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The use of Moodle e-learning platform: a study in a Portuguese University

Carolina Costa[a,*], Helena Alvelos[a,b], Leonor Teixeira[a,b,c]

[a]*University of Aveiro, Department of Economics, Management and Industrial Engineering, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal*

[b]*University of Aveiro, Governance, Competitiveness and Public Politics (GOVCOPP), Campus Universitário de Santiago, 3810-193 Aveiro, Portugal*

[c]*University of Aveiro, Institute of Electronic and Telematics Engineering of Aveiro (IEETA), Campus Universitário de Santiago, 3810-193 Aveiro, Portugal*

Abstract

This article describes a study carried out at the University of Aveiro (UA), Portugal that analyses the functionalities and tools of the Moodle platform and their use by the students. The data was collected based on content analysis, one non structured interview with the responsible of the Moodle from UA and a questionnaire applied to 278 students. The results show that despite Moodle has a great potential, it is mainly used as a repository of materials. However, students recognize the importance of the use of other functionalities of this platform in order to promote the success of the teaching/learning process.

Keywords: e-learning; e-learning platforms; Moodle; Higher Education.

1. Introduction

Nowadays it is not possible to think about the teaching and learning process without associating it with the Information and Communication Technologies (ICTs). Actually, ICTs are present in all processes that involve

* Corresponding author. Tel.: +351 234370361; fax: +351 234370215.
E-mail address: carolinacosta@ua.pt.

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collection of data, processing of information and knowledge creation, being the teaching and learning one of the most typical processes having these characteristics.

ICTs play an important role in education, having a special relevance in the instructional component, supported by Learning Management Systems (LMS), such as Moodle. However, these platforms have many capabilities provided that they are used in their fullness. For example, interaction, feedback, conversation and networking are some of the possible actions using learning platforms. Furthermore, they provide a lot of opportunities to explore new methods of teaching and learning. Particularly, the Moodle platform adopted by the University of Aveiro (UA) integrates several modules which allow creation, organization, delivery, communication, collaboration and assessment activities.

The present paper analyses the main functionalities and tools available in the Moodle platform and their use by the UA. Additionally, it discusses the results of a study carried out in the Department of Economics, Management and Industrial Engineering (DEGEI) through the application of a questionnaire to students with the objective of characterizing the use they make of the Moodle and of its main tools. In this way, the paper intends to contribute to a systematization of the activities and the respective modules provided by Moodle, as well as their importance in the students' perspective, revealed in an exploratory study.

2. E-learning platforms

There are different expressions used to describe educational computer applications, such as e-learning Systems, Learning Management Systems (LMS), Course Management System (CMS) or even Virtual Learning Environment (VLE). In these systems, students can access courses' contents in different formats (text, image, sound), as well as interact with teachers and/or colleagues, via message boards, forums, chats, video-conference or other types of communication tools [1]. These platforms provide a set of configurable features, in order to allow the creation of online courses, pages of subjects, work groups and learning communities [2]. In addition to the pedagogical dimension, these systems have a set of features for registering, monitoring and evaluation activities of students and teachers, enabling the contents' management via Internet. According to the approach of Piotrowski [3], an e-learning platform represents a system, which provides integrated support for six different activities: creation, organization, delivery, communication, collaboration and assessment.

In a technical perspective, there are different types of LMS, some of them representing commercial solutions (such as Blackboard/WebCT) and others open-source solutions (such as Moodle). Regardless the type, several studies revealed the existence of strong advantages on using e-learning platforms [4-6], however, their adoption involves some challenges to the institutions as well as an appropriate choice of the technologic platform.

Concerning open-source solutions, there are some studies that identify the Moodle (Modular Object-Oriented Dynamic Learning Environment) as the most used platform in higher education, as well as the most easy to use [2, 7-14].

