

# Using ICT to Support e-Learning in Higher Education

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Abstract: As e-learning has an established presence in higher education we need to ask the question: How effective is an information and communication technology (ICT), including Learning Management System (LMS) and OpenMeetings synchronous tool, for student learning in high education? This paper collects teacher and student opinions on teaching and learning using ICT, and addresses the following key elements: (i) technological aspects and (ii) methodological aspects. These opinions are compared and analysed to provide also the resources needed for high quality learning using ICT.

## 1 INTRODUCTION

Information and communication technologies (ICT) have a “powerful” role in academic learning (Ketabchi *et al.*, 2008). Several universities in the world use it on traditional and electronic learning (e-learning). Identification of effective ICT characteristics on offering e-learning courses is an important issue. The purpose of this paper is to provide a case study concerning the current use of ICT for e-learning in higher education. In this course, the Learning Management System is *Moodle* (<https://moodle.org>) and, for synchronous sessions, the OpenMeetings framework is used (<http://openmeetings.apache.org>).

This case study covers student and teacher opinions about ICT aspects of e-learning in an undergraduate degree context (Bologna first study cycle) and addresses the following key elements: (i) technological aspects and (ii) methodological aspects.

With the element (i) it is possible to collect participants’ opinion about Moodle and OpenMeetings, in particular, and other ICT elements (video, power points, etc.) in general. Element (ii) collects how participants use Moodle and OpenMeetings, in particular and other ICT elements (video, power points, etc.) in general.

This paper is organized as follows: Section 2 presents the background, while Section 3 presents the method of the survey application; Section 4 presents the results and discussion and, finally,

conclusions and future work are briefly outlined in Section 5.

## 2 BACKGROUND

Although aware that ICT alone does nothing to enhance online pedagogy, advancements in ICT, specially learning management systems such as Moodle, have created remarkable opportunities for higher education to expand the educational process beyond the traditional classroom to include geographically dispersed students. It is important to understand how ICT are being used and how they impact on students and teachers.

### 2.1 E-learning

One possible definition for e-learning is: “The use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration.” (EU Commission, 2005). Therefore, the term e-learning is an umbrella concept for the use of technology in various ways to enhance learning. So, this paper presents the ICT involvement considering:

(i) ICT support for e-learning communication. The communication could be synchronous (e.g. chat) and/or asynchronous (e.g. threaded discussions).

(ii) ICT offers media sources, using speech, and video. Besides this, spreadsheets, text and data management are also ICT sources.

(iii) Learning Management Systems (LMS): a software framework that deploys, manage, tracks and report on interactions between learner and content and between the learner and the teacher (EU Commission, 2005).

## 2.2 Related Work

The work in (Heirdsfield *et al.*, 2011) collects teacher, student and staff perceptions of teaching and learning using Blackboard (<http://www.blackboard.com>). The impact of Blackboard has been such that technology-mediated instruction is the norm including for on-campus learning. All participants see Blackboard as more than simply a repository of learning resources, and think its interactive features enhanced students learning experience.

(Hrastinski, 2008) presents the limitations and benefits of synchronous and asynchronous e-learning communication. The research discussed therein demonstrates that synchronous and asynchronous activity complements each other. Synchronous activity is used for increased motivation and convergence on meaning. Asynchronous activity is used for increasing reflection and ability to process information.

(Welsh *et al.*, 2003) reviews literature on e-learning and pointed out the future of e-learning, such as (i) growth in synchronous learning; (ii) prevalence of blended solutions; (iii) improved technology and access.

A subset of parameters of the Yi-ShunWang framework was selected to evaluate the eLearning Center at University of Tehran (Ketabchi *et al.*, 2008). These parameters are grouped into (i) content-related (ii) communicative-related (iii) evaluation-related and (iv) LMS-related. The opinion of 3000 students about eCourses (mathematics, physics, chemistry and languages) was collected and the results reveal a low classification for the LMS, which should be replaced by another.

