

Cyclic model application for evaluation of a Dynamic Web Environment

Sonal Chawla

Department of Computer Science and Applications
Panjab University Chandigarh

Ritika Bansal

Department of Computer Science and Applications
Panjab University Chandigarh

Abstract - Dynamic web environment in the form of E-learning systems are increasingly being adopted by educational organizations. This E-learning system is taking important place in formal and less formal educational setting. Such an environment enhances the conventional system of education by utilizing the digital resources comprising of learning objects as delivery mode for imparting instructions. This research paper, thus, focuses on the creation and evaluation of a Dynamic Web Environment and has fourfold objective. Firstly, it focuses on dynamic web environment, learning objects and their relation in development of dynamic web environment. The paper then pre-tests the perception of students for such an environment Secondly, it discusses the creation of dynamic web environment with special reference to the research study conducted by creating a demonstrative dynamic web environment called E-campus. The tools and technologies used in the development of this dynamic web environment are also highlighted. Thirdly, the paper post-tests the created E-Campus environment. And finally, the paper ends with analysis and conclusions drawn for these research studies.

Keywords – Interactive learning environments; Improving classroom teaching; Lifelong learning; Cooperative/Collaborative learning; Teaching/learning strategies.

I. DYNAMIC WEB ENVIRONMENT

A dynamic environment consists of changing surroundings in which the agent navigates, so the agent must adapt to new situations and overcome possibly unpredictable problems [1]. Dynamic Webs allows to create applications inside the own web, granting a greater interactivity with the navigator. Surveys and voting, forums of support books of visit, shipment of intelligent e-mails, reserve products, commands on line, personal attention to the client are various dynamic applications provided by DWE[2]. The development of this environment is more complicated as it requires a specific knowledge of programming languages as well as skill in creation and management of data bases. Dynamic web environment can be created with the help of digital repositories which create an E-learning environment further constituting Learning Objects.

1.1 Learning Objects (LO)

A learning object has been defined as "a collection of content items, practice items, and assessment items that are combined based on a single learning objective"[3]. The idea of object oriented programming was transferred to re-purposing content for different learning situations by setting parts of computer code be reused for various software applications. Traditionally, open and distance-learning (ODL) content is designed as a large course that does not

lend itself to potential reuse. But with a LO approach, content is designed as smaller units of learning that support potential reuse, that can stand alone, and that can be made accessible to meet the "just enough" and "just-in-time" requirements of learners. Learning objects offer a new conceptualization of the learning process which can serve as digital, re-usable pieces of content that can be used to accomplish a learning objective. So, a learning object can be a text document, a movie, a mp3, a picture or maybe even a website. Learning object systems are flexible, dynamic and highly engaging technology-based environments which have a great potential to capitalize on the goal oriented nature of human learning processes as well as allowing learners to associate instructional content with their prior knowledge and individual experiences [4]. Learning objects have been defined as "any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning" by IEEE [5].

Since a learning object is a chunk of content which is designed to ensure reuse within different instructional settings and to support learning through the possible inclusion of educational objectives, content, resources, activities and assessment, so this content can be stored within different digital learning management systems (LMS) or can be used in many different delivery modes. A learning object is not a piece of text, or a graphic, or a video clip rather these are the resources which support a LO and are often used to

create learning objects. So, this relevance of leaning objects can be comfortably utilized for the creation of DWE.

1.2 Creation of Dynamic Web Environment

Dynamic Web Project needs to be created before creating any web components like servlets, JSP files etc. This creation helps in organization and in collection of the web components. All class files, resources and deployment descriptors that are supposed to be packed in the same Web Archive (WAR) are to be created in the same Dynamic Web Project [6]. As Learning Objects are accessible and can be tagged with descriptive information called metadata which make their storage, retrieval and search easy by educators and learners so, can be comfortably utilized for the creation of DWE. Also they can be easily referenced in a digital database or Learning Object Repository (LOR). They can be used and transferred seamlessly between different technologies and institutions as they are independent of both the delivery media and knowledge management systems making learning objects interoperable. Dynamic Web Environment uses high quality material which is organized by content providers in several learning objects and maintained on their own Web servers. This avoids any property right related problems and the possibility for content providers to manage contents i.e. re-organize, update and delete locally and not through complex HTTP or FTP based remote interfaces. A three-layered cyclic model was developed during this DWE i.e. E-campus. Firstly, formative evaluation was done to refine e-learning planning and development before implementation. Secondly, the DWE was created and finally, the summative evaluation was carried out by testing the created DWE. Evaluation assists teachers in improving their e-learning strategies in further rounds of planning and development; and it also provides evidence through meta-analyses across projects, which can feed into overall e-learning planning and development.

