

Analyzing the use of the CVUPT e-Learning platform

Andrei Ternauciu¹

Abstract – The e-Learning solution currently employed by the Politehnica University Timisoara (UPT) takes the form of an online platform, catering to the needs of the Distance Learning Center of UPT, providing blended learning support to all the Masters programs in the University, as well as to some undergraduate level courses. The use of this platform has increased steadily throughout the years, thus bringing the need to keep it up to date according to the needs of its users. This paper aims to analyze the evolution in usage of the different parts of the platform, and highlight areas in need of improvements.

Keywords: e-Learning, platform, Moodle, CVUPT

I. INTRODUCTION

The Politehnica University Timisoara (UPT) has had a long history of adopting modern educational techniques. What is today known as “e-Learning” began for UPT in 1998 with the establishment of the Distance Learning Center [1] as a mean of catering to the needs of the emergent segment of (employed) adults who wanted access to higher learning, while still keeping regular hours on their jobs. Thus the need for a flexible scheduled learning program, with fewer face-to-face in-class meetings, and a student-centric learning environment.

The current e-Learning platform, the Virtual Campus of the Politehnica University Timisoara (CVUPT), has been active since 2009, and has seen an increasing number of students, teachers, courses and study programs.

It has also been the subject of various research endeavors, like the use of metadata to improve usability ([2], [3]), or the use of video technologies in e-Learning [4].

The study described in this paper was conducted in order to evaluate the actual use of the platform, and to identify tools, areas and processes where the usage is sparse and can be improved.

II. CVUPT BACKGROUND

The CVUPT (Fig. 1) platform replaced an in-house developed solution which met only partially the needs of a modern learning management system (LMS). While it provided basic access to course materials

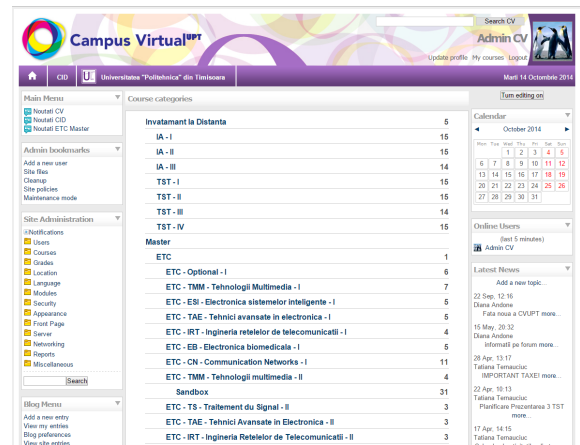


Fig. 1. The Virtual Campus of the Politehnica University Timisoara - CVUPT

(usually PDF’s) and some communication tools (forums, blogs, wikis, etc.), it did little to facilitate the learning process through grades management (for instance), or user activity tracking on the platform [5]. Based on the acclaimed open-source LMS Moodle, CVUPT was the result of years of research into e-Learning by the team of the Multimedia Research Center of UPT. Another notable result of this same type of research is the ViCaDiS platform, another Moodle based LMS which united students from 6 different European universities under the same semi-formal environment, with courses provided by the partners and accessible to all students, regardless of provenance[6]. CVUPT began functioning in September 2009 as the learning process management system for the Distance Learning Center, with its two specializations: Applied Informatics and Telecommunications Systems and Technologies. All the accounts and courses were created by the technical team behind the platform, since the official policy of the program stated that CVUPT was a closed platform, without self-registration or guest access.

The following year saw the introduction of sections dedicated to the Master level studies, as a result of the UPT decision to provide blended-learning support to all the Master courses in the university. This led to the exponential increase in user accounts (student and teachers), courses, and activity on the platform, and therefore to a wider adoption of the online medium as

¹ Faculty of Electronics and Telecommunications, Communications Dept.
Bd. V. Pärvan 2, 300223 Timișoara, Romania, e-mail andrei.ternauciu@upt.ro

a valuable auxiliary tool to classical teaching/learning scenarios. A series of courses aimed at undergraduate students was also created at the request of teachers who were familiarizing themselves with the platform and were incorporating its use in regular educational processes.