2.1. Moodle platform

The Moodle represents one of the most widely used open-source e-learning platforms, that enables the creation of a course website, ensuring their access only to enrolled students [15]. This platform allows the exchange of information among users geographically dispersed, through mechanisms of synchronous (chats) and asynchronous communication (discussion forums). In a functional perspective, it has easily configurable features, allowing the creation of student assessment processes (quizzes, online tests and surveys), as well as managing their tasks with their timetable [4, 16-17], besides offering a wide variety of complementary tools to

support the teaching and learning process.

Table 1. Activities and modules of the Moodle platform.

Activity	Module	Description
Creation	Database	allows to build, display and search a bank of record entries about any topic [19]; allows to share a collection of data [15];
Organization	Lessons	represent a set of ordered topics summarizing the instructional materials [15] and allow the access to them through the respective link;
Delivery	Assignments	allow teachers to collect work from students [15]; allow teachers to evaluate the student's work and provide feedback including grades, in a private mode [19]; allow students to upload assignment files [15, 20];
	Workshops	represent a peer assessment activity with many options [19];
		allow students to submit their work via an online text tool and attachments [19];
Communication	Chats	allow synchronous conversation [20];
	Forums	represent a communication tool where students and teachers can exchange ideas by posting comments [15, 19];
	News	represent a special forum for general announcements [19]; allow teachers to add posts and to send emails [19];
Collaboration	Glossary	allows creating and maintaining a list of definitions [19]; represents a mechanism for collaborative activities that can be restricted to entries made by the teacher [19];
	Wikis	allow users to edit collaborative Web pages [15]; provide space for collaborative work [15, 20];
Assessment	Choice	allows teachers to ask questions and specify multiple choice answers [19]; represents a useful mechanism to stimulate thinking about a topic [19];
	Quiz	allows teachers to design and build quizzes with a variety of questions, with different types of answers, such as multiple choice, true/false, short answer [15];
	Survey	allows teachers to gather feedback from students using prepackaged questionnaires [15, 19];
	Feedback	allows teachers to create surveys to collect feedback [19];
Reusability*	SCORM	represent specifications that enable interoperability, accessibility and reusability of the learning content [19]; represent tools that enable SCORM packages to be included in the course [15];
	External tools	enable interaction with compliant learning resources (eg. Learning Tools Interoperability) and activities on other Web sites [19]; provide access to new activities' types or materials [19];

* This term is not included in the classification by Piotrowski [3].

According the classification presented by [18] the Moodle platform is characterized by a set of functionalities grouped in two different classes: resources and modules. Resources represent instructional materials that are usually created in digital formats and then uploaded to the platform. Web pages, PowerPoint files, word documents, flash animations, video and audio files represent some examples of these resources. Modules are components created via Moodle in order to provide interaction among students and teachers towards manipulation and content transformation [18]. In this context, the Moodle platform provides several

modules, such as Database, Lessons, Assignments, Workshops, Chats, Forums, News, Glossary, Wikis, Choice, Quiz, Survey, Feedback, SCORM (Sharable Content Object Reference Model) and External tools [19].

Regarding the activities of the learning platforms [3] presents a classification based on six classes: Creation, Organization, Delivery, Communication, Collaboration and Assessment. Table 1 presents these activities, their correspondence to the modules, and a brief description based on the instantiation of some features that are possible to perform with them.

3. Methodology

In this study the Moodle of the UA (Moodle@UA) was examined through a content analysis, complemented with a non-structured interview carried out with the responsible for the platform at UA. Afterwards, the use of Moodle' tools by students from the University of Aveiro, Portugal was analysed. The data was collected through a paper-based questionnaire developed on the basis of the literature review and validated through the referred interview, and applied to 278 students who were attending to subjects of the responsibility of the DEGEI of the UA. The questionnaire consisted of the following sections:

Section 1 – Characterization of the participants in terms of: gender, age, course and degree attended type of device and network used to access the Internet, purpose of the access on the learning context and average time of use of the Internet per day for learning purposes.

Section 2 – Characterization of the general use of the Moodle' platform in terms of: number of accesses per month, purpose of use, and format of information accessed/posted.

