

# Networked Blended Learning Creation of Best Practices for Continuous Improvement

*Athanasios I. Margaritis, Kerstin V. Siakas, Fotini Dimopoulou, Amalia E. Pontikidou*

*Alexander Technological Educational Institute of Thessaloniki, Department of Informatics,  
Email: amarg@uom.gr, siaka@it.teithe.gr, fdimop@it.teithe.gr, amapont@it.teithe.gr*

## Abstract

Advances in Information and Communication Technologies (ICTs) have increasingly enabled global asynchronous interactive learning and teaching, thus offering greater flexibility and easier access to information in a life-long learning context. Also the Bologna Process for European Higher Education integration and various Quality Assurance procedures, as well as the emerging globalisation put pressure on teachers to rethink and redesign their courses. Through active, adaptive and cognitive project-based learning, networked learning can facilitate a supportive, motivating and affordable life-long learning.

The department of Informatics at Alexander Technological Educational Institution of Thessaloniki responds to the new challenges by adopting a blended learning model that combines traditional classroom teaching and user-centred networked learning.

This paper reports experiences and findings from different blended courses in the department revealed in a first assessment of the teaching-and-learning practices<sup>1</sup>. The assessment was carried out by using an on-line questionnaire completed by 119 students. Emphasis is put on students' views regarding the current teaching-and-learning practices. The ultimate outcome of the assessment aims at creating guidelines for best practice in networked learning. Continuous improvement of the research instruments together with regular assessments will ensure continuous improvement of processes and practices regarding networked blended learning.

## Keywords

Networked learning, Web-based learning, blended learning, teaching-and-learning methodology assessment

## Introduction

Blended learning is the combination of instructions from two historically separate models of teaching and learning: traditional face-to-face learning systems characterized by teacher-centred environments and a person-to-person interaction and distributed computer-based systems with distance networked learning capabilities. The convergence of those two different approaches is the result of the exponential technological growth of the last decades and the expansion of the possibilities for distributed and asynchronous communication and interaction between the students themselves and between students and the instructor. An interesting observation is that during the last ten years more than ten major new technologies for learning and collaboration have been invented. This growth is observed, not only at the hardware, but also at the software level, with the design and implementation of specialized software platforms that allow distance learning, such as course and the content management systems. Typical examples of such systems used broadly in education, is the Blackboard (2004) and the Moodle course management system (Riordan, 2004; Chavan and Pavri, 2004; Coba et al., 2000), as well as the ILIAS learning content management system (Margaritis and Kotisaslos, 2004).

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There are many trends and issues associated with the blended learning approach, the most important of them are associated with the improved pedagogy and the increased flexibility provided by it, as well as with the progress made in factors such as the quality, effectiveness, convenience, networking and cost of the learning experience. Even though the options regarding the methods and tools used during training have been improved dramatically, the dominant teaching strategy is still the live delivery of a lecture from the instructor with the focus to be directed to the transmission of the ideas rather than to the interaction between the students and the teacher. Blended learning provides the tools to increase the level of interaction, thus allowing the adoption of strategies for active learning, peer-to-peer communication and learner-centred approaches. On the other hand, this learning type allows the provision of a balance between the flexible and advanced learning options provided by a computer-based distributed environment and the human touch that characterizes a face-to-face interaction, a feature that is always desirable by both the students and the instructor.