The use of the CVUPT e-Learning platform further increased with the introduction of two different new specializations to Distance Learning: Communication and Public Relations, and Manufacturing Engineering, starting in September 2014.

At the end of the 2013-2014 academic year, there were 1267 courses on CVUPT, out of which 1022 dedicated to Distance Learning and Master Programs, the rest comprising of additional courses requested from other specializations in UPT, a few dedicated to various research projects, as well as a handful (10 to be more precise) of social courses, aimed at encouraging communication between different parties, outside of existing courses (for instance, for administrative issues regarding the Distance Learning students and staff).

III. ANALYSIS METHODOLOGY

Previous research on the CVUPT platform has been conducted, but it was either in the form of a case study from a management point of view [7], or the results of satisfaction surveys conducted with students [8].

For the current study we have opted to use a simplified method similar to educational data mining [9]. It is a quantitative method of data sorting, filtering and interpretation which involves virtually no direct input from the users of the platform, and uses only the data logs the platform already creates on all user interactions inside the application.

Previous work on the application of data-mining techniques in Moodle-based platforms has been done before [10], but the approach on that particular study was from the point of view of teachers, and the information they can use to better assess the students' activities inside a course. We have opted for a more generalized analysis on the platform, with a multiple year, comparative approach to the overall activity on the CVUPT learning management system.

The data to be analyzed was gathered primarily from two sources: the administrator's web interface of the CVUPT, and direct access to the database, where specially designed SQL queries were employed to return results relevant to the use of the platform.

While CVUPT does provide some statistical information regarding its use, we chose to only keep some general information (like the number of instances of the various tools integrated with the platform), and access the databases directly for a more in-depth, quantitative analysis of the overall activity.

Starting with the 2011-2012 academic year, in order to preserve a functional "snapshot" of the activity from the previous year, the entire database and file system of the platform was duplicated, with the archive in a so called "read-only mode" to prevent all non-administrator users from changing anything, while still

being able to access the information. This means that the same queries were run in 4 different databases, and the same information was extracted from 4 different instances of the web-based administrative interface.

All queries run on a specific database were limited to the time period during which that database was "live": for example, the database of the platform active during the 2013-2014 academic year was only analyzed for all activity between September 1st 2013 and August 1st 2014. This was necessary in order to prevent activities from the previous year (remained after the cloning of the previous platform) and all activities after the archiving, to tamper with the accuracy of the data.

Also, the information gathered can be regarded from two different perspectives: the number of instances of the tools of the platform, and the actual use by the users (either students, or tutors). The former can be influenced by the fact that course activity and resources are mostly reused from one academic year to the next, however, the latter shows exclusively the actual activity during the period in question.

IV. ANALYSIS RESULTS

As stated before, we split the data into two main categories: tool instances (which are indirectly an indication of tutor activities, since they have the privileges to add these tools into their courses), and activity logs, where all the user activity on the platform is recorded, regardless of role and privileges.

A. Tool instances analysis

The first item we looked at was the number of courses on CVUPT (Table 1).

Table 1

CVUPT courses	2010-2011	2011-2012	2012-2013	2013-2014
Distance Learning + Master Courses	539	641	656	1022
Academic (not Social) Courses	570	765	869	1257
Total Courses	577	773	878	1267

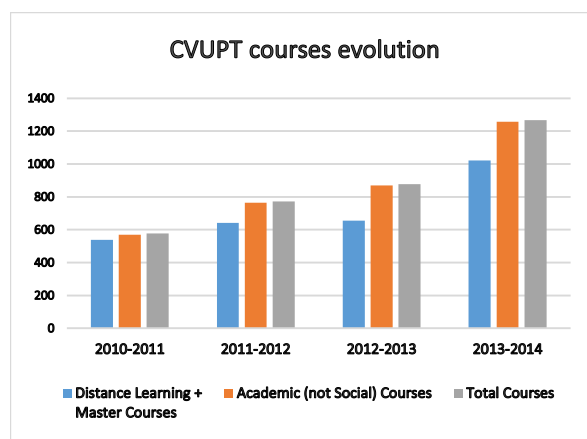


Fig. 2. The evolution in number of courses on CVUPT

The difference between the Distance Learning and Master courses, and the number of Academic Courses respectively, is comprised of the courses which were created at the request of teachers, and are not part of a study program which has all the courses by default on the platform. Fig. 2 further illustrates the increase in courses.