Section 3 – Characterization of the use of Moodle' tools (yes/no) and quantification of the degree of importance assigned to the use of each tool.

The collected data were analysed using the *IBM SPSS Statistics 19* software. First, a descriptive analysis was performed, in order to characterize the behaviour of each variable measured. Afterwards, paired samples *t*-tests were done in order to verify whether there were statistically significant differences between the average importance to each Moodle tools between the groups that use and do not use the tools.

4. Results and discussion

This section is organized in two sub-sections. In the first one, the Moodle of the UA is briefly examined, and in the second one, the questionnaire' results are analysed.

4.1. The Moodle of the UA

The Moodle is the e-learning platform adopted by the University of Aveiro (Moodle@UA) and was characterized through a content analysis complemented with an interview with the responsible for this platform at the UA.

The Moodle@UA incorporates a set of tools that can be used in the teaching and learning process classified in two groups: (i) The configured modules from the standard Moodle platform that provide interaction among students and teachers namely Assignments/Workshops, Chats, Forums, News and Quiz/Survey (see Table 1) and (ii) the external tools that are incorporated in the platform, in particular Blogs UA, Wikis UA, Questionnaires and Video-conference. These extended tools are characterized in Table 2, with a brief description of the functionalities and software used to support them.

Table 2. Extended tools of Moodle@UA.

Extended tool of Moodle@UA	Description
Blogs UA	allow to discuss, share ideas and answer questions; software used - WordPress;
Wikis UA	represent services used by teachers, students or researchers, within the activities, projects or research; software used - MediaWiki;
Questionnaires	represent services to implement and deliver online questionnaires, used to collect data in activities of teaching and research; software used - LimeSurvey;
Video-conference	allows real time communication; software used - BigBlueButton;

4.2. The usage of the Moodle platform by UA' students

In this sub-section the usage of the Moodle platform by the students of the UA is considered, through the analysis of the results obtained from a questionnaire applied to 278 of them (see section 3). The section is organized as the questionnaire' components, namely: characterization of the participants, general characterization of the use of the Moodle' platform and characterization of the use of the Moodle' tools.

4.2.1. Characterization of the participants

The participants were 150 female and 128 male. The average age of respondents was 21.8 years old (s=3.42), being the minimum 18 years old and the maximum 51 years old. Table 3 presents the distribution of the number of students per course and degree (there was 1 missing value).

Table 3. Number of respondents attending the courses and degrees.

	Undergraduate	Master
Management	41	---
Tourism	20	16
Economy	39	---
Management and Industrial Engineering	75	30
Languages and Business Relations	21	---
Others	18	17
Total	**214**	**63**

In can be observed that most of the participants were undergraduate students (77%) and also that most of them were from Management and Industrial Engineering at both undergraduate (35%) and master (48%) levels.

Regarding the devices used to access the Internet, all the respondents referred the Computer and about 29% mentioned they additionally use the Mobile phone.

It was verified that 93% of the participants referred the use of a private network, while the remaining 7% mentioned that they do not have access to the Internet at home. The network from the University (UA) was referred by 87% of respondents and 35% of the students referred the use of networks from public spaces.

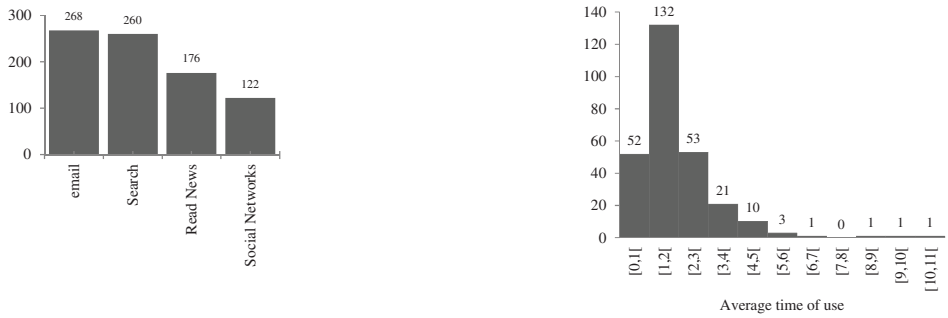


Fig. 1. (a) Number of respondents that use the Internet for each purpose for learning; (b) Histogram of the average time of use of the Internet per day for learning purposes.

