Evaluating Asynchronous & Synchronous Distance Learning platform in a High School

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ABSTRACT
ICT can play significant role in the educational process as they bring important changes to the traditional way of teaching, using multimedia and internet technology. This paper presents the evaluation of the application of a Learning Management System, called ASDL (Asynchronous & Synchronous Distance Learning), in Greek private high-schools. ASDL was mainly implemented to be used by students. Pupils are called to use and evaluate such a system for their first time. Studying the questionnaires helped us to export useful conclusions about the pupil's available material infrastructure at home and the way they appreciated the system. Pupils were between 12 and 15 years old. The questionnaires have been integrated in an explicative "story" due to the particular age of the pupils. This method was a better way, in comparison to the traditional questionnaires, to express more clear and comprehensible questions and to get safer answers. It is concluded, through the data analysis and our experience that the participation in this project and the use of ASDL really appreciated and helped pupils. Nevertheless, approximately four out of five pupils could systematically meet asynchronous communication requirements and less than one out of three could participate to synchronous distance learning.

KEY WORDS
LMS, High School, data analysis, Internet, Multimedia

1. Introduction

In our previous study we examined the possibility of applying a Learning Management System (ASDL) in High Schools in Greece [1]. Our aim was to record the needs of teachers and pupils as well, regarding the application of ICT in education and the role that a LMS, like ASDL, is called to play. ASDL has been applied in the Hellenic-French School "Calamari" High School for internal use for an 8- month period.

Our effort was completed by assessing the acceptance of ASDL by pupils who were called to use such a platform for the first time and subsequently to evaluate it.

The difficulties that were observed concerning the comprehension and completion of questionnaires by the pupils and our purpose to examine the availability of the pupil's minimal material requirements and the technical infrastructure at home, led us to a new extended study.

The aim of this study was:
1. The comprehension degree of a questionnaire completed by pupils between 12 and 15 years old. The used questionnaire was integrated in an explicative "story" and it concerns the evaluation of ASDL;
2. The record of the pupil's available technical infrastructure at home (computers, connectivity, available software.)
3. The adaptation of ASDL parameters [2], addressed mainly to students, for use by high school pupils and teachers (user environment, interactivity, system's ergonomics…)

2. ASDL Asynchronous and Synchronous Distance Learning

ASDL is a platform that integrates the functionality of a dynamic database and the ability to store and project educational multimedia information. Moreover it does not require technical knowledge of Internet services, in order to publish and manage data as it offers remote management only by the use of an Internet browser.

Links between the platform and the educational process are multi-dimensional based on the need of teachers [3] and pupils to communicate in a virtual classroom [4].

ASDL, which is an extension of an existing system named DOKEOS, meets synchronous communication requirements such as videoconferencing, streaming video and SCORM (Sharable Content Object Reference Model) lessons in Greek language. It is implemented by Multimedia and Graphics Lab of the Department of Applied Informatics of University of Macedonia, Greece [5]. After an extensive study, we found out that familiar platforms do exist in other universities and schools but they do not meet all the specifications of ASDL. Therefore we examined if this platform could be applied in High Schools and Lyceums and tried to evaluate its use.

Briefly ASDL:

- Supports storage and projection of educational multimedia files. In addition SCORM lessons can be supported in order to achieve reusability, accessibility and interoperability [6] of the content only by the use of any internet browser.
- Offers distance administration as everything can be done only by the use of an internet browser. In this way there is no demand for users to have technical knowledge as well as for the administrator to be physically presented.
- Supports different kinds of users in order to provide personalization, protect the files and the parameters of the platform and make the administration easier.
- Supports videoconferencing and streaming video and as a consequence it gives the feasibility for synchronous education. Therefore it cancels all the geographical limits existing in Greece.

All these features show that ASDL create proximity links between teachers and pupils or even better between pupils and the lesson. Therefore a virtual educational community is created.

