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**The Use of Learning Management
Platforms in School Context –
a National Study**
[English-version]

The Use of Learning Management Platforms in School Context —a National Study

This report results from a national study carried out under the Project “Educational application of learning management platforms”, supported and funded by the Computers, Networks, and Internet in Schools department of the Portuguese Ministry of Education- General Directorate for Innovation and Educational Development. This report has been developed by the ICT Competence Centre of the Faculty of Sciences- University of Lisbon, during the school year 2007/2008.

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TABLE OF CONTENTS

	Page
1) Introduction	5
1.1) Report structure	6
2) Methodology	8
2.1) Survey	8
2.2. Participants.....	10
2.3) Procedures.....	11
3) Results	12
3.1) Patterns/Levels of use of learning management systems	12
3.1.1) Number and type of LMS in use.....	12
3.1.2) Participants.....	14
3.1.3) Distribution of platforms use across curriculum areas	15
3.2) Characterization of the types of use of the LMS	16
3.2.1) Work developed between teachers.....	17
3.2.2) Activities of teaching-learning between teachers and pupils.....	18
3.2.3) Work of the school management	18
3.2.4) Activities and projects of the pupils.....	19
3.2.5) Work developed between schools.....	20
3.2.6) Work developed between schools and other partners.....	20
3.2.7) Global results	21
3.3) Effects of the use of the Learning Management Platforms in the school dynamics	22
3.3.1) Global results on effect of use of the platforms	23
3.3.2) Distinguish Dimensions	24
3.4) Level of Satisfaction of the schools with the use of LMS platforms	25
3.5) Facilitating Factors of using LMS Platforms.....	25

3.6) Limiting factors for the use of LMS platforms.....	29
3.7) Necessities felt in the scope of using LMS platforms.....	31
4) Conclusions and final considerations	33

1) Introduction

The present report results from a national study carried out under the Project “Educational application of learning management platforms”, supported and funded by the Computers, Networks, and Internet in Schools department of the Portuguese Ministry of Education- General Directorate for Innovation and Educational Development. This report has been developed by the ICT Competence Centre of the Faculty of Sciences- University of Lisbon, during the school year 2007/2008.

The main purpose of the project was to provide support to elementary and secondary schools and teachers in the effective and generalized use of learning management systems (LMS) platforms in Portuguese public schools. Thus, one of its goals was to carry a survey of the use of learning platforms in basic and secondary Portuguese public schools, in order to (i) identify use patterns of learning platforms in schools contexts and (ii) discover and categorize the main barriers and benefits associated with its pedagogical use.

This survey was conducted between March and July 2008 and consisted of the following stages:

Stages	
Stage 1	Identification of what would be required from the schools that have platforms; Development of a measure to collect the data, as well as the study design;
Stage 2	Online data collection;
Stage 3	Data organization and analysis;
Stage 4	Results discussion; Final report development.

The following procedures, results and conclusions attempt to describe and illustrate ‘state of the nation’ in terms of LMS platforms use in Portuguese elementary and secondary publics’ schools (from K1 to K12 classes).

The present report reveals three main goals:

- (i) to present a clear, concise and suggestive picture of the obtained results ,
- (ii) to systematize information about the benefits and challenges, drivers and inhibitors, identified by schools in the educational use of these technologies, and further
- (iii) to establish and to provide a dynamic and constructive view of the attained findings by raising up implications and recommendations about the development of future strategies for a more generalized integration of learning platforms in Portuguese educational fields.

To address these goals, data were analyzed using descriptive statistics methods. These findings are particularly relevant not only for schools, teachers, educational local authorities and governments, but also for the wide education community and the general public.

1.1) Report structure

The present report is formed by the following chapters:

- 1) A brief introduction of the study,
- 2) Methodological aspects of the study, with the description of the survey, of the procedure and of the respondent-schools.
- 3) Results, with 2 sub-sections where quantitative and qualitative data analysis is presented. The salient qualitative findings are summarized in:
 - a) Type and longevity of learning platforms used by schools;
 - b) Percentage of teachers and students subscribing/using these technologies;
 - c) Incidence and distribution of platforms use across the curriculum areas;
- 4) Description of how the learning platforms are being used (across different schoolwork daily tasks);
- 5) Analysis of the impact of learning platforms integration in schools;
- 6) Schools’ level of satisfaction through learning platforms use.

With respect to quantitative findings, the present study presents the reported drivers and inhibitors to Learning platform use, as well as the most emergent needs identified by the schools in this specific domain.

Conclusion and future recommendations: at this final section, findings are systematized and discussed in the broader educational context. A set of recommendations for the future are also proposed.

2) Methodology

2.1) Survey

Utilization patterns of LMS at public Portuguese schools were assessed using a questionnaire composed of five articulated sections:

Section A: the first part of the instrument included questions which addressed the type, the number and the opening date (month/year) of each school learning platform. It was also requested the percentage of teachers and students who were registered in the platforms, and the level of LMS used across the different subject areas included in the Portuguese elementary and secondary school curriculum;

Section B: the second part of the survey included a total of 24 items (4x6) addressing different functions played by learning platforms in schools contexts: communication, collaboration & interaction, information provision, and information collection. These different functions were analyzed across six different school working areas, namely (i) cooperative work between teachers, (ii) teaching-learning activities between teachers and students, (iii) schools heads & councils work, (iv) students activities and projects, (v) cooperative projects between schools and (vi) cooperative work between schools and other educational partners (i.e. parents, local associations). Teachers were asked to indicate the extent to which learning platforms are used in these different areas, by rating these 24 items on a 3-point scale ranging from 1 (rarely) to 3 (frequently);

Section C: the third section of the survey contained 24 items created to gather data about schools' perception of the learning platforms impact on organizational management, work development, interactions, teachers and students skills and school general involvement with information and communication technologies (ICT). Again, teachers were asked to rate these items on a 3 point scale ranging from 1 (little impact) to 3 (strong impact). Items having negative statements/questions (3, 16 and 24) were inversely scored. Factor analysis was used to group related items into distinct dimensions of school activities (see Annexes). From this analysis six (6) dimensions were identified:

- **teachers practices:** focused on teachers attitudes, skills and behaviors towards the use of LMS (items 1, 3, 12, 14, 21 and 24);
- **students practices:** focused on students attitudes, skills and engagement towards the use of LMS (items 5, 8 and 12);
- **learning resources and educational initiatives development:** related to the organization of educational initiatives, activities and resources in school context (items 7, 9 and 13);
- **interaction and communication:** associated with the interaction, communication and engagement between school members/actors and departments (items 4, 8, 10, 11 and 15);
- **school organization and management:** focused on school administrative and organizational activities (items 2, 9 and 13);
- **required investments:** related to the recent requirements resulting from LMS integration in schools (items 6, 17 and 20).

Section D: the fourth section of the survey contained 26 items addressing schools' level of satisfaction with the use of LMS. Teachers were asked to rate these items on a 3 point scale ranging from 1 (slightly satisfied) to 3 (highly satisfied).

Section E: the last part of the survey included two open-ended questions addressing the drivers and inhibitors and the main needs identified by schools concerning the use of LMS, respectively.

