Wiki Tools in the Preparation and Support of e-Learning Courses

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Abstract: Wiki tools, which became known mainly thanks to the Wikipedia encyclopedia, represent quite a new phenomenon on the Internet. The work presented here deals with three areas connected to a possible use of wiki tools for the preparation of an e-learning course. To what extent does Wikipedia.com contain terms necessary for scientific lectures at the university level and to what extent are they localised into other languages? The second area covers the use of Wikipedia as a knowledge base for e-learning study materials. Our experience with Enviwiki which originated within the E-V Learn project and its use in e-learning courses is presented. The third area aims at the use of wiki tools for building a knowledge base and sharing experience of the participants of an e-learning course.

Keywords: Wikipedia, wiki tools, enviwiki, e-learning, localization, mathematics education

1. Introduction

Internet has been under constant development from the very beginning. There is an unceasing flood of new services and tools, some of which become very popular, other of which are soon forgotten. One of the internet services which came into the world in the beginning of this century (in 2001) is the web portal Wikipedia (http://www.wikipedia.org). Wikipedia is a multilingual, Web-based, free-content encyclopedia project. The name "Wikipedia" is a portmanteau (a combination of parts of two words and their meanings) of the words wiki (a type of collaborative Web site) and encyclopedia. Wikipedia is written collaboratively by volunteers from all over the world. Anyone with internet access can make changes to Wikipedia articles. Presently there are almost three million entries created by more than 75,000 authors (Wikipedia:About 2009).
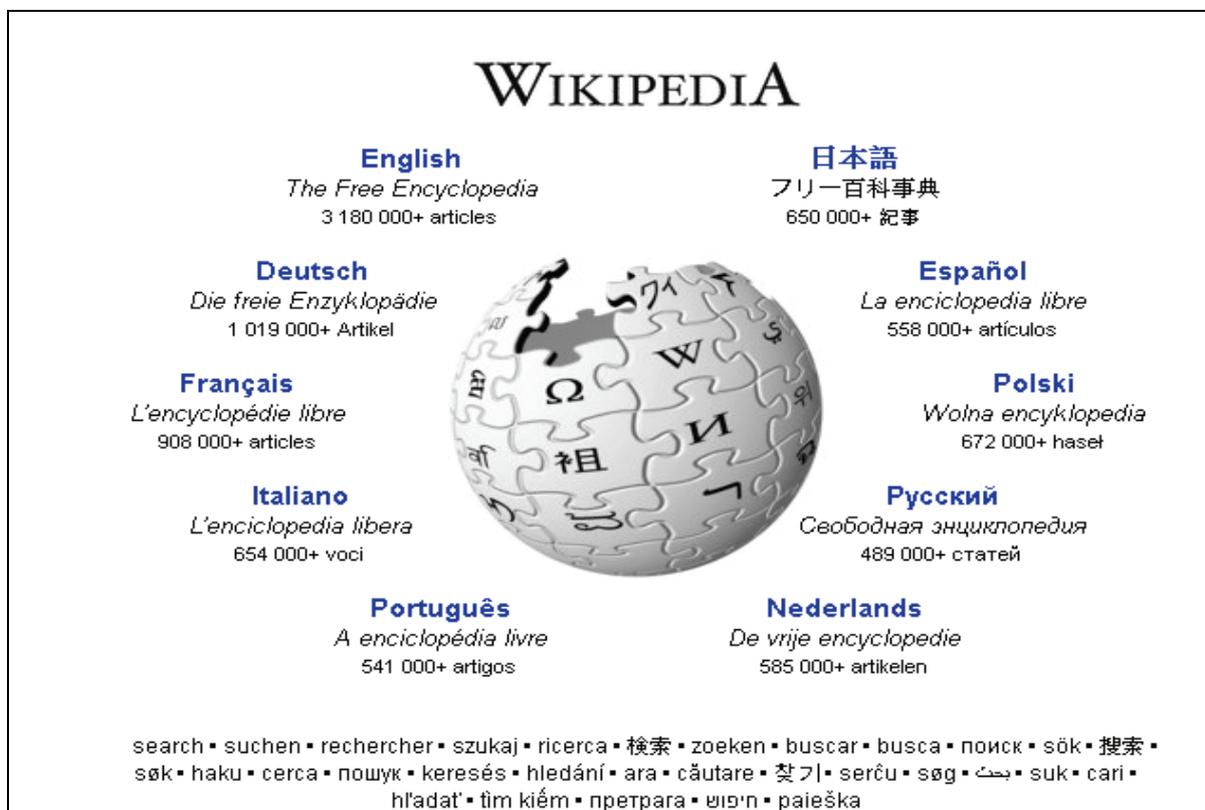
2. Wikipedia as a source of information