3. A pedagogical method for developing questionnaires

While studying questionnaires for the ASDL evaluation, in a previous study, many difficulties were observed by the pupils concerning the comprehension of questions. So, we were obliged to ignore 18% of the questionnaires.

The individual is not a passive receptor of environmental stimuli, but an active recipient of information [7]. He has the possibility of modifying his environment in what he develops relations of reciprocal interaction. The essential question is "how" the knowledge is acquired. The answer in this question is that, knowledge is a complicated process in which not only memory participates, but also will and imagination.

We tried to create an explicative "story", where the pupil could engage more easily the offered IT terminology, especially for those between 12 and 13 years old. On the other hand, pupils of 13 - 15 years old are already familiar with this terminology. It has been harmonised with their age and needs. Condition of answering the questionnaire was the nature of information. Thus, we visualised, where possible, the information given through the questions. The respect of the pupils' age and the particular relation they develop with their environment, prompted us in the use of a myth that has been written by us. The used places (e.g. the teenager's room, the computer) had real and virtual elements. In this way we try to excite the pupil's imagination. An essential parameter for the questionnaire development was the classification of the informative extensions. The questions are developed step by step helping the student to comprehend it and answer with clarity.

Briefly the story was:

A pupil should prepare a homework concerning Ancient Greece. He should search for information in the website of the "Foundation of the Hellenic World" (http://www.ime.gr). The pupil, in the virtual reality topic of this website, clicks on the statue of Minerva and oddly, the goddess livens up and is presented in front of him. A dialogue begins. The person from the past admires the progress of modern world and asks to learn about this entire marvel. In the plot of the story questions come as a consequence of Minerva queries.

Thus, we deployed questionnaires including 45 questions, separated in 10 units depending on the pupil's hardware and technical infrastructure at home, the use and the functionalities of ASDL and the assessment of the educational process. We used questions of closed type, multiple possible answers, and finally Likert scale questions for the evaluation of platform's ease of use [8]. We distributed 214 questionnaires out of which 14 were invalid. Comparatively with the previous research, a reduction 11,5% of invalid questionnaires was observed using this method.

Additionally, in order to see if the method used in the creation of the questionnaire helped pupils to answer, we added the following question (Table 1).

"Did the explicative "story" helped you to answer the questions?"

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	136	68,0	68,0	68,0
	No	39	19,5	19,5	87,5
	Dk/Na	25	12,5	12,5	100,0
	Total	200	100,0	100,0	

Table 1. Frequencies table for the variable "Story"

According to the table we realize that 68% of the pupils were finally helped.

Ages * Story Crosstabulation

			Story			
			Yes	No	Dk/Na	Total
Ages	12 - 13	Count	60	4	7	71
		% within Ages	84,5%	5,6%	9,9%	100,0%
	13 - 14	Count	43	21	9	73
		% within Ages	58,9%	28,8%	12,3%	100,0%
	14 - 15	Count	33	14	9	56
		% within Ages	58,9%	25,0%	16,1%	100,0%
Total		Count	136	39	25	200
		% within Ages	68,0%	19,5%	12,5%	100,0%

Table 2. Crosstabulation table between the variables of "Ages" and "Story"

The pupils of 12-13 years old, for which this method was mainly developed, corresponded positively. As we can easily observe 84,5% of them answered that the story helped them (Table 2). It was the highest percentage of acceptance among the three classes of ages.

4. Technical infrastructure and connectivity

An e-learning system, such ASDL, presupposes the existence of the pupil's minimal hardware and technical infrastructure at home. In the first unit, concerning the infrastructure, we asked to answer if they allocate a personal computer, an Internet access and the connection type.

