Asynchronous Tele-education and Computer-Enhanced Learning Services in the Greek School Network

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Abstract. The Greek School Network (GSN) has developed and put into production a number of e-learning services, including synchronous and asynchronous tele-education, electronic class management, blogs, video-on-demand, podcasts and multimedia libraries. These new services complement established and accepted e-learning services, such as teleconferencing, user wikis, forums, email, electronic publishing, and e-magazines. This report presents the most prominent digital e-learning services offered by GSN, with emphasis on the asynchronous tele-education service, which is presented in detail. Its implementation platform, the Moodle course management system, is compared against well-known asynchronous open source tele-education platforms such as COSE, Claroline, Fle3, ILIAS, Manhattan, KEWL, Comentor, e-Class and Eledge. The evaluation of the asynchronous tele-education platforms is based on detailed comparisons of their characteristics and of the methodology they adopt in order to deliver educational services. The comparison is based on evaluation criteria derived from the documented experiences of research institutes and educational bodies and also from the experience of GSN itself. The paper concludes with the presentation of an extension to Moodle for implementing communities of practice (CoPs) that facilitate the creation and delivery of electronic educational open content for teachers in a synergetic manner.

Keywords: Asynchronous tele-education, school network, e-learning platforms, comparison.

1 Introduction

The Greek School Network (GSN) [1] is the educational intranet of the Ministry of Education (MOE) [2], interconnecting and providing basic and advanced telematic services to all schools in Greece and [1]. The implementation of GSN is funded by the Operational Programme for the Information Society [3] in a close cooperation schema between MOE and 12 Research Centers and Highest Education Institutes [1], specialized in internet technologies and education. The GSN project was initiated to address the primary and secondary education institutions' requirements for innovative educational methods, access to digital content and collaboration between geographically distributed users' groups. GSN spans across all 51 Greek prefectures, and is the

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second largest nationwide network. Currently GSN connects almost all first and secondary education units, serving more than 67.000 teachers. GSN has received international best practice awards [4] in 2004 and 2003. Among other strategic goals, GSN aims to grow in the direction of broadband technologies and interactive web-based telematic services based on open technologies [5]. The strategic priorities set are based on international best practice, the current national telecom environment and the MOE's directions in terms of equipment, services and growth goals.

