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VidyaOnline: Design and Development of a FOSS based Virtual Learning Environment on Library and Information Science at Vidyasagar University, West Bengal

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Abstract

VidyaOnline, the prototype web-based modular and interactive learning system, is aimed to produce a Virtual Learning Environment (VLE) for library and information science courses. In its final contour, VidyaOnline will be acted as a generic e learning platform for courses offered by the Directorate of Distance Education (DDE), Vidyasagar University. As we know, learning system that supports VLE features (as prescribed by INSPIRAL project), is not restricted to distance education alone, VidyaOnline will have all the facilities to support off-campus learning and evaluation activities related to traditional courses of Vidyasagar University. In short, VidyaOnline will be emerging as a web integrated hybrid e learning system for library and information science courses as well as for other distance and traditional courses of Vidyasagar University. The structure of VidyaOnline extends support for all three forms of VLE – web-based training, supported online learning and informal e learning. The software architecture of VidyaOnline is completely based on FOSS (Free and Open Source Software). It uses LAMP (Linux-Apache-MySQL-PHP) architecture, Moodle course management system and GD graphics library to design and develop an interactive web-integrated e learning platform to accommodate library and information science courses along with other distance education programmes of DDE, Vidyasagar University. VidyaOnline is completely compatible with Unicode and one courseware is available in Unicode-based Bengali language interface.

1. Introduction

E learning is becoming an integral part of higher education today. It is a force, which has some kind of presence on almost every campus in developed countries. An increasing number of university courses are now available as hybrid courses in Virtual Learning Environment (VLE). VLEs are web-based toolkits that facilitate learning through the provision and integration of online teaching and learning materials and virtual communication tools (INSPIRAL, 2001). A brief comparison (as given in table 1) of virtual and traditional learning environment can help to perceive the basic features of VLE. VLE is a growing and dynamic environment in which education is changing culturally, institutionally and technically (Laurillard, 2002). The field of library and information science is presently passing through a phase of rapid changes. This situation demands an educational system of continuing or life-long learning for new technologies, methods and service procedures. Within this environment, the community of librarians in India is still searching for a full fledged, interactive and anywhere-anytime type education/training programme.

Virtual learning environment	Traditional learning environment
<ul style="list-style-type: none">• Learning materials and resources available within the system• Online assessment• User driven time and learning schedule• Discussion forum, chat room, video conference• Monitoring and tracking system	<ul style="list-style-type: none">• Resources available within a library or information centre unit• Examinations• Institute driven time and learning schedule• Classrooms• Registers, tutor records etc.

Table 1: Comparison of VLE and traditional learning environment

Distance learning is a planned environment; involving the use of technology, and its design should provide the learners with interaction. Distance education systems, which support interactivity between students and instructor, could generate a satisfactory learning environment. Once synonymous with distance learning, e learning has quickly evolved to include not only courses that are taught primarily online and over a distance, but also to include traditional *brick & mortar* courses that have been enhanced with electronic elements (Ryan, S., 2000). In fact, these hybrid courses now outnumber distance-learning courses in developed block of the world.

2. VLE and LIS Profession

The augmentation of traditional classroom activities with electronic learning objects along with the rise of the free and open source software based course management systems is changing the way faculty and students access, create and use learning objects, information and knowledge (FERL, 2005). It is providing new opportunities for libraries to design and to disseminate new services. Library schools should also investigate the use of VLE in imparting traditional classroom based courses as well focused and continuing education and/or training programmes for LIS professionals. In fact the relationship between VLE and LIS profession may be viewed from two angles – application of LIS services in virtual learning environment and use of VLE in design & delivery of traditional as well as focused courseware. OCLC in its white paper (McLean, 2003) prescribes following library supported services for a typical VLE:

- Consecutive display and integration of a variety of information windows as part of a learning activity
- Aggregation of access (discovery/exchange) to content in any given learning context
- Provision of bibliographic tools that permit easy searching and reference completions

- Access to tools that render and present content in user-customized formats
- Integration of plagiarism software into course management systems to encourage good practice and to assess reliability of content
- Integration of library resources in course management systems
- Customization of portal facilities for storing personal preferences
- Provision of easy access to virtual reference services at the point of need
- Facilities for embed training modules to assist in information seeking

However, this paper concentrates on the second aspect of the relationship between LIS field and VLE i.e., use of VLE in managing LIS courseware.