(Kinuthia and Dagada, 2008) presents a study to explore how ICT is being used for teaching and learning purposes and was guided by the following questions: how is ICT being used for teaching and learning purposes? What instructional strategies are employed in the design and delivery of the ICT-integrated content? This study collected data from interviews with educators and instructional at three institutions of higher education in South Africa, in physical and virtual classrooms context. The results indicate that a variety of tools including software,

LMS and print resources are being integrated. There are barriers to e-learning, such as, large class sizes, limited bandwidth, time, and financial limitations. Regardless of this, learners and educators are satisfied with e-learning.

Our work differs from previous since we collect information about i) how participants use ICT elements (video, power points, Moodle, OpenMeetings, etc.) and ii) the participants' opinion about OpenMeetings, i. e. synchronous sessions.

## 2.3 Course Characterization

The undergraduate degree is offered both on-campus and distance mode. Therefore, some students choose to study in distance mode because of family and/or work commitments, or because they live too far from the campus. As said, the course uses Moodle as a LMS and for asynchronous sessions. Here is where resources are published: video (YouTube or other); power point documents; documents in pdf or spreadsheets; glossary, etc. Forum, Chat and assignments are Moodle features used by teachers and students.

For the synchronous sessions, i. e. web conference, the OpenMeetings (OM) framework is used, using its Moodle's plug-in ([https://moodle.org/plugins/view.php?plugin=mod\\_openmeetings](https://moodle.org/plugins/view.php?plugin=mod_openmeetings)).

All curricular units use OM two hours per week. The teachers had training in Moodle and OM, but students did not. Teachers have autonomy to expose the content as they wish.

## 3 METHOD

All teachers and students of the undergraduate degree were invited to participate in an online survey. Two surveys, one for each group, were performed based on three criteria. The criteria were the identification of (1) participants' profile, (2) technological aspects and (3) methodological aspects. Using criterion (2) is possible to collect participants' opinion about Moodle and OpenMeetings, in particular, and other ICT elements in general (video, power points, etc.). Criterion (3) collects how participants use Moodle and OpenMeetings, and other ICT elements. The survey's items for criteria (2) and (3) are presented in Section 4.

Considering the results of participants' profile, the average age of teachers is 42 and the age range is 28-52. The average age of students is 39 and the age range is 23-56 years. About half the students from

the study cycle are from all country districts apart from the campus one.

100% of students and teachers use Internet and have computers for over 3 years. 52% of students classify as good the way they use the Internet. 48% of students classify as good the way they use a computer. The majority of students (87%) in the current study had broadband internet access at home.

## 4 RESULTS AND DISCUSSION

### 4.1 Technological Criterion

There were many commonalities between teachers and student opinions in relation to both positive and negative features of ICT. However, there were also points of difference between the two groups. The following sections present the opinions for each item in the survey. When considered relevant, comments are made for specific items. These comments results from global analysis of the survey, and contact meetings with teachers and students elected by their peers to represent them in the Technical-Scientific and Pedagogic Commission of the course.

#### Moodle

##### *How do you classify menus presentation in Moodle?*

As shows in Figure 1 the majority of students and teachers give good classification, 57% and 63% respectively.

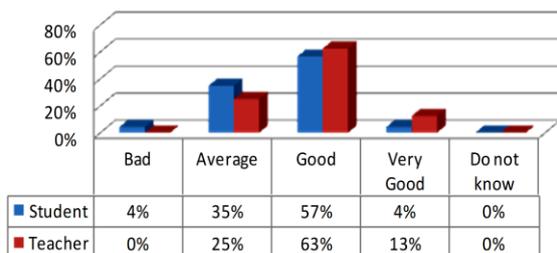


Figure 1: How do you classify menus presentation in Moodle?

##### *How do you classify Moodle forums?*

As shows in Figure 2 the majority of students classified as average (52%) and the majority of teachers classified as good (69%). We believe that this difference is because the teachers have more experience and training to use forums. If a forum is very participative, the student can be lost in the set of replies.



Figure 2: How do you classify Moodle forums?

##### *How do you classify Moodle chat?*

As shows in Figure 3, the majority of students and teachers classified as average, 48% and 50% respectively. We believe that this result is related to the difficult to manage the chat and the impossibility to record the information posted in the chat.

