

An Assessment of Popular e-Learning Systems via Felder-Silverman Model and a Comprehensive-Learning System using the Tools on Web 2.0

Maria Dominic

Department of Computer Applications, Sacred Heart College, India
Email: dominic@shcptt.edu

Sagayaraj Francis

Department of Computer Science and Engineering, Pondicherry Engineering College, India
Email: fsfrancis@pec.edu.in

Abstract—Learning is based on collaborative learning theory. Collaborative learning theory has interaction, individual accountability, teamwork and personalized guidance. All these aspects can be performed in web 2.0 using social networking sites. So e-learning 2.0 on web 2.0 is not a new class of learning management system or a pedagogy but which promotes the user to collaborate and build the information and not just a mere spectator/consumer of information. In this paper the researchers have made an assessment of 23 e-learning systems, a survey on some of the popular tools/sites which will be useful and augment e-learning 2.0 and have discussed the features of an experimental web solution to have a look and feel of these tools.

Index Terms—E-Learning 2.0, Web 2.0, Learning Styles, Social Networking, Cloud Computing.

I. INTRODUCTION

An individual's way of processing information is said to be cognitive styles (CS) [1]. Humans have the cognitive ability to acquire and recognize information, map them to representations and then to knowledge and then use them. Some of the CS are Cognitive Trait Model and Inductive Reasoning Ability [2]. Learning Styles are the different ways in which learners perceive and process information [3]. Several learning styles have been in [4] towards designing e-learning materials based on multi-learner style [5]. Felder-Silverman's synthesis of these theories is designed to easily translate them into strategies for a higher education sector (Table I) [6]. Mostly the authors classify the learners into groups and propose corresponding inventories and methods. One such model is Sarasin [7]. According to him, the learners are classified into three groups based on their learning styles namely visual learners, auditory learners and kinesthetic learners. Visual learners gain knowledge through visual inputs, auditory learners learn through

listening and kinesthetic learners learn through experiments and exploration [8].

This paper is structured as follows. Section II describes about e-Learning and lists some of the popular e-learning systems used around the world and provides a comparison table of these systems with Felder-Silverman model. Section III identifies various ways of utilizing web 2.0 to augment e-Learning. Section IV and Section V lists the various tools in web 2.0 and compares its characteristics with the Felder-Silverman model and tabulates them. Section VI shows the proposed comprehensive e-LMS and discusses its features. Finally a brief conclusion is described in Section VII.

II. E-LEARNING

Teaching and learning process has undergone a vast change after the advent of Internet. As Internet and World Wide Web expanded rapidly e-Learning has become a major form of education where time and geographical constraints have been overcome. As pointed out in [9] e-Learning is a learning that involves acquisition, generation and transfer of knowledge using ICT. This enables universal learning, overcoming the barriers of time and distance. E-learning is based on learning objects [10] like audio, video, presentations, documents, etc., which are stored in a learning repository from where they are accessed and processed by the learner. The learning management systems like Black Board, Web CT, MOODLE etc., support various kinds of teaching learning activities but, they do not suit all kinds of learners who have different levels of intelligence and maintains "one size fits all" approach. Hence, the adaptive and intelligent web based educational systems [11], which cater to different types of styles of learning according to the requirements of the learner and their situations. Net Coach and SIETTE are comparable with modern day LMS.

TABLE I: LEARNING STYLES

Authors	Characteristic's				
David Kolb's	Accommodating	Diverging		Converging	Assimilating
Peter Honey & Alan Mumford's	Activists	Reflectors		Theorists	Pragmatists
Dunn and Dunn	Environmental	Emotional	Sociological	Physiological	Psychological
Felder-Silverman	Active / Reflective	Visual / Verbal		Sensing / Intuitive	Sequential / Global
Sarasin VAK	Visual	Auditory			Kinesthetic

Most of the e-Learning systems, adaptive or non adaptive, do not relate or collaborate with external systems and mostly they are stand alone. A search was made for some of the popular e-learning management systems along with their URL (Table II). This motivated the researchers to make a comparison between the popular e-LMS's and the Felder-Silverman model. So, a comparative study was done on the systems mentioned in Table II for the various characteristics of the selected model to know how far they exhibit them. Table III provides these statistics. The serial number in Table III corresponds to the LMS listed in Table II.