3. VidyaOnline: An Overview

Directorate of Distance Education (DDE) of Vidyasagar University was established in 1994 and started offering postgraduate courses in distance mode from the session 1994-1995. DDE has its own building, guesthouse, laboratories, computing facilities and other infrastructures. It is now offering a total of 16 courses (5 MA, 6 M.Sc and 5 Bridge courses). Students pursuing distance learning are provided with study materials in the form of modules on topics prescribed in the respective syllabus. DDE regularly organize Personal Contact Programme (PCP) for interaction of students with leading academic experts in the subjects. Vidyasagar University has recently installed a high-speed campus-wide ATM LAN (OFC based) and the university is now connected online through the help of UGC-Infonet programme with its own web server, mail server, ftp server and domain name (<http://www.vu.ernet.in>)

Keeping in view the above factors, we have already developed a prototype virtual learning system (named as VidyaOnline) for online teaching-learning of library and information science courseware along with a digitally interactive student management subsystem (online registration, online assignment submission, online MCQ test & result, online survey, chat, wiki, glossary, forum, exercise, lesson, workshop etc.) through the application of open source software (basically a combination of LAMP [Linux as

operating system; Apache as web server; MySQL as relational database management system; PHP as scripting language] architecture & open source course management software) and open standards. This VLE has two groups of aims – primary and secondary. The primary aim is to extend the prototype system (VidyaOnline) for providing courseware on library and information science in digital distance education mode and the secondary aim is to convert the prototype system into a generic platform to deliver all the courses offered by DDE, Vidyasagar University. This web-based e learning system will help in

- Finding different methods of accessing the learning objects
- Establishing interactive student management subsystem
- Producing stronger learning environments, since multiple media can be combined
- Increasing student retention rates
- Creating an independent study environment
- Providing instant access to information
- Facilitating life long learning for LIS professionals
- Ensuring a less hostile learning environment
- Improving record keeping and reducing costs

The major objective of VidyaOnline is to design and develop a distributed e learning system for the Directorate of Distance Education, Vidyasagar University which will provide: -

- An interactive distributed (web based) e learning system for courseware in library and information science [to start with we introduced two focused courseware – MARC 21 Bibliographic Format (4 weeks skill development course) and a 10 week programme on KOHA (the first open source web integrated 4th generation library management software)]
- A generic VLE to mount and deliver over web all the courseware presently offered by DDE, Vidyasagar University and to be offered in future course of time

- A support system for the traditional class room based courses in library and information science

- An integrated learning environment to include
 - o Structured learning programmes
 - o Learning objects and information resources
 - o Communication tools
 - o Assessment tools
 - o Personal management tools
 - o E tutor tools
 - o System administrative tools

4. Methodology of Developing VidyaOnline

The methodology for the development of VidyaOnline, as a whole, is divided into three levels – system level, programme level and software level. In the system level, VidyaOnline adopted an internationally recognized model, the Salmon model. The programme level methodology is a five stage activities and software level methodology involves three basic steps – identification of Learning Management Software (LMSs), selection of LMS for VidyaOnline and implementation of LMS.

4.1 System level methodology

It includes development of a process for practical implication of five-stage model of e learning as proposed by Salmon (Salmon, 2000). The Salmon model includes following five stages –

- o Stage 1: Access and motivation
- o Stage 2: Online socialization
- o Stage 3: Information exchange
- o Stage 4: Knowledge construction
- o Stage 5: Development

4.2 Programme level methodology

The programme development process for the prototype VLE includes following five stages

- Need analysis: It involves
 - Analyzing current situation and gathering information
 - Identifying requirements
 - Specifying learning outcomes
 - Producing a programme outline

- Design: This involves considering
 - Aims and learning outcomes
 - Topics and the theme
 - Detailed learning and teaching strategy
 - Assessment strategy
 - Development of modules, content, exercises, activities and their logical links
 - Delivery mode of learning objects
 - Determining total learner hours and e-tutor hours

