RESEARCHERID
THOMSON REUTERS

[Vinay * *et al.*, 7(1): January, 2018]
IC™ Value: 3.00

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

SEMANTIC WEB TECHNOLOGY BASED TOOL FOR ENHANCING THE E-LEARNING CONTENT

Vinay M*[1] & Dr. Deepaanand[2]
[*1]Scholar, JJT University, Rajasthan, INDIA
[2]Department of Computer Science, CMR Institute of Technology, Bengaluru, INDIA

DOI: 10.5281/zenodo.1135386

ABSTRACT

We are unfolding a new educational and technological tool that enhances the lesson content using Semantic Web Technologies. We tested it with 130 students and their results shows changes in the understanding level and improved performance in students. When compared to existing tools, proposed prototype gives new potentiality in lessons content enrichment.

KEYWORDS: Learning Management System, E-learning, digital Lessons, teaching tool, enhanced learning content

I. INTRODUCTION

In the current teaching and learning conditions E-Learning has made-up a great growth permitting academicians to depend on latest enhanced technology to give a different experience and allow the students with improved learning resources [1]. Within the current method of learning many latest trends have risen such as online Classrooms, Virtual Learning Systems (LMS), that allows users to share learning resource, develop content, work together through chat, forums, wiki, create assignments, give and receive feedback from other contributors, integrate digital tools inside LMS and some other tools. These LMS and Digital tools are used by many universities and colleges as part of their courses and degree program and several faculty and students are, now, accustomed with them. However, with these new tools new challenges will come. Out of many changes that takes place we are concentrating on Semantic Web and content improvement. Faculty members expertise content on e-learning is helping to improve the knowledge of the learners. However, there can be many more information that can be linked, related to main content using appropriate new technology and tools.

Consider the example, if some data is representing Narendra Modi, a student may be questioning who is Modi or puzzled if modi is stated in numerous ways (like narendra modi, modi, narendra, narendar damodara modi, N.D.Modi). This kind of problematic situation is resulting because of the absence of proper semantics in the available content. The suggestion of this tool or technology is to take benefit of Semantic Web to deliver more learning resources pertaining to the main content, improved pages, combine entities and with RDF (Resource Description Framework). The key work in this research is an enhanced tool that adopts a Semantic Web technique to improve and broaden the learning courses content. Proposed technological tool allows to complement learning cresources hosted in Google classroom or any LMS favoring the increment of courses improving effectiveness [2] as this work states.

II. LITERATURE REVIEW

LMS based extended tool is described in [2] which is like the one which is proposed by us in this paper, they have used different way to link the data. Semantic web based data enhancing scheme is presented in [4] where data related to museum objects are added, to which the semantic web is linked. An identical architecture of that is shown in this paper by [3], in which authors explained an architecture to improve data related to government and circulate these improved data as linked data.

The authors in [5] have also used linked open data based on geo-spatial to improve social media tagging, like Twitter/ Facebook to enhance the user generated content.

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

Those students who are dependent on their progress and fails, a personalized content enhancer and recommender using ontologies is presented in [6]. Enhanced video and images can definitely improve the quality of the learning using media management system is described in [7].Relationship is specified in [8] where writers highlighted its use in technology improved learning. To provide personalized e-learning experiences, how web semantic techniques is showcased in [9]. How to Share content in open-courseware and the application of semantic web is discovered in [10].

Structuring education material is defined and described using ontologies is presented in [11]. Searching educational videos using annotating video with LOD (Linking open data) is described in [12].

Process od enhancing the content can be done using adaptive techniques through Hyper media which is specified in [13] and using learning objects in[17] [18].

III. PROTOTYPE (PROPOSED)

To enhance the learning experience of the learner we have developed a prototype model called **DigiLearn**, which enhances the lesson content in LMS. Improvement and enhancement in this tool refers to the changes and mapping of related information to the lesson resources. This improvement offers tremendous opportunity for learner to gain new knowledge without using any new platform. This tool provides the students an ultra-modern way of searching the related content. Most relevant known information is extracted from the basic text and kept ready using NLP (Natural Language Processing). To add most relevant information the tool uses Semantic Web. The main idea behind this tool is to catch the benefit of the Semantic Web and give the additional relevant information inside the courses.