III. E-LEARNING IN WEB 2.0

Web 2.0 is a collection of inter operable web applications that facilitate user interaction and collaboration with each other as creators of content rather than passive viewers as in web 1.0. Examples of Web 2.0 are social networking sites, blog, wikis, mashups, etc. [12]. Many of these tools can be used by the learning community to interact, share knowledge and augment problem based learning. It has ignited the culture of not only connection but also contribution. Web 1.0 was useful for connecting people to the contents thus useful for finding information and performing basic transactions. The meeting point of users and resources are called a course [13]. E-learning is primarily focused on groups. A group is a collection of individuals who are engaged in a joint work. One such place is a social networking site, which are very popular among people to stay connected. "Social" is often referred to as communication, construction and collaboration [13]. Currently 300 million people use social software [14] and it is still growing. In social networking, each individual has a page and profile that one develops and shares with others in the network. These social networking sites act as pedagogical agent for problem based learning since it is a combination of personalization and socialization. These social software provide platform to enable users to build applications

for e-learning and enables them to learn from each others' work [14].

To broaden and generalize the data transfer between different social networking sites, Google brought out an open social development platform in 2007. This platform defines common API, which can be used to develop sites to provide services to multiple sites and easily exchange data between different social sites. MySpace, Friendster, LinkedIn uses open social API. Using REST API, personalized materials and queries can be provided to users. The dimensions of a high quality education experience are structure, content, service and delivery [15]. Structure is the foundation of quality content, service and delivery. Content should be comprehensive, authentic and researched. Services are resources, administration and technical support for the action done. Delivery is the usability, interactivity levels of the action performed [16]. All these desirable dimensions could be easily achieved through web 2.0. It is also very easy to monitor the students' learning process and levels through social media since they are open and transparent and allow the learners to construct their own learning. The critical challenge of web 2.0 is identifying the right co learners, content, service, and user interfaces to facilitate interaction, communication and collaboration. Scaling is another problem and expensive to implement. Here, Cloud computing comes to the rescue by providing storage and other services, freeing the users to focus on applications [17]. Applications like Google docs, presentation, etc., provide teachers and learners with free and low cost alternative. Browser based applications are easily accessible even on mobile platforms making learning possible where Internet is accessible.

IV. TOOLS OTHER THAN SOCIAL NETWORKING SITES

Web 2.0 offers a wide variety of tools that can be used

for e-learning. Social networking sites can be used for e-learning. According to Felder-Silverman Learning style model, the learning style can be sensory, intuitive, visual, verbal, inductive, deductive, active, reflective, sequential and global. There are a number of tools in web 2.0, which according to the researchers, could be mapped to Felder Silverman learning styles. Tools such as WebCasting and PodCasting can be used to broadcast audio/video/slide/recordings, which can complement classroom environment. Similarly, Wikis for group assignments; wikiversity.org to collaborate and create contents freely; SuTree.com and Slide.net offers a variety of resources to learners and teachers; eduSlide allows teachers to group their content and present them to the learners; Footnote allows the users to access documents and other resources and prepare online reports; VoiceThread.com allows tutors to create lessons and add audio narrative along with it;

TABLE II: LIST OF POPULAR E-LEARNING SYSTEMS

S. No	Title	URL
1	Apex Learning	www.apexlearning.com/
2	ATutor	www.atutor.ca/credits.php
3	Blackboard	www.blackboard.com/
4	Brainshark	www.brainshark.com/
5	Chamilo	www.chamilo.org/
6	Claroline	www.claroline.net/
7	CERTPOINT	www.certpointsystems.com/
8	Desire2Learn	www.desire2learn.com/
9	DoceboLMS	www.docebo.com/
10	Dokeos	www.dokeos.com/
11	LRN	www.dotlrn.org
12	Latitude learning	www.latitudelearning.com/
13	EFront	www.efrontlearning.net/
14	HotChalk	www.hotchalk.com/
15	ILIAS	www.ilias.de/docu/
16	Interactyx	www.interactyx.com/
17	Moodle	www.moodle.org/
18	Metacoon	www.metacoon.net/
19	Meridian Knowledge Solutions	www.meridianksi.com/
20	RCampus	www.rcampus.com/
21	Saba Software	www.saba.com/
22	Sakai	www.sakaiproject.org/
23	Studywiz	www.studywiz.com/