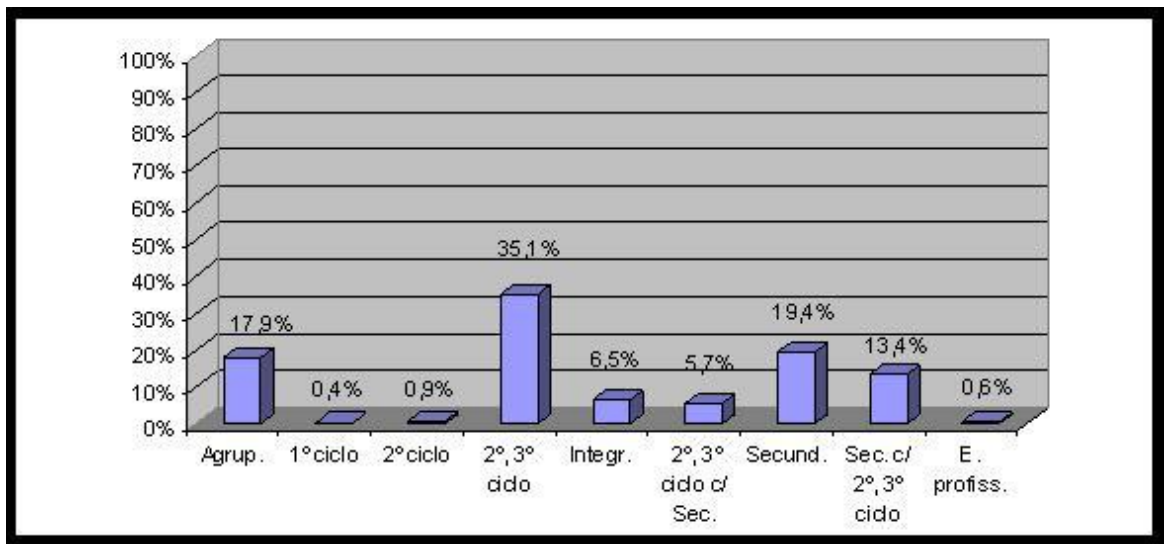
The last question of the survey asked the respondents to provide additional information they considered important about the use of LMS in schools. The fact that none of the participants mentioned any information accounts for the quality of the survey.

2.2. Participants

All Portuguese elementary and secondary public schools were asked to participate in this study by completing and submitting online the survey previously described. Of the 582 submissions returned between March and July 2008, 49 were eliminated from the sample: 8 because the schools didn't support any LMS, 14 because surveys were returned blank and 19 duplicate surveys.

Figure 1 show, in graphic form, the distribution of participating schools and local schools groupings¹ by cycles of education².

Fig.1.: Percentage of schools by cycles of education



When analyzing the use of the LMS platforms we considered the following aspects: the type of LMS platform; the number of open LMS platform, and for how long they were open, in each school/school grouping; the percentage of teachers and pupils enrolled in the platforms; and how much the platforms were used according to the

1)

¹ In Portugal schools are locally grouped under the coordination of one school - in general a junior high school (cycles 2 and 3 of basic education)- and each grouping includes between 5 and 15 schools from kindergarten to junior high school.

² In Portugal, Basic Education consists of nine years of schooling divided into three sequential cycles of education of four, two and three years. The first cycle of basic mandatory education covers years 1st-4th, the second cycle years 5th-6th and the third cycle years 7th-9th. Secondary education consists of a three-year cycle after basic education.

different curricular subjects as defined by the National Curriculum for Basic and Secondary teaching.

As can be seen the majority of surveys (54.6%) were submitted by schools including/serving 2º and 3º cycle students (35.2%) and secondary schools (19.4%). Some 18% were submitted by local schools groupings.

2.3) Procedures

The survey, disseminated online at <http://MOODLE.crie.min-edu.pt/course/category.php?id=62>, was available for submission at <http://www.crie.min-edu.pt/index.php?section=215> between March 15th and July 15th 2008.

As it was clarified in the survey instructions, it should be completed by two teachers together (the ICT coordinator and one teacher involved in the school's platform management), whose responses should reflect the school overall standpoint about the current use of LMS.

3) Results

3.1) Patterns/Levels of use of learning management systems

The use of learning management system was analyzed considering the following features:

- . Number, type and longevity of LMS supported by each school;
- . Percentage of teachers and students registered in the platforms;
- . LMS use across the different subject areas included in the Portuguese elementary and secondary school curriculum.

3.1.1) Number and type of LMS in use

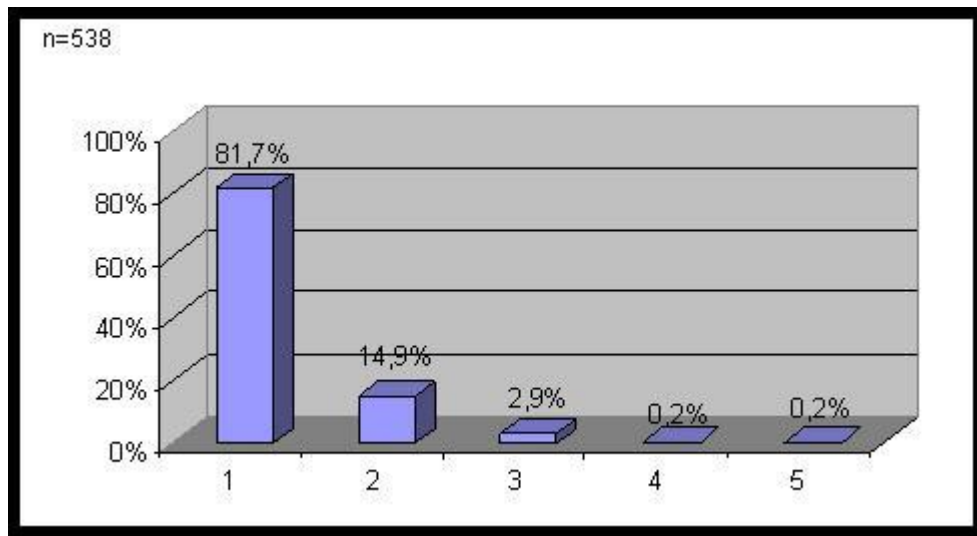
According to the results 98.1% of all participating schools use MOODLE (additional information in <http://moodle.org>), i.e., only 1.9% reported the use of another type of platform.

Table 2: Other types of platforms used by schools

Software	Absolute Totals
Joomla	8
Dokeos	4
Windows Sharepoint service	3
TWT	2
Gato	2
Wikispace	1
Plone	1
Wordpress	1

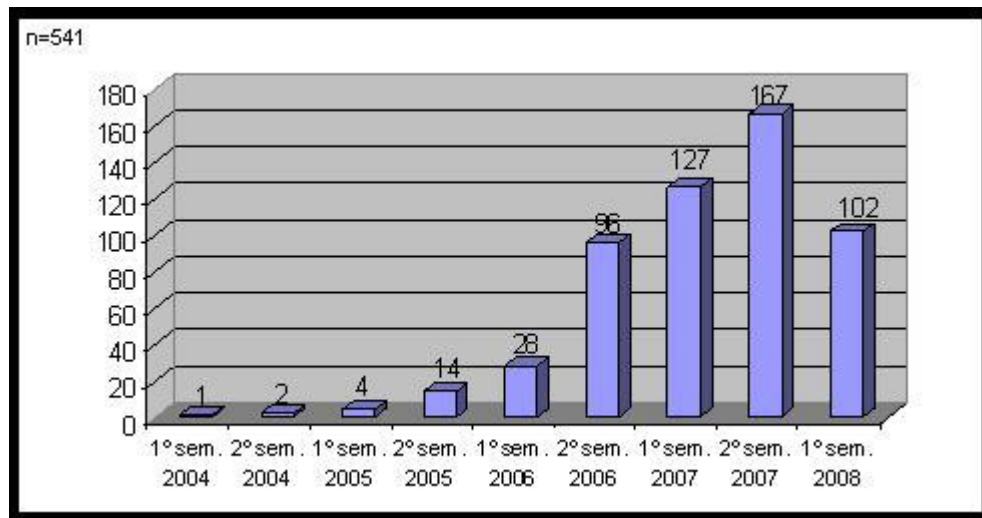
Table 2 provides descriptive information about other types of platforms supported. As we can see, Joomla and Dokeos (free software) were the most referred ones.

Fig. 2: Number of platforms used by schools



As reported, the vast majority of schools support only one platform. About 15% of the schools support 2 platforms and only 3% support 3 or more (Fig.2).