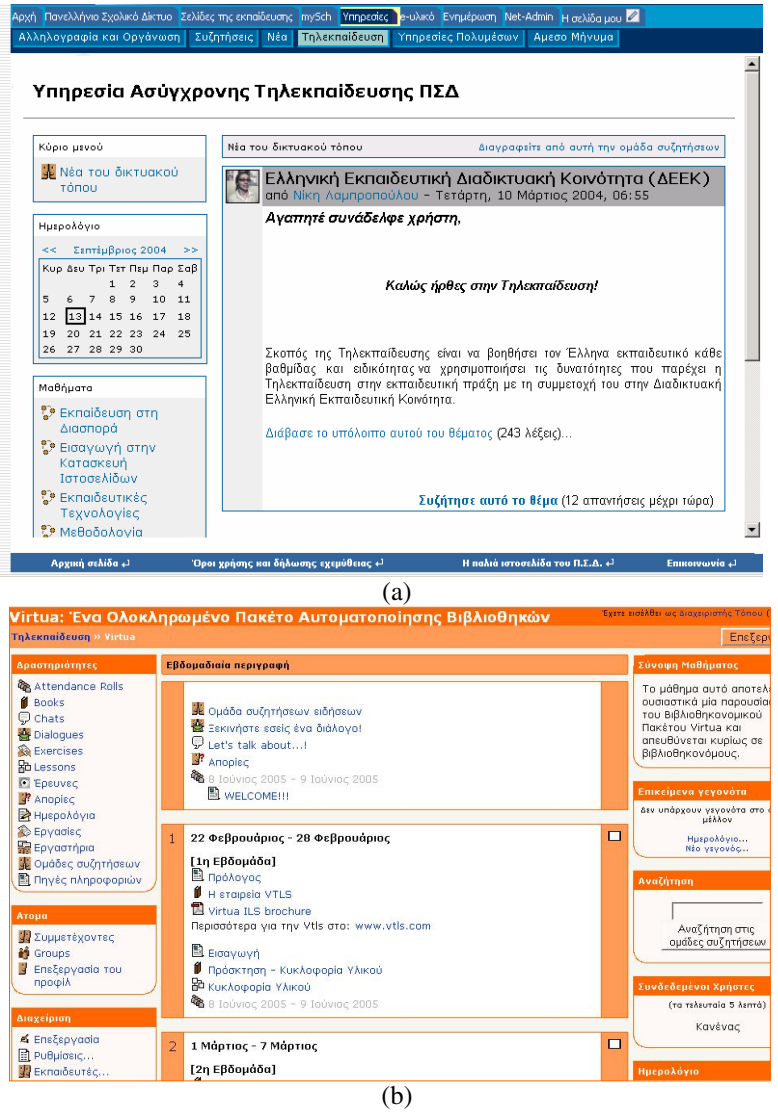
2 The e-Learning Service

The e-learning service, or asynchronous tele-education [6], is offered through the GSN portal [1] and is currently a production service, following a successful pilot operation. The service is based on the Moodle [7] open source learning management system (LMS) for course management in order to implement role-based, spatially and temporally independent educational procedures.

The e-learning service was built in order to aid the introduction of modern educational methods to the national educational system. Moodle is based on social constructionism pedagogy [8] that supports the position that knowledge is actively constructed by students and that knowledge acquisition is an adaptive process involving interaction with and feedback from the experienced world. Moodle is suitable for many educational methods such as self-paced, group and social learning and it does not necessitate a constructivist teaching approach. It is currently one of the most successful course management systems (CMS) and there are numerous reports of successful installations in production systems [9] [10]. It has been the subject of thorough evaluation [11] [12] and comparisons [13], and has received considerable attention from the open source community since it is increasingly being used, extended, and included in integration initiatives [7].

GSN exposes the e-learning service through the GSN portal and the GSN students portal [14]. Users can thus use the service in the same way they use other GSN services, via the web interface. The service was initially introduced to schools, teachers and students in pilot operation so that users familiarize themselves with it. The result of the pilot operation has been a mature, established deployment that covers the production requirements for the service.

GSN e-learning currently involves 84 courses organized under 9 course categories, including the e-learning familiarization category that contains 4 courses, the information technology category that contains 22 courses, the GSN services category that contains 8 courses, the education category that contains 13 courses, and the new courses category that currently contains 21 courses. In addition to the latter, administrative categories serve the purposes of administrative course management practice. According to statistics provided by the service platform at the time the present text was written, the most participatory course during the last 2 months was the 2nd grade course titled: "Application development in a programming environment" [15]. The course has received 34 messages until now and has been accessed 22 times, giving a participation ratio of 1.55. During the same period the most active user had an activity index of 1841, while the five most active users averaged 621. Table 1 summarizes statistics about the e-learning pilot service. The interface of the service is presented in figure 1.



(a)

(b)

Fig. 1. The e-Learning service as offered via (a) the GSN portal and (b) the GSN students portal

The e-learning service has been created by integrating Moodle with the platforms used for GSN services. Moodle has been integrated with the GSN directory service and has been customized so as to receive configuration parameters that are stored in the directory profiles of users. The directory server is highly available, supporting all GSN users on a 24x7 basis. Since it is optimized for read access, it was chosen to store the GSN user profiles for the e-learning service. Whenever users log in the

Table 1. E-learning statistics

Category	Sub Category	Service
General	Course categories	9
	Number of courses	84
	Number of users	5.365
	Number of teachers	100
	Users registered in courses	2.750
Information sources	Web pages and catalogs	801
	Books	45
Activities	Forums	185
	Messages	1.365
	Chats	34
	Quiz's	51
	Users that sat in for the quiz	160
	Total quiz requests	473
	Assignments	89
	Submitted assignments	153
	Lessons	24
	Glossaries	27
	Glossaries entries	207
	Wikis	14
	Wiki pages	76

e-learning service, their personal settings are read from the directory server and are directed to the e-learning tool. Thus, the service is personalized and users adapt it to their needs or preferences by changing their GSN profile settings through a web application built for this purpose. The e-learning service supports a bilingual, Greek and English, interface.

The GSN e-learning platform supports various user types, such as administrators, lesson creators / teachers, students and guests. Administrators are responsible for the management and the operation of the services. They fine tune global settings such as default profiles, languages and themes, they set up user accounts and assign permissions and roles using the Moodle platform roles and permissions system. Lesson creators and teachers can create courses, manage course material and manage the ways material is presented to students. The latter are the prime participants in courses and can be involved in all types of course activities, including material acquisition, communication via forums, quizzes, exams, etc.