II. RESEARCH STUDY

Most e-learning programmes reflect a reconstruction of educational agenda from a closed environment to one where there is an open flow of information[28] based on an integrated, process-oriented instructional approach. Elearning environments are designed to offer opportunities for sharing information, to cater to students with a variety of learning styles and to allow for choice in information representation. The use of software and internet applications, databases and multimedia in e-learning have impacted society, schooling and curricular goals[29] and demand a reconceptualization of learning on the part of learners who are schooled in traditional settings. The challenges posed by e-learning are thus better understood and addressed when there is an understanding of learner readiness in technology-driven classrooms. In sum, it is believed that learners must be “e-ready” so that a coherent achievable strategy that is tailored to meet their needs may be implemented [30]. Thus e-readiness assessments allow enablers and policy makers to take appropriate policy measures and implement development plans that help create informed participants in

e-learning endeavors. Further, such assessments provide key information to educational institutions to supply solutions that can cater to the specific needs of each learning group. E-readiness assessment allows one to design comprehensive e-learning strategies and effectively implement ICT goals. Therefore, the development of E-campus was preceded by a readiness survey conducted to identify the preparedness of students and faculty for such a DWE called E-campus. For this a number of research studies were performed which have been discussed below elaborately. A survey was conducted with 178 students of various departments of a prominent university of India known as Panjab University. The aim of the survey was to know the demand of E-Learning among the students and based on the analysis further course of action could be constituted. Research and evaluation took into consideration two main objectives:

-To establish and identify the Preparedness and readiness of students for a Dynamic Web Environment.

-To Test and evaluate the created DWE called E-campus.

III. RESEARCH STUDY I

3.1.1 Aim of the Study

This study aimed to check the preparedness and readiness of students for the dynamic web environment called E-campus created as part of this research.

3.1.2 Methodology

This preliminary study employed a survey design involving a random sample of students. Data was gathered with the use of the e-learning Readiness Research Tool, a questionnaire developed by a panel of experts representing University faculty from education and technology-oriented departments. The 12-item questionnaire consisted of items focused on gathering demographic data and exploring other constructs like student’s internet usage, activities carried out by them on internet and analysis of whether they wanted E-Learning to be implemented

Sample

A random sample of learners from Diploma, Undergraduate and Post-graduate level were approached to respond to the questionnaire. The tutors taught and the learners were enrolled in a variety of programmes from management to teacher education. Altogether, 500 questionnaires were distributed to tutors and students. The response rate was 50% for tutors and 25% for students.

3.1.3 Analysis and Discussion

Based on the collected data, analysis was conducted to see the readiness of students for the e-learning environment. This analysis was based on the behavior and mind approach of the students towards the use of E-Learning before the implementation of E-campus.

The data in figure2 shows a two-point scale representation for if the students felt need for E-Learning or they felt no need for E-learning environment. Out of 178 students who participated in the survey, it was seen that 93.25% of the students were interested in E –Learning implementation while the rest 6.75 % students did not want such methodology to be implemented.

