Wiki Usage in Team Assignments for Computer Science Students

Zoran Putnik, Zoran Budimac, Živana Komlenov, Mirjana Ivanović, Klaus Bothe

Abstract: Collaboration in contemporary teaching and learning practice can be highly supported and improved via usage of information and communication technology, even when it comes to solving complex team assignments in university courses. One of the possibly best types of software tools for such purposes is wikis. This paper presents the experimental usage of wiki as means of introducing collaborative activities in two completely different courses on the undergraduate level of Computer Science studies – an introductory eBusiness course for freshmen, and the advanced course in Software Engineering for final year students.

Key words: Collaborative Learning, Student Assignments, Teamwork, Wiki.

INTRODUCTION

Collaboration among people can be highly supported and improved via usage of information and communication technology. Additional quality is that a person is aware not only of one’s own thinking processes, but also of various other viewpoints, through discussion and teamwork. Current trends of eLearning suggest collaboration as the central point of all learner-centred educational systems.

Learning management systems (LMS) are the prevailing technology today for delivery and organization of online courses. However, it has been noted that the Web is shifting into a platform, in which content is created, shared, repurposed, and passed along. This is realised through eLearning 2.0, strongly targeting at collaborative nature of learning. Wikis have especially been deployed in order to promote deeper learning, enhance collaboration skills and facilitate the knowledge discovery [7]. In most cases they have been used in research, writing assignments, group authoring projects, peer review...

This paper presents first experiences in using wikis as means of introducing collaborative activities in two completely different courses: an introductory eBusiness course for the first-year students, as well as the advanced course in Software Engineering for final year students of Computer Science. Collaborative work was bravely introduced to first-year students, together with the chosen Web 2.0 tool. This was, however, convenient since we had a lot of students, still unfamiliar with their colleagues and the course of studies, but accustomed to modern Web tools. The situation was different in the Software Engineering course, since the students were comfortable with their course of studies and their colleagues, thus the burden of using wikis was less stressful for them.

The rest of the paper is organized as follows. In the following section we present the state of the art in the area. Then we describe our case and motivation to introduce team assignments using wiki. Afterwards, we present some numerical results of students’ practical work. Finally, conclusions and plans for further research are presented.

STATE OF THE ART

Some research shows that, regardless of the subject taught, students working on their assignments in small teams tend to learn more, and retain that knowledge longer. It has been generally concluded that the inclusion of team exercises helps students get diverse ideas, opinions, and feedback, thus improving knowledge and grades.

It is especially noted that collaborative learning is actually quite appropriate for Computer Science courses. In fact, most courses in systems analysis and design and many programming courses require students to work on team projects.
While collaborative learning is most often used in courses focusing on programming, there is a lot of evidence that this technique is also useful in courses in: computer architecture [8], software engineering [5], [6], [10], database design, project management, multimedia and interface design [11], etc.

Wikis are also starting to become common in educational landscapes as they are easily available through various open source solutions. At our Department for seven years now, LMS Moodle [9] has been used as support-system for almost all our courses especially at master and PhD studies. Students are rather satisfied with this system, and so are the lecturers [1]. Since Moodle offers Wiki implemented in a straightforward way, we opted for such solution instead of using a standalone application.

**MOTIVATION**

This paper presents the first experiences with the extensive usage of wikis at our Department. The technique has been introduced to the first-year students within “Introduction to eBusiness” course, as well as to the final-year students within “Software Engineering” course. Factual difference in age, expert pre-knowledge and pre-knowledge in usage of the LMS induced our beliefs that the students will act differently concerning wikis. Yet, our wish to introduce students to teamwork, collaboration, and cooperation in problem solving encouraged us to try wiki at both courses. Differences between the two chosen courses are the following:

- the first year students had never used Moodle before, while the final year students had been using it for several years before getting their first wiki assignments;
- the first year students are unfamiliar with most of their colleagues, while the final year students have already formed some closer relationships with the colleagues;
- so, teams for the first year students were formed by the choice of lecturers, while the final year students choose their team members by themselves.

“Software Engineering” course, developed as part of a ten-year long international project, involving 15 universities from 9 countries [2], enforces teamwork, home assignments, and usage of eLearning facilities. First two (out of four) assignments require the team members to produce their solution in the form of a text document. In the first case they are required to write a review, i.e. critical analysis of the requirements specification of a software system, introduced as the course case study. Afterwards, the second task is to perform cost estimation for the same software by applying function point method.