The process of blending, and the various models designed for that purpose, can be applied to any dimension of the learning process (e.g. blending off-line and on-line learning, blending self-paced and collaborative networked learning and blending structured and unstructured learning) as well as to any one of the four available different levels associated with that process, namely, the activity, the course, the program, and the institutional level. Across those four levels, the nature of blending is either determined by the learner or the instructor. In most cases, learners determine blending at the program and institutional level, while, instructors are more likely to play an important role in determining the blending options at the course and activity level. Regarding the application of blending each one of the four levels defined above, it can be performed as follows (Bonk and Graham, 2006):

- At the *activity level*, blending occurs when a learning activity contains both face-to-face and computer mediated elements.
- At the *course level*, blending entails a combination of distinct face-to-face and computer mediated activities used as a part of a course. There are two different approaches that can be used: in the first approach these two different types of activities overlap in time, while, in the second one, such an overlapping is not appeared, and the activities are performed sequentially in time, one after the other.
- At the *program level*, blending is based on one of two different models, a model in which the participants choose a mix of face-to-face courses as well as outline courses, and a second model in which the combination of the two course types is prescribed by the program. A typical approach is to demand that certain courses are delivered in a face-to-face fashion, while, the remaining courses are taken at a distance.
- At the *institutional level*, blending is applied in many different ways depending on the institute needs and the organization of the studies. A typical approach at this level, is the one in which the students attend face-to-face classes at the beginning and the end of the course with online activities in between.

In addition to the description of the distinct levels at which blending can be applied, another important issue that has to be discussed, is the model adopted during the process of applying blending to learning. According to the literature, there are three fundamental models associated with the skill-driven learning, the attitude-driven learning and the competency-driven learning with each one of them to be characterized by the following properties (Valiathan, 2002; Margaris and Kotsialos, 2005):

- In the skill-driven model the objective is to combine self-paced learning with the support of the instructor to develop specific knowledge and skills. This objective is achieved with activities such as group and self-paced learning tasks with strict supervisions in a synchronous or asynchronous fashion.
- In the attitude-driven model the objective is to develop specific behaviour and attitudes by mixing various events and delivery media, and by adopting activities such as role-playing simulations, synchronous on-line meetings and off-line group project work.
- Finally, in the competency-driven model, performance support tools are blended with knowledge management resources to develop workplace competencies. In this model the use of specialized software platforms such as learning management systems and learning content management systems play a very important role.

## Learning Management Systems

Learning management systems are a valuable and required tool for implementing and using blended learning environments. These systems are the next step in a continuously evolutionary process starting with the creation of educational multimedia applications and continuing, in our days, with the implementation of computer simulations and virtual reality environments in a synchronous as well as an asynchronous fashion. The last case is very interesting, since it provides the ability to the learner to study at his own rate without limitations, such as the physical presence in a classroom and the availability of the required teaching material in printed form. There are many types of such systems with different capabilities and objectives, the most important of which are the following (Margaris and Kotsialos, 2005):

- *Learning management systems* that allow the creation, management, delivery and publication of the necessary information. An enhanced version of those systems is the content management systems that allow furthermore the management of documents containing teaching material.
- *Document management systems* that allow the creation and manipulation of documents of any type. These systems are based on a centralized database architecture whose structures and elements are described by appropriately defined metadata.
- *Course management systems* that allow the creation and management of training courses; furthermore they provide capabilities for evaluation and automatic grading and support learning in a self-paced fashion as well as the collaborative learning. The main drawback of this type of systems is that they do not support the creation of the teaching material that has to be developed by using third party applications to be embedded into the learning platform. Typical examples of such systems are Blackboard, Moodle and WebCT.
- *Enterprise learning management systems* that provide more capabilities with respect to the traditional learning management systems and a much deeper degree of parameterisation. However, such systems are very expensive and not affordable by many educational institutions. A typical example of such a system is the Docent Enterprise and the Knowledge Enterprise.
- *Learning content management systems that combine the functions of learning and content management systems* providing thus the capability of developing and publishing the teaching material. Typical platforms that belong to this category are the Mindlever and Midspan Solutions application as well as the ILIAS open source platform (Margaris and Kotsialos, 2004). The structure of a learning content management system provide among others, the following tools:
  - *Content creation tools* that allow the easy development of the teaching material by using a friendly and simple environment without the need of knowing a programming language as well as multimedia authoring tools.
  - *Course design and delivery tools* that allow the creation of training courses, the assignment of students to them, and the organization of the learning process (online examinations with automatic grading, homework and case study electronic submission and communication with the users).
  - *Administrative applications* supporting many operations, such as the logging of user activities, the creation of statistics, the backup of the system courses and the definition of the time period of the availability of the courses and the teaching material to the users.
  - *Communication and collaboration tools* that allow the interaction of the user with the system as well as the learner collaboration in a synchronous (chats, whiteboards and online sessions) as well as in an asynchronous (forums, discussion groups) fashion.
  - *Interface tools* that allow the interaction between the learning platform and other systems (access to web pages, uploading teaching material through the FTP protocol, etc).
  - *System security tools* that allow the implementation of processes such as the creation of the user accounts, the specification of the access rights of the learner and the encryption of the information that is considered confidential and important.