TABLE III: FELDER-SILVERMAN MODEL vs E-LEARNING SYSTEMS

LMS	Active	Reflective	Visual	Verbal	Sensing	Intuitive	Sequential	Global
1	N	Y	P	N	Y	P	Y	Y
2	Y	Y	P	Y	Y	P	Y	Y
3	P	Y	P	P	Y	P	Y	Y
4	N	Y	Y	N	Y	P	P	Y
5	Y	Y	P	Y	Y	Y	Y	Y
6	Y	P	P	P	Y	Y	Y	Y
7	P	Y	Y	P	Y	Y	Y	Y
8	N	Y	Y	N	Y	Y	P	Y
9	Y	Y	Y	P	Y	Y	P	Y
10	Y	Y	P	Y	Y	Y	Y	Y
11	Y	Y	P	P	Y	Y	Y	Y
12	Y	Y	Y	Y	Y	Y	Y	Y
13	Y	Y	P	Y	Y	Y	Y	Y
14	Y	Y	Y	Y	Y	Y	Y	Y
15	Y	Y	Y	Y	Y	Y	Y	Y
16	Y	Y	P	P	Y	Y	Y	Y
17	Y	Y	Y	Y	Y	Y	Y	Y
18	Y	Y	P	P	Y	Y	Y	Y
19	N	Y	P	P	Y	Y	Y	Y
20	Y	Y	Y	P	Y	Y	Y	Y
21	N	Y	P	P	Y	Y	Y	Y
22	Y	Y	Y	Y	Y	Y	Y	Y
23	N	Y	P	P	Y	Y	Y	Y

Y – Yes, Fully Available, P – Partially Available, N – No, Not Available

Visual Thesarus.com provides all the synonyms in graphical format; and wePapers.com allows sharing of academic/research papers, tutorials, lectures and test. LMS are learning management systems, which provide the learner with the learning contents. Personal Learning Environments (PLE) are tools, used by the learners to gather information, reflect and work on them. Since these tools are not exclusively meant for LMS, they could lead one to error. So, it becomes necessary to provide a system with the combination of LMS and PLE under controlled environment and this process can be done using web 2.0 tools. For example, SHARek – uses social bookmarking and consists of PLE within LMS.

V. TOOLS IN WEB 2.0

A survey was made to look for e-Learning components such as repository to hold different items like learning objects, student profile, etc., multimedia, simulations, gaming, quizzing, searching, socializing, assessment, etc., as mentioned in Felder-Silverman style of learning. Some of the popular sites/tools which can be used for e-Learning are tabulated in Table IV.

TABLE IV: SITES SURVEYED

S.No	Websites / Tools
1	https://voicethread.com/
2	www.facebook.com
3	www.myspace.com
4	www.twitter.com
5	http://www.wayfaring.com/
6	http://www.wepapers.com/
7	http://www.wordpress.com/
8	http://www.bebo.com/
9	http://www.ning.com/
10	http://www.friendster.com/
11	http://www.linkedin.com/
12	http://www.stumbleupon.com/
13	www.coolpreviews.com
14	www.wikiversity.org
15	www.visualthesaurus.com
16	http://translate.google.co.in
17	http://maps.google.co.in/
18	www.classmarker.com
19	www.quizgalaxy.com
20	www.tcyonline.com
21	www.surveymonkey.com
22	www.zoomerang.com
23	http://www.smg2000.org/
24	www.marketwatch.com/
25	www.cut-the-knot.org/
26	http://lstat.kuleuven.be/java/

27	http://www.thiswaytocpa.com/career-tools/interview-simulation/
28	http://en.wikipedia.org/wiki/Webcast
29	http://www.librivox.org/
30	www.slideshare.com
31	www.scribd.com
32	www.docs.google.com
33	www.youtube.com
34	http://www.google.co.in/blogsearch?hl=en&tab=wb
35	http://pipes.yahoo.com/pipes/
36	http://www.programmableweb.com/
37	http://www.google.com/talk/
38	https://www.google.com/calendar/
39	http://translate.google.com/
40	https://sites.google.com/
41	http://www.google.co.in/ig
42	www.rapidshare.com
43	www.mediafire.com
44	www.hotfile.com
45	www.4shared.com
46	http://depositfiles.com/
47	http://zshare.net/
48	http://uploading.com/
49	http://www.csse.monash.edu.au/~dwa/Animations/index.html
50	http://www.cosc.canterbury.ac.nz/mukundan/dsal/appldsal.html
51	http://www.cs.jhu.edu/~goodrich/dsa/trees/index.html
52	http://downloads.ziddu.com/downloadfile/12314754/Data_Structures_Through_C_-_Yashavant_Kanetkar.rar.html
53	http://www.dzone.com/links/animated_tutorials_for_data_structure_algorithms.html
54	http://www.edsim51.com/
55	http://www.homesoft.gen.tr/products/Sim8085.html
56	http://sourceforge.net/projects/picmicrosim/

