Educational Semantic Wikis in the Linked Data Age: the case of MSc Web Science Program at Aristotle University of Thessaloniki

Charalampos Bratsas [1,2], Anastasia Dimou[1], Georgios Alexiadis[1], Despoina-Eleana Chrysou[1], Konstantinos Kavargyris[1], Ioannis Parapontis[1], Panagiotis Bamidis[1,2], Ioannis Antoniou[1]

[1]Web Science, Mathematical Department, Aristotle University of Thessaloniki, Greece
[2] Lab of Medical Informatics, Medical School, Aristotle University of Thessaloniki, Greece
cbratsas@auth.gr, andimou@math.auth.gr, galexiad@math.auth.gr, chrysoue@math.auth.gr, kostaskav@math.auth.gr, paraponi@math.auth.gr, bamidis@med.auth.gr, iantonio@math.auth.gr

Abstract. Wikis are nowadays a mature technology and further well established as successful eLearning approaches that promote collaboration, fulfill the requirements of new trends in education and follow the theory of constructivism. Semantic Wikis on the other hand, are not yet thoroughly explored, but differentiate by offering an increased overall added value to the educational procedure and the course management. Their recent integration with the Linked Data cloud exhibits a potential to exceed their usual contribution and to render them into powerful eLearning tools as they expand their potentialities to the newly created educational LOD. Web Science Semantic Wiki constitutes a prime attempt to evaluate this potential and the benefits that Semantic Web and linked data bring in the field of education.

Keywords*: Wiki Engines, Semantic Wiki, e-learning, Linked Data*

1 Introduction

Semantic Web is the current state-of-the-art, whose unprecedented intension is to unlock the value of content; even though knowledge modeling is significantly difficult due to its complexity. Nowadays, this is mainly accomplished using the two prominent semantic technologies of ontologies and Linked Data [1]. Although their diffusion is not wide, the education field is well passed [2]. There are several educational projects which have already started to use Linked Data. Among them are meducator [3] [1], LUCERO JISC Project[2] , dotAC[3] , RKB Explorer[4] and SemTech[5].

[1] http://www.meducator.net/
[2] http://lucero.open.ac.uk/
[3] http://www.dotac.info/
[4] http://www.rkbexplorer.com/explorer/
[5] http://www.semtech.ecs.soton.ac.uk/

This paper attempts to highlight in a brief but informative way the integration of Advanced Semantic Wikis with the Semantic Web and Linked Data in the form of Semantic Learning Management Systems (SLMS). Web Science Semantic Wiki (WSSW) is used as a reference for this purpose and in a sense emphasizes on how Semantic Wikis might render to be a rich alternative eLearning approach in the Linked Data Age.

2 Web Science Semantic Wiki Presentation

WSSW was initially implemented as a project within the framework of Master Program "Web Science" of Aristotle University of Thessaloniki, Greece. It has nowadays evolved into a SLMS to support the adoption of Linked Data in the field of educational procedure following closely the tense towards Linked Data in Education as it is determined by the University of Southampton and the Open University in UK.

WSSW manages to conjunct successfully the two predominant semantic technologies. On the one hand, it uses the classical ontological structure to model its knowledge base and on the other hand it renders it available to be queried by the Semantic Web through its Triple Store connector. The purpose was to outreach the self-contained perspective of Semantic Wikis and try to expose its content to the Linked Data Cloud as a first step before the overall integration with it.

2.1 The platform

SMW+[6]-community option- was the platform's core software base together with a set of accompanying extensions to the Semantic Mediawiki[7] powered by MediaWiki. As far as the extensions were concerned, the Halo Extension[8] was specifically selected to facilitate WSSW's use for the more inexperienced users. It provided the WSSW with a semantic annotation bar and an autocompletion feature but its true value emerged in conjunction with the rest of the available extensions. Another essential extension used was the Semantic Gardening Extension[9]. It was installed to upload and maintain the WSSW ontologies and to continuously check for their consistency and referential integrity. It ensured that any anomalies, pages without annotations, and undefined entities would be detected and finally exported the ontology as it was modified after the users' intervention in order to be reused. The extension of Semantic Form[10] was also broadly used to allow users to enter their data semantically annotated without the need to learn the Semantic Mediawiki's syntax. Instead, the Semantic annotations were added indirectly through the simultaneous use of the corresponding templates. TreeView, (Treeview5[11] and Javascript dtree) was yet another extension used that