The number of users has also increased. There is also a distinction between active, current users, and users who either finished their studies and were not yet purged from the system, or have actually never logged into their CVUPT accounts (Table 2, Fig. 3).

Table 2

CVUPT users	2010-2011	2011-2012	2012-2013	2013-2014
Active Users	1522	2697	3951	6077
Total Users	2906	4846	6332	10206

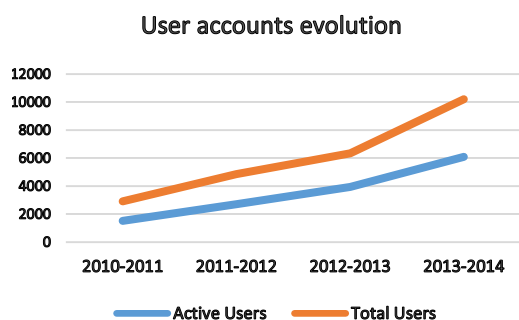


Fig. 3. The evolution in number of users on CVUPT

From the perspective of the course resources the statistics show the following (Table 3):

Table 3

Resources	2010-2011	2011-2012	2012-2013	2013-2014
Resource	3203	-	-	-
Page	-	1550	2828	4424
File	-	2673	3814	5924
Folder	-	165	411	751
URL	-	192	339	620
Lesson	11	1	9	16
SCORM/A ICC	4	2	4	10

The reason why the resource titled “Resource” is missing from the last 3 archives, and “Page”, “File”, “Folder” and “URL” are missing from the first one, is that the year 2011 saw the release of a major new version of Moodle, which saw the previously titled “Resource” tool, split into the other four, thus bringing a greater flexibility to designing a course.

We can also identify the greater preference for some of these tools (File, Page), to the detriment of others (Lesson, SCORM); this disparity is all too evident from Fig. 4 as well.

If resources are used mainly to disseminate course materials, the following tools (Table 4) give students

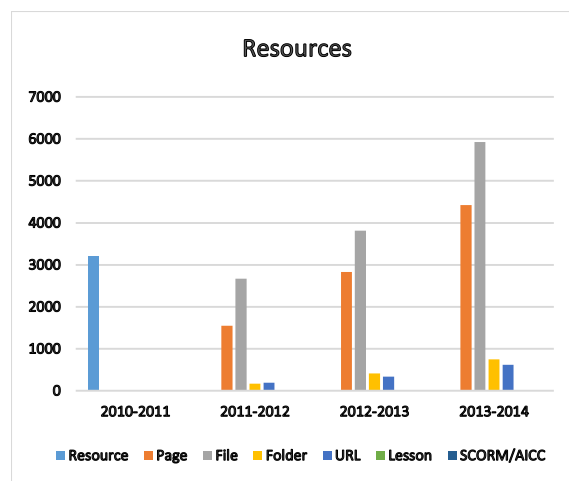


Fig. 4. Resources on CVUPT

assignments, which are in turn evaluated by the teachers.

Table 4

Student Assignments	2010-2011	2011-2012	2012-2013	2013-2014
Assignment	-	-	-	198
Assignment (2.2)	1138	1261	1526	1765
Glossary	16	25	50	73
OU blog	1299	1282	1308	1330
Wiki	174	140	182	181

The Moodle version used in 2013 introduced a new type of assignment, thus the old one was marked with the last Moodle version (2.2) where it was deployed. For the following academic year, we intend to transform all the assignments into the new format, which can be done automatically. For the 2013-2014 academic year, the two formats were used side-by-side. A clearer picture of the evolution of assignment instances can be seen in Fig. 5.

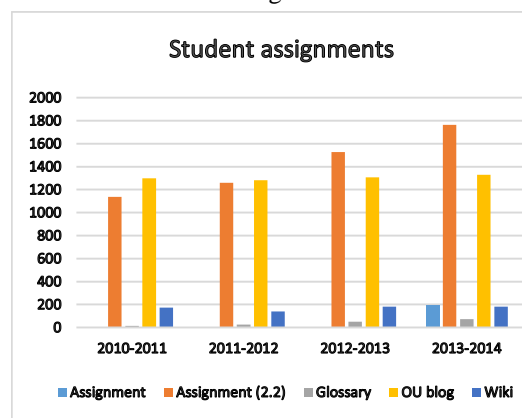


Fig. 5. Evolution of student assignments instances

Students were also evaluated using a series of tools available in courses (Table 5).