The structure of a typical learning content management system is shown in the figure 1 below:

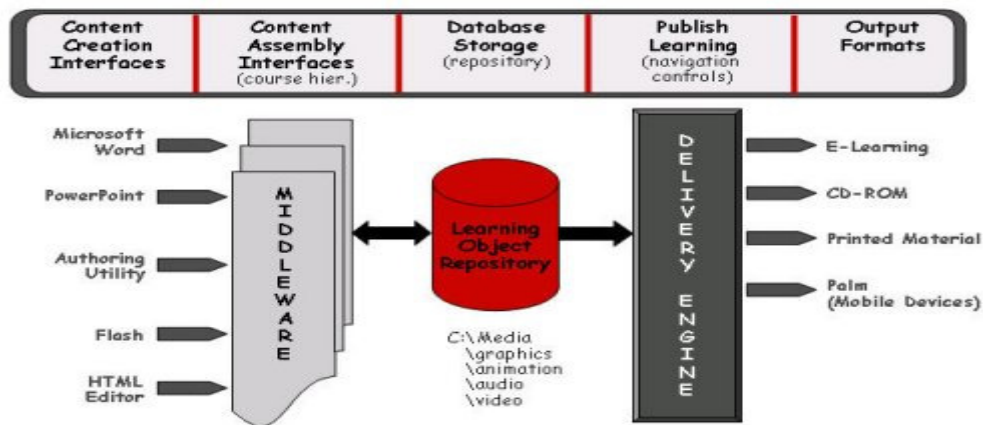


Figure 1: The structure of a typical learning content management system

## The Blackboard Course Management System

The course management system used at the department of Informatics at the Alexander Technological Educational Institution of Thessaloniki, is the Blackboard Learning System, a platform running under the operating system of Microsoft Windows. This platform provides many capabilities associated with tasks, such as the management of courses and learning content, the collaboration between students, homework and case study assignments. The most important capabilities are the following (Blackboard, 2004):

- Organisation of students in one or more groups for collaborative learning. The instructor has the ability to add and remove user accounts, to change the options for the system users and to enrol users into one or more courses. There are many user types with different access rights as for example the student type that can only have access to the teaching material, the instructor type that can create and organize a course and the system administrator that is responsible for the management and the administration of the training platform.
- Easy publication of the course documents through an advanced Web-based user interface
- Advanced tools for the submission of homework and case studies such as the digital drop box
- Useful tools and accessories such as the calendar and the address book
- Easy communication between the instructor and the users in a person-to-person or a person-to-group mode.
- Offline user communication through a discussion board
- Online user collaboration through the virtual classroom. This application supports a lot of different tasks such as live discussions through a chat application, collaborative study through a whiteboard, private and public message exchange between the instructor and the students and presentation of web content in the main screen of the utility.
- Easy design of examinations with automatic grading capabilities. The instructor can choose any one of the available types of questions (for example, true/false questions, multiple choices as well as text-input and matching lists questions). The platform allows the online display of the student grades grouped by questions or students, while, furthermore it provides statistics about the frequency of visits, the access count for each published item and the number of logins per hour/day/week/month.