Figure 1: Wikipedia.org

Wikipedia, an open educational resource (Godwin, McAndrew and Santos 2007), is often used by students as a source of information needed for their studies. A survey among pre-service teachers of mathematics at Charles University in Prague showed that Wikipedia is used by 85 % of students and almost one quarter of them quotes Wikipedia as one of the most important sources of information (second or third most important), immediately after their own notes from lectures. This only confirms that students more and more often give up the effort to search for the recommended literature in university libraries and instead of that use the Czech version of Wikipedia as the only source in preparation for their exams.

In consequence it is only natural to ask about the reliability of Wikipedia as a source of scientific information and a resource for university studies, and to ask to what extent it can be used in preparation of e-learning courses.

The first noteworthy study comparing Wikipedia with classic resources saw the light of day in 2005. In this study, the Journal Nature performed a comparative analysis of scientific data entry accuracy between Wikipedia, and Encyclopedia Britannica (Giles, 2005). This study pointed out that mistakes can be found in both of these encyclopedias. The difference in the number of mistakes (in absolute numbers) was not considerable. The result of this study awoke much stir and emotion. Thanks to the ongoing development, Wikipedia gradually takes the position of a major competitor of classic information resources. The defenders of classic encyclopedias often point at low quality of many entries in Wikipedia. However, the above quoted study shows that these entries do not contain formal mistakes. The advantage of Wikipedia is the quickly growing scope of entries, the possibility to correct mistakes in a very short period of time and the ability of Wikipedia to react promptly to new scientific discoveries. To put it briefly – Wikipedia's potential is enormous and one cannot be surprised that young people use it to such an extent.

3. Wikipedia and localization

The survey carried out among pre-service teachers at the Faculty of Education, Charles University in Prague, also tried to find out what proportion of students use Wikipedia in their mother tongue and what proportion work with the English version. The results show that the English version is used only by 35 % of all the students who use Wikipedia for their studies. This means that almost two thirds of pre-service teachers use only entries in their mother tongue – predominantly Czech. This motivated the authors to carry out a study whose aim was to discover to which extent the entries relevant for the studied subject are localized into various languages, to what extent they are accessible in Czech and to what extent they can be used for support and as a source of further, supplementary information when preparing an e-learning course.

It is very interesting not only to see the results of the comparison of "Czech" and English Wikipedia, but also the result of their comparison in a specific field – mathematics and biology. Presently the Czech version of Wikipedia includes more than 150,000 entries. This means that more than 10% of all entries are localized into Czech. However, what is the situation in case of scientific "universal" entries?

3.1 Methodology

The research presented in this paper focuses on teaching two scientific disciplines – mathematics and biology. The basic research question was:

Are Wikipedia entries a sufficiently scientifically erudite source for preparation of Czech pre-service teachers of mathematics and biology?

The research also tried to address the following three subquestions:

- In what extent are scientific entries from mathematics and biology localized into national languages?
- Does Wikipedia provide enough references to supplementary study texts?
- What other potential do wiki tools have in teaching (chapter 5)?

The method used for answering the main research question in the field of mathematics was the method of comparing entries from Wikipedia with literature. The selection of topics was not random – the selected topics are those integral to bachelor state exams at the Faculty of Education, Charles

University in Prague. Namely 15 topics were selected from each of the following disciplines – algebra, analysis and geometry. In case of each of the selected topics, we studied whether they exist in both the English and the Czech version of Wikipedia, in what detail they are treated, whether they include external links to other study literature and into how many languages they have been translated.

When studying entries in biology, the research was extended by five entries that have within the frame of biology already been compared (Callis,2009). The low content level of these entries in Czech language leads to the formulation of a follow-up question:

Is it possible to compare the scientific niveau of Wikipedia and of the wiki tool based sever created by university lecturers (chapter 4)?

The ground for this comparison was formed by ten entries corresponding to the scientific focus of the Enviwiki server. Enviwiki was compared both with English and Czech version of Wikipedia.