Fig. 3: LMS implementation from 2004 until 2008

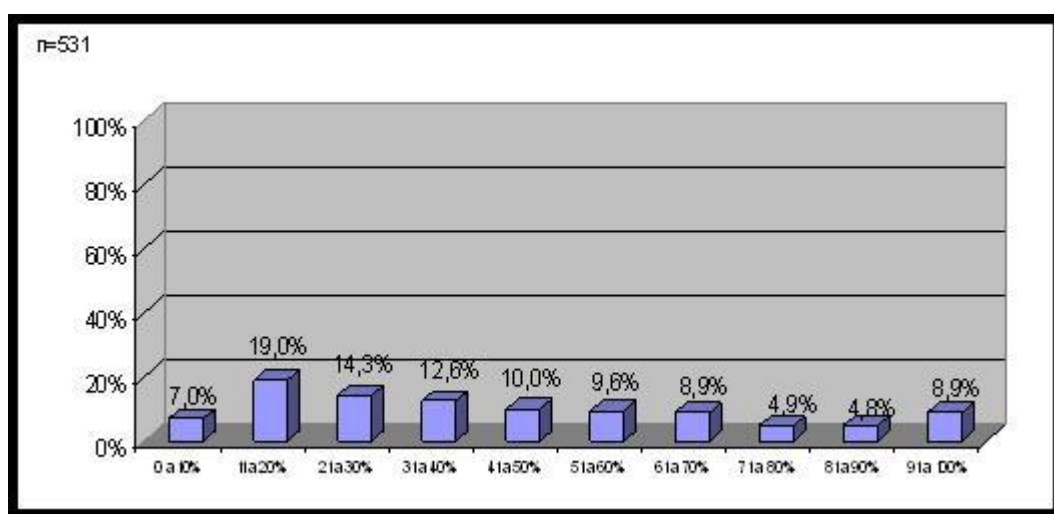


According to the results, the implementation of LMS increased exponentially from 2004 until 2007. As figure 3 shows, the majority of platforms was created through the calendar year 2007 (which covers school years 2006/2007 and 2007/2008), mostly during the beginning of school year 2007/2008. However, in 2008 this trend reversed, i.e., LMS implementation decreased, probably because most of the schools already had their own platform.

3.1.2) Participants

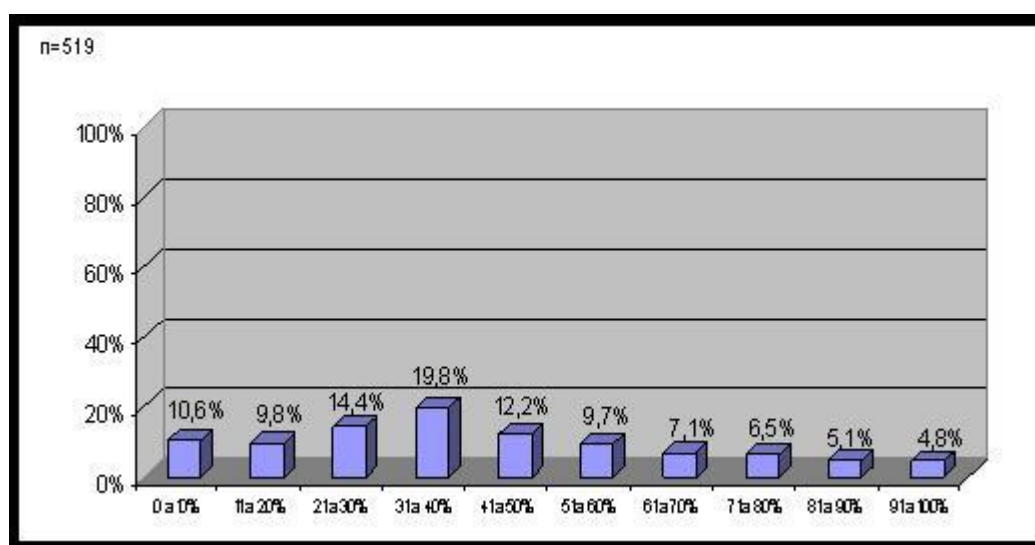
The percentage of teachers and students registered in the schools' platforms was calculated, for each school, by dividing the total of teachers/students enrolled in the school by the total of teachers/students registered in schools' platforms. Figures 4 and 5 present the percentage of teachers and students, respectively, registered in the schools' platforms.

Fig. 4: Percentage of teachers registered in the platforms in each school.



Around 63% of all participating schools have less than 50% of teachers registered in the platforms and only 9% have more than 90%. Actually, less than 6% of these schools have all their teachers registered in the platforms.

Fig. 5: Percentage of students registered in the platforms in each school



The results concerning the students were very similar, yet less encouraging. Thus, about 67% of all participating schools had less than 50% of their students registered in the platforms and only 5% had more than 90%. Just 1.8% of these schools had all their students registered in the platforms.

3.1.3) Distribution of platforms use across curriculum areas

The distribution of platforms use across curriculum areas was analyzed considering the following groups separately: (i) secondary schools (includes all the schools which cover secondary education, as well as professional schools) and (ii) basic education schools (includes all the schools covering 1.º, 2.º and 3.º cycles of basic education, as well as schools' groupings).

Fig. 6: Distribution of platforms used across curriculum areas in secondary schools

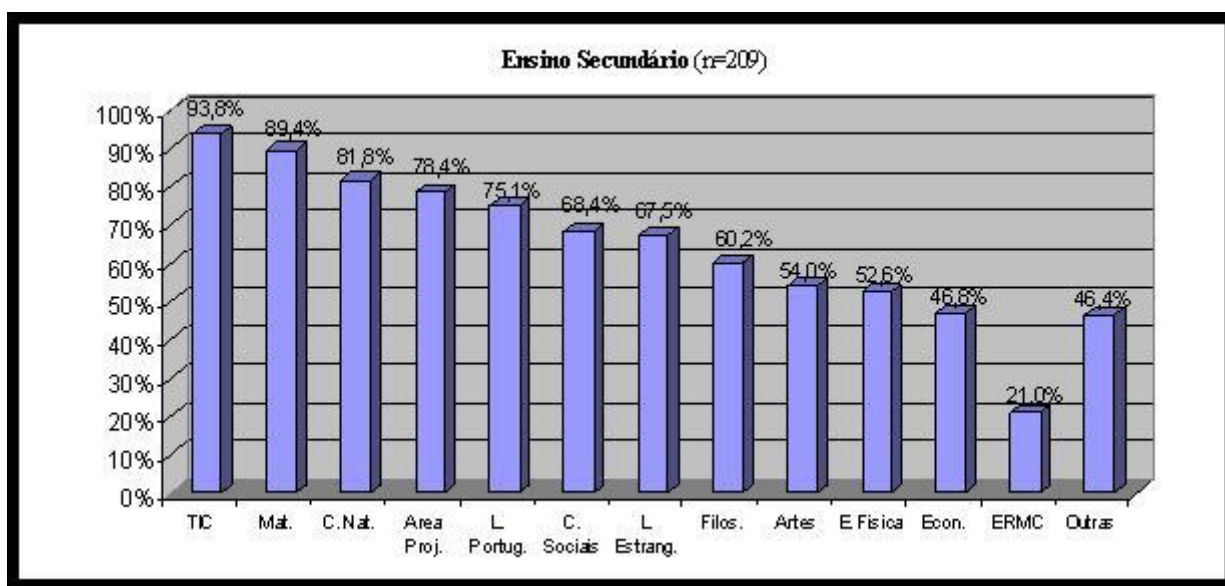
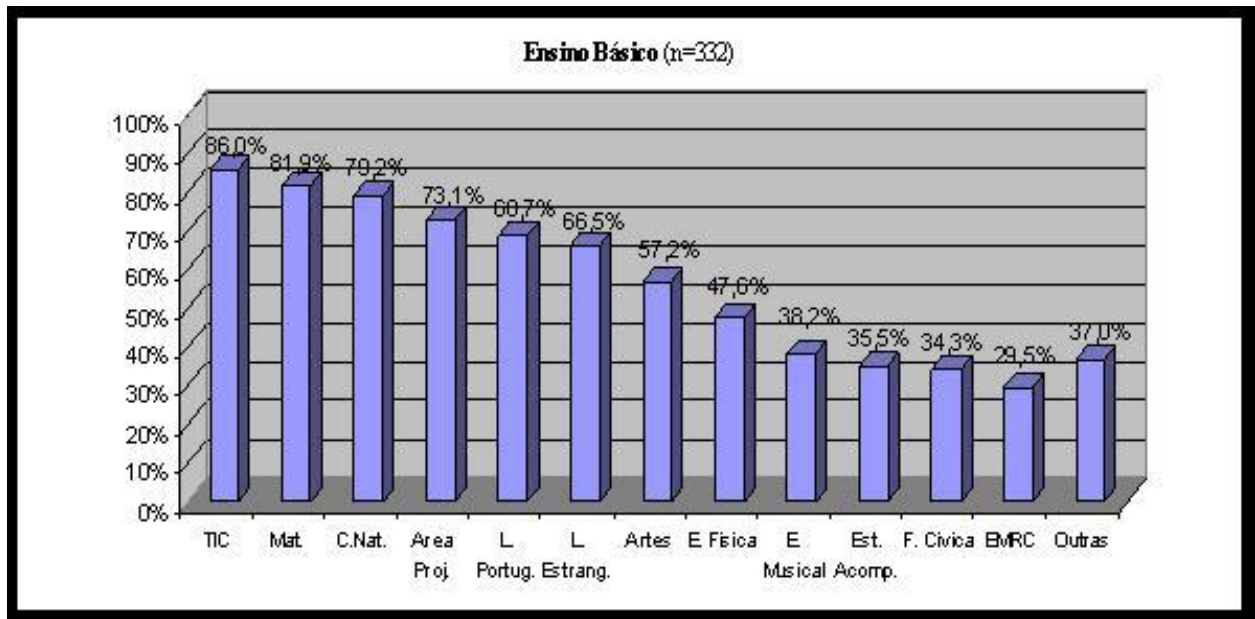