The Blackboard learning system is used at the department of Informatics at ATEI of Thessaloniki the last four years to some degree in a blended learning fashion. A very interesting application of the Blackboard learning system is the organization of virtual labs organized in a pure distance fashion. This is a required process, since during the last years the number of students has increased remarkably and the existing workstations are not enough to cover the lab needs. In order to participate in a virtual lab the students have to have received a grade between four and five in a previous semester (Below five is a fail). The rules of operation of a virtual lab are (Goba et. al, 2000):

- For each course, into which enrolled distance mode students have enrolled, the necessary teaching material and all the information required for a student about the lab and the teaching staff is created in the Blackboard system;

- For each virtual lab the department assigns a faculty member as the lab coordinator;
- A student is enrolled to the virtual lab after a successful establishment;
- The student studies the material at home, and through the platform he/she poses his/her questions, and in general, interacts with the instructor, as well as the other students;
- The student makes the assigned homework and sends it to the instructor every week through the digital drop box Blackboard utility. A necessary precondition for the successful participation to the course is the solution of at least 80% of the delivered assignments;
- At the end of the semester the instructor informs the students about the days and hours of the lab exams. The exams are taken at the Department together with the traditional students;
- The grades are announced to the students.

Currently, virtual labs have been set up and used for several courses. Last year the Blackboard learning system was also introduced for the organization and management of the final year theses assigned to students, a required step for the successful termination of their studies.

## Learning Methodology Assessment

In order to assess the learning outcome a questionnaire was developed. The aim of the programmed assessment, involving students following different blended learning courses in the department of Informatics, is to identify strengths and weaknesses of the current practices.

### Demographic analysis

The questionnaire was distributed to 119 students during week 6 of the autumn semester 2007-2008. The response rate was 100% due to the fact that the questionnaire was distributed in the classrooms on the different courses using blended learning. The demographic picture of a typical student is as follows: In total 59.3% of the respondents are male and 40.7 female studying in their third year with an average age of 22.2 years old. For 93.1% of the respondents the studies in the department of Informatics at ATEI of Thessaloniki is their first school of studies at University level.

Totally 3.3% also stated that they have mobility or sight problems. In total 80.8% of the students have taken a certificate in the English language (first certificate or proficiency) and 44.8% study notes in English fluently. In total 31.1% of the respondents spend more than 30 hours weekly in front of the computer, 25.2% 20-30 hours, 34.5% 5-10 hours and 9.2% 1-2 hours.

Figure 1 below show the time the respondents spend on internet regarding five reasons