Students were also asked about the general purposes for which they used the Internet on the learning context. Fig. 1. (a) presents the number of respondents that referred each of the purposes. It can be noted that 'email' and 'Search' are the most mentioned purposes by respondents and that 'Social Networks' are not so used in this context.

Concerning how long participants use the Internet per day on the learning context, it can be noticed that on average, respondents use the Internet about 1.5 hours per day (s=1.22). Fig. 1. (b) presents the histogram of the referred variable.

4.2.2. Characterization of the general use of the Moodle platform.

The use of the Moodle was analysed through the frequency of access, the purpose of the accesses and the formats of the information accessed or posted.

Fig. 2. presents the histogram of participants' answers about the frequency of monthly usage of the Moodle (there were 4 missing values). As there were 4 severe outliers that had a number of accesses extremely high (from 210 to 600), it was decided to remove these cases from the analysis of this variable. On average, students access the Moodle about 49 times per month (s=35.2).

It is interesting to note that there can be distinguished three groups of users from Fig. 2., namely: (1) those that have a low frequency of access (51%, 0-40h), (2) those that have an intermediate frequency of access (41%, 60-100h) and (3) those with a high frequency of access (7%, 120-160h).

Regarding the purpose of use of the Moodle, it can be seen in Fig. 3. (a) that the main ones are 'Download materials', mentioned by about 98% the respondents and 'See news', mentioned by about 84% of them. 'Deliver assignments', 'Communicate with teachers' and 'Ask questions', in this order, are much less mentioned.

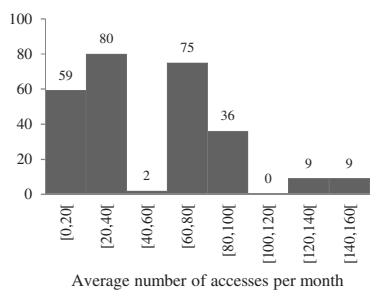


Fig. 2. Histogram of the average number of accesses per month to the Moodle.

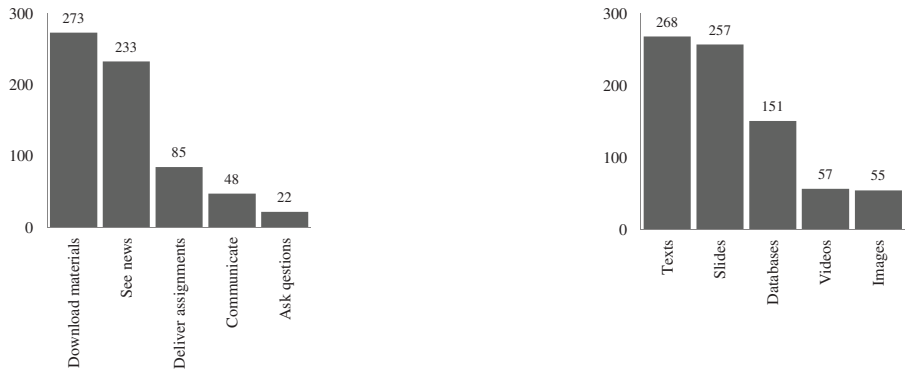


Fig. 3. (a) Bar chart of the number of respondents using each purpose of Moodle; (b) Bar chart of the number of respondents using each format.

These results can be interpreted as the Moodle being mainly used as a repository of materials and information. This hypothesis is reinforced by the analysis of the results presented in Fig. 3. (b), where it can be observed that the most used materials' formats that respondents access/post are 'Texts' and 'Slides'.