3.2 Wikipedia and mathematics

45 topics from the requirements for bachelor state exams were selected as the basis for testing the efficiency of Wikipedia in pre-service training of teachers of mathematics.

In the case of 42 out of the selected topics (93,3 %), a corresponding entry in the English version of Wikipedia exists. In one case - Circle inversion, the topic is listed as a sub-topic of a broader topic (Inversive geometry). Two of the topics were not found. They were Apollonius' Tangency Problem and "reper", which is a common term used in Czech for coordinate system (O, e1, e2, e3) where O is the origin of the coordinates and (e1, e2, e3) the vector basis.

38 of these entries have been localized to Czech (84 % entries). Three of the topics are mentioned within another broader topic (Homothetic transformation, Convergent series and Antiderivative) and four of them do not exist in the Czech version: Monge's theorem, Circle inversion, Apollonius' Tangency Problem and "reper"). This means that mathematical topics are localized in a much greater degree (in 88%) than is the average (about 10% of all topics).

What proved to be a considerable problem in the case of Czech entries was their quality. Most of the topics are treated only very briefly and unlike the English version the Czech version does not provide sufficient information about the particular topic. For example the entry Linear map is in the English version made up of 2602 words, in the Czech version only of 413 words (the number of words is in all cases taken directly from Wikipedia). In total, 8 of the topics in the Czech version contained only very brief basic information inadequate and of very little benefit for students' preparation.

Another major difference between the two versions is the fact that while English entries included in almost 80% of the cases links to printed resources (monographs, university textbooks, research papers), such links could only be encountered in 6 entries in the Czech version, i.e. approximately in 15% of all entries.

All the found mathematical entries were localized into other languages. The entry that was localized to fewest languages was the entry Monge's theorem, which is apart from English available only in the Ukrainian and Finnish version. On the other hand the most frequently translated entry is the entry Set theory which can be found in sixty language versions, which means in one third of the languages used in Wikipedia. On the average, each of the entries could be found in 28 languages (See the Figure 2). The basic mathematical entries can usually be found in all the world languages and in many translations to languages of smaller nations.

However, the content of the entries after their localization often shrinks into a basic definition and offers no supplementary information which could be used in preparation of an e-learning course. This has been confirmed by a comparative study of the English and Slovak versions of Wikipedia (Jancarik 2010) which showed the problem of Slovak version is not only a total absence of some relatively fundamental entries (e.g. Linear Map, Antiderivative) but also the absence of exact definitions and merely intuitive introduction of concepts. In this light it comes as no surprise that the use of Wikipedia by students has been the target of severe criticism of Slovak university lecturers who regard the use of Wikipedia as a source of mistakes and inaccurate terminology. On the other hand, it seems to be

very convenient to use links to the English version in which the topics are treated in a broader context and which simultaneously introduces the students to the English terminology.
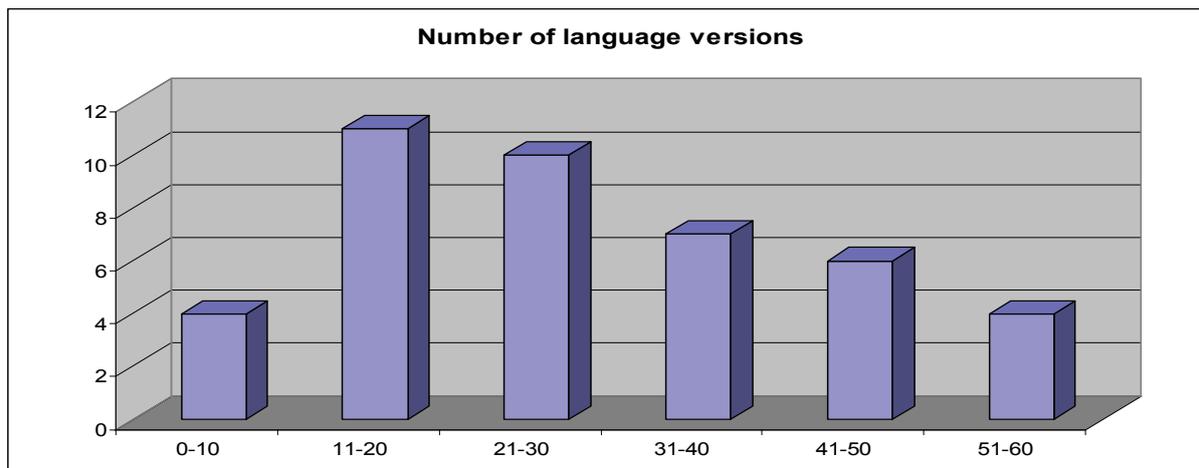