We concluded that 98,5% of the pupils allocate a computer at home. This constitutes an important background for the future development and use of a system for distance learning adapted in the abilities of pupils. In addition, 79,5% of the pupils have access to the Internet. Out of this percentage, 33% allocates PSTN line, 18% an ISDN line and 28,5% an ADSL connection.
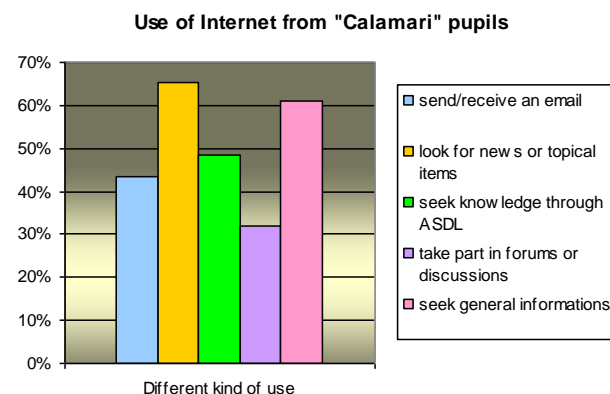
Asking the question "*How often do you usually use the Internet?*" we concluded that the majority of the pupils use Internet several times a week. Nevertheless the percentage of 15,5% that uses it seldom is important. We applied a crosstabulation table for examining the relationship between the variables of "Connection type" and "Frequency" (Table 3).

Connection type * Frequency Crosstabulation

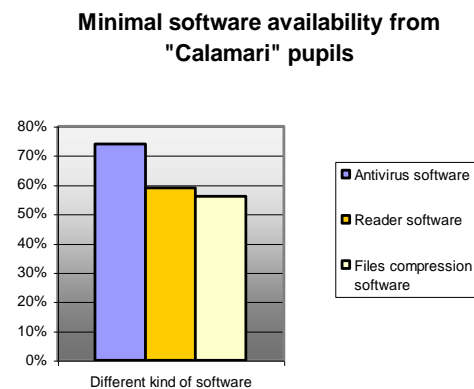|			Frequency					
			Every day	Several times a week	Once a week	Once a month	Less often	Total
Connection type	PSTN	Count	6	25	17	13	5	66
		% within con_type	9,1%	37,9%	25,8%	19,7%	7,6%	100,0%
	ISDN	Count	5	14	9	2	6	36
		% within con_type	13,9%	38,9%	25,0%	5,6%	16,7%	100,0%
	ADSL	Count	21	24	5	2	5	57
		% within con_type	36,8%	42,1%	8,8%	3,5%	8,8%	100,0%
Total		Count	32	63	31	17	16	159
		% within con_type	20,1%	39,6%	19,5%	10,7%	10,1%	100,0%

Table 3. Crosstabulation table between the variables of "Connection type" and "Frequency"

We observe that, by PSTN holders 90,9% are connected by once a month to several times a week. By ADSL holders the 78,9% are connected several times a week to every day. We appreciate that this result is owed to the relation between cost and flow of data transmission. As it appears from the following table, half of the pupils are connected to the Internet especially in order to use ASDL (Figure 1).

Use of Internet from "Calamari" pupils

- send/receive an email
- look for news or topical items
- seek knowledge through ASDL
- take part in forums or discussions
- seek general informations

Different kind of use

Figure 1. Internet use

Considering that the total of pupils having a computer at home uses Windows 2000/XP and has installed a certain version of MS Office and Internet browser, we asked for additional software namely Antivirus software, Reader Software and Files compression software (Figure 2).

Minimal software availability from "Calamari" pupils

- Antivirus software
- Reader software
- Files compression software

Different kind of software

Figure 2. Minimal software

Studying the table we can see that a relatively important percentage of pupils have installed the required software. Nevertheless is necessary that the total of pupils dispose of the minimal particular software.

Let's separate the conclusion of the infrastructural evaluation on two fundamental axes: the ASDL application at first for asynchronous and on the other hand for the synchronous distance learning. Both of those two axes are very important.

Regarding the asynchronous distance learning we understand that 78% of pupils (possessing a pc with any kind of internet access) can have access on course

presentations, announcements, resolved exercises, on line tests and SCORM lessons.

On the other hand, only 28% of pupils (possessing a pc with an ADSL connection) can have access on synchronous communication such as videoconferencing or streaming video.