Fig. 7: Distribution of platforms use across curriculum areas in basic education schools



According to the results presented in figures 6 and 7, ICT teachers are the most intensive users of LMS, both in secondary (94%) and in basic education schools (86%), followed by mathematics, science, project area (non-disciplinary curricular area) and Portuguese teachers. Note that ICT is a non-disciplinary curricular area in basic education. In basic education Portuguese teachers are followed by foreign language teachers, conversely, in secondary education, are followed by social science teachers.

Thus, the use of LMS across the different curriculum areas is very similar in secondary and basic education schools. Only in secondary schools the use of LMS is apparently slightly higher.

3.2) LMS patterns of use

LMS patterns of use was defined in terms of the ways platforms were being used by schools, namely functions used, type of activities supported and functionalities explored.. Thus, teachers were asked to rate on a 3-point rating scale ranging from 1 (“Rarely used”) to 3 (“Frequently used”) how often the platform was used to communicate, collaborate, provide and gather information across 6 different school working areas, namely (i) cooperative work between teachers; (ii) teaching-learning activities between teachers and students; (iii) school heads & councils work; (iv)

students activities and projects; (v) cooperative projects between schools and (vi) cooperative work between schools and other educational partners.

The following data analysis was based on arithmetic means, which were calculated given schools ratings for each item presented.. Mean scores close to 3 (\geq to 2,50) were considered high and mean scores close to 1 ($<$ than 1,50) reduced.

Note that standard deviation (SD) scores were also calculated, though are not presented in the following result tables, since proved to be close to 0 ($<$ 0) (see annexes).

Equally, we point out that the N values (that can be found in these tables) refer to the number of valid responses for each item.

3.2.1) Cooperative work between teachers

As shown in Table 3, in cooperative work between teachers the highest mean score was obtained for/on items concerning information provision ($M=2.37$), whereas the lowest mean score was obtained on items related to collaboration/interaction activities ($M=1.83$).

Table 3: Cooperative work between teachers – Mean Scores

Items	N	Mean
Communication (call for meetings, files sending, news,...)	540	1,70
Collaboration/interaction (discussions in the forums, chats, wikis,...)	538	1,39
Information provision (providing resources, glossary contribution, databases,...)	539	1,93
Information gathering (tests, surveys, quiz, questionnaires, assignments submission...)	538	1,57

However, all mean scores revealed to be inferior to 2, a score associated to a “Moderate” level of use. This leads us to conclude that LMS platforms tend to be used in a limited way in the scope of cooperative work between teachers.

3.2.2) Teaching-learning activities between teachers and students

Regarding teaching-learning activities between teachers and students, the highest mean score was obtained on items related to information provision ($M=2.37$), followed by those related to information gathering ($M=2.05$) and communication ($M=2.04$).

Table 4: Teaching-learning activities between teachers and students – Mean Scores

Items	<i>N</i>	<i>Mean</i>
Communication (call for meetings, files sending, news,...)	535	2,04
Collaboration/interaction (discussions in the forums, chats, wikis,...)	537	1,83
Information provision (providing resources, glossary contribution, databases,...)	539	2,37
Information gathering (tests, surveys, quiz, questionnaires, assignments submission...)	534	2,05

Again, the lowest mean score was obtained on items concerning collaboration/interaction activities ($M=1,83$). However, all mean scores are very close to 2, associated to the answer “moderately used”, which suggests that LMS platforms are being used more often in the context of teaching-learning activities between teachers and students than in cooperative work between teachers.

3.2.3) School heads & councils work

When considering the use of LMS platforms to support school heads and councils work, data analysis revealed that mean use rates were lower than those reported in other domains. As shown in Table 5, the highest mean score was obtained on items related to communication activities, followed by items related to information provision activities. Note that this tendency/trend was not revealed/observed in both domains previously presented (cooperative work between teachers and teaching-learning activities between teachers and students). Again, the lowest mean score was obtained on items related to collaboration/interaction activities ($M=1.15$), a result that being close to 1, suggests that, at this level, LMS platforms are “rarely used”.

Table 5: School heads & councils work – Mean scores

Items	<i>N</i>	<i>Mean</i>
Communication (call for meetings, files sending, news,...)	527	1,56
Collaboration/interaction (discussions in the forums, chats, wikis,...)	529	1,15
Information provision (providing resources, glossary contribution, databases,...)	531	1,53
Information gathering (tests, surveys, quiz, questionnaires, assignments submission...)	529	1,21

In addition it is important to point out that there were fewer valid responses (*n*) in this domain than in both previous ones, suggesting that the *N* values for this dimension (total of schools that answered the respective items considering the 541 participant schools) are more reduced than those registered in the previous areas, which can reveal a schools' tendency to choose not to answer to these questions.

3.2.4) Students activities and projects

Again, we have registered new reductions of the *N* values, evidence that an increasing number of schools chose not to answer to the item presented in connection to the use of LMS platforms in the activities and projects developed by the pupils.

Table 6: Students activities and projects - Mean Scores

Items	<i>N</i>	<i>Mean</i>
Communication (call for meetings, files sending, news,...)	513	1,31
Collaboration/interaction (discussions in the forums, chats, wikis,...)	519	1,38
Information provision (providing resources, glossary contribution, databases,...)	501	1,49
Information gathering (tests, surveys, quiz, questionnaires, assignments submission...)	506	1,11

Taken together, mean scores presented in Table 6 suggest that in students activities and projects LMS platforms are used mainly to provide information. However,

unlike the trend revealed in the other domains, items regarding collaboration/interaction presented a higher mean score than those related to communication and information gathering.

3.2.5) Cooperative work between schools

Again in this area, the *n* values are quite reduced which can be associated to a “rare use” of LMS platforms in the support of the work developed between schools of the same grouping or of different groupings, either national and/or international.

Table 7: Cooperative work between schools – Mean Scores

Items	<i>N</i>	<i>M</i>
Communication (call for meetings, files sending, news,...)	511	1,31
Collaboration/interaction (discussions in forums, chats, wikis,...)	515	1,12
Information provision (providing resources, glossary contribution, databases,...)	517	1,29
Information gathering (tests, surveys, quiz, questionnaires, assignments submission...)	512	1,14

As shown in Table 7, in cooperative work between schools, LMS platforms are used mainly for communication activities, since the highest mean score ($M=1.31$) was obtained on items concerning this domain, followed by Information gathering items ($M=1.14$). Again, collaboration/interaction are the kind of activities LMS platforms are less used for ($M=1.12$).

3.2.6) Cooperative work between schools and other educational partners

As it can be seen in Table 8, LMS platforms’ use mean scores in the context of cooperative work between schools and other educational partners (i.e., City Halls, Social Services, Parents Associations, Social Security, Job Centers and Professional Training Centers, IPSS or Local Companies) are close to 1, suggesting that they are rarely used in this domain.