- Development: This involves taking the prototype programme and producing all the relevant documentation, learning resources, setting up the learning environment, establishing the necessary learning support systems, providing management and administrative support

- Delivery: In this step e-tutors are concerned with monitoring the virtual learning environment, learner & e-tutor activities and technical support system. In this step e-tutors will also monitor various tracking tools meant for various learner activities such as number of times logged into the system; number of messages read; number of messages posted and performance on assessment activities

- Evaluation: This step is concerned with evaluating the e learning programme to ensure that it meets its stated aims and learning outcomes, and also the changing needs of library and information services. This step will focus on three issues – learning & its impact on learners; the learning environment & learning materials and the learning process

4.3 Software level methodology

This level involves task of searching a suitable LMS for implementing system level and programme level activities in VidyaOnline. The selection process is based on three general guidelines – the LMS must be open source software, the LMS should be platform independent, and the LMS should have strong user base (WebCT, 2002). On the basis of the above-stated criteria a total of 10 open source software have been identified initially. These are as follows (listed alphabetically): -

4.3.1 ATutor

ATutor is an open source web-based Learning Content Management System (LCMS). It is designed with accessibility and adaptability in mind. System administrators can install or update it easily and educators or e-tutors can quickly assemble, package, and redistribute instructional content, or conduct courses online. It is the first Open Source LCMS to adopt the IMS Content Packaging specifications.

4.3.2 The Connexions Project –Education for a Networked World

Connexions is a collaborative, community-driven approach to authoring, teaching, and learning that conveys the dynamic continuum of knowledge. Connexions features a synergistic mix of both software and content, and this integrated solution involves community development, modularization, XML markup, editorial lenses, and intellectual property cater directly to the wants and needs of the academic community. A global community of authors, using special authoring tools, continually converts “raw knowledge” into small, self-contained modules of information and places them in a repository, or *content commons*, to be used, re-used, updated, and adapted. Instructors can use a course composer software tool to weave modules into

customized courses that can be placed on the web, presented in class, or printed as paper text. Students and other learners access web courses or individual modules directly using special visualization and navigational tools designed to highlight the non-linear “Connexions” among concepts both within the same course, but more importantly, across courses and disciplines. The system currently hosts over 1,000 modules in the *content commons* and is used as the primary text for eight courses.

4.3.3 Coursework, Stanford University

CourseWork is an open source course management system based at Stanford University. Using CourseWork, instructors and e-tutors can set up a course site that displays announcements, on-line readings, a dynamic syllabus and schedule, on-line assignments and quizzes, a discussion forum for students, and other teaching-learning tools. CourseWork is designed both for faculty with little web experience, and for expert web-users, who can use it to organize complex VLE tasks.

4.3.4 dotLRN

dotLRN is a fully open source e learning platform and freely available to all under the GNU General Public License. Just as users rely on the "Office" suite of applications (word processing, spreadsheet, database, presentation, email) for basic productivity, dotLRN contains an integrated suite of applications to support distributed collaborative communities engaged in learning and research. It is a scalable, secure, and enterprise-ready e learning platform that can be deployed readily by small and large organizations. By its very nature, an e learning platform cannot be a stand-alone application. dotLRN can deliver “vertical integration” into the enterprise infrastructure through well established open standards and published APIs.

4.3.5 ILIAS

VIRTUS project of the Faculty of Economics, Business Administration and Social Sciences at the University of Cologne has developed ILIAS web-based training platform as open source software under the terms of the GNU-GPL. The current version of ILIAS offers the following features: Personal desktop for each user, Communication features like news system

and discussion forums, Group system for collaborative work and organizing members and resources, Integrated authoring environment (Editor) to create courses without HTML, Support of metadata for all levels of learning objects, Context-sensitive help system for learners and authors etc.

4.3.6 MIT OpenCourseWare (OCW)

The idea behind MIT OpenCourseWare (MIT OCW) is to make MIT course materials that are used in the teaching of almost all undergraduate and graduate subjects available on the web, free of charge, to any user anywhere in the world. The purpose of MIT OCW is to serve as a model for university dissemination of knowledge in the Internet age.