Prototype Application

DigiLearn basically extracts the content from the Learning Management System tool and analyses it to get a significant entity, which is shown to the learner, enhancing the existing lesson content with expanded information. For a prototype based testing we have integrated the DigiLearn with MOODLE LMS, which is a free - Open Source tool, that supports all needs of a typical LMS allows to integrate with and enhance its functionality. A Teacher has to do minimal steps to integrate and enhance the content. Once the teacher login to LMS, he/she will get the content which are not enhanced. If the teacher wishes to add additional content then they can import it. If they choose the import option, then the entity identifier algorithm will run, giving the teacher an option of selectable checkboxes. These entities are cross checked with the confidence level that their necessity in the lesson content

When the faculty selects the additional content , it will be mapped with the lesson, so that when the learner searches for it, it will be displayed along with the lesson content. This kind of reaction enhances the system because it can be revised based on the content and the faculty requirement.

DigiLearn adds the enhanced information to the course content by using fragment method, which displays the enhanced data based on the entity type selected by the faculty. Enhanced content for each and every individual fragment is possible, Fragments can be planned with several information based on the entity type, like place of birth, date of birth, description, image, etc.,

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

Fig 1– Proposed Prototype tool

For including these types of cardviews into the previously available content, a modal based approach has been used, hyperlink is shown when an additional content is available. When a hyperlink appears, it indicates that corresponding items description or enhanced details are available. Using this tool, a large set of enhanced knowledge can be offered to the learner without going away from the main content and tool.

IV. TECHNOLOGY BUNDLE

The following Technologies are used:

- Moodle[1]: A Learning Platform which is responsible for all learning bundle. This provides authentication, Robust Secure integrated system, content and course management, and plug-ins to expand its functionality.

- ApacheStanbol[2]: A set of reusable components runs the NLP (Natural Language Processing) and gives the result with URI's with few related qualities. Stanbol is used as an entity recognizer and acts as a program that determines the meaning of term from the context in which it is used.

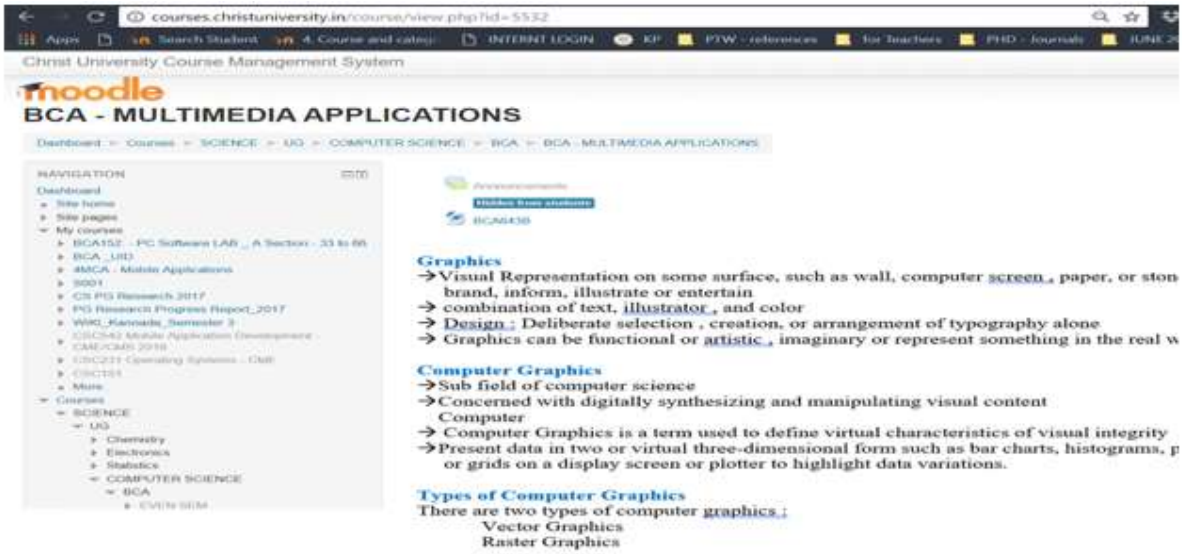

Fig 1: LMS without DigiLearn Tool

Apache Marmotta[3]: An Open Platform for Linked Data, which provides an open implementation of a linked Data Platform that can be used, extended and deployed easily. This is a Resource Descriptive Framework that offers Pluggable RDF triple stores (SPARQL[4] and RDF), custom triple store built on top of RDBMS with transactions, versioning and rule-based reasoning support. To enhance the content, it offers a set of web Services along with updation to RDF content. Marmotta sues MariaDB database to persist triples on it.

