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Integration of Software Components with Moodle Platform for Efficient Virtual Learning

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Abstract

Abstract—Online learning has become a common phenomenon nowadays but it does not seem to have reached an optimum or standard level. The components in which learners and instructors participate in on-line interactions of various kinds, including on-line learning, constitute Virtual Learning Environment (VLE). Most of the limitations in current VLE's are center around estimation, validation, Interoperability and collaboration of learning process. The principal components of a Virtual Learning Environment package include curriculum mapping, student tracking, online support for both teacher and student, electronic communication, and Internet links to outside curriculum resources. Learning Management System (LMS) is a software application used to plan, implement, and assess a specific learning process. The issues in any VLE are mainly concerned with collaborative study, evaluation, certification and skill set determination. To enhance the learning experience, this paper proposes integration of several learning components residing any type of file system using "Shareable Content Object Reference Model (SCORM)" in which API (Application Programming Interface) of Moodle is used to integrate with social blogging sites and other software components.

Keywords: *Virtual Learning Environment , Learning Management System, e-learning, Moodle, Shareable Content Object Reference Model, Application Programming Interface, Social Blogging.*

I. INTRODUCTION

Virtual Learning Environment has been the focus of much attention in recent years in higher education. It has opened up a whole new vista on our understanding of how virtual worlds may be used across a range of disciplines by shedding light on some of the deeper pedagogical issues relating to the use of virtual worlds. One area that has received little attention so far has been the effective use of virtual learning with existing web-based e-learning systems and the potential pedagogical benefits of blending the use of these technologies. A second emerging issue is the need to be able to share and reuse virtual learning materials and content. Sharing and reuse of virtual content that is linked to web-based materials present a challenge that has not been explicitly addressed to date.

The present work aims to provide a web-based effective virtual learning environment that supports learning and teaching in virtual worlds with the following features:

a) Using virtual learning environments for personalized learning in shared platform.
b) Effective web-based support for virtual learners
c) VLE integration to improve accessibility for collaborative learning activities
d) Integration of Web for virtual learning management support.
e) Providing a layer of structure to teaching and learning through the integration of platforms
f) Developing suitable materials and resources to enable successful third-party adoption and extension of the project's findings and outcomes.
g) Developing operation flow for the methodology.

January - February 2020
ISSN: 0193 - 4120 Page No. 2991 - 2996

h) Moodle plug-ins or extensions/ updates to improve support for personalization.

The present work will extend previous work of providing API done on VLE and provide an opportunity to capture the processes and procedures used by experienced virtual world educators to utilize web-based systems in a more effective way in supporting teaching and learning.

In this approach integration technique using Shareable Content Object Reference Model (SCORM) to implement the aggregation of various provisions that are mandatory to fulfill all the specification required for monitoring the learning experience and validating the skill set.

II. RELATED WORK

Presently available VLEs contain all the provisions that are required for interaction between learners and tutors but the integration of functions that are required for strategy designing for estimating learning potency of the learner and skill-set validation using different validating techniques are sorely lacking. Further, integration of other components for enhancing the learning experience could not happen in the absence of interoperability.

As far as the existing VLEs are concerned, many provisions that facilitate learning experience are dependent on individual vendors. Considering the status of monitoring the learning experience and validating the skill set of the learners, it becomes a complicated process while designing the VLE. Moreover it has the following disadvantages:

1) Analyzing and validating skill-sets.
2) Estimation of learning tendency.
3) Interoperability Issues.
4) Provision for collaborative study.

III. ENHANCEMENT ANALYSIS

For enhancing the existing system a new module that is specifically designed for integration of external functionalities with new features that are compatible with Moodle. To achieve this objective, open source frameworks and packages that support Shareable Content Object Reference Model and IMS Global Consortium standard are used. Developing VLE initiative is a much larger effort than that of an instructor-led training (ILT) program. Consider the increased expenses, number of people involved, development time, technological requirements, and delivery options. It is possible, even common, for an ILT program to be conducted without the knowledge of anyone but the participants, their immediate managers, and the training provider. By contrast, even the smallest e-learning program requires a wider group of people ranging from representatives from the IT and HR departments to an organization-wide task force.

IV. PROPOSED METHOD& RESULTS

In this approach, using SCORM and IMS GLOBAL CONSORTIUM standards provide several unique features and advantages for high level interoperability between several learning contents in a distributed environment. Thus integration of different learning provisions developed by different developers or vendors that support SCORM and IMS Global Consortium makes for an efficient learning process.

A. Integration with Social Networking

Integrating Moodle with social networking sites like Facebook, Google Plus, as in Fig. 4.1 helps student to get solution for tough problems. This in turn helps an individual to get into international community. This would mutually help students as well as teachers to gain knowledge in global trends.

