‘*Master en profesor*’ students, each one with a different curriculum background. Third, our

today’s students will be tomorrow’s teachers and must therefore experience how to teach tomorrow’s students.

**Multilineal Approach:** Nowadays there are many named web 2.0 technologies: blogs, wiki, forum boards, RSS . . . Wiki has no inherent structure. Wiki pages have neither chronological nor taxonomical order by default. They can be organized as required, interconnecting each other as users create new ones. This is the main reason that makes wiki a suitable technology to teach and learn in a social network style. The flexible knowledge space a wiki is it is useful for building, sharing and exchanging knowledge through collaborative teachers and learners work.

**Wiki and the flipped classroom:** Furthermore, a wiki is suitable for flipping the classroom. Each learner can choose when, where and which media suits his/her personal and individual learning needs. A web page nobody owns and anyone can edit is at the core of the wiki concept: the role of the teacher changes from transmitter of content to learning coach. As students must research about the contents and the objectives of the class before we can spend our class time answering questions, debating different points of view or working in groups.

**Teachers experiencing learning with ICT:** Sooner or later, ‘*Master en profesor*’ students will be teachers. In an internet connected global world, teachers have to find ways to encourage greater collaboration among students. Wikis make possible the shift from a teacher-centered teaching model, where the teacher has the role of transmitting information and knowledge to the students, to a student-centered model, where teacher and students are collaborative learners. Kurhila describes how wikis can be used to support learning communities [14].

Instead of knowing the wiki topic merely reading Wikipedia or a wiki user’s manual, future teachers have to experiment the technology themselves, creating pages or editing and posting comments on pages created by other classmates.

#### 3.2 Case study: *Disinstrucpedia*

‘*Master en profesor*’ is a postgraduate course every future teacher in Spain must complete. One of the *Instructional Design Fundamentals* module objectives is that the student must ‘know and assess the more relevant instructional design models and theories’ [15], which imply to understand and use some pedagogical vocabulary.

In previous years we detected understanding some pedagogical terms was hard for technologic students. In an attempt to remedy this difficulty we

planned an ‘icebreaker activity’ using a wiki we named *Disinstrucpedia*, where there could be ‘peer learning’. The premise for developing *Disinstrucpedia* as icebreaker was to explore new ways to express the concepts so all the students could understand them without losing rigor.

So we planned two different activities for each one of the two lessons per week: one lesson was dedicated to a lecture and the other we planned debates, discussions and work in small groups.

This second process took place with a weekly iteration:

- Day 1: After the class, tutor publishes on *Disinstrucpedia* a question, a definition, an article, a video, . . . ;
- Days 2 to 5: time for students to discover new material, reflection and add individual contributions like a new definition or redefinition, an article review or a short referenced essay;
- Days 6, 7: students post comments on peers’ posts;
- Day 8: during the lesson we debate last week topic or work in groups with the materials published in *Disinstrucpedia*. Before time ends we talk about which should be a good topic to learn about next week.

This process requires some information technology skills. As many of the students have never used a wiki before, to ensure that all of them had the same opportunity to contribute to this on line collaborative learning experience, the first step was the development of clear use guidelines published in the wiki front page. In addition, a link to a wiki manual was placed for further information.

**Wiki selection:** Schwartz et al. point to several criteria to consider before selecting an educational wiki. Some of them are control, clarity and common technical framework plus the need for minimal technical skills [16].

- Control: user registration, users right management and easy to restore pages to previous versions.
- Clarity: page structure, page creation and deletion and format that facilitates linking different pages.
- Common technical framework: editable by anyone with an internet browser and platform used.

Moreover, Cubric [17] points out the need to avoid anonymous access in order to evaluate individual contributions.

To support *Disinstrucpedia* we chose the wiki tool embedded in the Moodle platform. Actually, clarity is not the best quality of this tool. The procedure to

create a new page requires some kind of technical skills, there is no index or map site unless you create it in the front page and the only page hierarchy reference is the breadcrumb. But the whole course was scheduled in Moodle. All the students knew how to login and how to navigate in this platform and only the course staff and students have access to the content. Though this feature, privacy, is not one of the common wiki features Cabero advice to restrict access to class students only [18]. Finally, we chose it to ensure the confidentiality of any mistake done by the students while exploring terms and concepts of what is a completely new discipline for all of them.

We considered the ‘pros and cons’ and finally decided to use a platform students know and to maintain index manually as the *Disinstrucpedia* grew.

**Structure and participation.** Lamb contends that a wiki structure should be ‘shaped from within—not imposed from above’ [19]. The scaffolding provided by the tutor was just publishing the initial page and the guidelines.

O’Neill poses it is necessary to select some students with the responsibility of the wiki being a good site of reflection [20]. De Pedro points out the importance of the role of ‘Editor in chief’ to ensure the higher final quality of the work [21].

As Cubric suggests [17], we separated teacher and ‘Editor in chief’ roles. At the beginning of the course we asked for volunteers to be ‘Editor in chief’. One student was named to deal with *Disinstrucpedia* content, making new sections, maintaining the index and avoiding problems relating to mistaken deletions or repairing if they occur.