57	http://www.angelfire.com/electronic2/8085simulator/
58	http://www.sapphire.demon.co.uk/
59	http://www.ontko.com/moss/
60	http://vip.cs.utsa.edu/simulators/
61	http://www.cs.kent.ac.uk/people/staff/frmb/moss/
62	http://www.cs.unm.edu/~crowley/osbook/sos.html
63	http://www.freevbcode.com/ShowCode.asp?ID=4079
64	http://samate.nist.gov/index.php/Tool_Survey.html
65	http://pmd.sourceforge.net/
66	http://www.stachliu.com/resources/tools/google-hacking-diggity-project/attack-tools/
67	http://findbugs.sourceforge.net/
68	https://www.fortify.com/ssa-elements/threat-intelligence/rats.html
69	http://www.modelsphere.org/open_modelsphere.html
70	http://www.sqlpower.ca/page/architect
71	http://www.dbvis.com/
72	http://www.sqlmanager.net/tools/free
73	http://www.elphsoft.com/
74	http://www.isi.edu/nsnam/ns/
75	http://www.cc.gatech.edu/computing/compass/pdns/index.html
76	http://www.ssfnet.org/homePage.html
77	http://www.cisco.com/web/learning/netacad/course_catalog/PacketTracer.html
78	http://www.filebuzz.com/findsoftware/Free_Network_Simulation_Exe/1.html
79	www.questionwriter.org
80	www.compilr.com
81	www.spicynodes.com

The websites surveyed exhibit the following features, which corresponds to Felder-Silverman learning styles. These are collaboration; sharing materials; creating groups / communities; uploading, managing and downloading materials / files; creating web pages / blogs; chatting/broadcast – audio, video, text, search and discover; perform analytics; play games; perform

testing and evaluation of the learner; track his learning pattern; allow the user to experiment / simulate different scenarios; conduct a survey and gain insight; translate to different languages; make use of open and free educational resources; and provide free storage and more.

A comparison of matrix between the Felder-Silverman learning style and the sites survey is illustrated in Table V. The extreme left vertical column identifies the sites by its serial number as mentioned in Table IV and the top most horizontal row represents the eight learning styles from ‘a to i’ as mentioned in Table I. A mark ‘Y’ is made, if the feature is available in the site, ‘N’ if not available and ‘P’ if partially available.

TABLE V: COMPARISON BETWEEN FELDER-SILVERMAN MODEL AND TOOLS IN WEB 2.0

Tools / Felder – Silverman Model	Active	Visual	Verbal	Sensing	Intuitive	Global	Local
http://voicethread.com/	Y	Y	Y	N	P	Y	P
https://www.facebook.com/	Y	Y	Y	Y	Y	P	Y
https://new.myspace.com/	P	P	Y	Y	P	N	Y
https://www.twitter.com/	Y	Y	P	P	Y	Y	Y
http://www.wayfaring.com/	Y	Y	P	N	P	Y	N
http://www.wepapers.com/	Y	Y	N	N	N	P	Y
http://wordpress.com/	Y	Y	Y	Y	Y	P	P
http://www.bebo.com/	Y	Y	Y	Y	P	N	P
http://www.ning.com/	Y	Y	Y	Y	Y	P	Y
http://www.friendster.com/	Y	Y	P	N	Y	P	N
http://in.linkedin.com/	Y	Y	P	N	Y	N	N
https://www.stumbleupon.com/	Y	Y	Y	Y	N	N	P
http://www.coolpreviews.com/	P	Y	N	P	N	N	Y
http://www.wikiversity.org/	P	Y	Y	Y	P	P	Y
http://www.visualthesaurus.com/	Y	Y	Y	Y	N	P	Y
http://translate.google.co.in/	Y	Y	N	Y	Y	P	P
http://maps.google.co.in/	N	Y	Y	N	Y	N	N
http://www.classmarker.com/	Y	Y	P	Y	Y	Y	P
http://www.quizgally.com/	N	Y	P	P	P	P	Y

