

Title:

PREPARING AND PUBLISHING WIKIPEDIA ARTICLES ARE A GOOD TOOL TO TRAIN PROJECT MANAGEMENT, TEAMWORK AND PEER REVIEWED PUBLISHING PROCESSES IN LIFE SCIENCES

Theme: New generation of learners / social media in the classroom

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Abstract

Besides accurate research, students writing skills are one of the main abilities today. The availability of Internet sources and word-processing software has changed the way students conduct research and write up their documents. But nevertheless the basic tasks of the student writer has to be focused in synergy with these new possibilities: Doing well-designed (literature) research and presenting it clearly and accurately, while following accepted academic standards for citation, style, and format.

In our paper we present the attempt to use Wikipedia article publication as a model to train teamwork, project management and the peer reviewed publishing process in life sciences.

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Introduction

In contrast to scientific workflows centuries ago, today most results are produced as an outcome of collaborative teamwork. The same is true for writing of scientific texts. Social Media and collaborative platforms, like Wikipedia, are excellent tools to enable synergistic effects of

multi-minded production of scientific texts. It can be observed in many disciplines that publication of research results in peer reviewed media is the global measure used to gauge a scientist's level of success. The availability of Internet sources and word-processing software has changed the way students conduct research and write up their documents. Accurate evaluation of scientific validity and credibility of many pieces of information and text composition in groups are one of the basic skills students have to learn. A modern and appropriate way to learn these skills is "problem based learning". This attempt helps to transfer knowledge gained from lectures to real world problems. The opportunity to produce a publishable scientific text in combination with the honour of the public mission of Wikipedia makes this kind of learning a special experience. Most of the participants posted to have learned a lot. Some of them are still active and writing members of the Wikipedian society. This is documented by comments of the participants published in articles in national austrian newspapers.

Teamwork and Project Management

Teamwork has been defined in the Merriam-Webster dictionary as "work done by several associates with each doing a part but all subordinating personal prominence to the efficiency of the whole." [1] However, there is no universally-accepted definition of "teamwork" in the academic literature.

Researchers have identified 10 teamwork processes that fall into three categories: [2, 3]

- Transition processes (between periods of action)
 - Mission analysis
 - Goal specification
 - Strategy formulation
- Action processes (when the team attempts to accomplish its goals and objectives)

- Monitoring progress toward goals
- Systems monitoring
- Team monitoring and backup behavior
- Coordination
- Interpersonal processes (present in both action periods and transition periods)
 - Conflict management
 - Motivation and confidence building
 - Affect management

These teamwork processes have to be managed using appropriate tools, like computer assisted project management. There are several specialized open source project management tools (e.g. OpenProj, <http://sourceforge.net/projects/openproj/> or the web based Collabtive, <http://collabtive.o-dyn.de/> for more references see <http://goo.gl/dDqrm>) but also Wiki Software applications offer all prerequisites for project management if a workflow is designed [4]. To enable location and platform independent collaboration web based solutions should be preferred.

For efficient teamwork team roles of all team participants have to be defined. Meredith Belbin is a British researcher and management theorist, best known for his work on management teams. Belbin analyzed numerous teams and their personnel inventory to understand the specific roles in teams. Nine team roles were identified and team participants should decide for at least one of those roles (Plant, Resource Investigator, Co-ordinator, Shaper, Monitor Evaluator, Teamworker, Implementer, Completer Finisher, Specialist). A person may and often does exhibit strong tendencies towards multiple roles [5, 6].

Scientific Writing

During early phases of the study students often have no original data from experiments. So how to train scientific writing? One solution to this problem may be using others original data or ideas to create or complement own scientific texts. Finding and evaluating useful sources and the use of a proper citation style has to be trained. Finally, scientific texts have to be defended in peer reviewed publishing processes.

