

ACTIVE BLENDED LEARNING FOR ADMINISTRATION OF NETWORKS – CASE STUDY

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Abstract

It can be observed that the number of students learning at engineer faculties has been dropping for several years. There may be many reasons for such a situation and difficult study program can be one of them. Academic teachers try new teaching methodologies to make their courses more attractive. On the other hand courses are often attended by very large groups of students and they are not motivated well to learn. The initiative described in the article is an attempt to apply active and blended learning to solve these problems. Traditional means of delivering knowledge are blended with web learning materials and collaboration tools. In consequence, students understand the course content better and they get better final grades. Great enthusiasm can be seen on both sides – students as well as academic teachers. What is more, students change their attitude from being too much individualistic to a group of students being capable to cluster around the task. Finally, they can form a group and work in a team.

Key words: Blended Learning, e-learning, blend-xl

1 Introduction

Nowadays at the universities there are two main ways of teaching: face-to-face and e-learning. Traditional teaching includes lectures, exercises, laboratories, projects and workshops. It is not rare that the students are also given electronic books for each course. The e-books are the main source of knowledge for distance-learning students.

The e-learning oriented universities offer study programs and extension courses over the Internet. They support traditional lectures and trainings as well as promote modern teaching methods. As it is stated on the official web pages of one of such universities: “*Methodologists, computer scientists and graphic designers, cooperating with best specialists in their fields, design individual courses, which are then taught in the course of entire study programs and trainings. PVU (Polish Virtual University) has the necessary knowledge and experience in the distance learning methodology – main emphasis is put on the stimulation of learners (through, for example, work in groups or team problem-solving)*” [1].

Usually students take the parts of courses over the Internet, but the exams are taken at the location of the campus during the exam period. Although the students can use the electronic materials any time they wish, they also have on-line meetings with the tutors, during which the problems and exercises are solved.

Both face-to-face and distance-learning methodologies have advantages and disadvantages. It seems that e-learning studies are more difficult for younger students and a better solution for economically active population.

2 Starting the Problem

The computer science students complain about several issues:

- most courses are difficult,
- some exams are extremely difficult mainly due to the amount of material or due to its complexity.

They also complain about lack of web programs which would be freely available for them to communicate. They lack the common area (environment) where their thoughts and ideas could be exchanged. It is extremely important especially for more practical oriented courses, e.g. Networks Administration. The teachers are also the ones who complain. They admit that, depending on the attitude of the group, they need some additional web environment to provide students with extra teaching materials.

Within one group of students there are some very active, professionally experienced and more creative people. When they are given some additional tasks (and some encouragement) the overall intellectual level of the group is much higher mainly due to the support they provide to the rest of the group.

Therefore, it has become clear that combining face-to-face learning and e-learning and preparing a blended course for students can bring a lot of advantages. It was decided some new tools should be chosen and the process of teaching should be enriched with them.

3 Administration of Networks – Blended Course Design

Computer Networks is one of the most popular specializations at the Department of Computer Science where the research was taken. It is mainly due to a market demand for network specialists (administration, design, security). “Administration of networks” is the first specialization subject at 4th semester. Students say this is the most difficult one (due to a very difficult final exam). Indeed, the main objective of the subject is to change the students way of thinking from a “computer user” to a “computer/server/network administrator”. Having completed the course a student should be also able to define fundamental elements in network administration, identify and maintain network operating systems and network services.

The course consists of 30 hours of lectures and 90 hours of laboratory (two semesters). The lectures finish with a two level exam. The first one is a written part (the students say it is the hardest task) where the students are given the IP addressing problems to calculate (CIDR, VLSM, Subnetting). The second part is oral.

The main objectives of redesigning the course are:

- to teach better,
- to make the course more interesting and challenging learning experience,
- to make good use of students’ abilities and their technical knowledge,
- to meet students’ expectations,
- to encourage students to be more hard-working and to motivate them to try harder,
- to give some tools to exchange ideas between students,
- to give some additional teaching tools for the teachers,
- to choose the most suitable tools for learning/teaching.