Table 8: Cooperative work between schools and other educational partners – Mean Scores

Items	<i>N</i>	<i>M</i>
Communication (call for meetings, files sending, news,...)	507	1,16
Collaboration/interaction (discussions in forums, chats, <i>wikis</i> ,...)	501	1,04
Information provision (providing resources, glossary contribution, databases,...)	505	1,13
Information gathering (tests, surveys, quiz, questionnaires, assignments submission...)	500	1,05

The highest mean score was obtained on items regarding communication activities ($M=1,16$), followed by items related to information provision activities.. Again, the lowest mean score was obtained on collaboration /interaction items ($M=1.04$).

It is important to point out that the n values (total of schools that answered to the item, considered the total of 541 participant schools) have a tendency to decrease throughout the areas pertaining to school work previously presented. In the area associated with the activities carried through between schools and other partners the n values have decreased significantly.

3.2.7) Global results

In addition, further analyses were realized to describe LMS platforms 'use mean scores by (i) school working areas and (ii) by type of activities supported.

When considering LMS platforms' use across the six different school working areas covered, mean scores indicate platforms are mainly used for teaching-learning activities between teachers and students. Findings suggest that, at this level, platforms are actually frequently used, as the mean score proved to be higher than 2.5. Across all other areas of work mean scores revealed a scarce use of LMS platforms (< 1.5), with the exception of cooperative work between teachers, where platforms 'use mean score

revealed a moderate level of use. The lowest mean score was obtained for cooperative work between schools and other educational partners.

Table 9: LMS platforms 'use mean scores by school working areas

Areas of work	<i>N</i>	<i>M</i>
Cooperative work between teachers	540	1,75
Teaching-learning activities between teachers and students	534	2,54
School heads & councils work	533	1,39
Students activities and projects	501	1,32
Cooperative work between schools	500	1,22
Cooperative work between schools and other educational partners	501	1,09

3.3) Effects of LMS use in school culture

With the purpose to address the effects of LMS use on school culture, namely on (i) organizational management, (ii) work development, (iii) interactions, (iv) teachers and students ICT skills and (v) school general involvement with ICT, teachers were asked to rate 24 items on a 3 point rating scale (1 = low, 2 = moderate, 3= high), 3 of which formulated in a negative way (Items 3, 16 and 24).

The following data analysis was based on arithmetic means, which were calculated based on schools ratings for each item presented. Mean scores close to 3 (\geq to 2,50) were considered high and mean scores close to 1 (< than 1,50), reduced.

3.3.1) Global results

Table 13 shows the mean scores for each of the 24 items presented in question 5.

Table 13: Mean scores for the 24 items addressing the effects of LMS use on school culture.

To what level do you consider that the use of the LMS platform in your school helped to...	<i>N</i>	<i>M</i>
1. develop teachers' ICT skills	539	2,37
2. improve schools' administrative and bureaucratic tasks accomplishment	533	1,66
3. overload teachers' work (*)	536	1,68
4. promote interactions between teachers and students	538	2,49
5. strengthen students' attention and interest towards school curricula	537	2,32
6. increase investment in technical training	538	2,00
7. organize and share resources created by teachers and students	538	2,43
8. stimulate interactions/relations within the school	537	1,95
9. promote information sharing and dissemination	538	2,39
10. improve communication between schools' councils	532	1,66
11. stimulate collaboration between teachers	536	2,04
12. increase teachers' use of ICT	535	2,35
13. streamline decision-making at school	527	1,44
14. stimulate teachers' creativity in the accomplishment of activities or school projects	536	2,08
15. improve cooperation between teachers and schools' councils	532	1,57
16. increase the difficulties experienced by school community in the educational use of ICT (*)	531	1,30
17. increase the need for financial investment in technological equipment	534	2,06
18. develop students' ICT skills	538	2,46
19. innovate pedagogical activities and projects	537	2,34
20. increase the need for financial investment in technical support	534	2,00
21. stimulate teachers' attention and interest in the educational use of ICT	538	2,40
22. increase students' use of ICT	539	2,56
23. share teachers' and students' projects/ activities/ initiatives	538	2,27
24. increase teachers' resistance towards ICT (*)	534	1,46

(* explicit negative item)

Globally, the results suggest that participating schools and local school groupings perceive the effects of LMS use on school culture as positive. Mean scores were moderate or high for all items, except for item 13 (concerning decision-making streamline at school) and item 15 (concerning the improvement of cooperation between

teachers and schools' councils), which revealed reduced and moderate mean scores, respectively.

The highest mean score was obtained for item 22 ($M = 2.56$), concerning the increase of students' use of ICT, followed by item 4 ($M = 2.49$), associated with the promotion of interactions between teachers and students.

When considering the items formulated in a negative way (item 3, 16 and 24), for which low mean scores would be desirable, mean scores for all three items revealed few negative effects concerning the use of LMS in schools.

3.3.2) Dimensions distinguished

A Factor Analysis, conducted with all 24 items of question 5, revealed 6 dimensions (see annex 2). Mean scores for the 6 dimensions distinguished were then calculated and analyzed (Table 14).

According to the results attained, the only dimension for which was obtained a high mean score refers to students' practices ($M = 2.56$). Conversely, the lowest mean score was obtained for the dimension concerning schools' functioning and structure ($M = 1.63$). However, it cannot be considered a reduced score, since it is still higher than 1.50.

Table 14: Mean scores obtained for the 6 dimensions concerning LMS effects (question 5)

Dimensions	<i>N</i>	<i>M</i>
Teachers practices	540	2,41
Students practices	539	2,56
Development of pedagogical initiatives and resources	539	2,34
Interaction and communication	539	1,95
Schools' functioning and structure	539	1,63
Investment requirements	539	2,02

3.4) Schools' level of satisfaction with (the use of) LMS platforms

According to the results attained, all participating schools declared high levels of satisfaction in using LMS platforms. Hence, the mean score obtained ($M = 2.61$) is considered high, since rating scale ranged from 1 (slightly satisfied) to 3 (very satisfied).

3.5) Facilitating factors for LMS integration

Analyzing the answers of the 439 schools to the open question, where schools were asked to state the factors that facilitated educational use of the LMS platforms it became clear that it was possible, to divide facilitating factors in different categories. Five categories emerged: factors related to the tool, factors related to users, factors related to the teaching-learning process, factors related to institutions and structural factors.

Table 17: Tool-related facilitating factors

Tool-related factors	Absolute Totals
1) Technical features	
Any place and anytime access	50
Ease to use	45
Quick access, diffusion and modification of information / resources	27
Easiness in resource management and storage	25
Variety of functionalities/ tools	20
Reduction of paper and supplies consumption	11
System security, stability and possibility of development	10
Free access (no financial costs)	10
2) Resources, sharing information and content	
Facilitates access to contents, materials, documents, activities	71
Mean of sharing information, knowledge, interests and ideas	66
Documents management and centralization of information	38
Mean of sharing activities, projects and best practices	10
3) Communication / interaction	
Mean of communication/interaction between teachers and pupils	44
Mean of communication between teachers	21
Easier/faster internal communication	11
Chance for the development of collaborative work between teachers	10

In the facilitating factors related to the tool, three main subcategories emerged, namely (i) technical characteristics and available functionalities and LMS platforms' role in (ii) facilitating information and resources and contents management and in (iii) promoting communication and interaction among users.

Regarding the platforms "Technical features", teachers considered any place and any time access the platforms' most relevant feature, since 50 of the given answers referred to it. Being easy to use was the following most referred feature, present in 45 answers. Quick access, diffusion and modification of information/resources, easiness in resource management and storage, as well as variety of functionalities/ tools were also referred as facilitating factors considering LMS platform use, though in a far less representative number of responses.

When considering the next subcategory, i.e. "Resources, sharing information and content", the LMS platforms' feature most reported by participating schools were the accessibility of contents, materials, documents and activities (71 responses), followed by its capability to spread information, knowledge, interests and ideas (66 responses).

In what concerns communication / interaction, teachers' answers highlighted the opportunity created by LMS platforms integration to promote communication/interaction between teachers and students and between teachers only, features reported by 44 and 21 schools, respectively. Table 18 presents the facilitating factors related with the users that arise from the use of LMS platforms, grouped depending on whether they were personal or professional.