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

DBpedia[5]: This is a crowd-sources community effort to extract structured information from Wikipedia and make this information available on the web (transforms it into RDF). DBpedia allows to ask sophisticated queries against Wikipedia, and link the different data sets on the Web to Wikipedia data.

Fig 1. Shows in what way mentioned technologies are interacting in proposed model.

We have used LTI(Learning Tools Interoperability) protocol [19] , from IMS Global Learning Consortium, version 1.1.1 for establishing the link between Moodle and prototype. This Platform is a way to integrate rich learning applications with platforms like Learning Management Systems (LMS), portals and other educational environments managed locally or in the cloud. Between DigiLearn and Apache Stanbol and I and between DigiLearn and Apache Marmotta we have used REST API. Through JDBC the Apache Marmotta is interconnecting with MariaDB meanwhile SPARQL endpoint is quiried with Apache Jena[6].

The application works like this: first the Application is raised from Moodle, based on the login user role (like admin, user, faculty) it displays the available menu. When the teacher starts the import entity, DigiLearn passes the required lesson content to Apache stanbol, in turn it executes a recognition algorithm. Stanbol completes the work and sends back the RDF in graphical way including URI entities which also has some extra properties. DigiLearn continues this RDF, and few additional queries from the DBPedia to Apache Marmotta. Lastly, after completion of the importation is persisted, when the user goes to content section, DigiLearn will run the SPARQL queries for various continued entities. DigiLearn will also modifies entities look for links that will shows the information.

V. EFFECTIVENESS OF THE PROTOTYPE

Proposed prototype is concentrated on enhancing the effectiveness of content using semantic web technology. The effectiveness of the proposed tool is checked when the users (student) were using the tool.

To check the effectiveness of this tool, we have composed a lesson with 3 subtopics (Graphics, Vector and raster, Resolution). The basic Moodle page with all these topic is shown in Fig 2. The DigiLearn tool takes all the lesson and enhances the content, enhanced content will be displayed in the from of cards. These additional enhanced contents will appear when the learner clicks on the corresponding hyperlink. (Fig 3.)

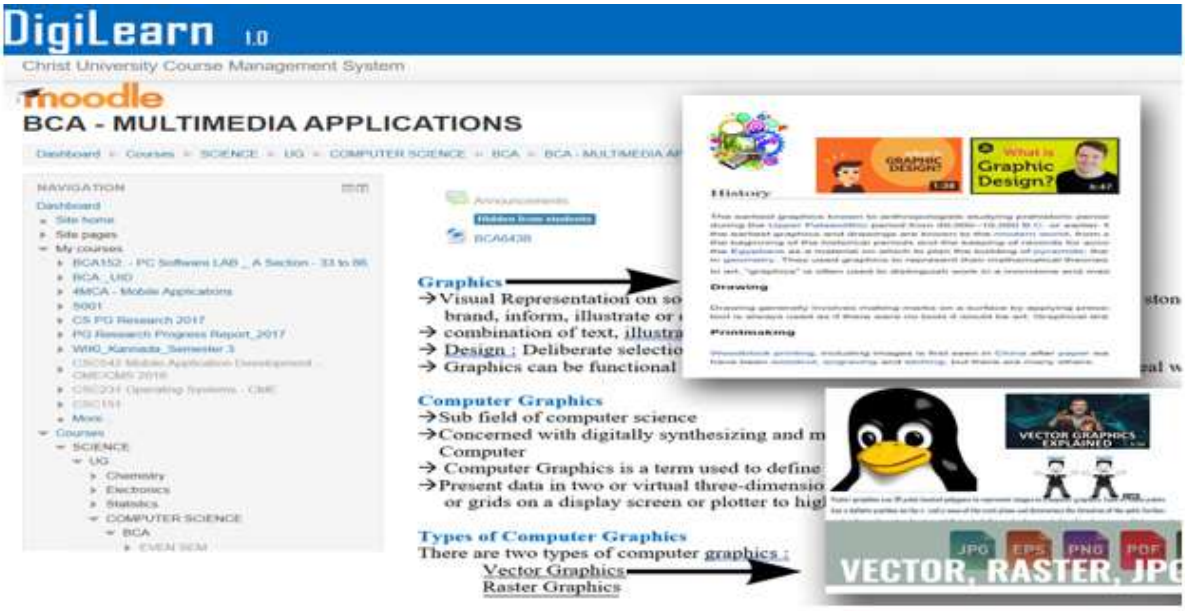

Fig 3 – DigiLearn tool with enhanced content (hyperlinks

The basic difference between basic view and enhanced tool view is that, enhanced content can be referred by the student without changing the view or leaving the basic content, finally the end user will get more knowledge from both.