The above mentioned objectives led us to define the following RESEARCH QUESTIONS we expected to be answered:

- How can teaching be improved in the following areas: students support, tuition, preparation, etc.?
- How effective and useful will envisaged teaching materials be in gaining knowledge? In what ways will online work and face-to-face work differ in this respect?
- What are students’ needs and their perception of learning and teaching?
- How can we arrange blended learning to increase and enhance students interaction, team work and peer support?

Answering the above questions was possible thanks to European Project Blend XL: Finding a Balance in Blended Learning with Extra Large student Groups (225552-CP-1-2005-NL-MINERVA-MPP).

The Blend-XL project defines blended learning as the effective, efficient and creative combination of modified face-to-face instruction and online, networked learning supported by pedagogically sound uses of technologies, tools and media. The project work is aimed at the improvement of the overall learning and teaching practice within specific, locally defined problem areas such as student motivation and active forms of learning. An added element to this definition is a focus on the implications for learning and teaching in extra large student groups. “XL” in the project name refers to this focus [2].

The Administration of Networks part of the project had two stages. The first one took place in 2006 and the first group of 152 students attended the redesigned course. The second run (2007) gathered 130 students.

4. First Run of the Project

We decided to enrich the traditional way of teaching by adding some e-tools. As mentioned before, the university where we introduced the new methodology of teaching has a long tradition to provide e-learning courses. The e-tools were made available for us.

For the purposes of the BlendXL project, we decided to use R5 Generation e-learning platform, which has been set up for the course. This platform has been developed for several years. It provides many e-learning tools: forums, chat-rooms, drop-in folders, course content folders, tests, evaluation forms, calendar, mailing system etc. There are several tools to help administering the users (students, teachers, admin). The authors write about their product that the e-learning platform “*possesses 61 different tools or functionalities for accomplishing and supporting the following tasks:*

- *communication,*
- *task management,*
- *material handling,*
- *course management,*
- *maintenance and up-date tools,*
- *Maintenance & Guides.”* [3]

We suggested and prepared (Fig. 1) forum, chat-room (*czat*), drop-in folder (*folder zwrotny*) and some monitoring and administration tools (users and documents managing, statistics).

Forum is the place where the posts and the answers are stored. The discussion takes place in this area of the platform. In the case of our blended learning course it was the most important place. Having this tool the teacher could

make the course less “theoretical” and more practical. The chat area was planned to be used for direct student–to-student or student-to-teacher communication. The drop-in-folder was supposed to be a tool for exchanging files, especially freeware network administration software.

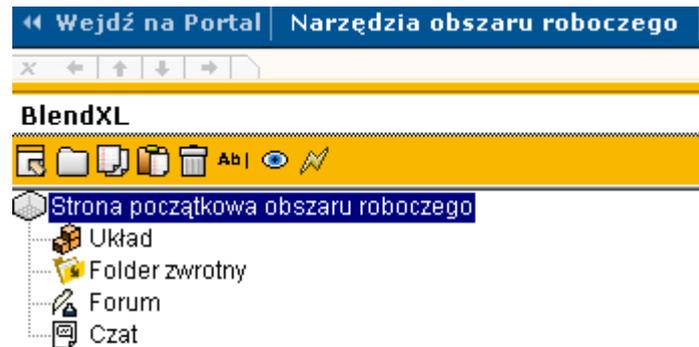


Figure 1. View of the e-learning tools

The main topics and questions of the forum were posted by both the teacher and the students. They focused on:

- basic and advanced network administration techniques,
- “how to” questions and answers (here experienced students made good use of their technical knowledge, supporting their colleagues),
- some course issues concerning network administration,
- discussion on the idea of web-based tools for improving teaching/learning process,
- informal, not related to the Administration of Networks, issues,
- “What changes are needed for the platform? Any new functionalities? New ideas? Any are warmly welcome :-)”

The most frequently “discussed” topic was “Linux vs. Microsoft”. It was suggested by the teacher (this issue always generates a very interesting and stimulating discussion).

Students could create their own posts. The main problem the students reported was information disorder. They said they needed more structured forum with issues for discussion organized better.

5 First Run Results

The interview with the teacher, students questionnaire and *focus conversations* with students were our main research instruments. R5 Generation platform was equipped with statistic analysis tools, which were used to check students' activity. Project partners prepared the evaluation questionnaire (feedback) which was delivered to the students.