Table 5

Student Evaluation	2010-2011	2011-2012	2012-2013	2013-2014
Questionnaire	25	50	84	238
Quiz	415	449	506	711

Survey	5	4	2	9
Feedback	-	6	24	61
Database	1	1	24	18
Choice	7	73	116	160

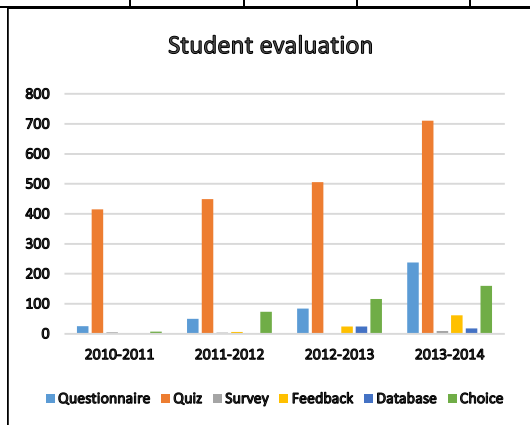


Fig. 6. Evolution of student assignments instances

The Feedback tool was unavailable in the 1.9 version of Moodle (the 2010-2011 year), and was only introduced in the next major release, Moodle 2.0, the following year.

Fig. 6 illustrates the evolution of evaluation tools during the four years of interest.

And finally, we looked at the instances of communication tools available to teachers and students. Table 6 shows the evolution in number of instances of the two communication tools, while Fig. 7 provides a graphical overview.

Table 6

Communication	2010-2011	2011-2012	2012-2013	2013-2014
Forum	633	812	955	1389
Chat	17	8	42	52

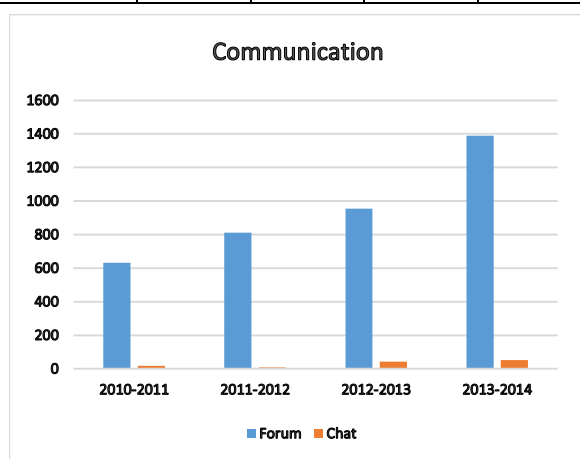


Fig. 7. Evolution of communication tools instances

B. Logs analysis

On a global level, the increase in access events (or "Hits") can be observed in Table 7, and illustrated in Fig. 8. This includes all user-platform interaction (in the appropriate time interval), regardless of role or context.

Table 7

Log	2010-2011	2011-2012	2012-2013	2013-2014
Hits	685996	663566	797795	1165592

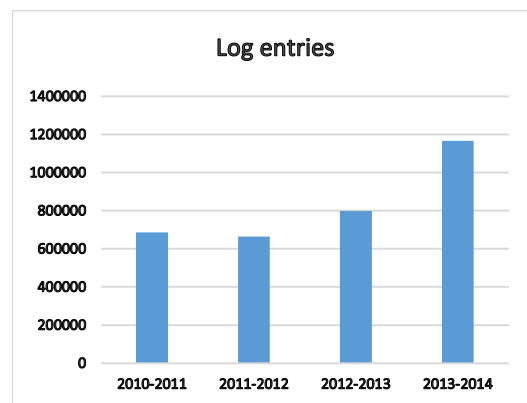


Fig. 8. Evolution of log entrances

As stated earlier, the tools' instances evolution is a direct indicator of tutor activities in courses. The main way to assess student activities is through their direct interaction with the platform. And while access to resources can be evaluated, we chose to focus on student-activities interactions, since they are a more direct evidence of dynamic use of the tools CVUPT provides.