4.3.7 Moodle - an open source learning management system

Moodle is a free, open source PHP application for producing Internet-based educational courses and Web sites on any major platform (Linux, Unix, Windows and Mac OS X). Courses are easily built up using modules such as forums, chats, journals, quizzes, surveys, assignments, workshops, resources, choices and more. Moodle supports localisation, and has so far been translated into 34 languages. Moodle has been designed to support modern pedagogies based on social constructionism ([Dougiamas, 2004](#)), and focuses on providing an environment to support collaboration, connected knowing and a meaningful exchange of ideas.

4.3.8 Open LMS Foundation

The OpenLMS Foundation is a membership-based, non-profit corporation. Its mission is to provide scientific and educational support for open source Learning Management Systems (LMS) software projects. The foundation provides technical, legal, and financial support to its members. OpenLMS is an open source learning management system (LMS) to be constructed as an N-tier application using Java 2 Enterprise Edition (J2EE) and Enterprise JavaBeans (EJB). The LMS will be conformant with the current ADL SCORM specification.

4.3.9 Open Source Software for Universities and Faculties (Open Source University Support System - OpenUSS)

OpenUSS is a J2EE- and GPL-based e learning platform. OpenUSS is an infrastructure software for every organizations, which have a need to build an e learning platform: - universities, - schools, - training companies and - other companies, which offer direct training to their workers. It uses Apache as web server, JBoss and JOnAS for EJB server, Tomcat for servlet server.

4.3.10 Stud.IP - course management tool for universities

Stud.IP offers a "minimal standard" for presence teaching or blended learning as "open source" software. Stud.IP offers a quick and uncomplicated introduction to the world of e learning. For every course offered at an institute, a range of tools is available. These include schedules, document folders, discussion forums, participant lists, literature and link lists, news tickers and much more. The aim is to support traditional courses with a multimedia approach. The second focus is at an administrative level, allowing the updating of current institute homepages via the Internet, the administration of resources such as rooms and technical equipment, printouts of course commentary or administering appointments with the integrated Personal Information Manager (PIM).

The section 4.3 contains a very brief representative description of ten LMSs selected primarily on the basis of ratings of UNESCO (Dauphin, 2005). After a threadbare analysis of all these open source LMSs, Moodle (Modular Object-Oriented Dynamic Learning Environment) has been selected on the basis of following reasons:

- Moodle's modular design makes it easy to create new courses, adding content that will engage learners
- Course content in Moodle can be re-used with different learners, including content from other vendors (Blackboard, WebCT etc.)
- Enrolments and learner authentication is simple yet secure
- Facilitates active support community to help solve problems and generate new ideas
- Moodle designed with "social constructionist" principles in mind

- Moodle has a “modular” design so adding the activities that form a course is a simple process
- Supported by a group of course management tools such as assignment, chat, discussion forum, glossary, journal, label, lesson, quiz, survey, workshop etc.
- Moodle allows learners to create a personal profile that can include a picture, helping connect students socially in the online learning community
- Moodle allows the course instructor to easily create group categories, and determine how members will interact with each other and within various activities
- Moodle helps in maintaining a calendar of events, which is important to both the learner and course instructor
- Upcoming events appear on the course homepage, alerting the learner across all courses they are enrolled in of different category events
- Administration control panel puts all important learner management functions in a single easy-to-manage interface
- Teachers and students can be manually enrolled or removed from a course
- Configuration of course Backup and Restore is achieved on a single screen.
- Instructors may define custom scales to be used for grading forums, assignments and journals
- Standard scales include assigning a value from 1-100% for each submission
- Viewing assignment and journal submissions, and adding grades and comments, are done from a single page that displays all enrolled students
- Moodle's logs provide detailed learner activity
- Moodle provides extensive help and includes a teacher only forum, where colleagues can collaborate on tasks and share ideas
- Learners can login *any time, anywhere* to interact with coursework, and can specify the time zone and language they wish to use
- Moodle has interface support for 34 languages