Table 18: Users- related facilitating factors

Users-related factors	Absol. Totals
1) Professional dimension	
Formal training in the MOODLE skills	92
Initiatives of internal training (informal)	75
Teachers Mastering ICT skills	14
2) Personal dimension	
Motivation, interest and knowledge of the ICT from the students	74
Motivation, availability and interest of the teachers for ICT	47
Curiosity, innovative and creativity spirit from teachers and students	25
Constant need of learning and update of the teachers	17

According to the results attained, (i) formal training in Moodle skills and (ii) initiatives of internal training (informal) within the school are the facilitating factors related with the users most referred by teachers concerning the professional dimension, referred in 92 and 75 responses, respectively. On the personal dimension, teachers highlighted the following factors: (i) motivation, interest and knowledge of the ICT from the students, (ii) motivation, availability and interest of teachers for ICT and (iii) curiosity, innovative and creativity spirit from teachers and students, reported in 74, 47 and 25 responses, respectively.

The factors related with the teaching-learning process were reported by a total of 66 schools. According to the results, 19 of these schools perceive the (i) higher level of individual support given to the students as a relevant factor, followed by the (ii) increase students' motivation and engagement, reported by 15 schools, the (iii) development of new strategies and teaching methodologies and (iv) the increase of effectiveness in the teaching process in connection to school achievement, both referred by 11 schools. Still considering this dimension, the promotion of proximity/interaction with the students outside the school schedule was the least mentioned factor (Table 19).

Table 19: Facilitating factors related to the teaching-learning process

Factors related with the Teaching-learning process	Absol. Totals.
Higher level of individual support given to the students	19
Increase students' motivation and learning involvement	15
Development of new strategies and teaching methodologies	11
Increase of effectiveness in the teaching process in connection to school achievement	11
Promoting proximity/interaction with the students outside the school schedule	10

The next category of facilitating factors analyzed concerns the schools, namely organizational and technical-administrative factors. Table 20 shows the total of schools that reported each of the presented factors.

Table 20: Schools- related facilitating factors

Schools-related factors	Absol. Totals
1) Organizational dimension	
ICT coordinator/ team support	43
Technical support to the school and teachers	24
Development of session about LMS and moodle	24
Support, involvement and use by school administration boards	22
Colleagues support	14
Initiatives and innovative projects	11
2) Technical-administrative dimension	
Access to the Internet (wireless) in the whole school	24
Access and availability of ICT equipments all around the school spaces	23
Access to school servers (through hosting in paid server)	14

The organizational factor most reported by participating schools as a facilitating factor concerns the support of the ICT coordinator/team, mentioned in 43 responses. When considering technical-administrative factors, the LMS platform's feature most reported concerns the access to the Internet (wireless) in the whole school, referred in 24 responses, followed by the access and availability of ICT equipments all around the school spaces, mentioned in 23 responses.

The last category of facilitating factors analyzed concerns structural factors. At this level the most referred factor, with a total of 54 responses, is related to national initiatives for ICT integration in schools, which occurred during the school year 2006/2007.

Table 21: Facilitating structural factors

Structural factors	Absol. Totals
National initiatives for ICT integration in schools	54
Technological Plan for Education (investment carried out in equipment infrastructures)	10
Support of Ministry ICT Centers	10

As shown in Table 21 (pointed out in 10 responses each, Technological Plan for Education and the support of Ministry ICT Competence Centers were the factors that followed in terms of representativeness.

3.6) Barriers: limiting factors for the use of LMS platforms

The limiting factors, i.e., barriers, for the use of LMS platforms reported by schools, were systematized in four categories: “Tool-related factors”; “Users-related factors”; “Schools-related factors” and “Structural factors”.

The factors, related with the tool, perceived by schools as limiting the use of the LMS platforms mainly concern technical features, such as (i) slow access, mentioned in 25 answers, (ii) (ii) limitations in space available for uploading files; (iii) lack of ready-to-use contents and good practices examples; (iv) difficulties in systems administration and (v) difficulties in managing the platform and courses editing. Finally, 10 schools mentioned flaws and a certain instability of servers as a barrier to platforms use. These results were organized in the following table.

Table 22: Tool-related barriers

Tool-related factors	Absol. Totals
Slow access	25
Limitations in space available for uploading files	17
Lack of ready-to-use contents and good practices examples	13
Difficulties in systems administration	12
Difficulties in management the platform and courses editing	12
Flaws/instability of servers	10

Users-related barriers, similarly to the procedures carried out in the facilitating factors previously presented, were organized in two subcategories: a personal and a professional dimension.

Table 23: Users- related barriers

Factors related with the users	Absol. Totals
1) Personal dimension	
Teachers reduced motivation, interest or/and receptivity	56
Teachers resistance to change	42
Teachers reduced confidence in ICT use	7
2)Professional dimension	
Lack of LMS teacher training	194
Lack of teachers basic skills in ICT	84
Lack of knowledge of the educational potentials of LMS	20
Difficulty in using ITC in classroom in innovative way	11
Little autonomy of the pupils (in kindergarten and primary schools)	11

When considering the personal dimension, teachers reduced motivation, interest or/and receptivity stand out as limiting factor, with 56 answers, as well as teachers resistance to change, with 42 answers,

Regarding the professional dimension 194 schools, when answering this item, mentioned the lack of teacher training for using the LMS platform. Teachers' lack of basic skills in ICT was referred in a total of 84 responses, and, the lack of knowledge of the educational potentials of LMS was pointed out by 20 schools.

In the next category analyzed, concerning "Factors related with the schools", the majority of the responses (168 schools) mention the lack of computers and other equipment, such as projectors, interactive boards and laptops.

Table 24: Schools-related barriers

Factors related with the schools	Absol. Totals
Lack of computers and other equipment (projectors, Interactive boards, laptop)	168
Internet instability and reduced speed connectivity	102
Insufficient covering of Wireless internet connection	50
Obsolete equipment and software	31
Recent use of the platform	21
Lack of technical support	17
Equipment and IT rooms not available for free use	15

Internet instability (102 schools), insufficient covering of wireless internet connection (50 schools) and obsolete equipment and software (31 schools) were also pointed out as barriers.

In what concerns the structural factors that have a restrictive effect in platforms use within the schools, it was mentioned by 25 schools the overload of tasks and roles to be played by the professors.

Table 25: Structural and socio-economic barriers

Structural factors	Absol. Totals
Overload of tasks and roles to be played by the professors	25
Changes pertaining to the school work due to the introduction of the new teaching career status	17
1) Social-economic level	
Students without computers and/or Internet access at home	83

Finally, a total of 83 schools referred social-economic factor such as, students' homes aren't equipped with computers and/or Internet connection.

3.7) Necessities arising from the use of LMS platforms

The last question included in the questionnaire asked schools about the necessities felt, by schools when using LMS platforms. Responses were then organized in three distinct categories, similar to the ones previously created concerning the facilitating and limiting factors, namely (i) "Tool-related necessities", (ii) "Users-related necessities" and (iii) "Schools-related necessities".

In what concerns the "Tool-related necessities" three main necessities were mentioned, although the number of schools answering this question was significantly reduced. These three necessities concern (i) more space (within the server) for the platform and for uploading files, (ii) quicker and stabler access to the platform and still, (iii) best practices of platforms' use (Table 26).

Table 26: Tool-related necessities

Tool-related necessities	Absol. Totals
More space (within the server) for the platform and for uploading files	16
Quicker and stable access to the platform	14
Best practices using the platform	10

When looking at the necessities related with the users, 303 schools referred the training in using platforms as their main need. Therefore, training must be considered a key-feature when searching for a more solid and generalized educational use of LMS platforms.

Table 27: Users- related necessities

Users-related necessities	Absol. Totals
More training for using platforms	303
More interest, motivation and adhesion by the teachers	28
More time available for teachers enrollee in trai and/or self-exploration initiatives	27
Training more focused on the acquisition of innovative teaching strategies and on the development of digital contents	24
More training for the non-teaching staff	22

The necessities related to the schools most reported in the responses analyzed concern (i) more available equipment, namely computers, interactive boards, laptops

and video-projectors, mentioned in 166 responses and (ii) Internet (cable and Wireless) with a wider band width, more stable and available in all classrooms and computers, mentioned in 155 responses.