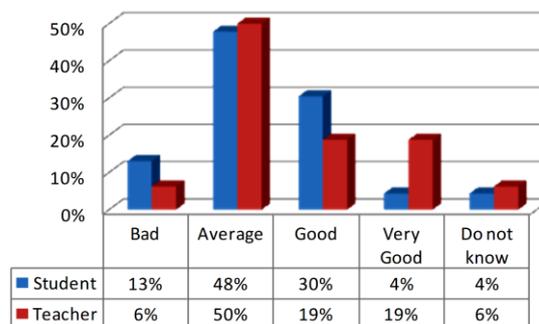


Figure 3: How do you classify Moodle chat?

##### *How do you classify Moodle assignment?*

As shows in Figure 4, 43% of students and 75% of teachers classified as good. Notice that 39% of students classified as average. We believe that average and good classification are very close because the students did not have any training to use this element.

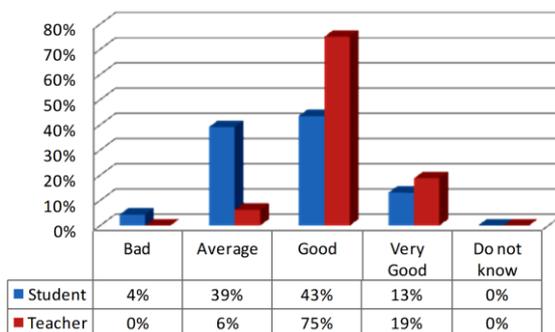


Figure 4: How do you classify Moodle assignment?

***How many times did you have trouble using Moodle this semester?***

As shows in Figure 5, 39% of students and 63% of teachers had troubles between 1-3 times in the semester. Notice that 17% of students had 10 or more troubles. We believe that this situation occurs specially to students in the beginning of undergraduate degree or with the students with internet access problems. Other strong causes are the use of wireless connection to access the internet, and the simultaneous use of other software applications on the computer.

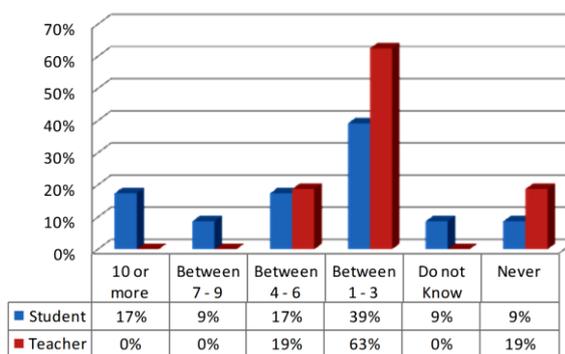


Figure 5: How many times did you have trouble using Moodle this semester?

Finally, considering Moodle’s items, students are less satisfied with Moodle than teachers. We believe that this situation is created by the lack of training. Therefore, training sessions for the students are proposed to address this issue.

**OpenMeetings**

***How do you classify the OM audio?***

As shows in Figure 6, 22% of students and 50% of teachers classified as good. Notice that 61% of students and 44% of teachers classified as average, and, on the other hand, 9% of students classified very bad and 4% very good. We believe that the worst classification is caused by: (i) internet access; (ii) use of high demanding computational/network resource applications when an OM session is running; (iii) headset (microphone and headphone) is not used.

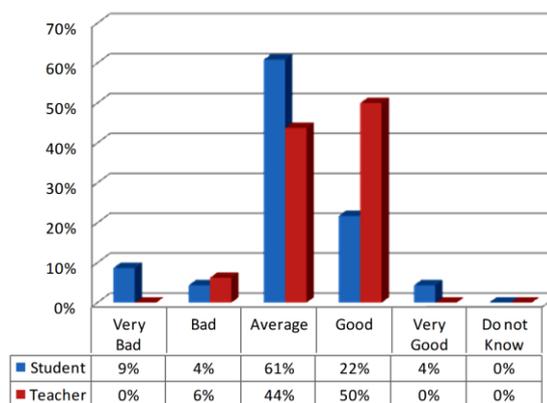


Figure 6: How do you classify OM audio?

***How do you classify OM chat?***

As shows in Figure 7, 31% of students and 61% of teachers classified as average. Notice that 9% of students and 13% of teachers classified as bad. We believe that this result, as the results regarding Moodle chat, is related to the difficult to manage the chat and the impossibility to record the information posted therein. Moreover, comparing this classification with Moodle chat’s classification, the participants classified very bad only on Moodle chat.