6 Students Activity Analysis I

There were 154 participants of the redesigned first run course (152 students, teacher, BlendXL observer).

Observing the activity on the R5 platform, we could calculate the number of active participants as 66 (57%) ("active participant" is the student who logged to the system at least once). Table 1 shows the activity of the students and the teacher (R5 Generation e-learning platform)

Table 1. R5 - activity of the students and the teacher during the first run of the course

Type of activity	Maximum per user	Average per student	Teacher	Average per active participant
Number of logons to the area	193	11	75	25
Discussed posts	26	1.74	26	2.06
Answers to the posts	62	1.74	62	4.06
Posted topics to discuss	70	0.45	12	4.06

The average time spent on the e-learning platform was 32 minutes (max: 5h14min – the most active student, 3h28 min. – the teacher). Each active participant logged on 25 times, discussed 2 topics, posted and answered 4.

The students used mostly the forum area. They did not use the drop-in folder. They did not like using the chat tool mainly due to its poor functionality. The discussion between the participants was very effective. Since R5 Generation e-learning platform was widely criticized by the students, it became obvious that a new e-discussion platform should be chosen. The new one was phpBB forum which was chosen, installed and set up by the students (students' initiative). phpBB is a bulletin board available to download at

http://www.phpbb.com/. As mentioned on the web site [2] the phpBB is a high powered, fully scalable, and highly customizable Open Source bulletin board package. phpBB has a user-friendly interface (Fig. 2), simple and straightforward administration panel, and helpful FAQ. Based on the powerful PHP server language and (...) MySQL/MSSQL/PostgreSQL or Access/ODBC database servers, phpBB is the ideal free community solution for all web sites.



Figure 2. View of the e-learning tools

phpBB forum has its own statistic system. The statistics report states that during the first run of the project the users wrote 353 posts and there were 92 topics. There were 53 registered users. This forum was viewed 9233 times (by 10.11.2006). Each active participant, on average, logged on 174 times, discussed almost 7 topics, posted 2 topics. In comparison to R5 Generation phpBB was visited more frequently.

As it was mentioned above, this forum was the initiative of the students. The statistic results are very significant. They mean e-tool was important for students in the learning process.

In comparison to R5 generation e-learning platform new solution was more user friendly. The topics put there were very well organized. Every issue had its own administrator who took care of high quality of the answers.

7 Students Survey – Part I

Ninety-seven of the students who took part in a blended learning course shared their experience with us. They filled in a questionnaire while taking an

exam at the end of summer semester. Most of them were men (90%). It is also worth mentioning that they were computer science students so the technological aspect of the Internet usage was not the problem for them.

Respondents really liked the teacher. He was given excellent notes. Students highly appreciate his availability, lecture/work preparation as well as the way he explains difficult matters to them. Almost 70% of respondents found the second factor excellent and 25% - good.

89 people out of 97 find teacher's ability excellent or good and 91% of the respondents felt he can explain the course content in an excellent or good way. Other aspects of teachers support also met students' expectations. The teacher's attitude towards students assessment is worth emphasizing since there are no bad marks and almost 93% of excellent and good ones.

A teacher seems to be a very important part of blended learning teaching. We could imagine a very good e-tool made available for students but without a motivated and well trained teacher the tool would be just a useless gadget.

Vast majority of the students (72%) also admitted that they received sufficient instruction from the teacher how to work in the VLE. As mentioned before, the students were the experienced users of web applications. In the case of liberal arts courses one should spend more time explaining how to work with VLE.

The next positive thing concerning blended learning course is peer support. 91% of the respondents received some or a lot of peer support and 89% witnessed it. This was one of the major outcomes of the project. We were able to gather the students into the group of students (not the individuals).

Analyzing the learning tools the students pointed to links to external information and 34% of the respondents find forums the most useful. Chats seem to be of little importance.

Regarding the usefulness of particular course components students decided the most helpful ones were: library resources, resources from the course website, e-mails with the teacher and e-mails with other students (51% of students found the web site helpful, 31% fairly helpful).