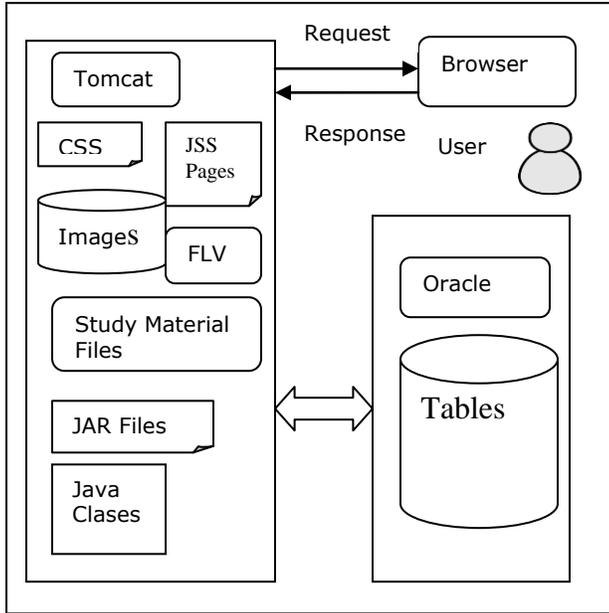


Figure 1. Architectural design for DWE, E-campus

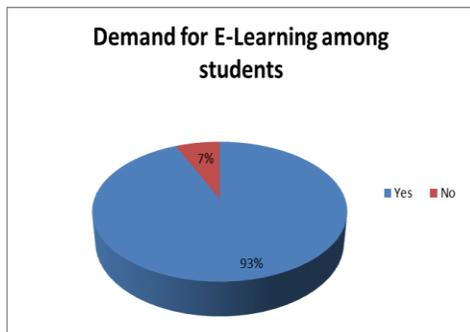


Figure. 2 Demand of E-Learning among students

The data for finding the no. of hours the students spent on the internet was collected on the four point scale ranging from (1) less than 5 hrs to (4) more than 14 hrs. The pie chart in Figure 3 represents the weekly internet usage of the students. 39% of the students used Internet weekly for more than 14 hours. Only 24% of the students had an internet usage of less than 5 hours a week.

Figure 4 states that the majority of the students used the Internet for social networking purpose only whereas 15% only used it for educational purposes.

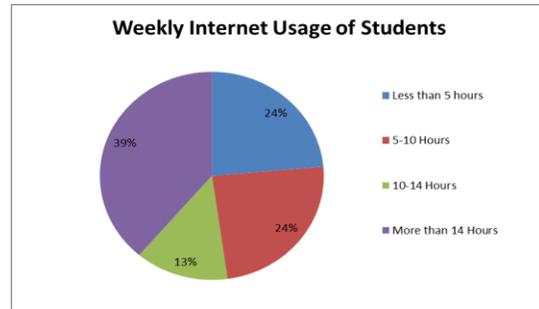


Figure. 3 Time spent on Internet by the Students

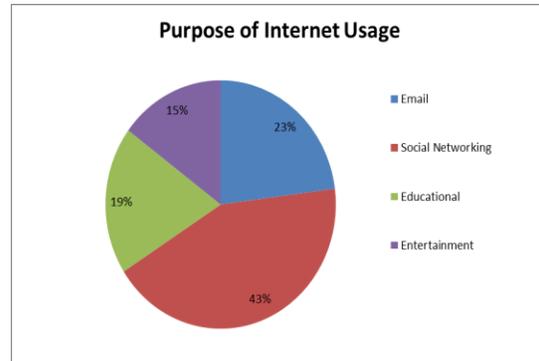


Figure. 4 Purposes for which student use Internet

Figure 5. shows that students who were already familiar with such web learning portals used these learning portals only to upload/download study material. Out of 178 sample size, 148 students utilized Internet for uploading/downloading study material.

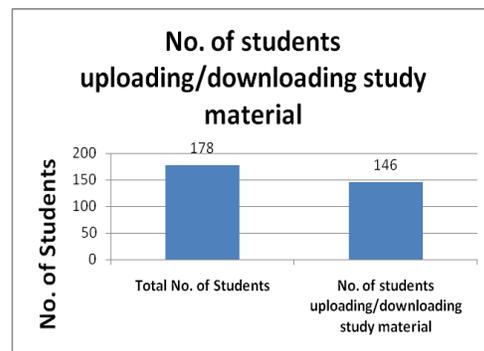


Figure. 5 No. of students uploading/downloading study material.