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

Sample testing consist of 60 students studying Bachelor of Science in Computer Science in Christ University, Bengaluru. Both Boys and Girls of age 16 to 18 were considered. Two set of random groups were made, and two methods were used to test the tool effectiveness. Method 1: without using the proposed tool, method 2 with the proposed tool, while studying the basic lesson with 3 subtopic.

First method had a questionnaire about the topic that were covered using the Moodle. In this the students were shown with the basic content about the topics and students were read about it, memorized and later the questionnaire was used to assess them. In the second method the students were exposed to the lesson content along with proposed prototype, later similar of method 1 questionnaire used to assess them. Both the set of students were given the feedback questionnaire to know the advantage of the enhanced content provided by the tool. The Evaluation questionnaires contained 15 questions.

All questions correct answer were assigned with 1, and no responses with 0. Queries were based on the content showed in the native and enhanced version in Moodle, with and without DigiLearn tool. The questionnaires were collected using online form (Google Form), consolidated using Online Google Spreadsheet. The Moodle and DigiLearn were hosted in the Microsoft windows machine, students were accessed the Moodle using Google Chrome web browser.

VI. RESULT

To evaluate the effectiveness the performance of the students was taken into consideration and tested. 30 students were taken the lesson skills without the proposed tool. 30 students were taken the lesson skills with the proposed tool. There thinking skills, logical skills , analytical skills and Problem solving skills were tested before and after the tool usage.

Table 1: Skill Enhancement Percentage

Skills	**Students(30) (without DigitLearn)**	**Students (30) (With DigiLearn)**
Problem Solving skills	37 %	48%
Logical skills	15%	28%
Analytical skills	20%	34%
Creativity thinking skills	28%	45%

Test conducted out of 20 marks,20 questions, similar for both the set of students. The results are shown below

3. http://marmotta.apache.org/
4. http://www.w3.org/TR/rdf-sparql-query/
5. http://wiki.dbpedia.org/
6. https://jena.apache.org

Table 2: Overall Score of the students

	Students(30) (without DigitLearn)	**Students (30) (With DigiLearn)**
Score 15 to 20	06	14
Score 10 to 15	10	08
Score 5 to 10	08	06
Score 0 to 5	06	02

The skill enhances percentage and the result shown in the tables above exhibits that the group b with the students who had exposed to the DigiLearn has a significant growth in performance and understanding knowledge.

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

VII. DISCUSSION

We also conducted the satisfaction survey for inclusion of the tool in different subjects. The survey shows that students were very happy while using this tool during the lesson practice. There fore we recommend that this tool to be used in all subjects without affecting their current subject learning methods. And also the survey shows that the usage of this proposed prototype tool has no issues in using it while using the current virtual learning environments.

In many of the methods which were proposed earlier the teacher need to know a lot technical knowledge [14] [15] [16] [17]. But in DigiLearn teacher need not worry more on technical part as he/she has to choose between the identified entity just to enhance the lesson content. DigiLearn uses the semantic web approach which provides more flexible for teacher. Moreover other approaches did not cover the assessment part [3] [4] [5] [7] [9].

VIII. CONCLUSION AND FUTURE ENHANCEMENT

The description, technology stack and the working method of the DigiLearn- proposed tool is explained in detail in this paper. This tool takes the advantage of the semantic web, linked data, Moodle LMS. This tool enhances the user learning experience by providing the additional required content to the user without leaving the current views/state of the learning methods. This work leads to the better way of using semantic web data in e-learning platforms.

