

Semantic Web and Learning Environments

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1 Introduction

A web-based learning environment provides large amounts of documents managed by author-teachers and defines access structures whereas students download materials. This approach allows students at different geographic location to access documents but it doesn't care of semantic issues concerning what is essentially a virtual learning environment whose didactic aspects stress the coordination of learning activity across different users at different times and in different locations. In addition, this approach focuses on particular educational domains and imposes serious difficulties when it comes to reusability because the didactical material is tightly coupled with a specific course.

2 Semantic-Web vs Learning Environment

Ideally it should be possible to extract and customise same components of didactical material and integrate it into a lesson according to the learner's skill. Unfortunately, due to the lack of some kind of conceptual information in didactical material, such a scenario is not possible. Despite the prominence of static didactic portals, recent research [1,2,3] promotes a learner centred perspective resulting in combining different context of learning as well as different software architectures i.e. DBMS, WEB, and Collaborative Environments. Central to this approach is the concept of learning-object defined as "any entity, digital or non digital, which can be used, re-used or referenced during technology supported learning". Learning Object Metadata (LOM) [5] allow to structure learning objects in order to model the knowledge in a didactic domain. LOM focuses on the minimum set of properties needed to best manage learning objects in order to facilitate queries and learner's interactions. At semantic level, these properties define a set of relations allowing LOMs to be sequenced or combined in educational units with navigational properties. The knowledge they introduce is narrow and represents only a limited amount of educational aspects. LOM's content is not aware of different learning styles and didactic methods to be applied to online learning in order to allow a flexible and customisable delivery according to the user's needs. To provide an effective training on one-by-one basis, we need to allow the exploration of context knowledge in the virtual space where the learning occurs in order to make possible the

selection of necessary and important information in dependence of learner's skill. To meet the requirements above, we need to express complex properties and relations that may exist between documents by using a didactic model. This deals with the definition of an Ontology that could be considered as conceptual schema for an abstract representation of items of knowledge of different granularities [4] i.e. knowledge objects describing the semantic content of learning objects. The Ontology consists of knowledge objects organised by taxonomic relations to state the containment assertions between learning objects, *symmetric* relations such as *different-from*, *similar-to* and domain *specific* relations such as *context-of*, *prerequisite-of*.

The Ontology should allow for defining an abstract representation of concepts and relationship that resembles to the way they are perceived and used by a teacher in traditional classroom lessons. To structure learning objects along didactic strategic dimensions the ontology should include axioms like:

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FOR X,Y
Y:Document [is_prerequisite_of >>Y]<-
X:Tutorial [requires ->>Y].
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The resulting conceptual schema will be richer than the logical schema offered by LOMs and will allow learner to access information under the constraints given by the ontology and to define a query as a view over the ontology.

References

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