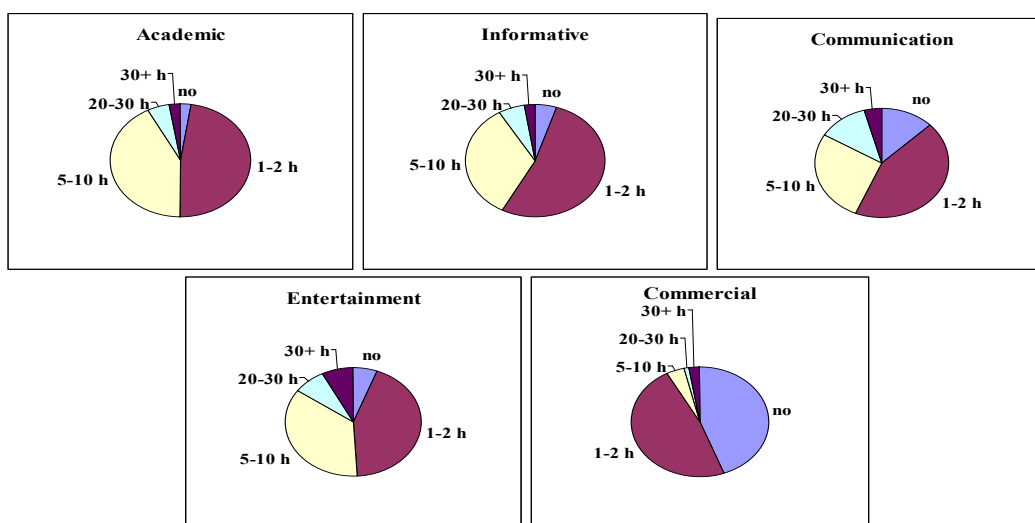


Figure 1: Statistics regarding reasons of internet use per week

From figure 1 we conclude that the respondents spend 1-10 hours per week on internet for academic, informative, communicative and entertaining reasons contrary to commercial reasons that cover only 1-2 hours per week. In total 16% of the respondents use internet more than 20 hours per week for both communication and entertainment.

### Obstacles regarding studies

As for the obstacles, regarding the studies in the department, 55.8% of the respondents consider that the distance is a main problem, as well as 17.4% consider financial problems important. It must be mentioned that the university is 17 kilometres away from the centre of the city and the use of public transport is difficult. >From the results above we conclude that the networked learning technologies provide significant practical support to the students in their learning process by enabling learning at own place, own pace and own time (Georgiadou and Siakas, 2006).

### The degree of e-learning environment use

In total 37.2% of the respondents replied that they use the provided networked facilities, two third for pure distance learning and one third for blended learning. The reasons for the low% of student using technologies are reported by 42.8% of the respondents to be:

- *Lack of resources* (21%). This can be confirmed by the fact that 20% of the respondents have stated that they do not have internet access at home.
- *Lack of interest among educators to apply e-learning technologies in their courses* (32.3%). The respondents have additionally stated comments, such as “*the electronic material is not updated*”, “*missing links to additional learning material*” and “*some courses use e-learning environments only as a notice board*”. This seems to indicate that the educators have a significant role in motivating students to participate in the e-learning environments, by updating the learning material frequently.
- *Lack of motivation provided by educators to students to trigger them using e-learning environments* (25.8%). As an example of motivation strategies we can mention that from 118 respondents who answered the question “*Have you ever participated in pre-test with automatic assessment*”, 42.9% replied ‘yes’ and they stated that they liked this procedure to a relatively high degree and would like this to be included in all courses to increase their understanding of the course and effectiveness of their learning outcome.
- *Lack of information* (21%). Many students are not informed by the educators about the possibilities e-learning environments provide. This seems to indicate that a common policy and strategy is missing in the department regarding the use of networked learning environments. It is up to every educator to use whatever tool he/she considers suitable.

### Advantages and disadvantages of e-learning

In total 30% of respondents that have replied that they use e-learning environments consider that the environment is useful and has considerably helped them to achieve their learning goals. The respondents believe that the e-learning environment offers them significant advantages, which are assessed on a scale from 1 to 10. The mean grade for each advantage is as follows:

**Table 1: assessment of advantages and disadvantages**

Advantage of	Mean Grade
Facilitates studies at own time	7.32
Facilitates studies at own place	7.18
Facilitates studies at own pace	6.97
Facilitates the students' learning outside the university	6.92
Improves the students' computer skills	6.56
Facilitates independence of the personal learning strategy	6.00
Disadvantage of	
Increases the dependency of the internet	7.36
Increases the dependency of the computer / technology	7.19
Reduces face-to-face contact	6.21
Meet difficulties in using environments	4.25

Table 1 shows that the respondents consider studies at own time as being the most important advantage of taking part in e-learning environments (7.32), followed by studies at own place (7.18). These results are correlated with the distance/transfer problems reported by 55.8% of the respondents.

Regarding the disadvantages the most important factors are considered to be the dependency on internet (7.36) and technology in general (7.19). In total 72.4% of the students stated that they print the learning material instead of studying it on-line. The results may be associated with the fact that 20% of the students do not have access to internet at home. A decisive factor may also be that the degree of broadband penetration (connections per 100 residents) on the 1st of January 2007 reached only 6.84% in Greece (Observatory, 2007). We presume that the speed of internet connection is a considerable factor for not preferring on-line activities. However, the rate of broadband penetration spread showed 156,39% increase compared to the previous year.