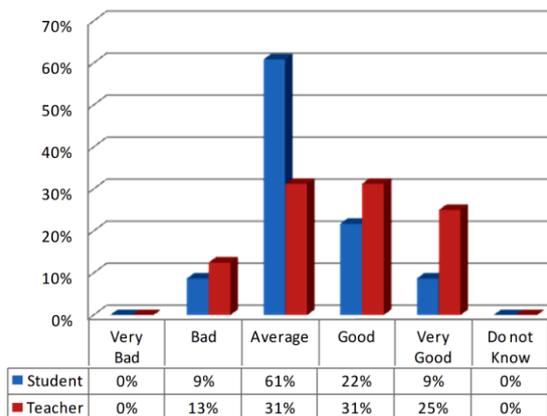


Figure 7: How do you classify OM chat?

***How many times did you have trouble using OM this semester?***

As shows in Figure 8, 30% of students and 50% of teachers had trouble between 1-3 times in the semester. Notice that 17% of students had 10 or more troubles. We believe that this situation occurs in particular due internet access problems, and, as referenced before, to the use of wireless connections and simultaneous use of other software applications.

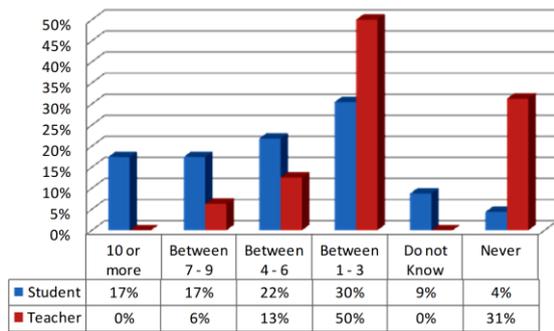


Figure 8: How many times did you have trouble using OM this semester?

## 4.2 Methodological Criterion

### *On average, how many hours do you use Moodle per month?*

As shows in Figure 9, 70% of students spend more than 30 hours using Moodle, and 50% of teachers spend between 11-20 hours. These results show that students and teachers use Moodle in the e-learning process in a significant way.

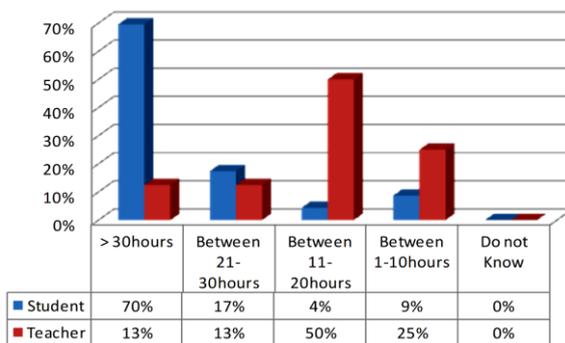


Figure 9 : How many hours do you use Moodle per month?

### *On average, how many hours do you use OM per month?*

As shows in Figure 10, 61% of students spend more than 30 hours using OM, and 44% of teachers spend between 11-20 hours. When comparing this result with Moodle results we can conclude that the use of Moodle is correlated to OM use, i. e. 88% of students use Moodle and OM more than 30 hours. The same analysis can be made for teachers, i.e., 88% of teachers use Moodle and OM between 11-20 hours.

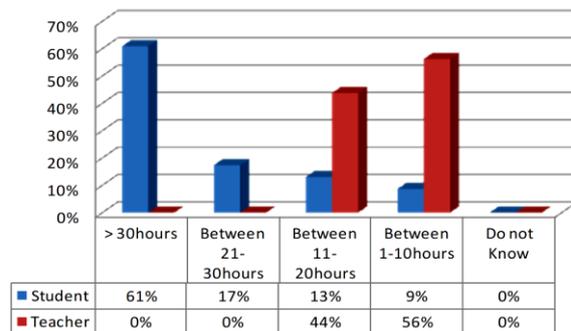


Figure 10: How many hours do you use OM per month?