In order to make possible the assessment of contribution that each student has made to *Disinstrucpedia*, we chose contributions were always signed.

**Assessment.** Finally, the redesign of the course requires the change of assessment. Assessment can be used for learning, besides for grading. Peer comments, own reflections, writing clear explanations of pedagogical subjects, . . . support students learning and must be taken into account.

Following Macdonald, who recommends to tie on line collaborative activities to the course assessment and to reward through assessment the additional time burdens that collaborative working imposes on students [22], the assessment structure of the Instructional *Design Fundamentals* module was modified to balance between the cost (time researching, reflecting and writing) and the benefits (learning and wiki participations account for the 30% of the final grade).

**Table 1.** One edit => five counts

08/12/11 18:28	83.43.nn.nn	user5	wiki edit	DisInstrucPedia: user5
08/12/11 18:33	83.43.nn.nn	user5	wiki edit	DisInstrucPedia: user5
08/12/11 18:35	83.43.nn.nn	user5	wiki edit	DisInstrucPedia: user5
08/12/11 18:39	83.43.nn.nn	user5	wiki edit	DisInstrucPedia: user5
08/12/11 18:44	83.43.nn.nn	user5	wiki edit	DisInstrucPedia: user5

### 3.3 Data collection

Both quantitative and qualitative data were collected from classroom observations, Moodle statistics tool, surveys and posts.

At the end of the semester surveys were used to know whether students considered the wiki an effective learning tool, both in higher and secondary education, and whether they have learned with ‘the flipped classroom’ model.

## 4. Outcomes discussion

### 4.1 Quantitative analysis

Since the wiki tool embedded in Moodle counts as ‘view’ each time a user views a page, regardless is the second, third, fourth, . . . time in the same session (i.e.: a user goes back to the main index to read about a different topic and statistic tool counts views +1), view statistics provided by Moodle are unreliable. The only reliable quantitative data about viewing *Disinstrucpedia* is how many times each student accessed it: each student accessed at least once a week without include access to edit and, which is most significant, more than 50% of our students accessed twice or more weekly (14 of 27 students).

Much the same happens with the edit statistics. Every little change like editing a hyperlink a student does is counted as an editing action, so we can’t actually know how many times a student has edited his or anybody’s wiki page. Besides, some reports like the one in Table 1 make us suspect a unique editing action has been counted five times (Watch the timeline in the first column).

The only reliable statistic is that every student wrote his/her personal wiki page and that five of them (which represents 18.5%), wrote an extra essay about topics they found interesting and wanted to learn more about.

The analysis of the quantitative data collected with the survey shows students value better the group contribution (2.83 over 4) than his/her personal contribution to *Disinstrucpedia* (2.61 over 4) (Fig. 1).

More meaningful are data about wiki as a teaching—learning tool in two ways: first, 91% of students partially or totally agree they needed to understand the concepts they were writing about (Fig. 2), so we achieved the goal of making pedago-

gical terms more clear to technologic students; and, second, 78% partially or totally agree they will use a wiki as a teaching— learning tool when they became teachers (Fig. 3), which indicates they perceived the value of this collaborative tool.

A last question about the easiness of use of the platform indicates we better chose a more user friendly one: while no student totally agrees it is an easy to use tool, 60.9% of students partially or totally disagree it (Fig. 4).

### 4.2 Qualitative analysis

Our experience using a wiki as a learning—teaching and assessment tool in a ‘flipped classroom’ model lead us to these reflections:

1. One of our objectives was to evaluate a wiki as a

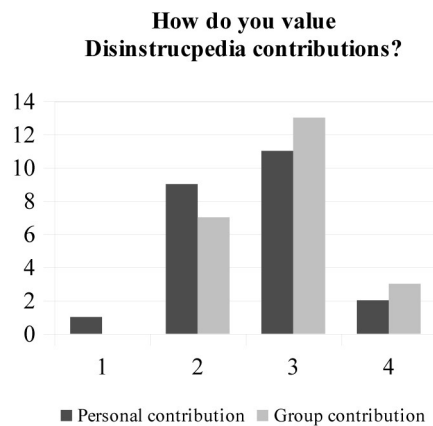


Fig. 1.

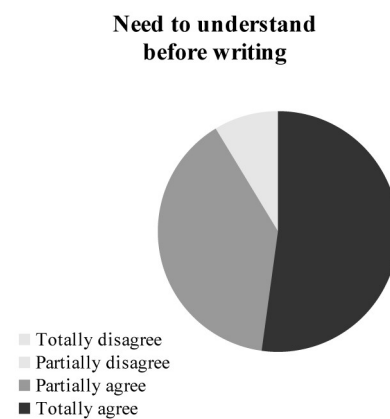


Fig. 2.