The GSN services development team actively participates in the open source Moodle community [7]. GSN has developed new tools and features, and has contributed code that complements existent course management functionality. GSN has contributed to the calendar, educational profiles, course wizard, wonders and quizzes modules. All the modules have been made available to the Moodle project. Most of them have been contributed since version 1.3 of the platform. All modules are accompanied with documentation and manuals in English and Greek. The calendar module allows the programming and the viewing of events, providing the ability to filter special events for every user, course, or group of students. The activity module can

automatically create such events for teachers or students. The course wizard is a tool that creates new courses or alters parameters of existing courses. Teachers can use the course wizard or the mainstream course creation procedure of the platform that provides a detailed but also more cumbersome way to construct and manage courses. The Wonders module is a course activity module that allows a dialog question-answer process among teachers and students. The information exchanged is injected in the platform's knowledge base allowing the automatic response to questions, if they are similar to past ones, without any participation from the teacher. The quiz module allows the categorization of questions based on their level of difficulty and their presentation, allowing teachers to manage quizzes according to class needs and capabilities. The quiz module is available to the community of Moodle developers. The educational profile module manages information about students who are registered in lessons. GSN has contributed to the development of the module and has introduced additional information concerning student performance, participation and activity. In addition to the above modules, GSN has contributed to the development of the student activity, document management, personal messages, and email sending modules.

3 The e-Learning Platforms Comparison

There is an abundance of proprietary and open source platforms for asynchronous tele-education. The majority of the most successful systems are LMS web-based systems. This section compares the free open source systems (FOSS) for e-learning that were considered for the implementation of the GSN asynchronous tele-education service based on the richness of features they provide and the use cases they support. The comparison was based on work [16] conducted by the University of Macedonia, one GSN consortium members. The study focused on the following systems: COSE 2.0 [17], Claroline 1.3.1 [18], FLE 3 [19], ILIAS 2.3 [20], Manhattan 2.0.1 [21], KEWL, 1.1 [22] CoMentor 1.0 [23], Moodle 1.0 [7], e-Class 1.2 [24] and Eledge 1.8 [25].

3.1 Methodology

The comparison of the e-learning systems was based on evaluations conducted by organizations and tele-education evaluation bodies and on relevant literature. The comparison took into account sources such as reports, evaluations and publications from the Western Cooperative for Educational Telecommunications (WCET) [26], the Centre for Curriculum Transfer and Design (C2T2) [27], the EduTools [28] and EduTech [29] projects, the Joint Information Systems Committee [30], and the Centre for the Application of Information Technologies [31]. These sources contain references to a significant volume of criteria and corresponding material for the detailed description and evaluation for tele-education systems. For the purposes of the current study, a limited amount of comparison criteria has been selected. The criteria were chosen to be adequate for the description of systems that are capable to support the basic principles of the educational procedure, to reproduce the class environment, to be installed in school environments and to be easily usable by all school users.

The evaluation criteria were categorized in terms of technical specifications, teacher convenience tools and features, student convenience tools and features,

communication tools, system administration/management features, and other criteria. Criteria that fall in the technical specifications category attempt to evaluate the infrastructure configurations required to setup and operate the LMS. The prime interest is the compatibility with the mostly used server platforms and the exposed interface. Criteria that fall in the teacher convenience category evaluate the quantity and the quality of tools provided by the LMS to enable teachers design, manage and conduct courses efficiently and effectively. Student convenience criteria evaluate the services offered to students within the context of courses. This category of criteria aims to be descriptive of the student-initialed interaction, active involvement, organization and self-assessment. The communication criteria category groups together the LMS evaluation criteria that characterize the communication among teachers and students, such as synchronous communication, messaging and all the tools and features that contribute to the educational practice. The administration/management criteria group evaluates the LMS against administration complexity and security factors. Evaluation criteria that do not fall into any of the above categories are included in the category "other".

3.2 Results

All the systems compared are web based LMS and, with the exception of KEWL, which is specifically designed for windows server platforms, they support all types of operating systems, including windows and Unix/Linux. The Claroline, KEWL, e-Class, ILIAS, Moodle, Eledge platforms require database backends. All the complementary requirements can be covered by open-source packages.