Finally, there were many students who could not say if they like blended learning or traditional teaching more. However, 31 respondents declared they prefer blended learning. It is a new teaching method for them and probably this is the reason for their "doubts" (31% – "I can't really say", 32% – blended learning, 20% – traditional teaching).

Finally, it should be emphasized the students really enjoyed the course. Only 6 out of 97 respondents declared they would give up the course if they could. Most of the students (74,2%) found the course interesting. Almost 63% of the students declared they enjoyed the course. 68 out of 97 respondents were satisfied with the overall quality of the course and 67 out of 97 claimed it encouraged them to independent study.

In the I cycle of the course three main problems were encountered:

- students' dissatisfaction from group work and group discussions (in the I cycle evaluation most of the students did not feel encouraged by fellow students to participate in group work and they found the quality of group discussions poor)
- students' feeling that introductory explanations given at the beginning of the course were not sufficient (they were lacked information concerning the following subjects: what is blended learning, the role of blended learning tools, amount of study time required)
- students' doubts concerning their preferences – 48% of them could not say if they prefer blended learning or traditional teaching methods

Taking into consideration these three problems the teacher conducting the course did his best to improve II cycle course and paid more attention to group work, providing students with more detailed introductory information and encouraging them to be more active in the course.

8 Second Run – Toward the Improvement

First of all, at the very beginning of the next run of course the phpBB forum environment was prepared for the teachers and the students. The forum was pre-formatted (some topics were already opened). There was one administrator of the forum. The course and the teacher were the same. All the students were given their own user names to log in. After the course had been finished, during the examination period, the students were given the questionnaires.

9 Students Survey - Part II

87 out of 130 students provided the feedback.

The students did not seem to be very hard-working as almost 70% of them spent only 1-3 hours per week studying the course. 21% of the respondents devoted 4-6 hours weekly for the course and 10% - 7-9 hours. Nobody spent more than 9 hours studying the course. For 19% of the students it was a lot more than they expected, for 28% it was a little more, for 26% it was as much as they expected and for 25% it was a little or a lot less than they expected. It was very important for the teacher that students had an impression that the new methodology was less time consuming than the traditional way of learning.

Students found readings, resources from the course website and e-mails with other students the most helpful which was similar in the I cycle course. Set books, library resources and online chats were absolutely less popular

among the students. Comparing with the first cycle course it seems that II cycle students used more components offered in the course and could notice advantages of using them. They did not find useful at all only four out of nine course components (readings – 3%, on-line conferences – 3%, online chats – 7%, e-mails with other students – 2%). They were absolutely more willing to use web based materials than paper ones.

Although on-line conferences were quite popular among the students and 48% of the respondents find them very helpful, they rarely referred to them in discussions or writings - over 43% of the students never referred to them, almost 50% used to do it sometimes, and only 7% did it frequently. However, comparing to the I cycle course, more students printed pages from the course website frequently (in the I cycle it was 17% and in the II cycle – 35%).

The teacher was given excellent notes for his work and support. They were even better than the ones from the I cycle. There were no students saying that his work was bad in any aspect. Students highly appreciated his attitude towards students, lecture/work preparation, as well as dealing with their questions

The students also appreciated on-line ways of communication with their teacher and generally perceived e-mails with him as a quite useful course component. 43% of the respondents find it fairly useful and 35% – very useful. No one said e-mails were not useful at all. However, 15% of the students declared they did not use this way of communication.

9.1 Peer Support and Group Work

Most respondents claimed they were given peer support on the course. 60% of them say they got a lot of support

II cycle students had absolutely fewer problems with accessing their on-line groups than I cycle students. Almost 70% of them admitted that they had no problems at all, while in the I cycle it was only 47%

Students felt more encouraged to participate in the group work by the teacher than by their fellow students. (It was similar in the I cycle course.) 65% claimed that their tutor encouraged them to participate in their groups very much and 26% of the respondents said he did it fairly. Only 7% of the respondents said they felt very much encouraged by their fellow students to participate in a group work.

Over 50% of students said they were fairly or very much involved in a group work and 7% admitted they were not involved at all. It seems the respondents were quite satisfied with the quality of the group work. On the other hand, almost 30% said the way group work was done did not meet their expectations – 6% said they were not satisfied with the quality of group work at all and 22% said they were not very much satisfied.