5. ASDL application in a High School

Proximity: "I am near", or "I feel near"
A lot of new theories using the proximity concept, in combination with the ICT, make their appearance: "proximity digital spaces", "proximity distance learning"… ICT has accomplished to decrease exchange distances for any kind of information. Certain years ago, before ICT's integration in education, proximity had powerful bonds with the geographical distance, which was absolutely measurable. Today, we conclude easily the differentiation from the geographical distance to that of points of presence in the Web, the contacts that link them and their usefulness. In other words, even if the schoolteacher and the pupil are not in the same place, they feel near. Consequently for the "digital spaces" or "digital worlds", the concept of geographical distance loses its value only if it exist a common objective or a plan of work. If this common objective is the acquisition of knowledge and ICT supports this objective, then we can achieve important results in the pedagogical process.

During the ASDL application at school, we used the basic offered operations mainly for the asynchronous distance learning. We choose these operations because of the fact that this type of platforms is implemented for use by students and not by High School pupils. ASDL was applied only for two courses. Our aim was to record the system's acceptance.
Briefly we published:
1. Presentations for the courses developed in MS PowerPoint
2. Notes for the courses developed in MS Word or Acrobat Reader
3. Examples resolved from the teacher
4. Interactive exercises that pupils should prepare for the next time.
We mainly used
1. The announcement unit to inform pupils about cooperative activities [1]
2. The agenda unit was used as a course organizer.
At the same time we created online test, using Hot Potatoes software and SCORM lessons using Reload.

Regarding the synchronous communication methods, we carried out about three live videoconferences via ASDL. Pupils were in the same classroom and the teacher was in another place. Two ADSL connections at 256 kbps were available for both of pupils and teacher.

We observed that pupils can be easily adapted to a lesson carried out via videoconference. Additionally, we consider that the presence of a supervisor in the classroom is very important, especially for more than 20 pupils. Self-discipline is a difficult process for children.

First of all, a video projector was an essential, technical and educational hardware because this way, pupils had a direct view of the teacher. On the other hand, the use of more than one microphones is recommended, so that the discussion with the teacher becomes easier and faster.

ASDL services, like a light-pen and a whiteboard, were very useful during the videoconference. These services can simulate the classroom considerably.

Taking into account that the ideal condition for the educational process is the physical presence of the teacher in the classroom, based on a previous statistical analysis of a videoconference project [9], we understand that the physical presence could approximately be replaced if:
1. Pupils feel satisfied for their participation in the videoconference process;
2. There is a high quality multimedia educational material (presentations, SCORM lessons.);
3. The data transmission flow permits high quality video and communication between teacher and pupil.

6. Evaluating ASDL

The aim of the rest 9 questionnaire units is to check out if it is possible to apply systematically ASDL in a High School. Those 9 units concern briefly:
1. software installation,
2. system's ergonomics,
3. ASDL help,
4. presentation of the information,
5. terminology,
6. familiarization with ASDL,
7. information quality,
8. general estimation for the system, and
9. particular information from the user.

Afterwards we mention some interesting elements from the data analysis of the sixth unit. From the following graph, it is obvious that the pupils' familiarization with the system was from moderate to difficult, 53%. The prevailing opinion was that the learning procedure concerning ASDL was quite complicated for the pupils. Moreover pupils used such a system for the first time.

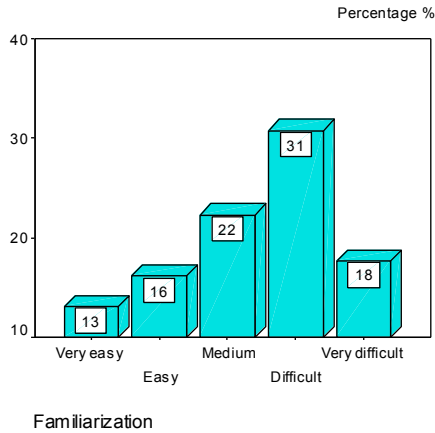## User familiarization with ASDL

Figure 3. User familiarization with ASDL

Combining user familiarization with the required time for that, we took some useful information (Figure 3). That is, the highest percentage of pupils estimate that the required time is bearable with tendency to become enough. Taking into consideration that we are addressed to pupils of 12 to 15 years old, the significance of time is different from an adult (for teenagers, time rolls very slowly) (Figure 4).