[6] http://wiki.ontoprise.de/
[7] http://semantic-mediawiki.org/wiki/Semantic_MediaWiki/
[8] http://wiki.ontoprise.de/smwforum/index.php/Help:Halo_extension
[9] http://smwforum.ontoprise.com/smwforum/index.php/Help:Semantic_Gardening_extension
[10] http://www.mediawiki.org/wiki/Extension:Semantic_Forms
[11] http://smwforum.ontoprise.com/smwforum/index.php/Help:TreeView_extension

requested subtrees automatically and allowed the demonstration of WSSW's tree as an alternative way to navigate through the wiki. TripleStoreConnector[12] Basic Extension was installed to enhance WSSW's querying capabilities. It contained the Jena Triplestore connector and connected the the Triplestore with the SMW+ and a tolerant SPARQL endpoint. It allowed queries of the semantic data directly from within the wiki or remotely via a SPARQL endpoint. This led into better search results since inverse, equal and transitive properties were reflected in the queries. A SMW User Manual Extension[13] enabled immediate access to help, context-sensitive selection of help articles and provided direct feedback in the online community, (submit bugs and ask questions). Semantic Results Format Extension[14] was installed because it bundled a number of result formats for the inline queries. Timelines, eventlines googlebars, googlepies and semantic maps and calendars were applied to present several queries in a more comprehensive and representative way.

Additionally, several other extensions were installed to support the better function of the WSSW and to succeed in better presentation of the content.

2.2 Structure Description

The approach followed to represent the structure of the actual master program was based on an ontology, which provided the essential building blocks to best suit the WSSW needs. It consisted of a primary, master's program ontology in combination with the imported FOAF[15] (Friend Of A Friend) one (Figure 1). The master's program key ontology was implemented initially on Protégé, it was then modified through the WSSW Ontology Browser and obtained its instances, dynamically, after the users' entries. On the other hand, the FOAF was imported to fulfill the specific descriptive needs of the master's manpower, (instructors and students). What follows is a brief description of the WSSW structure via presenting some of its elements.

The FOAF class "Person" is used to describe all the persons involved. The Master's ontology distinguishes them into the classes of "AcademicStaff" and "Student", and each one has its own subclasses. Apart from the class "Person", the Master's ontology also has the "Announcement" class that has as instances all the announcements of the Master and the class "Assignment" which includes all the assignments announced at the lectures. An assignment might be the same for all students or individual ones might be assigned to specific students each time.

In addition, the class "Course" includes all the information concerning each separate course and the "Degree" class is related to the class "Person" so as to define the higher educational level of a Person. The class "Lecture" describes the specific lectures of a course and the "Material" refers to all books, presentations and notes available on each lecture. The "News" class includes all news related to the Master and the class "UniversityOrganisation" is a subclass of FOAF class "Organization".

---

[12] http://smwforum.ontoprise.com/smwforum/index.php/Help:TripleStoreConnector_Basic
[13] http://smwforum.ontoprise.com/smwforum/index.php/Help:User_Manual_extension
[14] http://smwforum.ontoprise.com/smwforum/index.php/Help:Semantic_Result_Formats
[15] http://xmlns.com/foaf/spec/

Several forms were also implemented to allow easier user editing of the WSSW but to also ensure that the content would be automatically annotated and to maintain a consistent data structure. Each form creates a new instance for the class it defines. The fields that the users are asked to complete are the values of the properties of the instance. Each form is accompanied by its template which contributes further in the content presentation. Forms are used to create new and/or edit existing instances.