Figure 2: Number of language versions

3.3 Wikipedia and biology

Further investigation of topics in Czech Wikipedia was carried out in the field of biology and environmental education. Five topics used within the study (Callis,2009) were used in the first phase. They are the entries Pollination, Biological Dispersal, Herbivore, Frugivore and Seed Predation. Only two of these were found in the Czech version of Wikipedia and in both cases the entries were only very brief, consisting of fewer than 400 words.

Subsequently the sample of the investigated entries was appended by topics selected from the requirements for state exams in biology at the Faculty of Education, Charles University in Prague. This study has shown that only about one half of these topics can be found in the Czech version of Wikipedia. The topics are usually treated very briefly and serve more like dictionaries and milestones (see the figure 3, the entry Pollination).
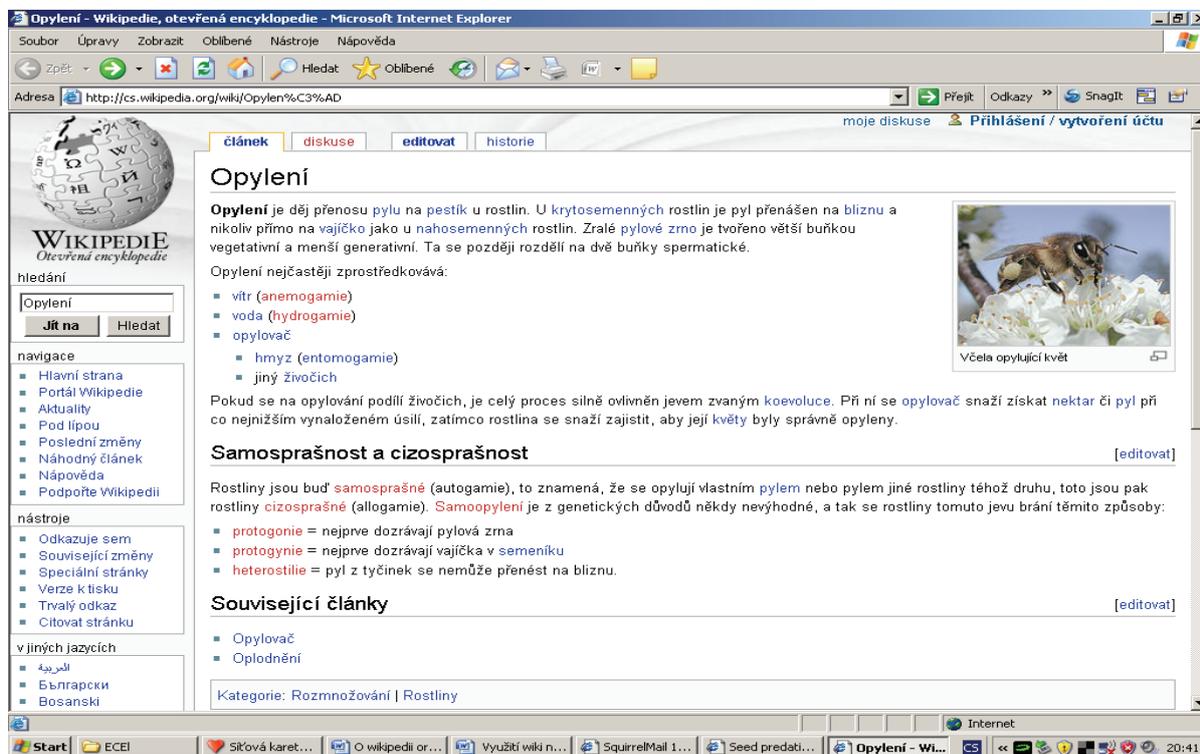

Figure 3: The entry pollination in Czech version of Wikipedia

In the field of biology and environmental education, the Czech version of Wikipedia does not provide sufficient support that could be made use of when creating e-learning courses.

4. Portal Enviwiki

The low quality of entries in the Czech version of Wikipedia became an impulse for the creation of electronic information resources on wiki basis whose content, however, is edited and guaranteed by experts. The following text introduces two wiki-based portals created at Charles University in Prague. They are the Enviwiki portal http://www.enviwiki.cz in the area of biology and environmental education and Wiki*PedF*ie in the field of mathematics.