- Moodle has a strong user base (Over 1150 organizations in 81 countries had registered Moodle sites by April 2004 (<http://moodle.org/sites>). This number is growing by about 10% each month as educators and trainers learn the value of implementing open source Moodle)
- Moodle is supported by hundreds of knowledgeable Moodle developers in a community of learners

5. Features of VidyaOnline

VidyaOnline is based on open source framework. The software architecture is basically a combination of LAMP system, Moodle courseware management and GD graphics library. This architecture supports the prototype E learning system through three basic modules – system administration subsystem, e-tutor subsystem and learner management subsystem. Each module has distinct activities, which are as follows: -

- System administration module performs following super user jobs - creation of categories and courses, setting of discussion forums as question-answering space; forum for e-tutors to exchange information/opinion between teachers; selection of themes and language of the site; installation of modules and blocks for individual courses; backup and restoration at the point of failure; enrollment of e-tutors and learners; monitoring of e-tutors and students logs; password authentication of students and e-tutors to access courseware etc.
- E-tutor tools support - uploading learning objects, web pages, web links, reading lists for individual courses by the assigned e tutors; adding various learner activities in each course such as assignment, quiz, survey, exercise, glossary, forum, lesson, workshop etc.; monitoring of students logs; formulation of performance measurement scales; determination of students grade etc.
- Learner management subsystem helps in performance evaluation, online survey of learners view and preparation of calendar of events. It provides - online help, list of upcoming events & recent activities related

to an individual course, facilities to update student profiles, searching facilities for entire site etc.

It is now clear that VidyaOnline has three basic subsystems – learner interface module, e-tutor module and system administration area. It supports all the virtual communication tools required by e-learners and e-tutors in VLE. The major facilities available in three subsystems of VidyaOnline may be tabulated (Table 1) as:

Learners module	E-tutor module	System administration
Remote registration through e-mail	Uploading of resources such as courseware, links	Site configuration and management
List of mounted courses	Addition of activities	Course structuring
Calendar of events	Preparation of scales	Student enrollment
Forum for news and communication	Preparation of student activity report	Assignment of e-tutors for different courses
List of recent activities	Setting of course structure	Backup and restoration
Online assignment submission	Teachers forum for communication of e-tutors	Selection course structure, themes etc.
Upcoming events	Addition of blocks	Language setting
Modular learning objects, reading materials, links and tutorials	Facilities for system level tasks e.g. HTML editing, backup and restoration	Management of site design and integration with other software

Learners module	E-tutor module	System administration
Online evaluation of performance in each module	Preparation of calendar of events, new events, topic and student surveys	Setting of modules and blocks of each course mounted in the system
Instant result and gradation	Uploading of files to the system for students	Management of cron jobs and user logs
Report of recent activities	Editing facilities	Enrollment of new user
Access to library OPAC	Log on record for students	Deletion & modification

Table 2: Facilities in Subsystems of VidyaOnline

6. Courseware on KOHA in VidyaOnline

VidyaOnline launched with two-focused courseware of which Koha requires special mention. The courseware on Koha includes a variety of learning objects such as text, animation and a complete video tutorial on different aspects of Koha. Video tutorial is a combination of screen capture video and commentary. The entire video tutorial on Koha was produced locally by using open source windows based software. The video files created by RenderSoft CamStudio (an open source screen capture software) were saved in the standard AVI (Audio Video Interleave) format (AVI format is used pervasively in many Windows applications that support video, including MS Office). Finally, AVI files were uploaded on Moodle and organized under various topics and subtopics for easy access and navigation. The main interface of VidyaOnline is given as Figure 1.