When the students were asked to rate various parameters to identify if they felt the physical presence of teacher necessary for better understanding of the course ware, 37.07% students strongly felt that it was not necessary for the teacher to be physically present but 4.49% felt that his/her presence was a must, as shown in figure 6. However, 33.14%, 20.22% and 5.05% of students rated this issue on the scales of 2, 3 and 4 respectively thereby depicting that students still were not sure if the teacher was needed for

lecture delivery. Also they were asked to identify if the availability of online study material was helpful in enhancing their learning experience, 42.13% of students felt that they could not retain their concepts through online medium but 1.12% felt that online concepts could help them. The remaining 38.20%, 14.04% and 4.49% students rated this issue on the scale of 2, 3 and 4 respectively. Also, 43.82 % of students stated that their class notes were not easily available online but 4.42% agreed that class notes were easily available if they missed their lectures.

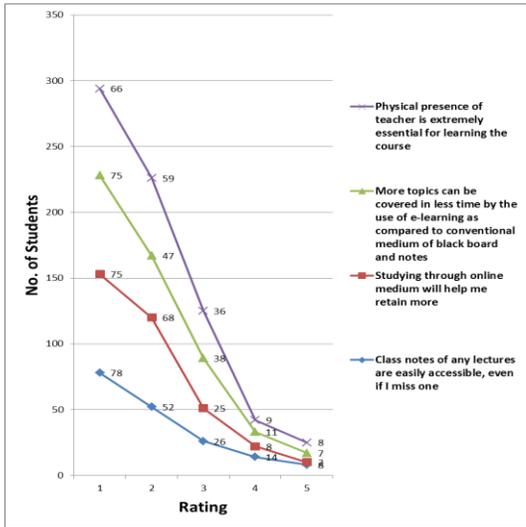


Figure. 6 Rate on various parameters

Discussion

Taking into account the survey analysis, it was observed that the students were positive about the concept of E-learning and thought that such new methodology was a good idea. There seemed to be a greater degree of readiness for the dynamic web environment. The preference for face-to-face lectures or interactive sessions as not-must mode of teaching learning was an encouraging finding. The data depicting readiness of students for DWE showed that out of 178 students, 166 students were interested in an E-Learning environment ,which is remarkable result as it shows the positive tilt towards a new mode of learning. Also, since majority of students were already accessing the educational video on the internet so this form of teaching/learning does not involve excessive overheads in introducing it as a methodology.

Such conclusions were sufficient to give a go-ahead towards creation of such a dynamic web environment called E-campus.

IV. THE E-CAMPUS FRAMEWORK

E-campus, a product of this research study is a Dynamic Web Environment which aims to provide an interactive way of education by means of video-tutorials, online discussions and online study material. This DWE has been built as a web application using Java programming language. It aims towards bringing the students and the teachers together at a single place where they can share their knowledge, clarify

their doubts and download study material. By providing online video lectures, the students can easily have access to them at any time. Moreover, the students can repeatedly watch the video lectures for better understanding. The facility of discussion boards enable students to interact with other students as well as the teachers. Due to its completely dynamic nature and complete dependence on database, this study gets the flexibility to be implemented in any educational organization irrespective of the subjects it is dealing with. Figure 1 is the architectural design of E-campus , the DWE created as part of this research study.

4.1 Architectural Design for E-Campus

This design depicts the client-server interaction i.e. how the client at the front-end sends a request to the open source server-Apache Tomcat while server at the back-end sends the response accordingly to the client. Also, server interaction with the Oracle database server is a component of this architectural design.

4.2 Tools and Technologies for the development of E-campus

E-campus has been developed in a web environment in which Java has been used as a programming language. The platform independence feature of Java makes it an ideal choice to build application software and web applications [7]. Dynamically generated web pages based on HTML, XML and other document types are developed using Java Server Pages (JSP). JSP merges the power of Java programming language into HTML to generate powerful, versatile and flexible web applications. Flash has been effectively put to use to play the videos within the web environment. To deploy and build application, E-campus has been deployed on an open source web server –Apache Tomcat. Tomcat implements the Java Servlet and the Java Server Pages (JSP) specifications from Sun Microsystems and provides a pure Java HTTP web server environment for Java code to run. Oracle Database Server is used for developing and deploying this DWE.