http://www.tcyonline.com/	N	Y	P	P	Y	P	P	Y
http://www.surveymonkey.com/	Y	Y	Y	N	P	P	Y	P
http://www.zoomerang.com/	Y	Y	Y	N	P	P	Y	P
http://www.smg2000.org	Y	Y	Y	N	N	Y	Y	P
http://www.marketwatch.com/	P	Y	Y	P	Y	P	Y	P
http://www.cut-the-knot.org/	N	Y	Y	P	P	P	Y	P
http://lstat.kuleuven.be/java/	N	Y	Y	N	Y	P	Y	P
https://www.thiswaytopca.com/career-tools/interview-simulation/	Y	Y	Y	Y	N	P	N	Y
http://en.wikipedia.org/wiki/Webcast	N	Y	Y	Y	P	P	Y	P
http://librivox.org/	N	Y	N	Y	N	Y	Y	N
http://www.slideshare.net/	Y	Y	Y	N	N	N	Y	P
http://www.scribd.com/	Y	Y	Y	N	N	P	P	Y
http://docs.google.com/	Y	Y	Y	N	Y	Y	Y	P
http://www.youtube.com/	Y	Y	Y	Y	N	N	P	Y
http://www.google.com/blogsearch?hl=en&tab=wb	Y	Y	P	P	Y	P	Y	N
http://pipes.yahoo.com/pipes/	P	Y	Y	N	Y	Y	Y	P
http://www.programmableweb.com/	Y	Y	Y	N	P	Y	Y	P
http://www.google.co.in/talk/	Y	Y	Y	Y	P	P	Y	P
https://www.google.com/calendar	Y	Y	Y	N	Y	Y	Y	P
https://sites.google.com/	Y	Y	Y	Y	Y	Y	Y	P
http://www.google.com/ig	Y	Y	Y	Y	N	Y	Y	P
https://rapidshare.com/	Y	Y	Y	Y	Y	Y	Y	P
http://www.mediafire.com/	Y	Y	Y	Y	Y	Y	Y	P
http://www.hotfile.com/	Y	Y	Y	Y	Y	Y	Y	P
https://www.4shared.com/	Y	Y	Y	Y	Y	Y	Y	P
http://depositfiles.com/	Y	Y	Y	Y	Y	Y	Y	P
http://zshare.com/	Y	Y	Y	Y	Y	Y	Y	P
http://uploading.com/	Y	Y	Y	Y	Y	Y	Y	P
http://www.csse.monash.edu.au/~dwa	N	Y	P	N	Y	Y	P	Y

/Animations/index.html								
http://www.cosc.canterbury.ac.nz/mukundan/dsal/appldsal.html	N	Y	P	N	P	Y	P	Y
http://www.cs.jhu.edu/~goodrich/dsa/trees/index.html	N	Y	P	N	N	Y	P	Y
http://www.ziddu.com/download/12314754/Data_Structures_Through_C_-Yashavant_Kanetkar.rar.html	N	Y	N	N	N	Y	Y	N
http://www.dzone.com/links/animated_tutorials_for_data_structure_algorithms.html	P	Y	P	N	P	Y	Y	N
http://www.edsim51.com/	N	Y	P	N	Y	Y	Y	P
http://www.homesoft.gen.tr/products/Sim8085.html	N	Y	P	N	N	P	Y	P
http://sourceforge.net/projects/picmicrosim/	N	Y	N	N	N	P	Y	P
http://www.angelfire.com/electronic2/8085simulator/	N	Y	Y	P	N	P	Y	P
http://www.samphire.demon.co.uk/	N	Y	N	N	N	P	Y	P
http://www.ontko.com/moss/	N	Y	N	N	N	Y	Y	N
http://vip.cs.utsa.edu/simulators/	N	Y	N	N	N	Y	Y	N
http://www.cs.kent.ac.uk/people/staff/fmb/moss/	N	Y	N	N	P	Y	Y	P
http://www.cs.unm.edu/~crowley/osbook/sos.html	N	Y	N	N	N	Y	Y	N
http://www.freevbcode.com/ShowCode.asp?ID=4079	N	Y	N	N	P	Y	Y	N
http://samate.nist.gov/index.php/Tool_Survey.html	N	Y	N	N	P	Y	Y	N
http://pmd.sourceforge.net/	N	Y	N	N	N	Y	Y	N
http://www.stachliu.com/resources/tools/google-hacking-diggity-project/attack-tools/	N	Y	Y	N	P	Y	Y	N
http://findbugs.sourceforge.net/demo.html	N	Y	Y	N	P	Y	Y	P