'Databases/Worksheets', 'Videos' and 'Images' are also referred, but much less used than the first ones. Six of the students identified 'Audio' as another format used in the Moodle.

4.2.3. Characterization of the use of the Moodle tools

The tools refereed in section 4.1 were evaluated through (i) their use (or not) by the respondents and (ii) the degree of importance respondents assign to their use as a means of promoting the success of the teaching/learning process.

Table 4 presents the number of users of each tool included in the Moodle@UA and some descriptive statistics of the respective degree of importance evaluated in a scale of 1 (unimportant) to 5 (very important).

Table 4. Descriptive statistics of the importance level of the use of the Moodle@UA tools.

	N_{valid}	N_{use}	Mod	Mean	*s*
Assignments	174	103	5	4.15	1.02
Chats	110	18	1	2.45	1.19
Forums	157	76	3	2.97	1.15
News	214	162	4[a],5[a]	3.90	1.01
Quiz/Survey	112	20	3	3.10	1.31
Blogs UA	137	39	1	2.36	1.17
Wikis UA	127	35	3	2.80	1.18
Questionnaires	148	68	3	3.05	1.13
Video-conference	97	4	1	2.21	1.17

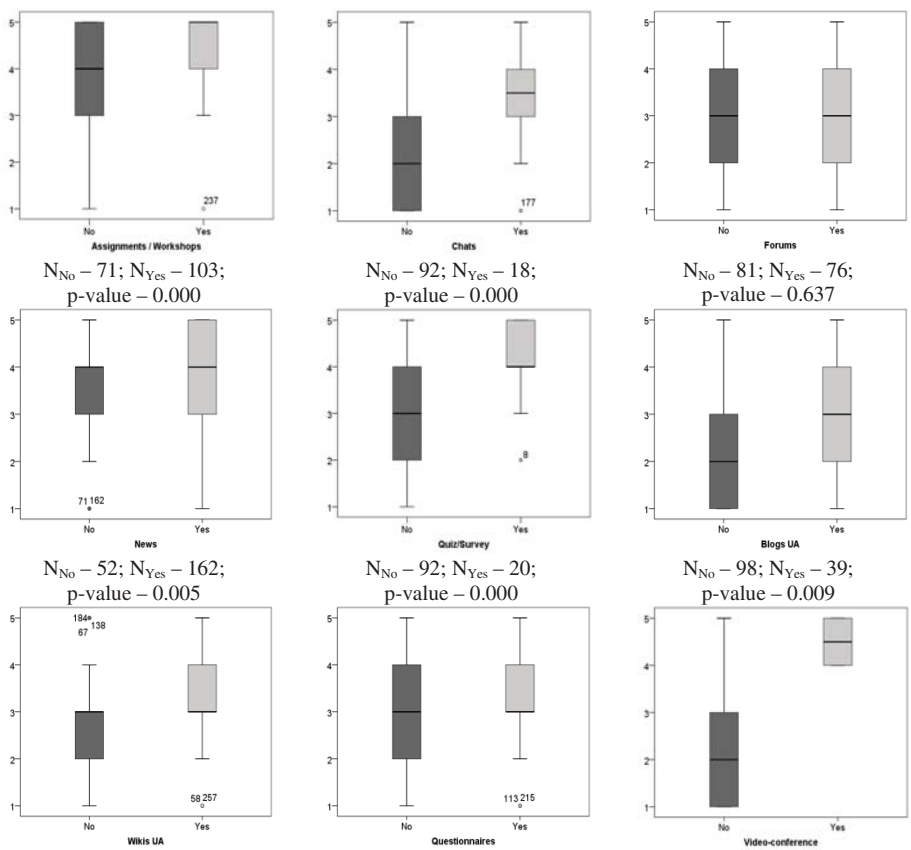
Legend: N_{valid} – Number of respondents that answered the question; N_{use} – Number of respondents that use the tool; Mod – sample Mode; Mean – sample mean; s – sample standard deviation; [a] – Two modes.