From Table 5 we can see that the Quiz and the Questionnaire are the most widely used tools of student evaluation. Table 8 demonstrates a more in-depth use of these two activities.

Table 8

Evaluation	2010-2011	2011-2012	2012-2013	2013-2014
Quiz	22	54	91	-
Quiz Questions	103	351	677	-
Quiz Completed	20	30	42	105
Quiz Respondents	98	1085	1060	2022
Questionnaires	17	19	41	91
Questionnaire Questions	103	154	258	667
Questionnaires Completed	6	7	18	25
Questionnaire Respondents	31	131	775	567

The evolution of two more types of activities can be seen in Table 9.

Table 9

Other activities	2010-2011	2011-2012	2012-2013	2013-2014
File submissions	153	3731	4314	5275
Glossary Terms	20	424	47	303

Regarding communication, the main tool seems to be the Forum, which is why it has been given careful analysis during our enquiries. Still, we compared its actual use with similar modes of communication, namely Private Messaging and Chat (Table 10).

Table 10

Communication	2010-2011	2011-2012	2012-2013	2013-2014
Total Forum topics	167	177	163	190
Max topics/course	35	41	133	178
Total Forum posts	873	700	1000	1357
Personal Messages	60	171	1140	4554
Chats	74	63	113	93

Fig. 9 illustrates the evolution of actual communication on the CVUPT platform.

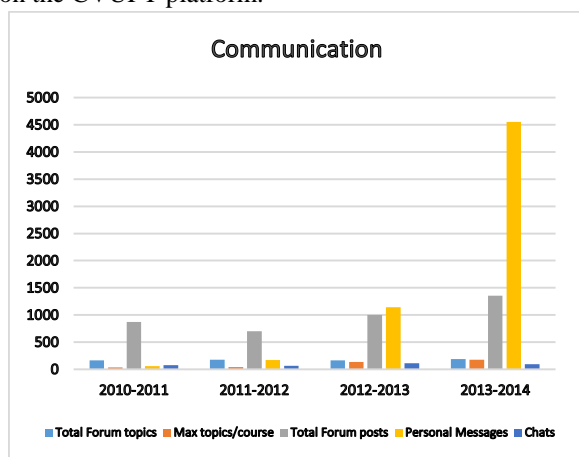


Fig. 9. Evolution of communication on the platform

And finally, to complete the picture of the tutors' indirect activity on the platform (namely, the creation of resources and activities), we looked at two essential indicators of teacher activity: grading, and creating events in the calendar. The data is presented in Table 11.

Table 11

Tutor activities	2010-2011	2011-2012	2012-2013	2013-2014
Completed Grades	342	3226	4621	5906
Calendar Events	816	971	1141	1472

The increase in teacher activity, according to the two probed interactions, is also visible in Fig. 10.

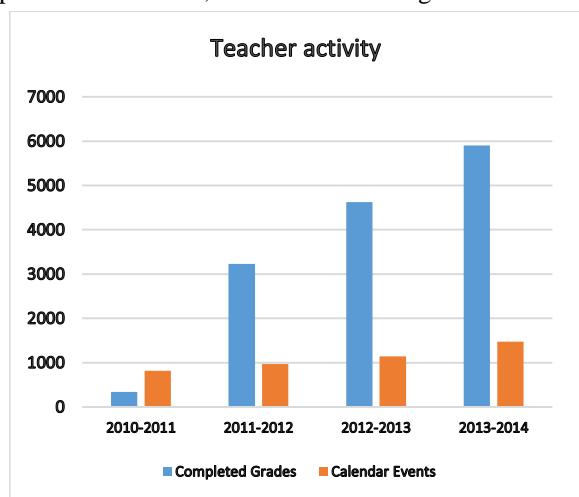


Fig. 10. Teacher activity in grading and calendar events creation

The interpretation of the results presented thus far will be discussed in the following chapter.

V. DISCUSSION

There is little doubt that activity on the CVUPT platform has increased significantly in the four years period that was analyzed. From the number of courses, to the number of users, and from the number of instances to the actual use of all the tools available on the platform, the data generally shows a constant growth across all areas.