Original data of others can be used in several ways to produce new scientific texts. Besides scientific journalism or review articles, encyclopedic articles are an interesting format. In the process of finding appropriate sources the writer has to understand, which kind of sources the target audience expects him to use. Then primary sources have to be consulted to collect evidences for the specific facts building the specific topic. Reading secondary sources helps to learn from other researchers and finally tertiary sources can be the basis for the introductory overview. Additionally, at universities it is highly probable to find someone who knows about the topic to write. These persons may also assist in finding appropriate sources and proof reading students texts to assure a high quality.

Aim of this study

This study was set out to proof the use of Wikipedia article publication as a model to train teamwork, project management and the peer reviewed publishing process in life sciences. This tool was already applied in different courses with young and advanced students. For this we set up a server with a sandbox copy of the technical Wikipedia environment to ensure look and feel of the real Wikipedia without the confrontation of articles being criticized by the wikipedia society too soon. Furthermore the Wiki environment enabled us to provide detailed instructions about the team and project management as well as the article preparation. Finally the internal

pre-reviewing process and the detailed project assessment and analysis could be performed. In the case that the articles were judged to be of appropriate quality the final task started. This was publishing and defending the completed articles in the “real” Wikipedia. This some kind of resembles the publishing status “accepted for publication” in the traditional publishing workflow.

Methods

Technical background

For computing power a standard personal computer with an Intel® Pentium® 4 CPU with 2.60 GHz and 1.5 GB RAM was used. 2 GB free hard disk space are enough for operating system and MediaWiki. We used a 10 GB partition. As operating system served the Linux distribution openSUSE 11.3. MediaWiki 1.18.1 was set up on an Apache 2.2 Webserver with PHP 5.3.4-dev and PostgreSQL 8.4.7 for database management. Table 1 lists all installed MediaWiki extensions to enable needed possibilities.

MediaWiki Extension	Version
User Merge and Delete	1.6.1
Cite	1.18
ParserFunctions	1.4.0
SubPageList	0.4

Validator	0.4.9 alpha
Vector	0.3.0
WikiEditor	0.3.0

Table 1: List of used MediaWiki Extensions

For Backup purpose we write a PostgreSQL dump every two hours and mirror it to a RAID 1 storage system keeping 13 backups. This is done with a simple Bash script using the standard Linux programs `pg_dumpall`, `find` and `rsync`. Additionally the system is mirrored in a daily manner using `rsync` to the RAID 1 storage system, excluding all temporary and personal data which is largely `“/tmp”`, `“/home”`, `“/proc”`, `“/sys”`. The periodic execution of the Bash scripts is done by the standard Linux job scheduler `cron`.

Internal MediaWiki as learning and presubmission area

An internal MediaWiki on the server mentioned above was set up, to give the instructors the opportunity of a pre-reviewing process before publication and upstream the “real” Wikipedia review. To enable an adequate preparation of the Wikipedia publication, all needed templates were transferred from Wikipedia to the internal MediaWiki. Of particular importance are the citation templates `Cite book`, `Cite journal` and `Cite web`. With help of these templates it is easy to generate correctly formatted citations and Reference Managers are able to retrieve them automatically. Additionally e.g. the Reference Manager `Zotero` [7] can be used to generate citations using this templates. The templates can be exported easily from Wikipedia using the special page `“Special:Export”` and imported using `“Special:Import”`.

To group the Wikipedia project within the internal MediaWiki a Namespace called “Skills” was generated with a set of subpages for instruction and process organization summed up and linked in “Skills:Portal”. “Skills:Portal/[year]/Participants” ([year] is replaced by the corresponding year) as team building section consists of a user table where every participant must fill in his name and special team qualifications (see introduction). Additionally detailed information how to do this and how to open a new group is given on this page. “Skills:Portal/[year]/Groups” as Group Area Section lists all groups (extension “SubPageList”) which are created as subpages. The group page is managed by the group and holds information about all group members, the projects and serves as platform for project management. “Skills:Portal/[year]/Projects” as Project section lists all projects (extension “SubPageList”) which are created as subpages. The individual project page should equate in all points to the future Wikipedia page including formatting and linking. The technical uncertainty was tried to be overcome by a page called playground (“Skills:Portal/Playground”), which allows the students to test everything they wanted in an area besides the „official“ pages.