It should be noted that the Moodle tools studied only include the modules and not the resources of the platform. Thereby, the most mentioned purpose of the Moodle – 'Download materials' (see Fig. 3. (a)) – is not reflected in this analysis.

'News' and 'Assignments' are the most used Moodle tools and also those that respondents consider the most important ones. This fact is in line with the results presented in Fig. 3. (a). Again the possibility of the main utilization of the Moodle being that of a repository of materials and information must be considered.

The Moodle@UA tools can be grouped considering the level of importance assigned to them. Actually, those considered most important were 'News' and 'Assignments' (1st group), followed by 'Quiz/Survey', 'Questionnaires', 'Forums' and 'Wikis UA' (2nd group), with an intermediate level of importance, and finally those considered less important which were 'Chats', 'Blogs UA' and 'Video-conference'.

In order to understand if the importance given to each tool is related with its use, for each tool the sample was divided in two groups: those who use the tool and those who do not use. A paired sample *t*-test (with significance level of 5%) was performed for each tool with the objective of analysing if the differences between the means of the two groups were statistically significant. Fig. 4 represents the parallel boxplots of the degree of importance given by the respondents for the two referred groups, and the *p*-value of the *t*-test performed, for each of the tools analysed. The test was not performed for the 'Video-conference' because of its small number of users.



N_{No} – 71; N_{Yes} – 103; p-value – 0.000

N_{No} – 92; N_{Yes} – 18; p-value – 0.000

N_{No} – 81; N_{Yes} – 76; p-value – 0.637

N_{No} – 52; N_{Yes} – 162; p-value – 0.005

N_{No} – 92; N_{Yes} – 20; p-value – 0.000

N_{No} – 98; N_{Yes} – 39; p-value – 0.009

N_{No} – 92; N_{Yes} – 35; p-value – 0.000

N_{No} – 80; N_{Yes} – 68; p-value – 0.007

N_{No} – 93; N_{Yes} – 4; p-value – ---

Fig. 4. Parallel Boxplots of the degree of importance of each Moodle tool for respondents that do not use and use the tool, respectively.

It can be observed that the students who use the tools give more importance to their implementation in the teaching/learning process than those who do not use them (the differences are statistically significant at a level of 5%) for all the tools except the 'Forums'. This fact can be interpreted as the students having experience with forums in other contexts and being able to imagine their use on the learning context better than with other tools. In fact, one of the respondents referred at the end of the questionnaire: "I do not know most of the Moodle tools presented here and probably if I knew I would have assigned them a greater degree of importance".

5. Conclusions and future studies

This paper analysed the main functionalities and tools available in the Moodle platform and their use at the University of Aveiro. It was found that the Moodle@UA contains some of the main tools of the standard Moodle platform, like Assignments, Chats, Forums, News and Quiz/Survey. Furthermore, it incorporates some external tools like Blogs UA, Wikis UA, Questionnaires and Video-conference.

The analysis of the students' answers to the applied questionnaire revealed that the most mentioned purpose of the use of the Moodle@UA were 'Download materials', 'News' and 'Deliver assignments' and that the most used information materials are 'Texts' and 'Slides'. Additionally, students gave more importance to 'News' and 'Assignments'. These results are compatible with the hypothesis that the Moodle@UA is being used mainly as a repository of materials and information.

Besides, it can be noticed that students that use the tools typically assign more importance to them, being the difference statistically significant at 5% (except for Forums).

It can also be noted that the not so used tools and thus not so important for students, enable the interaction, the collaboration and the real time communication.

To overcome the constraints just presented it should be taken into account that the successful use of e-learning platforms in the teaching and learning context critically depends on the teachers having knowledge about the tools, being aware of how they should be used and being capable of organizing all the communication process.

As future work it is considered important to perform a careful analysis of the underlying reasons for the use, or not, of the e-learning tools by the academic community, as well as to investigate on how these tools can help on promoting the success of the teaching and learning process.

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