The number of courses (Table 1) has more than doubled (from 577 in 2011, to 1267 in 2014), which can be explained, in part, by the growing number of non-mandatory courses created at the request of willing teachers. Some of the courses also appeared as part of the overhaul of the Masters programs in UPT, which saw new specializations (and thus, new courses) appear. However, the courses from specializations now defunct have not been eliminated from the platform, artificially contributing to the total number of courses, and in some cases, certain resources and activities.

Similar issues appear when analyzing the number of registered users. Data from Table 2 shows that any given year, the number of active users is a little over half the total number of accounts registered on CVUPT. This can be only partly explained by users who have no need or interest to use the platform, like students from the Master courses where classroom attendance is still required, and the platform only acts in an auxiliary role. However, there is still a large number of "expired" accounts, which either graduated or abandoned, and were not purged in time for the beginning of the next year.

Still, even considering the above, the number of active users has quadrupled, from 1522 in 2011 to 6077 in 2014.

In regards to the tutors' preferences for course materials, the steady increase in resource instances did not change the relative use of the different types of tools available.

Table 3 reveals that the favorite types of resources were, and still are, the File and (HTML) Page, followed at a distance by Folder (of Files) and URLs. More exotic types of resources such as Lessons (complex, linear material, accessible conditionally by students) or SCORM packages remain little more than experiments for teachers and vary insignificantly.

Course activities follow a similar path, with a few exceptions (Table 4). The preferred method remains the Assignment, which even with the major change in version, is still the most used type of activity, in tune with the increase in courses and users. OUBlog, however, a third-party extension which was installed at the request of teachers, was once a worthy contender, even surpassing the Assignment tool in the beginning. However, it did not grow at the same rate, and is now a distant second.

Similarly to resources, Wikis and Glossaries, though much less used, have nonetheless moderately increased

in use, which can also be seen in the actual use of the glossary (Table 9).

In terms of student evaluation, the preferred tool seems to be the Quiz (Table 5). It is most likely preferred due to its ability to provide automatic grading and many customization options. However, recently, the Questionnaire (another third-party extension, not included with Moodle's standard kit of tools) has gained some ground, probably because it is simpler to use than the Quiz, even though it lacks its ability to provide automatic grading. The other types of tools presented alongside the Quiz and the Questionnaire have also been subjected to moderate growth.

The same conclusion regarding the two most used evaluation tools can be reached by looking at their actual use by teachers (creating questions) and students (answering them), in Table 8.

There are two issues here. The first, is that the total number of Questionnaires (238 in 2014) in Table 5 is different than the number of Questionnaires (91 in 2014) in Table 8. We must keep in mind the fact that Table 5 presents the total number of Questionnaires in existence on the platform, while Table 8 deals with those which were modified during the current year.

The second issue extends the first one, by revealing that from the 91 Questionnaires which were modified in the 2013-2014 academic year, only 25 were actually used by students. So a little more than 10% of the questionnaires in existence were actually completed, which raise concerns regarding their overall use, and prompt further investigations.

In analyzing the use of communication tools, the forum seems the undisputed leader. With a number of 1389 instances in 2014, compared to the 52 chats (Table 6), it does seem to be the preferred choice. However, we must take into account the fact that any new course created on Moodle has a default News Forum. Which means that of those 1389, 1267 have been created by the administrators upon course creation.

Still, one forum per course is usually enough to perform its basic function, that of ensuring official communication among the students and teachers.

We also need to correlate this data with the one from Table 10, which shows that in the 2013-2014 academic year, 190 different topics across all forums were created, with 1357 individual posts, compared to the 93 messages in chats.

Table 10 also highlights one of the biggest surprises of this study, the rapid increase in Personal messages on the platform, from 60 in 2011, to 4554 in 2014. This fact, maybe more than others, emphasizes the adoption of the CVUPT platform, as a tool to exchange (maybe informal) educational ideas, as well as the users' preference for a private, one-on-one mode of communication.

Maybe the most revealing data in regards to teacher activity is presented in Table 11. We can observe here a steady increase in Calendar events, and even though individual users can create their own entries, the Calendar is usually the place to schedule meetings (for

distance learning), or deadlines for activities, by a teacher, for all course members.