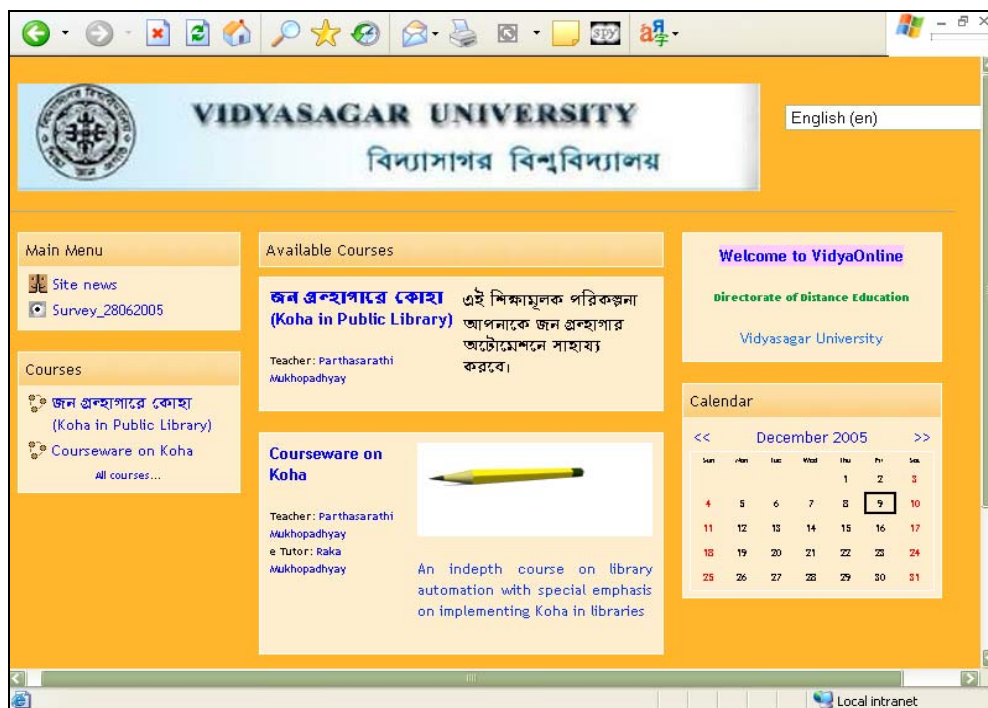


Fig 1: Main Interface of VidyaOnline

In web environment AVI files are not suitable format because of their large file size, particularly in India because of the bandwidth problem. In view of this fact video files were again converted to SWF format by using one utility programme of CamStudio. However, many AVI to SWF converters are available as freeware or shareware. This way large AVI formatted files (typically 49-60 MB) were converted into small size (typically 400 KB to 1.5 MB) SWF files for delivery over the web. Figure 2 shows the outline and few modules of Koha courseware. The courseware on Koha contains a total of 12 modules, which is again divided into sections and subsections. Each section/subsection contains a video tutorial along with textual learning objects. Each module/section/subsection is also supported by quiz and assignments. For example the 10th module is related to report generation activities of Koha and it contains two textual learning objects and one video tutorial. The video tutorial shows step-by-step report generation procedures in Koha (see Figure 3).