4.1 Portal Enviwiki

Portal Enviwiki (http://www.enviwiki.cz) came into existence in the beginning of the year 2006. Enviwiki is intended for all university lecturers who work with environmental issues or are interested in them, for students, but also for any other interested person (Dlouhá e al. 2009)

The portal Enviwiki currently (after fewer than three years of existence) features 667 entries from the field of environmental issues. (To compare, the Czech version of Wikipedia contains 524 articles featuring the word ecology and 83 entries featuring the word environmental). Out of the 667 articles published in Enviwiki, only 75 are fragments. The articles are as a rule elaborated by the academic staff or students (under their supervision). Unlike in Wikipedia, entries in Enviwiki are published both within GNU Free Documentation License and in different copyright arrangements, e.g. those that do not allow modifications of the text by other readers of Enviwiki, or which limit free circulation. The advantage of Enviwiki is that most entries include a reference section where the author (or authors) cite the sources used for elaboration of the entry and list study literature both in Czech and English languages. This guarantees the quality of entries published in Enviwiki. The original intention of the creators was to place on the portal only narrowly specialized topics that cannot be found in Czech version of Wikipedia. This goal is easy to achieve in case of highly specialized entries. However, Enviwiki also features entries that are broader (e.g. Ecological footprint, Sustainable development, Biodiversity or Evolution). These can also be found in Czech version of Wikipedia. However, the treatment of the topics in Enviwiki is much more detailed more sources and study literature are cited. For comparison of 10 basic topics in Enviwiki and Czech and English versions of Wikipedia see the graph on the figure 4.

Enviwiki shows the way to creation of specialized databases in local languages. The fact that the content of Enviwiki is in the hands of relatively few authors guarantees not only the quality and erudition of the entries but also inner consistence of the whole portal. The comprehensiveness of the whole portal also makes it possible to use links to Enviwiki in preparation of electronic courses. The content of entries (especially those elaborated with copyright) is comprehensive and does not change so often as in Wikipedia. Therefore an author of an e-learning course may feel quite confident that the link will take the student to the same content as there was in the time of development of the course. Several e-learning courses closely interlinked with Enviwiki have already been prepared at Charles University. The experience shows that this connection is very effective. That is why other courses of this type are presently being developed.