But of real importance is the evolution in use of the Grading part of the platform. From a mere 342 grades in 2011 (corresponding to 577 courses), to 5906 grades in 2014 (for 1267 courses) it seems to be one of the best improvements in CVUPT use, and for a teacher activity of utmost importance. Students need to know the results of their evaluations, and posting on forums (which poses privacy issues), or receiving personal messages from the teacher (which is private, but extremely time consuming) can be successfully replaced by the use of the course's gradebook.

A closer look, however, tempers the apparent success of the platform in this regard. Let us consider the following scenario: a typical course has about 25 students enrolled. They will receive maybe two grades on assignments during the semester, one grade on the exam, and the final grade for the whole course. This means 100 grades given by a teacher to all the students in one course. The almost 6000 grades would then account for almost 60 courses out of the over 1200 in existence. On the other end of the spectrum, if a tutor would only give those 25 students their final grade, it would still mean only 240 courses contributed to the total.

The explanation for the apparent light use of the CVUPT grading system is the perceived difficulty in configuring the gradebook. Further qualitative analysis will be needed for a more definitive answer.

And finally, by looking at the data from Table 7, the total log entries during the period of each year represent a logarithmic increase in platform use. For a more relevant overview, however, Table 12 shows the average of hits per user, while Fig. 11 presents it in a graphical way.

Table 12

	2010-2011	2011-2012	2012-2013	2013-2014
Total Hits	685996	663566	797795	1165592
Active Users	1522	2697	3951	6077
Hits/User	450,72	246,04	201,92	191,80

Far from increasing, average use of the application has more than halved, meaning that all the extra users that

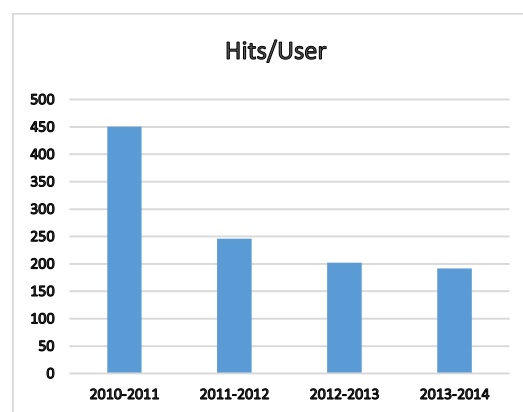


Fig. 11. Evolution of CVUPT Hits/User Ratio

were created were far less active than the ones from the beginnings of the CVUPT.

This may be due to the fact that newer users come from the Master programs and are therefore not obligated to use the platform, or because the teachers' activity was greater in the beginning, and current courses are easily adapted from the existing resources and pre-configured activities.

Whatever the case, the fact remains that overall use of CVUPT has increased and each year, a large number of new accounts are created. This means that all those new users must quickly accommodate with the platform, and it is the job of the administrative team to facilitate the process.

In order to achieve that, we propose the following guidelines for improvement:

- The popularization of the less used tools in Moodle (course resources and activities, communication tools, etc.), by providing comparisons with the more popular ones, as well as concrete use scenarios.
- The increase in support for the use of the platform by all types of users, through regular training seminars and other means of live consultancy (by phone or by chat).
- The training of tutors in specific areas, such as the creation of calendar events, or the configuration and use of the CVUPT gradebook.
- The identification of other factor which might hinder the use of the platform (such as usability, or mobile access), through further qualitative and quantitative research.

VI. CONCLUSIONS

The aim of this paper was to conduct a quantitative study on the use of our own Moodle-based platform across the last four year of its use, by analyzing and interpreting the access logs and other useful information that the application stores in its day-to-day use.

The regular increase in users and courses was explained by the dynamic nature of the study programs, as well as the growing interest that teachers developed in using the CVUPT learning management system.

The evolution of usage by the users of different aspects of the platform was analyzed and possible motivations were formulated.

While not all the tools available have been used to their fullest potential, adoption of the core aspects has been more than satisfactory.

And finally, a small set of guidelines for the improvement of the use of the platform has been proposed, with an emphasis on increasing the familiarity of the users with some of the least used aspects of the application.

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