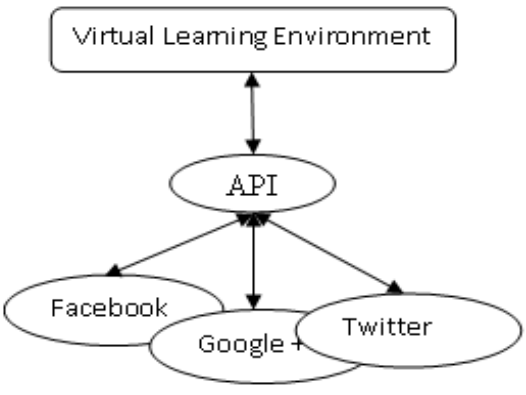

Fig 4.1 Social Blogging VLE Model

January - February 2020
ISSN: 0193 - 4120 Page No. 2991 - 2996

Algorithm: - Post Discussions in Social-Networking.

foreach i in User do
foreach i registered insocialnetworkingdo
Update post in i.socialnetworking;
Get comments foreach post in i.socialnetworking;
endforeach
endforeach

B. Dynamic Blogging Facilities

Blogging helps one share easily and quickly one's ideas or views about a domain of knowledge or an area of interest. Integrating blogging with Moodle may benefit students to post and thereby disseminate their ideas or opinions far and wide.

V. IMPLEMENTATION TECHNIQUE

The implementation method recommended in our proposed system brings together scattered Moodle modules into a single framework that concentrates on User Interface/User Experience (UI/UX) design provisions and integration of external functionality with the Moodle platform. This is achieved first by listing the modules and, its User Interface (UI) and functions. Then the UI objects and its specific functions are matched by using API core modules of Moodle. Actions limited to students and teachers are well defined according to the UI and functionalities. Now by using Moodle Extensible Hyper Text Markup Language (XHTML) and Yahoo User Interface (YUI) guidelines, a new UI framework integration part can be developed. Also by using external functions Application Programming Interface (API) from the core API of Moodle, the functionality module is also integrated.

A. Typical Moodle Architecture

The typical Moodle architecture has a learner, tutor and an administrator connected and communicating through a VLE as shown in the Fig. 5.1. Here the administrator has the responsibility to assign roles to the users as student or instructor and editing their profiles etc,. Also the entire design of the VLE and all the configuration settings can be modified in the VLE by him. The learner can be enrolled in any course and can discuss with the instructor.

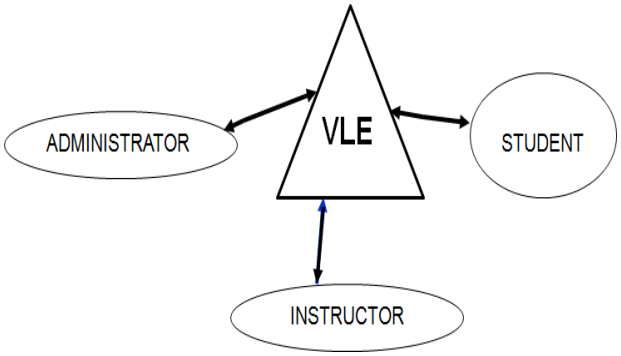

Fig. 5.1 typical VLE Architecture

In this typical architecture the VLE is as it is; it cannot be modified or no other features can be added to it. In such a situation the interoperability and collaborative learning techniques gets very much complicated. Thus a module for collaborative learning functionalities and UI modification becomes necessary and should be developed for integration of these functionalities.

B. Proposed Architecture

The proposed architecture has the integration module interface between the administrator and the virtual learning environment because all the provisions and features that are relevant to the VLE cannot be integrated by student or instructor except the administrator. In the proposed system architecture the administrator is provided with a convenient interface to manage and integrate other features through integration module. So no coding expertise is needed except the knowledge of configuration.

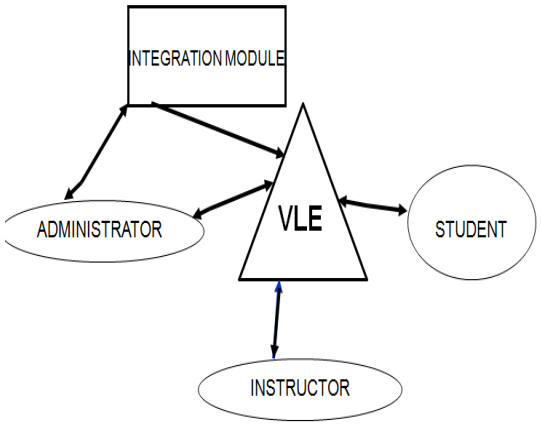

Fig. 5.2 Proposed VLE Integration Model

January - February 2020
ISSN: 0193 - 4120 Page No. 2991 - 2996

As shown in the Fig. 5.2 integration module is maintained only by the administrator since instructors and users are there only to use the provisions and not to program the VLE.

C. Integration Module

Integration module consists of a set of classes that can communicate with the core API of Moodle which handles tasks related to content posting and reading with actions and restrictions; it also takes care of UI library usage with new options such as dropdown functionalities mainly dealing with links and buttons. By using these features, all the tasks that are related to the learning process are thus brought together seamlessly.

D. Matching the UI and Functions

Matching the UI and Functions is a tedious process, and without a commanding knowledge of the coding style and

Table 5.1 List of actions and their UI

Roles	Actions	Restrictions	UI
Instructor	Post content	Cannot change the student profile	YUI for posting content
Learner	Read and write content	Cannot modify the posted content	YUI for reading and writing content
Administrator	Manages the VLE and its functions	Has access to all modifications	YUI for read, write and modify content.