Beside the instructions on the relevant pages we wrote a „common thread“ to lead through the workflow of the individual projects step by step. In addition to these instructions referring mainly to the internal MediaWiki environment, we offered an article “How to write scientific articles in Wikipedia”. It gives background knowledge about the suitability of Wikipedia for scientific content and about the conventions to focus on from a scientific point of view. It serves as a starting point and overview of the Wikipedia guidelines and should accelerate the learning process.

To help the students finding a project topic we offered three pages with project proposals. These are:

- “Supplementation with current research findings”
- “Writing an article to an axon”
- “Revise and wikify an incomplete last year's article”

With these options we offered topic suggestions we judged being appropriate for young students competence and expertise.

Tools to support the students work and citing

Students work in the internal Wiki was monitored by Wikipedia skilled tutors. For this they mainly used the MediaWiki page “Special:RecentChanges”. With help of this special page, a given namespace (in our case “Skills”) can be monitored easily for any changes. Additionally MediaWiki offers an Atom Feed. This feed can be used with any news reader, enhancing usability.

For active support request of the students we generated a support page as suppage to “Skills:Portal” where we linked to the user page of the corresponding tutor. There the students can write an E-Mail or ask something on the users discussion page. By this we reduced the barrier to contact a tutor.

Citing is a key skill in scientific writing. Thus we took care that students use all possibilities to enable professional citations in Wikipedia. The Open Source reference manager Zotero [6] makes this process as easy as possible. It has a “Wikipedia” output format. Using this, references grabbed with Zotero can be inserted in Wikipedia by simple drag and drop. To simplify the learning and application of this step, an screencast based E-Learning tutorial was produced and provided via the MediaWiki.

Description of scholarly work and grading process

The practical training should ensure the use of the achieved technical education, academic skills, increase the individual motivation and elucidate the defined goal of the university courses. The starting point was an introduction in the lecture hall to enable the interactive aim definition, the scientific background and the internal MediaWiki. The whole process organisation was summed up on the Internet platform in a common thread and lead the participants through the management steps. It was the students choice to write about a suggested topic or to find an individual one. To ensure the availability of university experts “free” projects were requested to have biomedical relevance. To open up the horizon some groups contacted external experts, to get professional assistance and knowledge. Thus their support was included as an additional impact value as experts and reviewer.

As soon as the first user accounts were created the individual users pointed out their own team inventory role (according to [4, 5], see introduction) in the provided part of the team building section. Based on these features the formation of the groups took place and the first sites called group pages with group and project description were created for the future project management. In this phase a more frequent feedback was necessary to ensure the successful onset. The allocative space for the interactive feedback was the discussion page, which is attached to every MediaWiki page. Activities in “Recent Changes” were frequently monitored, thus the tutor has the possibility to spot problems as well as mistakes instantaneously.

In this phase besides the technical barrier compliance of the Wikipedia guidelines is not trivial for newcomers. Thus the tutors took care to support by correspondence and reprimands.

The next step of writing the scientific article was constructing the project page. The following writing process was based on the Wikipedia standard guidelines and evaluated by the professor, the tutor and other students.

The project assessment and analysis included the individual student performance, which was influenced by an E-Campus survey and the individual user logs in the Wiki. The grading process consists of criteria relating to scientific skills, the internal Wiki and Wikipedia. This are organization management as well as the workflow progress, but also compliance with Wikipedia policies and guidelines (Table 2).

Skills Criteria	Rating
Members are listed on group page and correctly assigned to projects	4
Group page describes project adequately	8
Group page design	4
Group page is subpage of groups list	2
Project page is subpage of projects list	2
Project goal was achieved	14
Time frame was reasonable to membership	4
The priorities were appropriately distributed on the content and formatting / compliance with the Wikipedia policies and guidelines	6

Wikipedia Criteria	Rating
Correct page name	2
Correct text design	4
Correct structuring of the article	8
Correct formatting of citations	4
Sufficient scientific sources	12
Sufficient information to file sources (copyrights)	8
A category was assigned to the article	2
Correct formatted Wikipedia internal links	2
The article / content was new	2
Unnecessary redundancies have been avoided	4
The term has been adequately addressed	8

Table 2: Criteria for the grading process after completion of the projects. The single topics were weighted by their importance with a total of 100 points.