9.2 Virtual Learning Environment (VLE)

Students said they were given sufficient instruction to work in the virtual learning environment (72%). Only 3% found it not sufficient. They found working in the VLE to be a positive experience. On the other hand, 35% of them were not sure about it.

II cycle students had fewer doubts concerning user-friendliness of the VLE than their I cycle colleagues. I cycle respondents used to give the answer “I am not sure” very often, while their II cycle fellows did not choose this option so frequently. They found VLE easy and pleasant to work with.

However, it should be emphasized that VLE in which II cycle students worked was different than I cycle students’ VLE. During I cycle course students worked on the R5 Generation Platform which they found not user-friendly or pleasant to work in. Therefore, they decided to change it. As a result, PhpBB was prepared to work in during the course. Fig. 3 shows it was a right decision to change VLE and let the students decide what VLE they want to use.

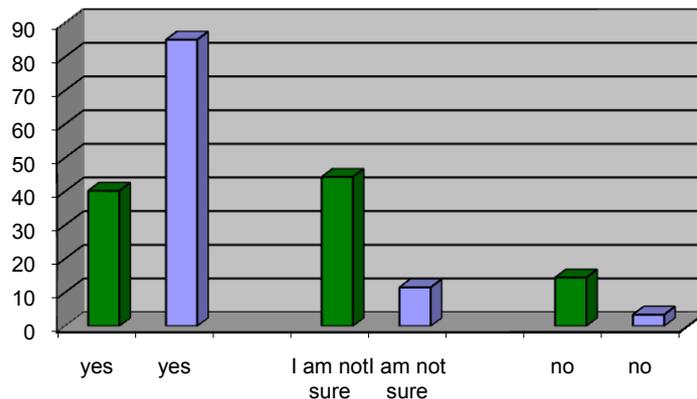


Figure 3. Was the VLE as a whole pleasant to work in? (green color for the I cycle, blue color for the II cycle)

9.3 General Opinions Concerning the Course

Comparing to the I cycle, students of the II cycle course were more satisfied with information they got before the course started, especially information concerning what blended learning is, the role and usage of blended learning tools, learning outcomes, as well as prior skills and knowledge required and amount of study time required.

After the I cycle course only 2% of the students found information concerning study time required very accurate and 20% not accurate at all. In the case of blended learning tools information and advice they had received before the course it was perceived as very accurate by 8% of the respondents, not very accurate by 34% of them and not accurate at all by 14%. When it comes to the explanation concerning what blended learning is, almost 80% of the students found it accurate or very accurate. It was similar in the case of explanation concerning blended learning tools, prior knowledge/skills required, study time required and learning outcomes. Students really liked the course. 55% of them found it very interesting and 35% – fairly interesting.

According to 90% of the respondents the learning outcomes/objectives of the course were fairly or very clear. Students were also satisfied with the overall quality of the course (52% – fairly satisfied and 35% – very much satisfied).

The students did not find the course very difficult. Only for 7% of the respondents it was very difficult and for 38% – fairly difficult

If the students fell behind the recommended study pattern it was rather easy for them to catch up. Only 3% of the respondents said they did not fall behind. On the I cycle course it was 8%.

Finally, II cycle students seemed to have fewer doubts concerning the fact if they prefer blended learning to traditional way of teaching. For over 47% of I cycle respondents it was difficult to say what teaching method they find better. 32% of I cycle students said it was blended learning they liked more and almost 20% preferred traditional teaching. II cycle students had fewer doubts and only 18% of them chose the option “I can’t really say” and for 55% of the respondents blended learning is better or rather better than traditional teaching.

10 Students’ Diploma Works

It is worth mentioning that two students of the first cycle were so interested in methodology and phpBB forum that they decided to write their diploma works based on the BlendXL project. One of them became the administrator of the second run of the project and introduced the methods of administration of the system. He created and described the procedures which made the phpBB platform easy to use for students and teachers. He also reacted to any technical issues (trouble shooting) [4].