After having some negative experiences in previous years with the way students handled those teamwork assignments, we decided to try using wikis. Namely, earlier, teams formed by students, as a rule had friends as members, friends willing to cover for their other, non-working friends. Even when this was not the case, self-chosen teams, who produced and delivered to lecturers only the final solution, were problematic. It was noted that after fulfilling the obligatory part of the assignments, and achieving required number of points, a lot of less-ambitious students stopped participating in assignment solving. As a consequence, the rest of the team had to work much harder, so lecturers were not able to recognize individual contributions made by the team members.

“Introduction to eBusiness” course has been gradually developed over the last several years in a form of blended course, proposing student-centered learning. As such, it requires active input and participation from students and includes a set of rather complex and demanding collaborative assignments. The first assignment is to create the business model for an imaginary eCommerce company. The solution is considered to be complete if all crucial aspects of the online presence of such a business are covered. Final output of the team effort to create such a business model is expected to be a wiki.

Having in mind the obstacles appeared when introducing wiki assignments in the “Software Engineering” course, and also knowing that research proves that self-formed teams underperform when compared to instructor-selected ones [3], teachers decided to
form teams of students by themselves.

Knowing that ideally teams in such occasions should be diverse enough to include students with a range of intellectual abilities, academic interests, and cognitive styles, our students were instructed to complete an online survey on their personal characteristics and academic background, together with the Index of Learning Styles (ILS) questionnaire, the most frequently used model for determining students’ learning styles [4]. According to the gathered results, our teams were finally made up of 4-5 diverse students.

In spite of their initial doubts, as soon as newly assigned teams came together, members shared names and contact details and explored what each could bring to the course and team experience. When students learned that their assignment to a team was based upon a principle of resource wealth distribution, they valued their team members more because they became aware of the fact that they were all pretty equal and that each of them had some particular strength to bring to the discussions.

NUMERICAL RESULTS

Within the course on Software Engineering, 86 students were divided into 17 teams. Students were required to use wiki as the authoring tool for producing their final solutions. For the first two assignments we recorded:

- Total number of accesses: (for the first) 8812; (for the second) 2464
- Total number of edits: (for the first) 6972; (for the second) 1789
- Number of accesses per student: (for the first) 2-1125; (for the second) 0-168
- Average number of accesses per student: (for the first) 103; (for the second) 26.

In the course “Introduction to eBusiness” we had 66 students, i.e. 16 teams working on one assignment using Moodle’s Wiki module. It also was the first team assignment students ever solved in most cases. They had to get to know their team members and complete the assignment in four weeks. We gathered the following results:

- Total number of accesses:19229;
- Total number of edits: 5512;
- Number of accesses per student: 0-574;
- Average number of accesses per student: 154.

The need to learn how to use Wiki is obvious, for the sake of adjusting to the new tool. For the first assignment in “Software Engineering” course, it took around 100 accesses per student to completely articulate their opinions, and even 50% more (154) accesses for the freshmen in the course “Introduction to eBusiness” (leading to the remarkable total of over 19000 accesses per the whole class). While 1125 accesses might seem too much for one person, there were several students with more than 1000 accesses! Even disregarding those as too fuzzy, average numbers do not change too much: average number of accesses was still around 80.

Interestingly, for the second assignment in “Software Engineering” course, things changed considerably. Total number of accesses dropped around 3.5 times! The similar stands for total number of updates, which dropped almost 4 times. “Per student” numbers go down also. Some of the students did not participate at all (not too many, which we consider to be a good sign). Those "fuzzy" students, needing so many accesses to articulate (the same persons are again those with the highest numbers), needed 7 times less approaches. The average number of accesses per student dropped 4 times as well.

The general charts of approaches to our LMS, separately shown for each of the analysed courses in Figures 1 and 2, reveal some interesting peaks. When it comes to “Software Engineering” course the first peek in Figure 1 stands for a moment when the first wiki assignment was at full speed. The second peek presents the period when the first wiki was due, and second one was at full speed. The third peek corresponds to a moment when the second wiki assignment was to be finalized. Finally, the fourth peek was registered at the end of semester, when the last two (non-wiki) assignments were due.
According to the structure of the course “Introduction to eBusiness” Figure 2 peaks correspond to the moments when 4 assignments were to be completed. The first one is the highest since only in the first assignment students were required to use wiki within the LMS Moodle, while other assignments were solved using other software solutions.