### *(Student) What ICT aspect contributed most to your learning? Or (teacher) What ICT aspect contributed most to your knowledge transfer?*

As shows in Figure 11, 74% of students and 50% of teachers select OM as the aspect that contributes more. OM is used a lot by the teachers to guide the students in the learning process and to clarify students' doubts.

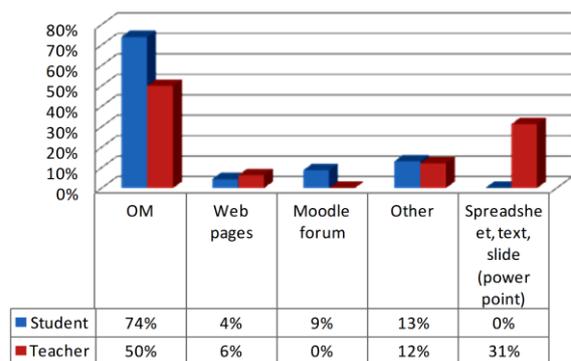


Figure 11: What ICT aspect contributed most/higher? to your learning? Or What ICT aspect contributed most to your knowledge transfer?

### *(Student) What ICT aspect contributed less/few to your learning? Or (teacher) What ICT aspect contributed most to your knowledge transfer?*

As shows in Figure 12, 17% of students chose Moodle forum as the aspect that contributes less. For 38% of teachers, video is the aspect less interesting for knowledge transfer. This is clearly in opposition to student's opinion (9%), and we believe that the teacher opinion is related to the lack of training. So, video training sessions for the teachers is proposed to address this issue.

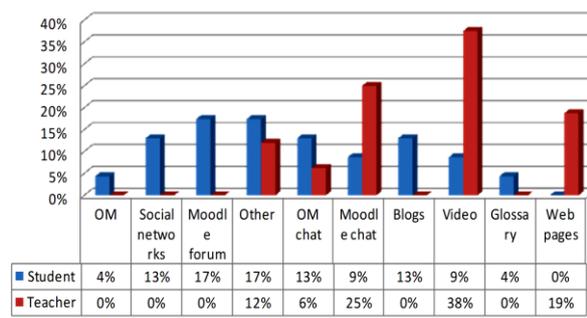


Figure 12: What ICT aspect contributed less to your learning? Or What ICT aspect contributed less to your knowledge transfer?

## 5 CONCLUSIONS

The results of this case study pointed out the importance of synchronous sessions (OM sessions) to the students and teachers, supporting (Welsh *et al.*, 2003) conclusions. Based on this, we will propose to improve teachers' skills in order to manage synchronous sessions.

In a nutshell, the positive aspects of ICT in e-learning context are:

- Students have access to resources anywhere, anytime;
- High degree of flexibility and individualisation;
- The positive attitude and involvement of teachers in relation to the use of ICT.

The negative aspects of ICT in e-learning context are:

- Low quality audio;
- Difficulty to clarify doubts in a timely manner when asynchronous mode is used;
- Technical problems arising from lack of training and knowledge;
- Too much resources for study and sometimes not fully organized.

The recommendations pointed out by the participants are:

- Teachers must have ICT training, e. g. video, spreadsheets, database, author tools, etc;
- Teachers must ensure the existence of the right conditions before the beginning of OM sessions;
- Improve audio quality in synchronous sessions;
- More training and support for Moodle users (students and teachers);
- Sessions held in OM must be recorded simultaneously with chat, sound and image;
- Files (power point, pdf) must be loaded more quickly in synchronous sessions;
- Avoid using video streaming in synchronous sessions, to avoid audio problems;

- Teachers should use the same "way" to publish the resources on Moodle (topics, etc.);

- Avoid using the forum to post messages of gratitude (Sometimes, 20 "thank you" posts are received that origin time wasting).

Finally, the results of this survey corroborates the strategies defined by the EU Commission (EU Commission, 2005) which focus on issues as the training of teachers, and increasing the students' use of e-learning as well as their ICT skills. Moreover, demonstrates the students' high consideration to synchronous mode sessions.

For future work, we plan to assess the organizational issue, namely the technical support. Technical support is indeed a very important strength in relation to the use of ICT in e-learning context.

## ACKNOWLEDGEMENTS

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