Fig 2: Koha Courseware in Moodle

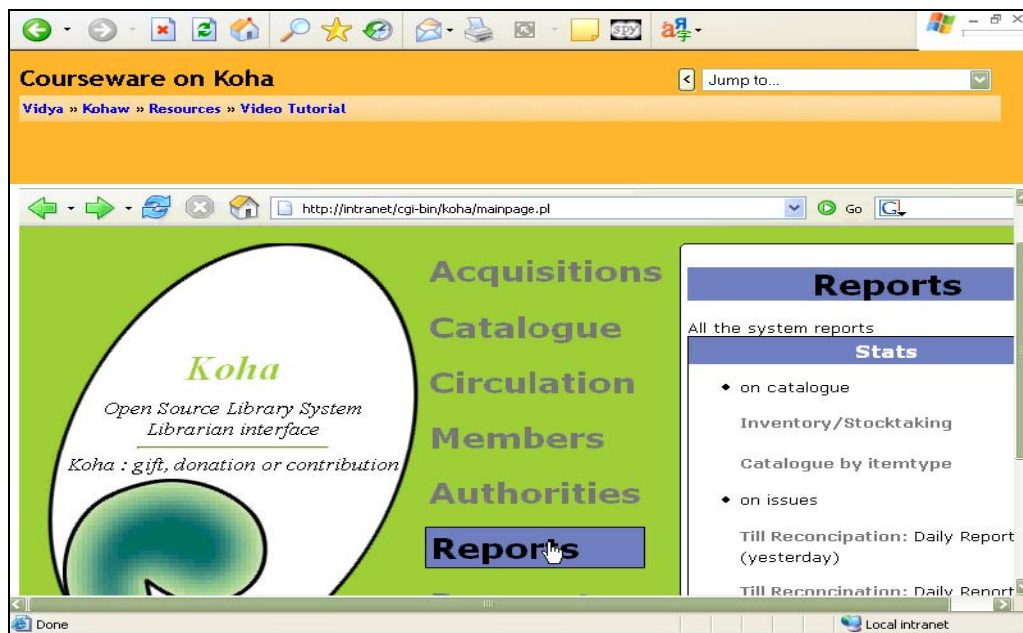


Fig 3: Video tutorial on Koha in Moodle

A Bengali language based courseware on Koha is being developed for VidyaOnline in view of the tremendous possibility of application of Koha in automating public libraries of West Bengal. Few screen snapshots are given on these enduring activities of VidyaOnline. For example, figure 4 shows the same 10th module of Koha courseware in Bengali language and figure 5 presents the quiz assignment on Koha report generation activities in Bengali language.