Table 28: Schools-related necessities

Schools-related necessities	Absol. Totals
Have more available equipment (computers, interactive boards, laptops and video-projectors)	166
Have Internet (cable and Wireless) with a wider band width, more stable and available in all the rooms and computers	155
More time in teachers schedule to manage and organize the work related to with the platform	29
Dissemination, awareness and promotion of platforms' use within school community	18
More technical support for maintenance	17
More hours in teachers' schedule for the development of digital contents and resources	16

Still concerning necessities related with the schools, in 29 responses was pointed out the necessity for more time in teachers schedule to manage and organize the work related to the platform.. Necessities like (i) dissemination, awareness and promotion of platforms' use within school community, (ii) more technical support for maintenance and (iii) more hours in teachers' schedule for the development of digital contents, were also referred by the respondents, in 18, 17 and 16 responses, respectively.

4) Conclusions and final considerations

The main conclusions that arise from the results attained are presented bellow, as well as some recommendations, considered relevant and crucial for the fulfillment of the main purpose of the project in which these research is subscribed and that concerns the establishment of structures and resources that support an effective and generalized educational use of LMS platforms across national schools.

First of all, it was possible to conclude that more than 98% of participating schools and groupings use MOODLE as a LMS platform. This reality appears substantiated by the initiative of CRIE/DGIDC team (supported by the FCCN-Fundação para a Computação Científica Nacional), during the year of 2006, where it was made available the opening and lodging of MOODLE platforms for schools free use. Conversely, the fact that MOODLE is a free, open source LMS (learning management system) software and therefore with the ability to be customized and developed, seems to be an underlying factor in its proliferation in national schools. Findings also suggest that, besides MOODLE, schools tend to choose open-source software rather than commercial software.

The high percentage of schools that, in this study, revealed using MOODLE can be understood as a favorable factor to the acquisition, development and establishment of regular habits of use, since it is part of both a shared language and a shared repertoire, collectively understood among teachers, pupils and the remaining school community. Moreover, since all features are integrated in the same kind of space and the tool potentials (resources, modules, activities) are known, it is easier to create support and cooperation networks between users, e.g., between teachers of one same school/grouping or between teachers of different schools throughout the country.

Findings from this study also suggest that, since 2004, there has been in Portugal an increasingly search for MOODLE platforms by Basic and Secondary Schools. This movement was more intense throughout 2007, including the end of 2006/2007 and the beginning of the 2007/2008 school years. Still according to the attained findings, the majority of the participating schools has a LMS platform available for about one year,

which illustrates that the educational use of LMS platforms is very recent. Some international research findings (e.g., Brinkerhoff, 2006; Fanklin, Turner, Kariuki & Duran, 2002)³ have demonstrated that the process of generalized adoption and the establishment of habits and routines in what concerns the use of these virtual environments to support learning, takes between 2/3 and 5 years.

In a sense favorable to maintaining and generalizing the use of MOODLE platforms in the schools, are The results attained concerning both the enablers and barriers of platforms use and the necessities felt by the schools/groupings, strengthen the maintenance and generalization of MOODLE platforms use across schools, as the technical characteristics of the platforms used by schools (MOODLE for 98%) appear as the most referred enabler factor among schools responses. Furthermore, factors related with the tool were the less pointed out by the schools, in what concerns either the constraints or limitations to the use of platforms or the necessities felt.

Recommendation 1:

Considering the high number of schools already using MOODLE platform, as well as the investment carried out by teachers and students in the acquisition and establishment of new practices of work and habits of learning in this virtual environment, it is seen as beneficial the creation of stability for a consolidation and deepening of the recently developed interaction and communication skills.

Consequently, it is advisable to keep and stimulate the educational use of this type of LMS (Learning Management System) platforms by schools and school groupings.

Not being known, at this moment, concrete initiatives of

1)

³ Brinkerhoff, J. (2006). Effects of long-duration, professional development academy on technolog skills, to computer self-efficacy and technology integration beliefs and practices. *Journal of Research on Technology in Education*, 39, 1, 22 - 43.

Fanklin, T., Turner, S., Kariuki, M. & Duran, M. (2002). Mentoring overcomes barriers you technologies integration. *Journal of Computing in Teacher Education*, 18, 1, 26-31.

conception and development of an educational platform in Portugal, and since MOODLE is a free software, investments in the development of new modules that include necessary functionalities for schools' LMS platforms, are considered convenient.⁴

According to the attained findings, the great majority of schools uses only one LMS platform for its educational community. This can be understood as positive since it prevents information dispersion and multiplication of on-line spaces for communication and work among elements of the same school community.

It is important to mention that the educational exploration of different digital tools and applications, as well as the creation of different virtual spaces to match the different pedagogical necessities and objectives is understood as beneficial and enriching. However, such movements, when carried out in an individualistic and dissociative way, can lead to (i) some disorientation and incoherence in the development of initiatives at school, (ii) a lack of definition of what should be a shared process of technologies integration in the school reality and (iii) the inability of bringing together the efforts, knowledge and skills of the different school community members in what concerns the educational use of technologies.

The previously presented findings provide evidence that the number of schools with more than 50% of its faculty and students registered in the platform is reduced, thus, making it necessary to stimulate the integration of teachers and students in these digital spaces.

It is important to consider the registration as a very important stage (for the use of these environments) but not as the only one needed in the process of integrating individuals in the platforms. The full and effective integration of users involves equally other stages and tends to be a slower process, sometimes with setbacks, due to the fact

1) _____

4 An example is the Module REPE created by the Centro de Competência da Escola Superior de Educação de Santarém.

that it implies new habits of communication, work organization, sharing and collaboration.

Recommendation 2:

Considering the school community integration in schools LMS platforms, it is advisable that over 90% of its members are registered. Therefore, there is a need to stimulate the development of activities and initiatives, aiming to strengthen the integration and participation of school members in the platforms, i.e., students, teachers and other school community members. Thus, school councils should define and implement intentional and combined strategies, explicitly focused on the integration of the different school members in the schools and schools groupings platforms.

Paying close attention to the differences found between the different curricular areas concerning the use of LMS platforms, it is possible to conclude that the use of platforms is quite different across the several curricular and non-curricular areas, in both basic and secondary education. Information and Communication Technologies was the subject that, according to participating schools, most uses the LMS platform, followed by Mathematics and Sciences.

Actually, curricular areas like Languages, Social Sciences, Economic Sciences, Arts and Physical Education, tend to present lower rates of use than those registered for the area of Sciences. Considering the strong support for communication, interaction and collaborative work that platforms can offer, it is understood as natural and beneficial if rates of use become more similar between these curricular areas.

Recommendation 3:

Once distinguished the several curricular areas considered in the national curriculum for basic and secondary education and the differences of platforms rates of use registered for teachers of those subject areas, it is necessary to define measures against these asymmetries.

Therefore, it is crucial to stimulate training initiatives that establish some connection between platforms multiple functionalities and the different curricular areas, considering the specificity of their scientific features.

In the same way, it is perceived as advisable that teachers of the same departments form collaborative groups (face to face and/or online) to share experiences and resources relation with the teaching activities developed in classroom context.

Regarding the results found in what concerns LMS platforms patterns of use in school context, it was verified that the highest mean scores, representing a more frequent use of platforms, were registered in teaching-learning activities carried out between teachers and students. Although this finding is a positive indicator, since, effectively, this is the underlying purpose for conceiving and development of this type of platforms, at the same time it is not as positive when considering the differences registered between the mean scores presented in this work area and the ones registered in the other work areas.

Despite LMS platforms, such as MOODLE, have been created to support distance teaching and learning activities developed between teachers/tutors and students, practice and research have demonstrated that these same platforms can be used in a beneficial, useful and productive way for supporting activities and projects developed among others elements of the school context, either in its broader or a more restrictive form.

In this respect it is relevant to point out the n values registered (the total of schools that answered the item, considering the total of participating schools, that is, 541), which reveal a tendency to decrease throughout the 6 school working areas

presented, particularly in what concerns cooperative work between schools and other educational partners. Schools may have chosen not to respond to these items since teachers who took the questionnaire may have considered that the items focusing on these schools working areas are far from their reality (e.g., when schools platform is not used at all for any kind of work between schools' councils or between different schools) and, therefore, none of the answering options would reflect the actual level of use.