https://www.fortify.com/ssa-elements/threat-intelligence/rats.html	N	Y	N	N	N	Y	Y	N
http://www.modelsphere.org/open_modelsphere.html	N	Y	Y	N	N	Y	Y	P
http://www.sqlpower.ca/page/architect	N	Y	Y	P	P	Y	Y	N
http://www.dbvis.com/	N	Y	Y	N	P	Y	Y	P
http://www.sqlmanager.net/tools/free	N	Y	Y	N	P	Y	Y	P
http://elphsoft.com/	N	Y	N	N	N	Y	Y	N
http://www.isi.edu/nsnam/ns/	N	Y	Y	N	N	Y	Y	P
http://www.cc.gatech.edu/computing/compass/pdns/index.html	N	Y	Y	N	N	Y	Y	N
http://www.ssfnet.org/homePage.html	N	Y	Y	N	N	Y	Y	Y
http://www.cisco.com/web/learning/netacad/course_catalog/PacketTracer.html	P	Y	Y	P	N	Y	Y	Y
http://www.filebuzz.com/findsoftware/Free_Network_Simulator/1.html	N	Y	P	N	N	Y	Y	N
http://www.questionwriter.com/	P	Y	Y	N	P	Y	Y	N
https://compilr.com/	Y	Y	Y	N	Y	Y	Y	Y
http://www.spicynotes.org/	Y	Y	Y	N	Y	Y	Y	P

Y – Yes, Fully Available, P – Partially Available, N – No, Not Available

VI. COMPREHENSIVE E-LMS

Using the knowledge acquired from the survey listed in Table V, a web based e-learning system specific for learning Object Oriented Programming Using C++ was developed. It is a minimal working prototype which gives the look and feel of all the learning components [17] that utilizes various social tools, interactive environments of Web 2.0, various web based services and cloud. The main components of the system are shown in Fig. 2. This proposed system can be further enhanced to accommodate various other topics in future. The proposed system is available at [18]. Some of the key features of the system are as follows:

Cloud is used as a repository for learning objects like presentations, documents, etc. The cloud service used for this purpose is [19]. The service provider

provides 500 GB of free storage, freeing the server from the respective overload and enables the researchers to focus on the application.

All the video lessons are uploaded to YouTube.com and played here. This is implemented using the open APIs provided by YouTube.com.

Google Gadgets, like Google Calendar are used to publish the Schedule / Course plan.

Links to different sites for non human resources like animations, references, books, journals, articles and other forms of media are incorporated. Online quizzes produce the result of the quiz and mail it to the stakeholders about the learners’ performance. This was done using Question writer [20]. A dictionary of all the key words in the C++ language, a custom built software is also provided. The main aim of this e-learning web solution is to provide the learner with audio, visual and kinesthetic learning from the tools available in web 2.0. REST API and other API provided by FaceBook are used to build discussion forum and chat room features for those attending the course. (Fig.11). The learners can also test their programs using [21], which provides a platform for program compilation and execution facility for many programming languages. (Fig.8). A question bank is a repository of questions to support the learning process. This web solution also holds a sample question bank for learning C++. (Fig.9). Using [22] mind map is generated to represent and structure ideas and concepts of C++ graphically. (Fig.10). Some of the other features included in the system are deriving class diagrams from source code [23], learning by playing cross word puzzle [24], analyzing the code’s efficiency using static analyzer [25] and sample C++ programs [26].

When the proposed e-LMS was compared with Felder-Silverman model learning styles, the mapping obtained is as listed in Table VI.