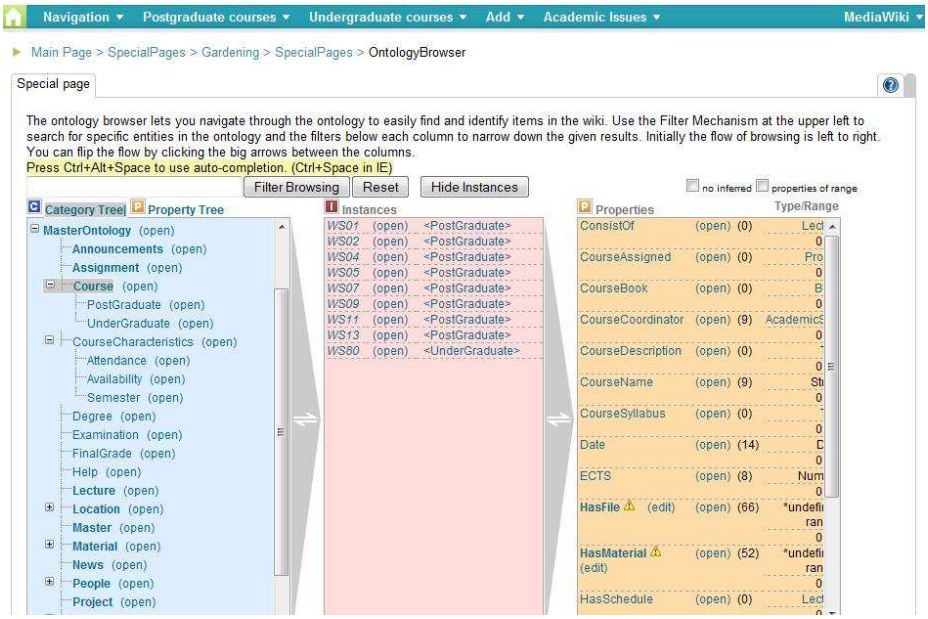

Fig. 1. The key ontology at the ontology browser

Each WSSW registered user owns a unique profile created via the “PeopleForm” and depending on the category he belongs to, he is assigned with different access rights in the available forms. For instance, only the Master’s and course Coordinators have access to the “NewsAnnouncementsForm” form and are allowed to add new entries at the associating sections. The Master’s Coordinator can also add new, or renew existing Courses via the “CourseForm” and can additionally assign a Thesis to an eligible student using the “ThesisForm”. On the other hand, the Course Coordinators may add new Lectures for their Courses, announce the Project topics and assign them to one or more Students, always through the associating forms. In general, each time a registered user attempts to enter a new entry, a table list, result of an inline query, informs him of any already existing entries and instances of that certain category and when he completes the values at the form’s fields, autocompletion feature based on concepts, facilitates his work.

A course example is presented at Figure 2. The course’s overall timetable is gathered at the course’s main page as it comes up combining its separate lectures properties. Its material is, also, collected via an inline semantic query which sum ups all separate materials added by individual lecturers. The course’s calendar follows as

a result of inline query to the lectures timetable (not illustrated at the Figure 2). Moreover, the users may browse the WSSW via the Semantic TreeView on the right of the context pane.