4.3 Structure of E-campus

The structure of E-campus has been classified into 4 major modules-Users Maintenance, Video Tutorial, User Discussions and Reference Material. Each module is allocated a particular task and is further divided into sub modules according to the requirement.

4.3.1 User Maintenance Module:

This module handles all user information like registration of new users and authentication of users. Any new user registering for E-Learning is required to provide certain credentials like User Name, password , email ID, address etc. There are three types of user accounts maintained in E-campus.

Administrator – The administrator manages the entire web application

Faculty – They provide video lectures , study material and store them in the digital repositories.

Student – They are actual users, who access video lectures, share their own video contents and post their queries in discussion topics.

The authentication part of the module is responsible for authenticating the users at login. Only authenticated users are able to post the content while the other users who have not registered cannot view the content of the lecture.

4.3.2 Video Tutorial Module:

This module handles all the video lectures uploaded by the users. Each video is posted under a particular topic. This module allows the users to view video lectures, count the number of views and so on. The users who have registered as students and faculty are able to upload new video lectures to the DWE.

4.3.3 User Discussion Module:

It handles all the queries posted by the users. All the registered users have the privilege to create their discussion topics and post their queries in it and can also reply to the discussion topic which has been added on the DWE. This Module provides the functionality to create discussion topics and post new messages in a particular topic.

4.3.4 Reference Module:

It handles the content that can be downloaded by the users. The reference material can be provided in the form of PowerPoint presentation, text documents, E-books etc. and can be uploaded by the users who have been authenticated as faculty or by the administrator.

were asked to rate the environment on various criteria like quality of lectures and the user interface.

5.3 Analysis and Discussion

After the survey, analysis was conducted to record student’s observation regarding E-Campus .Given below are the results in the form of charts, graphs and tables analyzed under various sub heads.

5.3.1 Evaluating the need of E-Learning Methodology to be implemented

This study found that 98.30% students wanted E-Learning methodology to be implemented. Contrary to the previous similar study performed during the pre-testing phase, there was a rise in demand for E-Learning. Earlier 93.25% of the students wanted an E-Learning teaching system but after the demonstration of E-Learning environment, there was a rise in demand for E-Learning from 93.25% to 98.30% as shown in Figure 7.

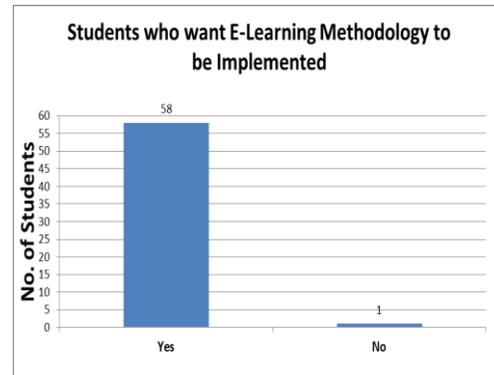


Figure. 7 Demand of E-Learning among students

V. RESEARCH STUDY II

5.1 Aim of the Study

This study aimed to test and evaluate the dynamic web environment E-campus created for this research study. The purpose of this study was to identify the challenges and issues that instructional designers face when designing learning objects and to evaluate the effectiveness of a learning object. This study attempts to evaluate the efficacy of the use of digital technologies in educational settings and to explore possible improvements in creative and effective uses.

5.2 Methodology

After the development of this environment, various lectures associated with the field of computer science were uploaded on the portal for testing and survey was conducted. Students of Department of Computer Science and Applications, Panjab University, Chandigarh, India were introduced to the environment and given time to use it. After the completion process, survey was conducted on 59 students for which questionnaire [Appendix C] was distributed and collection of data was done on different parameters. They

5.3.2 Rating of Video Lectures, User Interface

The E-Campus’s content was rated by the students on the scale of 0(lowest i.e. least liked) to 5(highest i.e. most liked). Video lectures and User Interface were rated 4 by the highest percentage of students i.e. 42.37% as shown in Figure 8. The table 1 below shows the correspondence between the percentage of students and their rating of the user interface of E-Campus whereas Table 2 shows the Content rating of E-Campus by the students. Table 3 shows the Student ratings of other parameters like percentage of students who think discussion boards can help them clarify their doubts, percentage of Students who think providing study material for downloading is useful etc.