BlendXL phpBB forum system live CD is the outcome of the diploma work of the second student. The designed solution allows the teacher to get to know the system itself without the necessity of installing it on a hard disk. The system was made available to academic teachers, who are interested in contemporary methods of teaching. Prepared bootable CD (ISO image availa-

ble from: <http://www.blend-xl.eu/node/232>) is a complete software solution to test and install forum board. It can be easily used by teachers to set up blended learning e-tool – BlendXL phpBB forum system.

There can be two ways of using BlendXL phpBB forum system: *test mode* or *server mode*. *Test mode* allows the user to start the system directly from the CD. Test mode does not affect any part of the operating systems installed previously on the computer. It will keep all the forum data until the system is powered on. When the system boots again, it will contain the starting form of the forum. To be able to keep all information added by forum users it will be necessary to install it on the server. *Server mode* keeps all configuration and information files (also the data stored by students and teachers) on a hard disk. The *server mode* should be used when the teacher (or team of teachers) wants to use the BlendXL phpBB forum system to work with students on regular basis. BlendXL phpBB forum system is a very intuitive communication board. What is more, it was constructed in a such a manner that the student or teacher needs just a web browser and the Internet connection to access the discussion topics. The installation process was also simplified so no professional system/network administrator is needed to complete the set up of software environment.

11 Dissemination BlendXL Methodology at the University.

During the 5th conference Innovation in Education which took place in Lodz, the results of research were presented. We decided to organize several seminars about blend-xl methodology. There were some teachers interested in the program and decided to try using the platform for their lectures, mainly in Philology and Management study programs. Since their groups were relatively small we do not present the statistic results for those courses. Still, it is worth mentioning they were so fascinated with the methodology that they decided to continue using phpBB platform for other courses. The teachers found this method very useful so they decided to present the main concepts of the methodology to the faculty council to introduce it broadly to the academic community.

12 Conclusions

I and II cycle course students' opinions differ a lot in some questions. There can be two reasons for that and one should be careful with drawing conclusions. Of course, the teacher did his best to improve the course and meet students' expectations. He provided them with more detailed explanations at the beginning of the course and tried to work on students' discussions quality. It seems it helped a lot (it can be seen while comparing I and II cycle

data). On the other hand, during the II cycle course the teacher was working with a different group of people. They could be integrated better or more willing to work in the group and it can also be the reason for different results. Students were also provided with new VLE (phpBB) which improved cooperation and communication among them. Therefore, it can be assumed that students should be given the chance to work out their own tools and adapt VLE to their own needs. The more satisfied they are with the e-tool the more they like blended learning the more effective their group work is. Time- and place-independent work and study is of great importance for the students, as well.

The role of the teacher is important. If the teacher is not active enough there is no forum activity. Still, even the greatest effort and motivation on the teacher's side does not guarantee a success concerning dissemination of this methodology at the university. It is the university board which should introduce the methodology to the academic teachers and present its advantages. It is also very important to train the teachers how to work with e-tools effectively.

The research proves that using BlendXL methodology and devoting some time to students help them to gain knowledge. In consequence, their final results are better than results of students who use only traditional methods of learning. It does not mean that BlendXL methodology should replace traditional teaching but for sure it can and should enrich it. In consequence, the course will be more interesting for the students. They can also gain new skills, e.g. teamworking or IT skills which are absolutely useful nowadays (it concerns courses for non-IT students).

It seems that the cost of the e-tools is a key issue in such projects. In academic reality (in Poland we observe decreasing number of students due to the period of population decline) the cost factor is very important. Relying on such e-tools, basing on GNU/GPL license brings about great decrease of the cost of such programs. Therefore, the designed, cost-effective e-tool e.g. BlendXL phpBB forum should facilitate entering the World of Internet teaching, where technology is not a problem anymore.

The Internet has been developing for several years. It has become very popular. During last 10 years the number of Internet users increased to more than 1.4 billion [6]. It means that 1 person out of every 5 has the access to the Internet. Academic community makes good use of the Internet resources and e-tools. Services provided by the community support work and information exchange. The Internet knowledge database shapes people's mind. BlendXL project showed how to use the Internet to improve teaching large groups of students and how to change individual work into group work, how to create student teams.

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