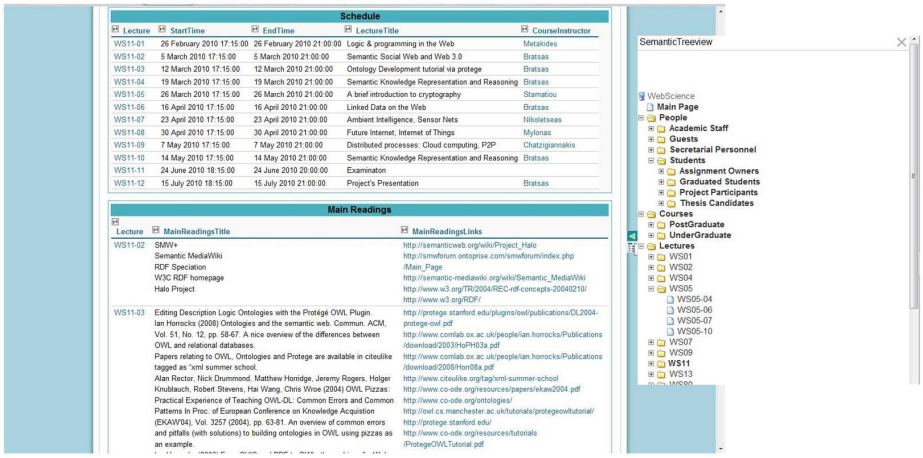

Fig. 2. A course as it is presented at WSSW

2.3 Highlights

The WSSW provides the usual benefits the most Semantic Wikis tend to exhibit and as these are summarized in scientific papers. It differentiates however in terms of content presentation and availability. Most Semantic Wikis seem to lack a much desired flexibility in the ways that content becomes available to their users. The WSSW approach caters for this need with a more thorough use of semantic annotations and attains a greater level of flexibility. It manages to offer consistent and well presented content in multiple and rich ways. WSSW users may choose one of the several different presentations that best suits their needs and experience enhanced browsing and navigation capabilities.

Apart from the inline links in regular semantic wikis, the WSSW offers alternative ways to navigate through its content. For instance, users may browse the WSSW via its compendious Factbox which sums up the semantic annotations referred at each specific page or choose a Semantic TreeView on the right of the context pane. In addition, one may use the most conventional way of the menu, which is an inline semantic query on each one. Besides regular navigation, enhanced Semantic Search Option and friendly Query Interface are provided to the users to serve their needs.

A well-adapted Semantic Calendar accompanied with Semantic Maps allows users to be informed of the timetables and the exact places associated with each lecture. This and all other intersperse information of the WSSW are readily available via inline semantic queries.

Another strong point of the WSSW is that it exploits the advantages of a Jena Triple Store Connector that besides storing, it also exposes data to the Semantic Web

and allows queries to be performed on them from other remote endpoints. This feature makes the difference comparing to the common Semantic Wikis which are independent of the rest Linked Data Cloud. The uppermost goal is the WSSW to be able, also, to incorporate data from Linked Data Cloud as well.

At the design stage of WSSW, SMW+ set of extensions was the only option for a wiki powered by MediaWiki to expose its knowledge base to the Semantic Web and to also allow queries via SPARQL. One has nowadays additional options when choosing a triple store connector/extension with each providing different functions and advantages. A comparison of their features is available at [4].

3 Conclusions and Future Work

Through WSSW we demonstrated that Advanced Semantic Wikis, integrated with the Semantic Web and Linked Data in the form of SLMS, exhibit true potential in becoming rich alternative eLearning approaches in the Linked Data Age. For this purpose a brief sum up of the up-to-date work on the field of education and Linked Data was presented mainly focusing on the WSSW. The used platform, its ontologies, its structure and its semantic functions were concisely reported.

As far as future milestones are concerned it is important to overcome the barrier that predefined ontologies cause and broaden the presented content by importing other sources from the Linked Data Cloud without applying any changes to our ontology. It is also of critical importance for the MSc in Web Science to incorporate an extension to this Semantic Wiki which will allow the instructors to query multiple repositories and aggregate selected resources to recommend to students and in general, to embody data from the Linked Data cloud. Another milestone is to use SKOS representations of scientific classifications and to characterize, the available learning objects of the WSSW, so as to clearly define their content and to make it easily searchable. The uppermost goal is a complete solution which will make broad use of Linked Data.

4 References

1. Christian Bizer, Tom Heath, and Tim Berners-Lee. Linked data – the story so far. International Journal on Semantic Web and Information Systems (IJSWIS), 2009, pp.1-22
2. Bamidis P.D., Kaldoudi E., Pattichis C., "mEducator: A BEST PRACTICE NETWORK FOR REPURPOSING AND SHARING MEDICAL EDUCATIONAL MULTI-TYPE CONTENT", In proceedings of PRO-VE 2009, Springer Verlag 2009, IFIP Advances in Information and Communication Technology 307, pp. 769-776
3. Bratsas C., Kapsas G., Konstantinidis S., Koutsouridis G., Bamidis P.D., "A Semantic Wiki within Moodle for Greek Medical Education", in Pocc of 22nd IEEE International Symposium on Computer-Based Medical Systems, New Mexico, USA, 2009, pp.1-4s.
4. Comparison of Semantic MediaWiki triplestore connectors, http://www.mediawiki.org/wiki/Extension:SparqlExtension#Comparison_of_Semantic_MediaWiki_triplestore_connectors