4.2 Portal Wiki*PedF*ie

A different approach was selected for the process of creation of the mathematical section of the portal Wiki*PedF*ie (see Figure 5), which serves as a support to e-learning courses at the Faculty of Education, Charles University in Prague (confer Adamec a spol. 2009). This portal is interlinked with courses in LMS Moodle. The aim of this portal is not to give information in the extent comparable to the English portal Wikipedia but to offer a guaranteed source of brief information which can be used by students as an outline of the taught topics and a source of exact definitions. The topics are arranged with respect to single subjects, which makes it easier for students to orientate themselves and which makes it a good source of information for lecturers about the subject matter taught in other subjects, The portal is constructed in cooperation of lecturers and students.
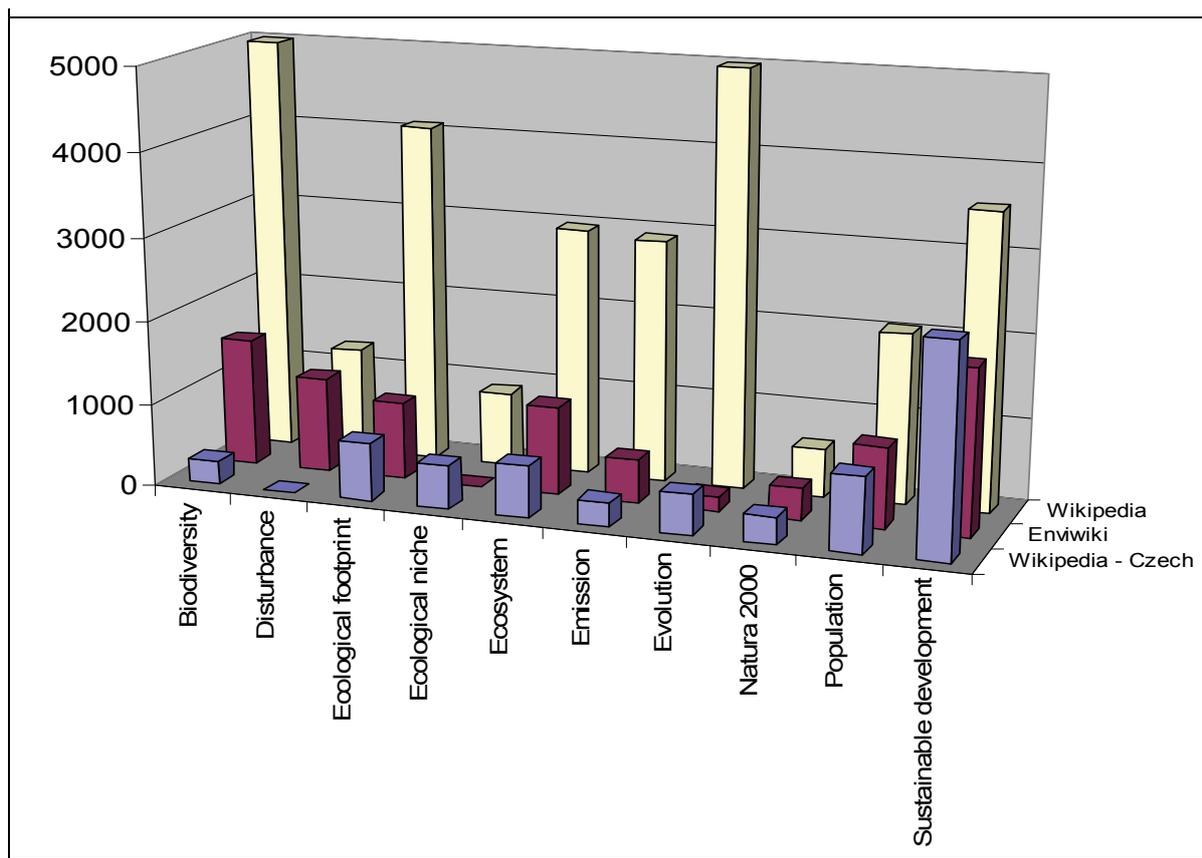
Figure 4: Comparison of 10 basic topics in Enviwiki and Czech and English versions of Wikipedia

Figure 5: Portal WikiPedFie

Students' collaboration on preparation of entries which are subsequently evaluated by teachers and after their editing placed on the Wiki*PedF*ie portal is a part of their compulsory course work. This process thus guarantees that all the entries placed on the portal have been edited by the academic staff and their content has been reviewed. Links to various topics are subsequently used within different courses, usually for definition of pre-requisites needed for the course or for support of theoretical exposition and during practice in the form of a link to already clarified concepts.

Collaboration on wiki is one of the tasks students must fulfill within the course and substitutes the previously requested output of students' individual work such as seminar work and oral presentations. During their work in wiki, students may either create new entries or edit the already existing ones. They may work individually or in groups.

The existing experience shows that students prefer individual work on new entries. Even in cases in which they are to develop already existing topics and treat them in more details, they usually do not take the already existing material and start work from scratch with the use of other information sources. The niveau of the created entries is very different, both with respect to their content and their form. The crucial problem seems to lie in students' management of information resources, their choice, use and citing. This in fact means the current experience of creation of entries for the portal Wiki*PedF*ie corresponds to the experience from work on E-V Learn project. (Zahradnik and Pachmanova 2009).

5. Wiki as the space for sharing experience

The connectivist theory (Simens 2005a) claims that it is important not only to transfer information and create information resources, but also to create such an environment (ecology – see Simens 2005b) which will foster integration of information into students' knowledge networks. This process is supported by the Web 2.0 tools for interaction among students and interaction student – teacher such as chat, blog, forum and wiki.

Therefore the last possibility of using wiki tools to be discussed in this article is the use of wiki portal within a closed group of users for exchange of their experience. This is exactly how wiki tools are used by the authors within the frame of the project Smash (Jancarik and Jancarikova 2008) and for support of courses in Moodle at the Faculty of Education.

Every e-learning course provides, besides other forms of support, the space for collaborative recording of one's own knowledge and experience connected to a particular topic. This method has been used on a long-term basis in courses developed by the University of Athens and it proved to be highly effective (Giannoukos, 2008).

The form predominantly used for sharing opinions and experience are blogs. Wiki tools however offer a completely different approach. The main differences are:

- The notes of the different users are interwoven.