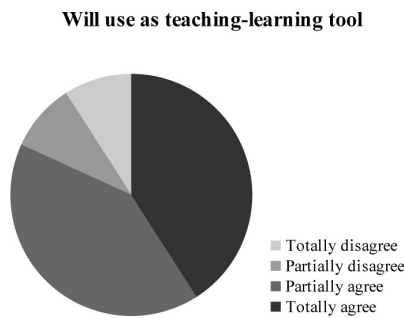


Fig. 3.

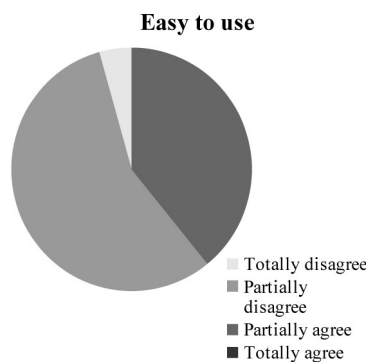


Fig. 4.

learning tool in a postgraduate course. Let our students speak:

*'I think the wiki is a good collaborative learning method. Therefore, its use for higher education can be very helpful if all members get interest and contributions are 'informed' (It's hard to translate the Spanish expression 'con fundamento'). Otherwise, it becomes very weak'.*

*'I liked the ability to share resources and opinions to enrich the learning or to even build a common and higher quality learning'.*

2. Our second objective was to evaluate the 'flipped classroom' model.

*'I think it's a good way to learn, as I did it when I had been better and I have spent time when I could do it, calmly and without haste'.*

*'You need individual work at home, reading and pencil and paper or keyboard and screen, and then discuss it in class, knowing different points of view'.*

3. *Disinstrucpedia* has been a funny and 'structured bulletin board' for analysis and reflections: *'Encourages you to find information on the subject, before you begin to write'; 'I find it a useful tool because it forces everyone to have analytical skills to make it functional and avoid repetition or something out of place'.*
4. But not for feedback. Students were 'too polite'

to edit or post comments in other student's work. Though in the classroom they debated and discussed each other opinion, they didn't write it down in *Disinstrucpedia*.

5. Clearly, the *Disinstrucpedia* wiki as it has been utilized so far does not constitute a wiki system in the fullest sense of the term, but it has been a good tool to encourage students' reflection and learning: 94% students agreed publishing in the wiki requires previous reflection.

*'My assessment is very positive, because for me, doing works which imply reflection and research, it's always good. I consider its part of teaching. I think teachers should teach students to do this kind of work.'*

**Difficulties:** We would be remiss if we didn't mention some of the objections our students made.

1. Wiki has been a novel technology for some students and they have needed extra time to learn how to use it.
2. Some students complained that the wiki syntax needed to edit a new page lacked simplicity. In next courses we will choose a more user kindly wiki platform: *'I have not yet learned how to conveniently format my publications. In conclusion, the experience has been good but how do I find it a bit complicated.'*

**Disagreements.** Though not named by most students, time needed to complete the wiki assignments is a question with no agreement. While one of them thinks time needed *'was excessive, but worthwhile for my own learning'*, another believes that *'it requires the same effort as for a normal delivery, but it is easier and exciting'* and another one complains that *'requires time I'm not left'*.

All *'Máster en Profesor'* students agreed wiki is a good learning tool in higher education but there was no agreement on whether wiki is a good tool to use in high school education. As part of their training as future teachers, students do internships in high schools. They were asked if a wiki like they were writing could be used as learning tool with younger students.

Even though some students believe that *'it can be used to develop personal maturity, interest and responsibility'* or that *'it is very positive and active and offers a lot of versatility and many options for work and communication between peers. It is simple and dynamic'*; *'useful but in the sense that when students want to publish something, they have to take time to prepare, study and ensure what it's been written has a minimum level'* many others see some difficulties using wiki with less mature students *'and so, in my opinion, the results are less reliable'*, *'it could be merely a copy of another web sites'* or

'students need a degree of maturity to make a collaborative learning works'

## 5. Conclusions and future work

We have found that a wiki can be a reflective learning tool which enriches student's learning, moving from the mere rote reproduction to the meaningful comprehension, and that the flipped classroom model moves learning beyond the bounds of time and classroom walls.

Students liked *Disinstrucpedia* is an evidence: reflecting, writing and sharing knowledge with classmates, choosing when and where to learn . . . but, in order to get the most benefit from a wiki as a learning tool, we will consider some options recommended by the students themselves.

The wiki Moodle module is a little hard to use if you want to create new pages or refer to existing ones. Next courses we will choose another platform with a more user friendly interface.

The numbers of participants in the *Disinstrucpedia* have been limited (some 30 students plus teaching staff), as was their previous knowledge of the field, which have meant the total number of posts has been quite low. One of the students commented '*I think it's valid as a tool used in large groups*'. Next courses we will try to extend *Disinstrucpedia* research to students in other '*Máster in profesor*' specialities.

Time students spent preparing and writing *Disinstrucpedia* content will be focus of attention in next editions to evaluate how it must be taken into account in the assessment.

In addition, we will propose some students to use a wiki as learning tool while they're doing their internship and to evaluate the results about quality of contents and degree of maturity and reflection of younger students.

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