TABLE VI: COMPARISON BETWEEN OUR E-LEARNING SYSTEM AND FELDER-SILVERMAN MODEL

	Active	Reflective	Visual	Verbal	Sensing	Intuitive	Sequential	Global
e-LMS	Y	Y	Y	Y	Y	Y	Y	Y



Figure 1. Experimental Web based e-Learning System



Figure 4. Video Lessons from YouTube

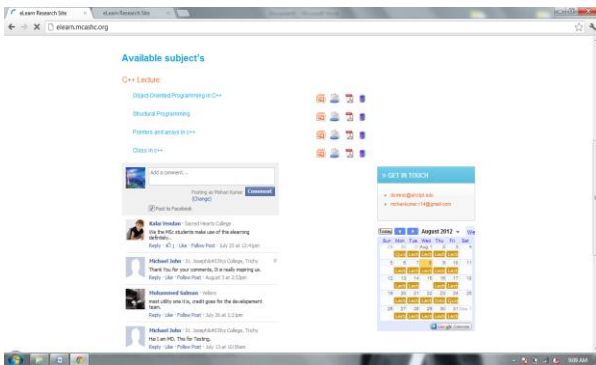


Figure 2.Components of the e-learning system



Figure 5. Usage of Animations

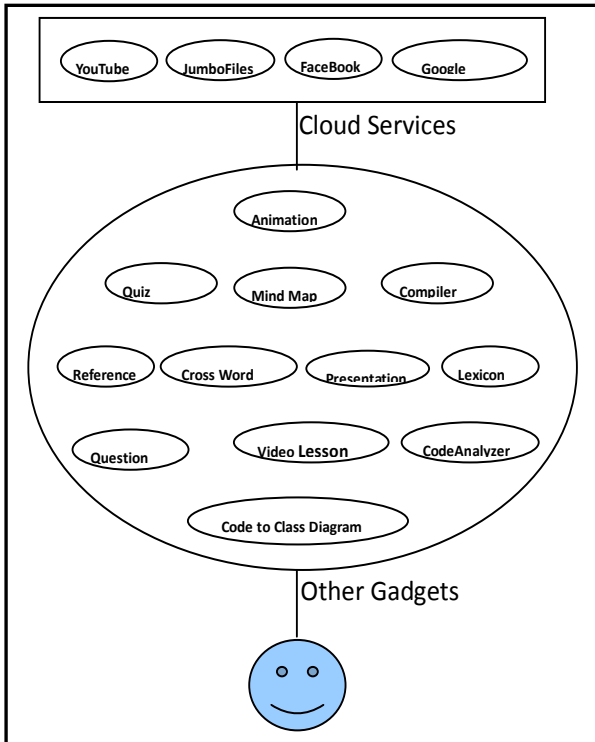


Figure 3. Learning Materials using Jumbo Files

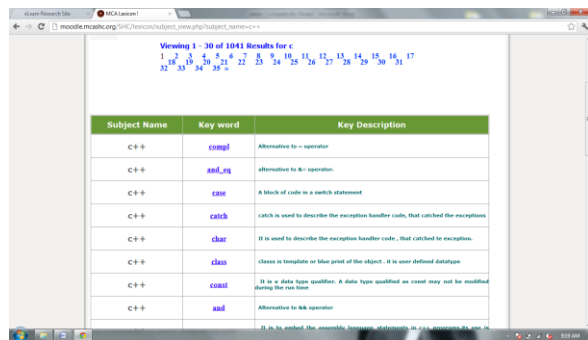


Figure 6. Custom built Lexicon software

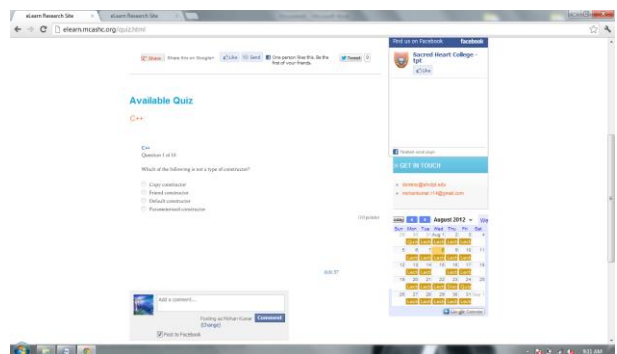


Figure 7. Quiz using questionwriter.com

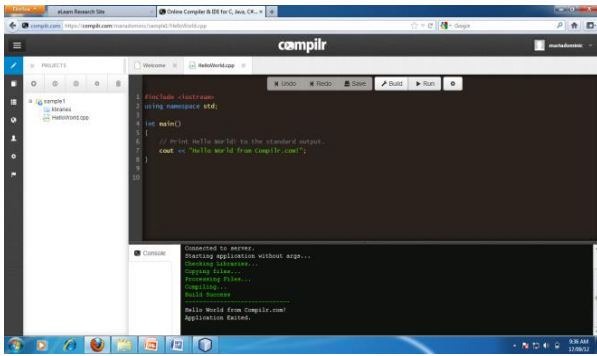


Figure 8. Using compiler.com

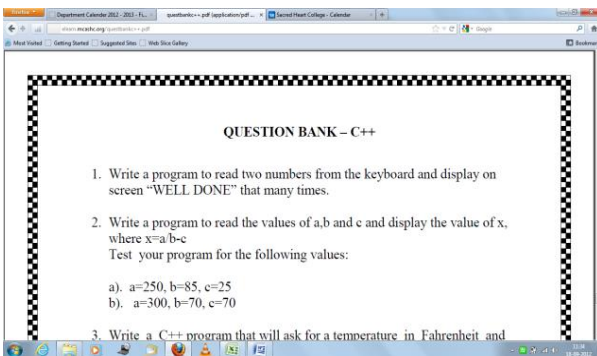


Figure 9. Custom designed Question Bank

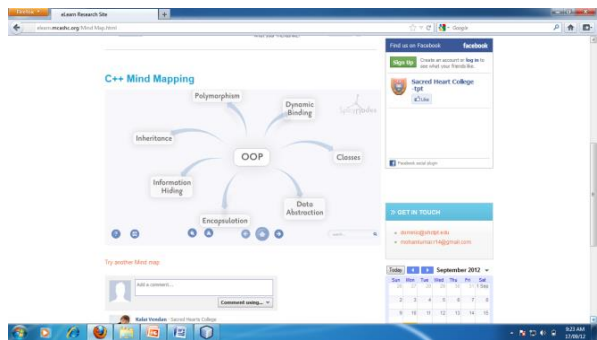


Figure 10. Mind Mapping using spicynodes.com

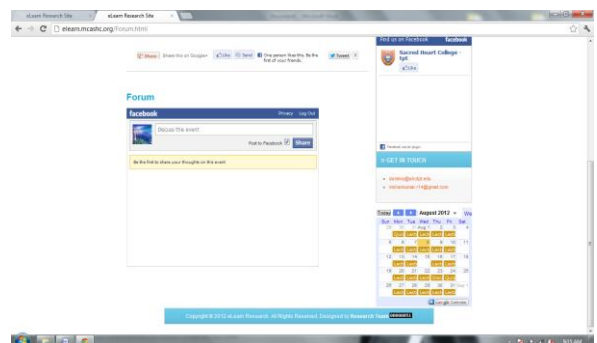


Figure 11. Discussion Forum using FaceBook.com

As seen from Table VI, the experimental research site satisfies all the required characteristics mentioned by the Felder-Silverman model. Similar projects using cloud based e-Learning are Casquero [27] and Virtual Computing Lab [28].

VII. CLUSION

This study aims to identify e-learning possibilities using social and other tools available in web 2.0. This will enhance the e-learning framework by using the freely available tools to be mashed together to provide a better e-learning framework according to the need of the stakeholders. Every requirement can have different frameworks. Thus, the above research and the experiment, is bound to motivate and enlighten the stakeholders to go for customized e-learning platforms according to their requirements. Initial feedback from users of this system found it to be interesting and useful than the traditional system. Based on the behavior pattern and other parameters the system needs to become dynamic and adapt according to the learner learning path. This could be the future scope of this system. This can be implemented using the tools available in web 3.0. Another e-LMS for learning Java Programming is also being designed and is available at [29].

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Maria Dominic received his Master’s in Computer Science from Bharathidasan University, Trichy, India. He is currently an associate professor in the Department of Computer Applications at Sacred Heart College, Tirupattur, India. He is a research scholar in the field of e-Learning and Cloud Computing.

Dr. Sagayaraj Francis is an associate professor in the Department of Computer Science and Engineering, Pondicherry Engineering College, Pondicherry, India. He specializes in Data Management, Data Modeling, Information Systems and e-Learning.