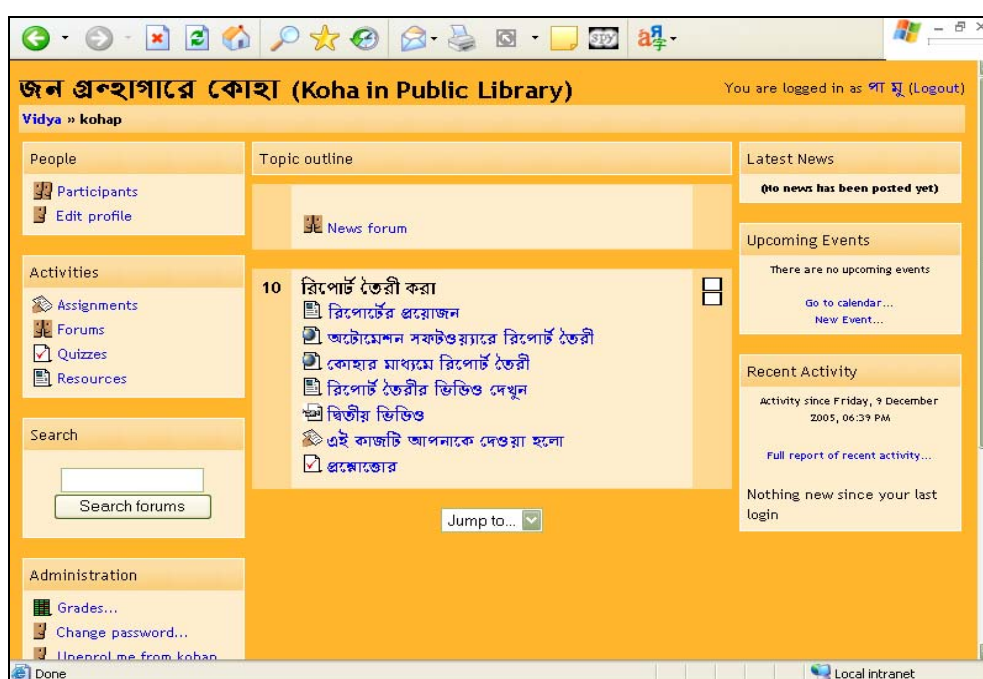


Fig 4: Courseware in Bengali

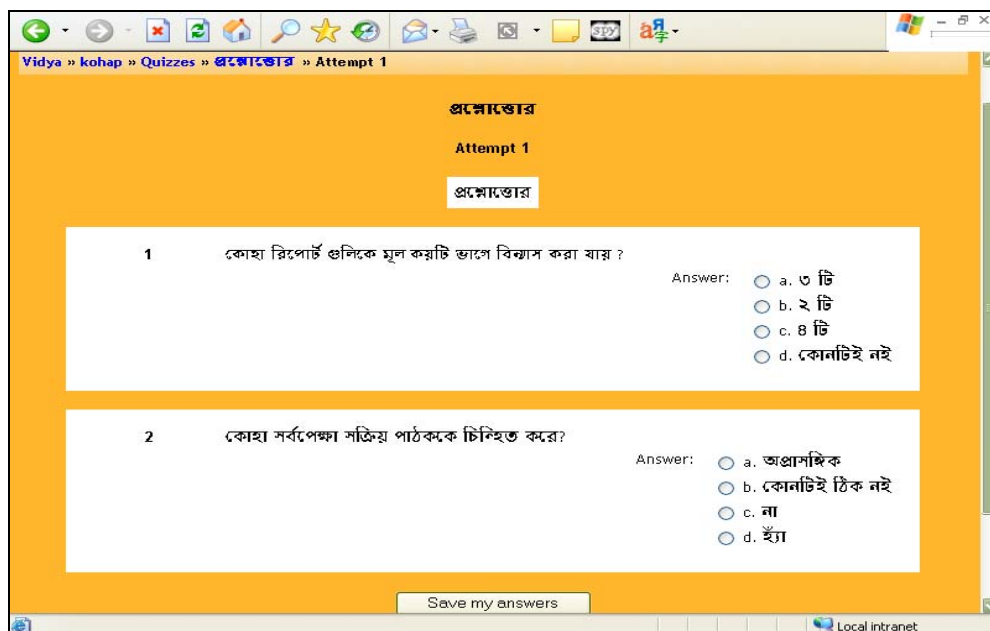


Fig 5: Quiz in Bengali

7. Conclusion

The term e learning no longer applies only to distance education, but also to traditional courses that have incorporated electronic elements into the day-to-day teaching and learning process. In fact, these hybrid courses (a combination of traditional distance and e learning education system) now outnumbered distance-learning courses in developed countries. According to ECAR summary report (Evolving Campus Support Models for E Learning Courses, March 2005, p.2), 70% of all U.S. institutions offer distance learning and 80% of U.S. institutions offer hybrid courses. Course management systems (software applications that manages a course's electronic elements and interactive facilities) have also enjoyed an analogous growth. The current international activities in the development of e learning systems may be grouped as follows: -

- Development of Virtual Learning Environment (VLE): VLEs are web-based toolkits that facilitate learning through the provision and

integration of online teaching and learning materials and tools. These materials and tools usually consist of most or all of the following facilities: facilities for electronic communications such as discussion lists, bulletin boards and chat rooms, facilities for collaborative group learning, online learning objects; links to remote resources; course timetables and reading lists; online assessment tools; and an administrative area, including a log-in access function (Currier, 2001).

- Development of Managed Learning Environment (MLE): MLEs include all the functions of a VLE, while integrating other information systems and process of the institutions, such as student databases, library OPAC, institutional repositories etc.
- Application of Open Standards and Open Source Software in VLE and MLE: IMS is a global consortium that develops open specifications to support the delivery of e learning through Learning Management Systems (LMS). Similarly, course management systems are being developed by using LAMP open source framework and in adherence to open standards in terms of metadata schemas (e.g. IMS metadata specification for VLE) & harvesting protocols (e.g. OAI/PMH developed by Open Archive Initiative).

The VLE movement initiated lot of enthusiasm in Indian universities. For example, Department of Library and Information Science, IGNOU developed an e learning system for library and information science courses under NISSAT project, School of Educational Technology, Jadavpur University came with e learning system for multimedia education, Indian Institute of Technology, Kharagpur started web based life long learning (3L) programme from various nodal points etc. But none of the currently available e learning systems in India supports all the VLE requirements as prescribed by INSPIRAL project and these systems are generally platform specific software solution which do not follow open source architecture and open standards.

VidyaOnline, the prototype e learning system for DDE, Vidyasagar University will satisfy all the requirements of VLE, as proposed by

INSPIRAL project. It will ensure, in its final shape, a web-integrated e learning system for library and information science based on open source software and open standards. The software architecture of VidyaOnline will be quite accommodative to mount and deliver other courses of DDE, Vidyasagar University and thereby can be extended to act as a generic platform for distance, traditional and hybrid courses offered by Vidyasagar University.

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