If we take a look at the tables representing behaviour of individual teams we can notice some interesting differences between the two groups (Assignments 1 in Table 1 and Table 2), but also the changes in the behaviour of the same students’ when solving two consecutive assignments in the same course (Assignments 1 and 2 in Table 1).

All in all, in “Software Engineering” course almost all of the edits of the documents teams did were actually updates. It can be noticed that for 11 (out of 17) teams, every access was an update. First-year students, however, behaved a bit differently – for only one team every access was an update. Also, with the second assignment in “Software Engineering” course, the situation changed drastically. It seems that teams and students in general, better re-taught their opinions, before entering them. Those teams were also evidently better organized, they divided the duties among team members and managed entering of solutions better.

Is it possible that the first-year students behaved in the similar manner within the first (and the only though) wiki assignment they had? According to their results and comments on their work, they were more motivated to succeed in solving a challenging task, also more enthusiastic. We also believe that the process of structuring those teams heterogeneously, taking the qualities of every student into consideration contributed to the more reasonable behaviour noted.
It can be noticed in Table 1 when analysing the process of students’ work on the second assignment solutions that, except for 4 teams, there were no changes of entered things, just adding the new stuff. Still, those 4 teams that entered something and changed and reshaped it later behaved in the same way in the first assignment too. Summing up the activities, in this second assignment we had about one half of the number of accesses we had for the first assignment, and only minimal number of changes (25). Yet, this creates another, third possibility that we do not like. It is possible that teams decided to act as the technique was not wiki at all, created solutions on paper, possibly during their meetings, and than just simply divided it into parts so that the team members could enter them into the wiki. Going against the exact nature of wiki, this conduct created problems with grading too.

<table>
<thead>
<tr>
<th>Team</th>
<th>Assignment 1</th>
<th>Assignment 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Entering new notions</td>
<td>No. of updates</td>
</tr>
<tr>
<td>Team 1</td>
<td>166</td>
<td>36</td>
</tr>
<tr>
<td>Team 2</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Team 3</td>
<td>137</td>
<td>137</td>
</tr>
<tr>
<td>Team 4</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>Team 5</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>Team 6</td>
<td>75</td>
<td>8</td>
</tr>
<tr>
<td>Team 7</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Team 8</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Team 9</td>
<td>210</td>
<td>38</td>
</tr>
<tr>
<td>Team 10</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td>Team 11</td>
<td>56</td>
<td>36</td>
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<tr>
<td>Team 12</td>
<td>176</td>
<td>89</td>
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<td>Team 13</td>
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<td>119</td>
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<td>Team 14</td>
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<td>34</td>
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<td>Team 15</td>
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<td>29</td>
</tr>
<tr>
<td>Team 16</td>
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<td>31</td>
</tr>
<tr>
<td>Team 17</td>
<td>78</td>
<td>9</td>
</tr>
</tbody>
</table>

The whole assignments were evaluated and graded, and then, by observing actions of individual team members, each of them received appropriate number of points. After receiving their points, some of the students required meetings with the course conductors, and stated their dissatisfaction with the general idea of using wikis for creating assignment solutions. Yet, there was a clear difference between teams – those who accepted wiki as a technique and acted accordingly, were satisfied. Those who solved the assignments on paper and just entered the final solution were less or not satisfied at all. There were some students who did not participate in assignment solving at all, but this time they finally received deserved number of points – none.

**CONCLUSIONS AND FUTURE WORK**

Collaborative teamwork by students requires a lot of efforts from both students and the lecturers. Still, since its benefits are substantial – mostly including larger participation by students as a part of the course, better acceptance and understanding of the material, larger percentage of retention of the knowledge gained, mastery of soft skills gain achieved, or increased enthusiasm for self-directed learning – it was worth the effort. It was a challenge both for students and for lecturers.
The experience gained while conducting the presented courses very valuable for the further inclusion of wiki assignments in other courses at our Computer Science study directions. However, in future iterations of the presented courses we plan to focus on developing even more subtle means for team formation and teamwork evaluation. The final goal is to help students achieve even better results, as well as to be able to perform the evaluation of individual contributions to team efforts.

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