UI interfacing is a major task in Moodle as it is, in general, very hard to achieve a desired user interface, whatever be the design of VLE. Incorporating UI into Moodle being a tedious process, an interface agent that facilitates provision for UI mapping is necessary as a part of the integration effort.

E. Core API for Integration Module

The API for integration module allows to create methods that are communicated through parameters of the functions that can be accessed by external programs (such as Web services API).These external functions are available in externallib.php files. This external function is executed inside a class and is complemented by two description functions:

1. FUNCTIONNAME_parameters() that describes the value of the parameters of the functions
2. FUNCTIONNAME_returns() which describes the return value

It uses external description classes specifically created for this purpose.

F. Integration Module Pseudo Code

IF parameters are not matched
THEN compatibility NO
AUTHORIZATION failed
ELSE
CHECK compatibility
If returned value from API is YES
THEN proceed INTEGRATION
ELSE
CHECK updates
FOR updated value equals returned value
Proceed INTEGRATION
End LOOP

G. System Model

This approach follows a hierarchical system model as in Fig. 5.3 for collaboration and avoiding collision.

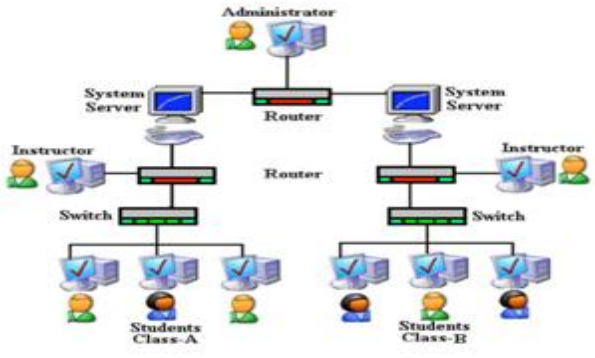

Fig. 5.3 System Implementation Model.

January - February 2020
ISSN: 0193 - 4120 Page No. 2991 - 2996

Hierarchical System Implementation Model as in Fig. 5.3 illustrates, a hierarchical model has three layers: Core, Distribution, and Access. The core layer is responsible for optimal transportation between various sites. The distribution layer focuses on rule-based connectivity. The access layer provides end-user connectivity to the network. Each layer provides necessary functionality to the network.

These layers do not need to be implemented as discriminated physical components. Each layer can be implemented in communication devices like routers or switches or in software components by using LDAP (Light-weight Directory Access Protocol). This separation of layers in hardware system implementation and software components avoids collision as sequencing of process is maintained by the hierarchy. A specific layer can be removed if necessary, but for optimum performance, a hierarchy is mandatory. It is a good approach to follow this implementation model for our work.

VI. COMPARISON WITH OTHER VLES

When our approach is implemented new features has been added so that all perspectives of web technology are valued. In this approach all the features that are available in web technology from video sharing (not a video file, but a live video interaction) to PowerPoint sharing is implemented thus forming an intensive collaboration platform, as shown in the Table 6.1. As compared in the table, no other open source VLE has the same featureset as our approach. Since the mainconcernhereis collaboration and integration of technology, the scalability of the technology features and the flexibility of changes have been greatly enhanced.

Table 6.1 Comparison of various VLE Products.

VLE Type	Web Technology	Listening	Live Video Interaction	Speaking	Reading	Writing
IPEVL (Our Approach)	Yes	Yes	Yes	Yes	Yes	Yes
Moodle	Yes	Yes	No	No	Yes	Yes
Atutor	No	No	No	No	Yes	Yes
Caroline	No	Yes	Yes	Yes	Yes	Yes
Black board (Commercial)	Yes	Yes	Yes	Yes	Yes	Yes
Second Life	Yes	Yes	No	No	Yes	No

VII. CONCLUSION

This VLE is a software environment for housing the oral and written content, with which learners engage by sharing and using interactive learning material. This VLE also provides new opportunities for innovation in the subject, ultimately improving the learner experience. It is supported by VLE and imperative to plan in advance, starting with small then increasing areas for collaboration and usefulness for digital media. Provisions for integration of various learning components are made possible by the implementation through Modular Object Oriented Programming. Interaction between the participants of this VLE can take place through forums, blogs and chat modules. In this way the suggested architecture addresses all the issues arising out of the efficient use of digital media resources within VLEs. This work has mainly concentrated on technology integration. Future work will take up deploying VLE on the cloud platform.

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Dr. K. Dinakaran received his M.E. Degree in Computer Science and Engineering and Ph.D. (ICE) Degree in Anna University Chennai, India. He was a Professor of Computer Science and Engineering at R.M.D. Engineering College, Chennai, India for 5 years. He worked as Principal of P.M.R. Engineering College, Chennai, India for three and half years. He is Currently working as Professor in Information Technology at Saveetha Engineering College, Chennai. His research interests include Data Mining, Bio-Informatics and E-Learning with over 30 technical publications.

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