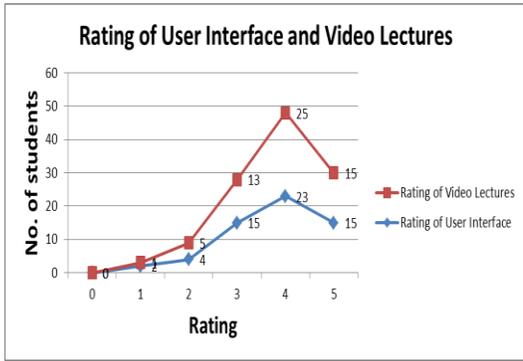


Figure. 8 Rating of user interface and video lectures simultaneously

TABLE 2 CONTENT RATING OF E-CAMPUS BY THE STUDENTS.

Rating of Video Lectures	% of Students
0	0 %
1	1.69%
2	8.47%
3	22.03%
4	42.37%
5	25.42%

TABLE 3. STUDENT RATINGS OF OTHER PARAMETERS.

5.3.3 Other Parameters

This case study required the students to rate various parameters which help us to decide whether E-learning should be created or not. Shown in Figure 9.

S#	Parameter	% of Students
S1	Students who think discussion boards can help them clarify their doubts	91.52 %
S2	Students who think providing study material for downloading is useful	94.91 %
S3	Students who think online lectures can provide better concentration	91.52 %
S4	Students who think that online lectures can replace conventional classroom lectures	50.84 %

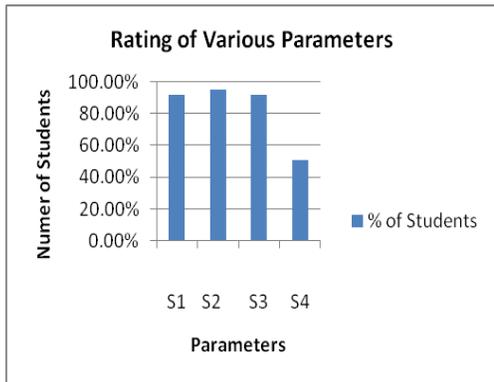


Fig. 9 Other parameters related to E-Learning portal

TABLE 1. USER INTERFACE RATING OF THE E-CAMPUS BY THE STUDENTS.

Rating of User Interface	% of Students
0	0 %
1	3.38%
2	6.77%
3	25.42%
4	38.98%
5	25.42%

VI. CONCLUSION

Traditional environment of the educational process is becoming more flexible and is enabling acquisition of new skills and competences when integrated with the E-Learning system. This also asks for adaptation, reorganization and investments in order to create better educational scenario. E-learning systems such as E-campus are a dynamic web environment created with the learning objects. Such methodology is a positive move towards the betterment of the education system as shown by the research study and its analysis.

The research study II, conducted for testing and evaluation of DWE proved that majority of the students wanted such an E-Learning systems to be provided to them for a better education. The results of this case study were highly motivating with the majority of students supporting the user interface & content of the E-Campus.

From the above research studies it can be easily concluded that E-Learning study environment is a much looked for environment by the students though it cannot completely replace the physical presence of the teacher but it can certainly be used along with the traditional learning system. According to the reaction of students depicted in the research studies, the e-learning systems have taken their position in formal and informal setting. Development of new skills next to the sufficient motivation and possibility of free access offer new role in this blended learning environment.

However, the process of implementing a total E-Learning educational environment must only begin in phases by initially integrating it with the conventional classroom education system and then slowly letting it bloom.

REFERENCES

[1] Baer, Walter S. E-Learning: A Catalyst for Competition in Higher Education.
http://www.cisp.org/imp/june_99/06_99baer.htm

[2] Cowan, J. (2006). Introduction. In J. O'Donoghue, Technology supported learning and teaching - A staff perspective (pp. 1-13). London: Idea Group

[3] Chawla, Sonal, Singla, R.K.(2009), titled "Student's perception of Online Learning and their readiness for a Virtual University" published in Indian Journal of Distance Education (pp 43-47) Vol. X, October 2009.