None of the evaluated platform requires teacher users to be specialized in the use of IT or computers in order to operate them, with the exception of Elegde that requires knowledge of the html language. All the platforms come with detailed user guides and course design is supported in all platforms. Teachers are generally autonomous in managing content, except for the case of Comentor, where teachers need to engage administrators even for operations on courses they teach. Synergetic teaching, the support of teacher assistants, is supported by all systems except Moodle, KEWL and Eledge. Student groups and subgroups are supported by all systems but Eledge, which scores the lowest in teacher convenience tools and features. The COSE and ILIAS are the only platforms that support subgroup types with respect to the type of users that are grouped and the aim of the group. Content sending to groups is also supported by all systems but Moodle and Eledge. Except for the cases of Comentor and Fle, multiple choice tests are supported. All platforms but Comentor, Fle3 ad Manhattan support tests and automated grading; however, only half of them support automatic grading book as a means for student performance monitoring (Moodle, ILIAS, KEWL, Claroline, Eledge). Only Moodle, Cose and KEWL allow teachers to send personalized instructions to a single student. KEWL, eClass and Elegde are the only systems that do not support a participation monitoring functionality.

As far as student tools are concerned, none of the e-learning platforms maintains a database populated with student questions. Personal student folders are supported by ILIAS, KEWL, COSE, Fle and Elegde. COSE provides a full set of personal folder management. On the contrary COSE, Claronline, Manhattan and e-Class do not support student personal web pages. KEWL, COSE, ILIAS and Fle also support a full

organization suite for course organization that includes thesaurus, agenda, content search, user search, notepad, bookmarks. Along with Comentor they support the creation of groups of students without teacher interference and the detailed monitoring of user actions. Student profile is kept and managed by all systems but Cose, Claroline, Manhattan and eClass. Claroline, Manhattan and eClass also do not support personal notes, a feature supported by the rest of the tools. Only ILIAS supports printing services, and along with Comentor and Manhattan anonymous users. ILIAS, Cose and Eledge are the only platforms that support performance monitor and ILIAS, Manhattan are the only that offer reminder services. All systems but Comentor, Fle3 and eClass offer students web access to grades and all but Comentor, Fle3 and Claroline offer self-assessment functionality.

All systems include communication tools for information exchange between users. However, ILIAS, KEWL, COSE, Comentor and Manhattan embody autonomous e-mail engines, while the rest of the systems use standard external solutions for e-mail. All of them support file sharing and disussion. Forums are also supported by all but ILIAS, Fle3, Claroline, eClass and Elegde. Moodle, KEWL, COSE, Comentor and Manhattan support chat, while KEWL and Comentor supports whiteboard. All systems but Fle3, Manhattan and Eledge support announcements. Messaging is supported by ILIAS, KEWL, COSW and Comentor.

Manhattan is the system that offers the richest administrative options. It supports login notifications and a full-featured user and system monitoring system that can even be used for helpdesk application. Similar features are provided by Moodle, ILIAS, COSE, Fle3 and e-Class. All systems offer complete permissions systems and at least basic authentication. All but ILIAS, Comentor, Elegde offer security at the level of content. All but Moodle, eClass and Elegde offer content management system functionality. Six of the platforms, namely Moodle, ILIAS, KEWl, Fle3, Claroline and Manhattan, are multilingual. None of the systems offers a remote management functionality.

All systems, except for Eledge and Comentor, support multimedia content and applications. All systems, except for Elegde, provide satisfactory internationalization documentation as well as user manuals, tutorials and demos. Multilingual interface is supported by Moodle, ILIAS, KEWL, Fle3 and Claroline. ILIAS, KEWL and COSE provide useful tools for working offline. ILIAS and COSE allow standardized content metadata editing. KEWL and COSE also support the lesson cd-roms.

4 Conclusions and Future Work

We presented the GSN e-learning service and provided a comparison of various LMS systems that were considered for the implementation of the corresponding platform. Selecting an LMS requires the consideration of specific criteria according to needs. GSN has employed Moodle to build the national school network asynchronous tele-education service, even if it did not rank first in the evaluation. Moodle is modular and was easily customized in the case of GSN e-learning. It is also supported by a very dynamic community in which GSN is an active contributor [5]. In the future, GSN plans to extend Moodle to support communities of practice (CoP) [32] [33] for secondary education teachers. The prospective features include metadata indexing,

third party content and content feedback. The indexing module and interfaces will be used for inserting and retrieving useful metadata of the CoP content. Metadata will be indexed in a database so that users enjoy optimized search functionality. The content feedback module will allow peer teachers and learners to provide feedback on the content itself and share experience obtained in class or through their individual interaction with the content.

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