After the articles were pre-reviewed and evaluated by the professor and tutors a sequence of improvements allowed the students to full-fill last gaps uncovered by this process. Now the

articles were transferred to the Wikipedia. This should open the knowledge to the public and create a win-win-situation. At least the „online-defense” has the potential to show additional aspects, as well as controversies and round off the students work. The fact that authors do not appear in the respective articles was solved by referring to the students from the central UIBK-Bio user, if they wanted their names to be published.

Discussion and Conclusions

For a traceable publishing process the articles should be published and organized by a central user (in our case UIBK-Bio, <http://de.wikipedia.org/wiki/Benutzer:UIBK-Bio>). The incident-based maintenance provided by the user UIBK-Bio thinned out with the influence of the students themselves and the Wiki community.

For the reason that a large number of students participated the project, different obstacles raised in the 2010's pilot project. For example problems in the team building process and project management, were solved via E-Learning tutorials. The annual course evaluation enables the students to point out their impressions and further improvements for future implementations. The tools developed for this project and the mediated knowledge are well suited to be used in other university courses, because literature research, project management and scientific writing are basic skills for life sciences. A synergistic effect is achieved by tracking the use of this material. Therefore we are trying to join E-Learning tutorials of the different courses. Management instructions are refitted after each usage of the MediaWiki and new ideas, coming up with the progress, are influencing the future use.

An interesting outcome of this project would be how many students linger as Wikipedians (an active working Wikipedia editor). As example the 2011's article about *Rapana venosa*

(http://de.wikipedia.org/wiki/Rapana_venosa) is online since the 13-01-2012, the main-author has written four other articles with biological background. This shows us that the surplus value goes beyond the university course requirements. But the analysis of the endurance and maintenance of the students future Wikipedia work isn't trivial, because the students are often using nicknames. We are focusing the maturation of this evaluation and feedback process for improved conclusions about the efficiency of improvements in our training workflow.

The progress of constructing the „group page“ as representation tool for the members, the group aim and project introduction sometimes needed the professors and tutors help. The support was needed because the team-management process, especially regarding to progress organization and structure, sometimes needed recommendations for a proper start-off. As mentioned before the following writing process was supported also by the students themselves. Some last year's course participants as well as the students of this year's course collaborated, especially relating to task performance problems relating to style and design (e.g. article length, writing in Wikipedia,..).

In 2012 the main prospective aim is to emphasise the incorporation of social networks for data sharing and communication, because the project management emerged the need of extended computer network interaction. Especially the data sharing within the groups should be facilitated by synchronization tools with free online storage like Google Drive and Dropbox.

Furthermore the interaction with external experts of the Wikipedia quality assurance group will be focused to ensure the policies and guidelines of Wikipedia. For this reason our working group will participate the 2012's Austrian WikiCon to be informed and inspired by new possibilities. An important aspect is servicing of the Meta-Area, which is the content opposed to actual encyclopedia articles. These are for example requests, data licences, discussions apart

from the encyclopedic article and new organizational framework. Our aim is to improve the workflow management model concerning this Meta-Area and article supply. This will hopefully be ensured by new interactive collaborations with users of the Wikimania.

With the completion of the 2011's project we have published 17 articles in the Wikipedia (Table 3), while 14 are not transferred yet and need again a sequence of improvement. The number of students and groups increased. This shows us the demand of new learning strategies and interactive Teamwork-Processing.

	2010	2011
Groups	19	21
Students	72	88
Articles	10	7
Articles not transferred yet	6	8

Table 3: Group composition and number of published Wikipedia articles

The engagement with E-Learning, scientific work and new workflow management ensures a more practical learning and guides the students to an autonomous and independent practical mind. But this will only work with good preparation, concrete tasks and frequent feedback.

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