[4] Farrell, Glen M(1999). Introduction. In: Farrell, Glen M et al. eds. The Development of Virtual Education: A global perspective, 1999

[5] Honebein, P.C., Duffy T. and Fishman B. (1993) Constructivism and the Design of Learning Environment: Context and Authentic Activities for Learning, in T.M. Duffy, J. Lowyck and D. Jonassen

[6] http://ai.eecs.umich.edu/cogarch4/toc_defs/defs_env/defs_dyn_env.html

[7] <http://www.webandmacros.net/dynamic-website.htm>

[8] <http://www.learning-objects.net/>

[9] http://kovalteaching.com/Library/NTFL_Discussions/WEEK%202/2_1_bannan-ritland.pdf

[10] http://en.wikipedia.org/wiki/Learning_object

[11] http://help.sap.com/saphelp_nwsrcr/helpdata/en/44/f6ddf7b7dd0e8fe1000000a11466f/content.htm

[12] http://www.java.com/en/download/w_hatis_java.jsp

[13] <http://www.javazoom.net/jzservlets/uploadbean/uploadbean.html>

[14] <http://www.longtailvideo.com/>

[15] <http://www.jsptut.com/>

[16] <http://download.oracle.com/javase/1,5,0/docs/index.html>

[17] <http://download.oracle.com/javase/1,5,0/docs/index.html>

[18] Kay, R. H., & Knaack, L. (2006). A systematic evaluation of learning objects for secondary school students. Interdisciplinary Journal of Knowledge and Learning Objects Volume 1, 2005 Pg 229-254

[19] Khakhar, Dipak (1999) . A framework for open distance learning- organisation and management. In: Henk Van der J. Molen, ed. Virtual University? Educational Environments of the Future. Proceedings from a Symposium held at the Wenner-Gren Centre, Stockholm, October, 1999, pp.32-33.

[20] Iasnica, K.; Seljan, S.; Lasic-Lazic (2005). Quality Metrics of an integrated E-Learning System-student's Perspective 2005. <http://www.intechopen.com/articles/show/title/quality-metrics-of-an-integrated-e-learning-system-students-perspective>

[21] MacDonald, C. J., Stodel, E., Thompson, T. L., Muirhead, B., Hinton, C., Carson, B., et al. (2005). Addressing the eLearning contradiction: A collaborative approach for developing a conceptual framework learning object. Interdisciplinary Journal of Knowledge and Learning Objects, 1, 79-98. <http://ijlko.org/Volume1/v1p079-098McDonald.pdf>

[22] M.D. Merrill and the ID2 Research Group (1996), Instructional Transaction Theory: An Instructional Design Model based on Knowledge Objects, Educational Technology, 36(3), 1996; 30-37; <http://www.id2.usu.edu/Papers/IDTHRYK3.PDF>

[23] Pressman, R. S. & Ince, D. (2000) Software engineering: a practitioner's approach. 5th ed. – European edition. McGraw-Hill.

[24] Savery, J. (1994, May) What is problem-based learning? Paper presented at the meeting of the Professors of Instructional Design and Technology, Indiana State University, Bloomington, IN.

[25] Sun, L., Williams S., Ousmanou K and Lubega J. (2003) Building Personalised Functions into Dynamic Content Packaging to Support Individual Learners, 2nd European Conference on e-Learning 2003, Glasgow, Scotland, ISBN: 0-9544577-4-9

[26] Sommerville, I. (2000) Software engineering, 6th Ed. Addison-Wesley

[27] Wiley, D. A. (2000). Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy. In D. A. Wiley (Ed.), The instructional use of learning objects: Online version. <http://reusability.org/read/chapters/wiley.doc>

[28] Constructivism in the Design of Online Learning Tools. http://ozelacademy.com/EJES_v2n3_7.pdf

[29] Students's Evaluation of Learning Objects. http://www.ndlrn.edu.au/verve/_resources/students_evaluations_learning_objects_2007.pdf

[30] A Study of the Design and Evaluation of a learning Object and implications for content development. <http://ijlko.org/Volume1/v1p001-022Krauss.pdf>