IX. REFERENCES

[1] S. Y. Park, "An Analysis of the Technology Acceptance Model in Understanding University Students' Behavioral Intention to Use eLearning," Journal of Educational Technology & Society, vol.12, no.3, pp. 150–162, 2009.
[2] M. Paule-Ruiz, V. ´Alvarez-Garc´ıa, J. R. P´erez-P´erez, and M. Riestra-Gonz´alez, "Voice Interactive Learning: A Framework and Evaluation," in Proceedings of the 18th ACM Conference on Innovation and Technology in Computer Science Education, ser.ITiCSE '13. New York, NY, USA: ACM, 2013, pp. 34–39.
[3] D. Glachs, V. Damjanovic, F. Strohmeier, and S. Fern´andez, "EAGLE–Local Government Learning Platform," Proceedings of the Linked Learning meets Linked Up: Learning and Education with the Web of Data, co-located with 13th International Semantic Web Conference (ISWC 2014).
[4] M. Coccoli and I. Torre, "Interacting with annotated objects in a Semantic Web of Things application," Journal of Visual Languages & Computing, vol. 25, no. 6, pp. 1012–1020, dec 2014.
[5] D.-P. Deng, G.-S. Mai, C.-H. Hsu, C.-L. Chang, T.-R. Chuang, and K.-T. Shao, Linking Open Data Resources for Semantic Enhancement of User–Generated Content, ser. Lecture Notes in Computer Science, H. Takeda, Y. Qu, R. Mizoguchi, and Y. Kitamura, Eds. Berlin, Heidelberg: Springer Berlin Heidelberg, jan 2013, vol. 7774.
[6] A.Gladun, J.Rogushina, F.Garc´ıa-Sanchez, R.Mart´ınez-B´ejar, and J.T.Fern´andez-Breis, "An application of intelligent techniques and semantic web technologies in e-learning environments," Expert Systems with Applications, vol. 36, no. 2, pp. 1922–1931, mar 2009.
[7] T. Kurz, G. G¨untner, V. Damjanovic, S. Schaffert, and M. Fernandez, "Semantic enhancement for media asset management systems," Multimedia Tools and Applications, vol. 70, no. 2, pp. 949– 975, 2012.
[8] S. Lohmann, P. Heim, and P. D´ıaz, "Exploiting the Semantic Web for Interactive Relationship Discovery in Technology Enhanced Learning," in 2010 10th IEEE International Conference on Advanced Learning Technologies. IEEE, jul 2010, pp. 302–306.
[9] P. Markellou, I. Mousourouli, S. Spiros, and A. Tsakalidis, "Using Semantic Web Mining Technologies for Personalized e-Learning Experiences," in Proceedings of the web-based education. Grindelwald, Switzerland: ACTA Press, feb 2005, pp. 461–826.
[10] P. Nelson, T. Edmundo, C.-P. Ricardo, L.-V. Jorge, and A. C. Janneth, "Consuming and producing linked open data: the case of OpenCourseWare," Program, vol. 48, no. 1, pp. 16–40, 2014.
[11] L. Stojanovic, S. Staab, and R. Studer, "eLearning Based on the Semantic Web," in Proceedings of WebNet 2001, World Conference on the WWW and the Internet, no. FEBRUARY 2002, Orlando, Florida, 2001.
[12] H. Q. Yu, C. Pedrinaci, S. Dietze, and J. Domingue, "Using Linked Data to Annotate and Search Educational Video Resources for Supporting Distance Learning," Learning Technologies, IEEE Transactions on, vol. 5, no. 2, pp. 130–142, 2012. [13] P. Brusilovsky, "Methods and techniques of adaptive hypermedia," User modeling and user-adapted interaction, vol. 6, no. 2-3, pp. 87–129, 1996.

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

[13] P.DeBra, D.Smits, K.vander Sluijs, A.I.Cristea, J.Foss, C.Glahn, and C. M. Steiner, Intelligent and Adaptive Educational-Learning Systems: Achievements and Trends. Berlin, Heidelberg: Springer Berlin Heidelberg, 2013, ch. GRAPPLE: Learning Management Systems Meet Adaptive Learning Environments, pp. 133–160.

[14] A.Montes Garc´ıa, P.DeBra, G.H.L.Fletcher, and M.Pechenizkiy, "ADSL Based on CSS for Hyper text Adaptation," in Proceedings of the 25th ACM Conference on Hypertext and Social Media, ser. HT '14. New York, NY, USA: ACM, 2014, pp. 313–315. [16] P. De Bra, E. Knutov, D. Smits, N. Stash, and V. F. C. Ramos, "GALE: A Generic Open Source Extensible Adaptation Engine," New Rev. Hypermedia Multimedia, vol. 19, no. 2, pp. 182–212, 2013.

[15] M. del Puerto Paule Ruiz, M. J. F. D´ıaz, F. O. Soler, and J. R. P. P´erez, "Adaptation in current e-learning systems," Computer Standards & Interfaces, vol. 30, no. 1–2, pp. 62–70, 2008.

CITE AN ARTICLE

M, V., & D., Dr. SEMANTIC WEB TECHNOLOGY BASED TOOL FOR ENHANCING THE E-LEARNING CONTENT. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY, 7*(1), 54-60.