- Each user has the right to change the notes of other users or to replace them by their own notes if they find it right.

- The contributions to one topic are not listed in chronological order, although the user has the chance to follow the development of the topic in time.

6. Wiki and teacher training

The use of e-learning courses in undergraduate teacher training at the Faculty of Education, Charles University in Prague has two principal goals:

Its first objective is provision of first-rate, easily accessible and popular study materials.

The other, perhaps the more important objective is to furnish students – future teachers with personal experience with the use of e-learning courses in teaching. Students, within their pedagogical training, get acquainted with the potential of the use of modern technologies in teaching. However, this training is purely theoretical. There is only a single course in pedagogy at the Faculty of Education (called Effective instructional strategies) that is supported by e-learning materials in the Moodle environment. In consequence, it is the subject departments that take on the main burden of introducing students to

the use of ICT in teaching by integrating it into their subject curricula. Students most often get a chance to meet e-learning courses at the departments of biology, ICT, English and mathematics. In case of most students, it is their first encounter with an e-learning course. At the department of mathematics, there is also an e-learning course that supports the course of subject didactic (Mathematics education II). Here the e-learning course is no longer a tool, but also the subject of the course.

The past three years has witnessed an on-going collaboration of the Faculty of Education and the Environment Centre of Charles University in the area of e-learning support of the subjects Introduction to ecology and Selected environmental issues. At the beginning of the semester, students of these subjects have the choice either to attend a standard seminar (which the students must attend), or to meet the criteria necessary to get the credit or pass the exam through an e-learning course. It is about 1/5 of students who select e-learning (e.g. because they are employed or because of illness

The course begins by a meeting in a computer lab where students get information about the rules and where they get the necessary passwords (to log in). The e-learning course involves compulsory output (essays, seminar work or contributions to enviwiki) which must be handed in to meet agreed deadlines (in six steps in one semester). Another students' compulsory task is to watch, comment on and asses the work of other participants of the course using the recommended tools. The teacher then together with the students evaluates the quality of the work submitted but also controls the students' activity and their interaction (big brother), since the minimal number of comments on other students' work is given in advance. The training therefore does not only function on the level teacher – student, but also on the level student – student and naturally also on the level of individual study from the recommended literature. The teacher's role in an e-learning course is predominantly the role of a guide or a moderator. Every year, there is a proportion of students who fail to finish the course. This proportion seems to be slightly higher than in the case of the standard seminar, which might be caused by the fact that an e-learning course is predominantly selected by those students who have a lot of extra-school activities and sometimes find it difficult to manage combination of all their activities. Social bonds that are often created in standard courses are not eliminated in an e-learning course but are replaced by a different type of social relationships (skype, blog, chat), which are in fact very intensive in some of the courses. Students' evaluations of a successfully completed course are very positive. Therefore it can be expected that e-learning courses will quickly develop not only in the frame of full-time studies but also (predominantly) in the combined form of studying.

7. Conclusion

The comparison of the Czech and English versions of Wikipedia validates the hypothesis that the English version is much wider (it consists of more entries) and at the same time its entries are treated in much more detail (the entries are longer, with more hypertext links, pictures, graphs and photographs, and they also cite more references). The research, which explored localization of scientific topics, showed that scientific topics are translated much more often than other topics. Despite this positive trend, the research also showed that the entries are treated in much fewer details. Also the level of localization is different in different scientific fields and disciplines. The advantage of localized entries is that in some cases they provide links to references in national languages, or to literature in a different world language than English. However, the use of the Czech version of Wikipedia in preparation of e-learning courses seems to be more than problematic.

The authors believe that a possible solution of this problem may be the development of specialized portals, localized to national languages, based on the same principles as Wikipedia, which will however also be:

- a) locked (i.e. entries are changed concurrently),

- b) authorized, guaranteed, or defended (i.e. the quality of the entries is guaranteed by a specialist).

An example of such portals are the portals Enviwiki and WikiPedFie described in the article. They have effectively been used in the Czech Republic in preparation of e-learning materials.

Wiki tools may be used in development of e-learning courses not only for creation of a knowledge database but also for sharing of experience. Wiki tools have been successfully used in this area by the University of Athens for several years. This institution lent the technology for solution of the

SMASH project, in which the authors of this article collaborate. The experience from the SMASH project has been made use of in teacher training..

Acknowledgement

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