Similarly, it is important to highlight that it is necessary to promote and create more virtual spaces in schools platforms for the development of students' activities and projects where they can be responsible for its management and improvement. These enables the creation of students' personal work spaces and also the acquisition of knowledge and the development of new skills, particularly for management and improvement of virtual spaces, activities and resources in this type of environment; this requires a readjustment of the access permissions offered to "students" (considering MOODLE).

Recommendation 4:

It is also perceived as important to use LMS platforms to support the development of activities between teachers and students, and to stimulate the creation of virtual spaces in schools for the several school working areas, namely for those whose practices are less familiar with these new virtual environments and particularly to support (i) cooperative-work between students, (ii) collaboration between teachers, (iii) schools' councils activities, (iv) partnerships between schools and (v) to promote communication and collaboration between schools and their local educational partners.

Taking into account the type of activities supported by LMS platforms (communication, collaboration/interaction, information provision and information gathering), the results previously presented demonstrate that schools 'platforms are mainly used to make information available, being much more unusual its use for

collaboration/interaction activities between users. Actually, the lowest rates across all school working areas analyzed concerned this dimension.

However an exception occurred with regard to activities and projects developed between students, where LMS rates of use were higher for communication/collaboration activities than for communication and information gathering. These findings show that students, when compared to teachers, tend to reveal more established habits, as well as a bigger interest in using LMS platforms as a support for collaboration and interaction activities (e.g., using forums and chats to talk and to discuss and writing collaboratively in wikis).

Recommendation 5:

It is necessary to create and support activities integrated in the LMS platforms, namely those related to communication, interaction and collaboration, in what concerns the work among students, teachers or other educational partners.

Communication, interaction and collaboration are key dimensions that need to be developed when conceiving and making these kind of tools available, which, going beyond the traditional sites (of static, informative and unidirectional nature), enable interaction, dynamism and reciprocity in information sharing.

When considering the effects and the impact of LMS platforms integration in schools, findings illustrate that, generally, participating schools see the introduction of platforms in its education realities as positive. An exception to this trend are the limitations of LMS platforms that schools pointed out when considering the accomplishment of administrative and bureaucratic tasks, as well as schools' decision making processes.

Similarly, regarding the dimensions to which each item was associated, it is possible to verify that the impact of LMS platform introduction in schools was considered smaller in what concerns schools functioning and structure than in the other

dimensions analyzed...Conversely, findings show that the greatest impact was on students' practices, attitudes and skills and on their engagement with technologies.

Pointing in the same direction, schools' general level of satisfaction with the use of learning platforms was high. Thus, schools' general evaluation of this movement of opening, integration and use of LMS platforms was very positive.

When considering schools responses to the open-ended questions, as well as the different categories that emerged from these, it is important to note that the enablers and the barriers for LMS platforms integration, as well as the necessities felt by schools at this level, are related to 3 basic categories: the tool (technical features and access), the users (their skills and attitudes) and the school (as a teaching-learning organization). These three categories, individually but mainly in relation with each other, seem to be essential for a well succeeded movement of LMS platforms integration in school context. Even though its individual weight can be uncertain and variable, findings suggest that it will be necessary to focus and to act, in a joint and coordinated manner, considering these 3 categories.

Hence, it is important that schools 'councils become aware that the integration and effective use of LMS platforms by the school community require:

- . the selection of tools that, being powerful and close to the user, are based on principles of reliability, robustness, attractiveness, customization and transparency;

- . a strong and articulated commitment to teacher training, to the development of ICT skills and, also, to change its professionals' attitudes and perceptions (facilitating attendance to training sessions; developing workshops that, despite being limited in time, are pursued by follow-up strategies, as well as peer support; promoting the identification and dissemination of good-practices and sharing of experiences);

- . an internal movement of adjustment between the new tools and the institutions 'organizational functioning systems, with the purpose of eliminating procedural and organizational barriers and establishing solid practices and habits closely related to the school community.

The widespread use of the LMS platforms by the school community assumes that these are incorporated in the several dimensions of the daily school life in an intentional, conscious and articulated way and that their use is collectively valued and promoted by the organization.

Recommendation 6:

For an effective integration of LMS platforms into schools it is necessary to consider in a joint and articulated manner three main aspects: the tools' educational potentialities and limitations (software functionalities, access issues); the prior skills and knowledge of its potential users, as well as their attitudes, representations and motivation; and the school organization specificities, its inner work dynamics, its infrastructures and equipment, its work and support networks, its level of investment, sense of development, initiative and autonomy.

When considering the facilitating factors, results show that formal training in Moodle platforms was the one most referred by participating schools, followed by initiatives of internal training (informal) and by the motivation, interest and knowledge of ICT from students.

On the other hand, the majority of schools referred teachers' lack of training in what concerns the use of LMS platforms, both as a barrier and as a necessities felt by teachers regarding an effective use of the LMS platforms in schools. Actually, the necessity of more training on how to use of the platform was mentioned by more than 300 schools.

Recommendation 7:

It is strengthened the necessity to promote and increase training initiatives (formal and informal) on the use of LMS platforms in school context. It is recommended that training sessions cover software' technical features, but also:

- . the pedagogical issues underlying the accomplishment of activities supported at a distance by platforms;
- . the acquisition of teaching and learning innovative strategies and methodologies;
- . the conception, development, research and organization of digital educational contents;
- . a strategical and intentional projection of work spaces creation and development in platforms;
- . a reflection on the relation between these new virtual environments, school reality and the schools/groupings goals concerning the integration of technologies;
- . the connection between platforms use and the different curricular areas, focusing on its utility for developing teaching and learning activities with the students (in and outside the classroom).

It is also important to point out the benefits of organizing activities to share, raise awareness and promote the educational use of platforms, namely by presenting good practices, sharing concrete and diversified experiences with regard to platforms use, with emphasis on both processes and results, across different curricular areas and different school working areas.

In the same way, a great proportion of schools also mentioned as necessities and as barriers to platforms use in schools some aspects related to equipment availability and infrastructures, standing out the lack of computers and other equipments, such as interactive boards, laptops, video-projectors, as well as, the lack of Internet network (cable and/or wireless) in some schools.

Recommendation 8:

Despite the recent initiatives to provide technological equipment and infrastructures to schools and to modernize the existing ones, it is still necessary to work on some aspects that require improvements, namely:

- . the space available in the servers for the platforms (with upper limits for uploading files);
- . more equipment in schools, ensuring access and free use for students and teachers;
- . expansion of the Internet networks' coverage and stability in schools, including all basic and secondary schools and not only within classrooms but also in free access spaces for students.

There were other relevant findings concerning the enablers and barriers for using LMS platforms reported by participating schools, related with structural and macro-organizational definitions, i.e., beyond schools. Thus, as enablers schools reported the ERTE/PTE (then CRIE) initiative “School, Teachers and Laptops”, held during school year 2006/2007 and the implementation of the “Technological Plan for Education”, as well as its follow-up by the ICT Competence Centers. Such findings show that schools notice the positive impact of some of the initiatives centrally developed to modernize and promote the integration of technologies into school activities.

Ultimately, it is also important to highlight not only the positive effects reported by schools concerning LMS platforms use and the high level of satisfaction revealed, but also the fact that the number of barriers is lower, in quantity and in frequency, than the number of enablers referred. As an exception arise the lack of equipment - computers, laptops, interactive boards and video-projectors – as well as teachers training.

Therefore, and in a generic way, it can be stated that the participating schools evaluate favorably LMS platforms integration into space, practices and school activities.

It was also found a connection between the barriers for platforms use that schools reported and the necessities felt in this concern, as well as a inverse connection

between both this dimensions and the referred facilitating factors. That is, factors that, according to schools, are missing and thus referred as needs, when integrated or guaranteed, assume the role of enablers and can promote a higher level of use of platforms within school context.

Hence, and considering the set of the information previously presented, this study can be considered a valid and useful contribution to the identification of crucial factors for a generalized and effective use of LMS platforms in the national educational territory.

Due to the unpredictability and the constant change of what is considered “nowadays”, it is important to draw attention to the need for further studies, with more comprehensive analysis, based on with longitudinal data collection and considering the effective practices acquired by students and teachers in these new learning, both in a national scope and in a micro-analytical perspective. However, it is important to point out the need to direct and keep focused the investigators, educators and decision-makers attention to this topic and its effects in schools organizations.