All students who take part in e-learning environments consider that their learning activities and outcome are improved to some degree. By using cross-tabulation we found that 63.15% of these respondents believe that the e-learning environment helps them to a medium/high degree in their learning activities and outcome, and also consider that it provides independence of their personal learning strategy.

## Communication

Table 2 shows the communication habits between stakeholders in the e-learning environment.

**Table 2: Assessment of communication habits between student / students and teachers**

Communication means	Among students	Between students & teacher
Chat	6.23	2.17
Through e-learning environments	3.31	4.04
Email	5.91	7.04
Face-to-face	8.09	7.78
Forums	4.55	3.52
Mobile/Portable wireless devices (mobile phone & palmtops)	6.69	2.90
Phone	6.69	3.62
Skype, Msn etc.	7.06	2.39
Tele-conferencing	3.00	3.05
Whiteboard	3.04	4.62

The students prefer face-to-face communication (reference) both with the teacher and with other students. This was also mirrored in table 1, where decrease of face-to-face contact is regarded a considerable disadvantage. Moreover, 71.7% of the students who already take part in such environments in addition to traditional learning prefer blended learning and table 2 confirms that communication within the e-learning environment is used both between students and between students and teachers.

Concluding, the results from the survey show that the students still prefer traditional learning methodologies. Networked learning environments are appreciated as an additional learning source.

## Guidelines regarding Best Practices

The guidelines for the best practice in networked learning were created based on experiences from discussions between educators and the results from the student survey. The guidelines, listed below, aim at serving as a roadmap and initiating the development of a list of relevant best practices.

### *Overall objectives and goals*

- Creation of a vision and mission statements, defining the primary purpose of learning.
- Setting up goals in order to make mission statements more concrete.
- Description of what needs to be accomplished for compliance with the goals.
- Assessment of the learning culture of the institution and the necessary changes.
- Adoption of a holistic pedagogic approach.
- Acquisition of management commitment and support for resources and standardisation of procedures.
- Appointment of a pedagogic quality assurance committee/board responsible for the planning, management and improvement of the best practices and the follow-up of compliance to requirements.

### *Learner involvement*

- Assessment of learners' current skills and desired skills (individual and team perspectives).
- Promotion of open-ended learner centred teaching by encouraging more dynamic, reflective, interactive and constructive learning experience.
- Creation of incentives for informal learning and knowledge sharing (Communities of Practice).

### *Implementation of blended learning practices*

- Creation of a best-practices strategy and an implementation plan including assessment strategies.
- Accommodation of alternative learning sources to facilitate individual learning preferences.
- Selection of the delivery mechanisms that will foster desired behaviours.
- Documentation of processes and procedures; definition of performance metrics.
- Training of involved staff and newcomers in the processes and the procedures.
- Regular evaluation/assessment, analysis and demonstration of results aiming at continuous improvement through shared stakeholder commitment

If a specific practice is characterised as a weakness, a change in teaching and learning processes will be proposed, otherwise the practice, if considered satisfactory by both students, instructors and management, will be added into the list including best practices.

## **Conclusions and Future Work**

The ultimate outcome of the assessment aims at creating guidelines for the best practice in networked learning. The assessment emphasising the views of students regarding the current teaching-and-learning practices will be repeated regularly. Depending on the need of capturing additional issues and the maturity of the assessment process the assessment instrument will continuously be improved. Regular assessments will ensure a common viewpoint. The assessment will also be an instrument for continuous improvement of processes and practices regarding networked blended learning.

Future work will concentrate on involving more departments of the University in the assessment process. Also collaboration with other educational institutions for exchange of best practices will be promoted.

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