Figure 4. Time required for familiarization

The publication of notes and presentations for the course helped considerably pupils in case of absence (Figure 5). Generally, their opinion for the announcements and the presentations was positive. We can easily understand that pupils preferred presentations of the courses to the teacher's announcements in case of absence.
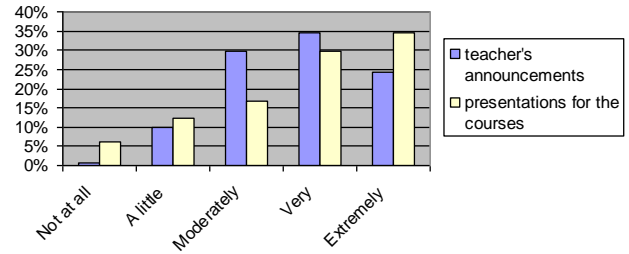

Figure 5. In case of absence

The fact that pupils find a motive to study more is not only proved by the above diagram but also from the grades they achieved. This fact was observed by us during the teaching process and was confirmed by the pupils through the questionnaire. 90,8% of pupils were prompted at least little to study (Figure 6). An important percentage of pupils, get satisfaction using ASDL.
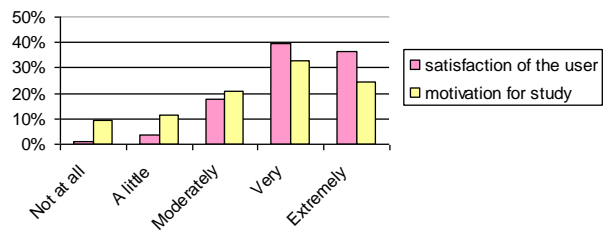

Figure 6. Motivation for study

In the answered question regarding the general view about ASDL, we observe that 83,7% of the pupils consider that it is a good or very good platform.

Finally, taking into account the fact that for more than a year ASDL supports only two courses of secondary education and the fact that most of pupils are connected several times a week at least for the ASDL, we concluded that the system has high acceptance from pupils.

7. Conclusion and Future Work

After the data analysis of the questionnaire and the experience we obtained through the teaching process we came to the following conclusions. The adopted method of using questionnaires integrated in an explicative "story" seems to have positive results as this kind of questionnaire renders the procedure of answering more valid.

At the moment, the asynchronous distance learning can take place without important infrastructure limits as approximately four out of five pupils could meet asynchronous communication requirements.

On the other hand, taking into consideration the fact that one out of three pupils use broadband connection at home, we can estimate that there are perspectives for more systematic use of synchronous distance learning in the future.

Regarding ASDL's ease of use, we faced some obstacles depending on the user's familiarization and the required time to learn the system. We should mark again the fact that ASDL is addressed to students and that pupils are called to use it for the first time. Despite familiarization gaps, pupils responded positively at the question regarding the use of ASDL for other courses as well.

The fact that ASDL was designed primarily for use by students at university level does not constitute in an environment that satisfies the educational needs of pupils of secondary education. Taking this fact into consideration we intend to redesign the interface of the ASDL using elements that are familiar to pupils.

Furthermore, from our experience we observed that ASDL has been an important helper in the educational process, especially for the pupils with learning difficulties (e.g. dyslexia, hyper kinesis, and distraction). In future we aim to research in what extend a learning environment such as ASDL helps these pupils to ameliorate the performance at school.

Concluding, a completed ICT project for the educational process can lead to positive results only by establishing and "articulating" its potentials, pupils and teachers, by creating organizational practices.

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