

# The EduOntoWiki Project for Supporting Social, Educational, and Knowledge Construction Processes with Semantic Web Paradigm

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## INTRODUCTION

The Web is going to produce a revolution in learning and teaching: the debate on the role of ICT in educational processes leads to a reconsideration of how we deal with information and knowledge. The widespread use in educational contexts is also due to the ease with which learning resources can be retrieved and shared: for example, the recent introduction of learning objects means that the contents which reside in different e-learning platforms is easy to find and access. But knowledge is also deeply embedded in millions of Web pages. Nonetheless, searching for information on the Web is not a simple task and the great number of documents found using search engines, such as Google, is beyond the human cognitive capacity to deal with this information overflow. Teaching information literacy skills or stimulating collaborative information filtering that supports the discovery of resources in a way that is responsive to the context of users may help, but there is a need for more efficient cognitive tools to search, organize, and discuss information in order to codify it in shared knowledge structures.

In a more and more complex world we need support to think at a high level so the technologies let us develop strong knowledge structures that do not have the representational problems of the old schemas. An attempt in this direction is the Semantic Web: if we succeed in making the Semantic Web available and useful for education, it could revolutionize the way we think about teaching and learning with ICT. Our current research is aimed at the development, experimentation and evolution of an integrated learning environment called EduOntoWiki that is backed up by a semantic structure based on the active consent of communities of practice.

## BACKGROUND

Current research suggest that it is not correct to assume that the introduction of ICT necessarily changes the way students learn. We have to acknowledge that the teacher plays a critical pedagogical role in creating the conditions for technology-supported learning through selecting and evaluating appropriate technological resources and designing learning activities (Galliani, Costa, Amplatz, & Varisco, 1999). We can distinguish between two approaches to ICT: a technology-centered approach and a learner-centered approach (Mayer, 2005). The former generally fails to lead to lasting improvements in education: looking back at the many predicted educational revolutions, in which the current “new” technology (radio, television, computer, multimedia, the Web) would have been the “killer” application for teaching and learning processes, we see that they failed to materialize (Cuban, 1986) and so was the case with the claims and worries, during the 1960s, that computers-as-tutors would replace teachers (Cognition and Technology Group at Vanderbilt, 1996). A learner-centered approach can, on the other hand, help students and teacher to learn and teach through the aid of technology with a focus on how ICT can be used as an aid to human cognition and consistent with the way the mind works solving complex tasks and dealing with today’s information overflow. The quantity and kind of information students today need to assess has expanded exponentially in the last few years, due mainly to the World Wide Web and improvements in the capabilities of search engines. In this context, it is important to consider both student and teacher roles using a constructivist approach that can stimulate collaborative formalization and knowledge building.

## SEMANTIC WEB AND ONTOLOGIES

The Web has arrived at an important epistemological crossroad and there is a need to integrate the current dialogic-informative model, which allows us to interact with people and search for documents on the Web, with a model based on the contextual knowledge domains within which we operate: the Semantic Web approach (Berners-Lee et al., 2001). Both models are strongly based on a learner-centered approach so the applied research, in particular in the field of ICT and educational technologies, is moving in two directions:

1. The development of solutions for information exchange, and in general, for intelligent knowledge management;
2. The development of a collaborative/cooperative approach to knowledge building.

The Semantic Web was coined by Tim Berners-Lee to refer to a vision of the next evolution of networks that can add meaning to the navigational context of the current World Wide Web. It is the new-generation Web that makes it possible to express information in a machine-interpretable form, ready for software agents to process, as well as to understand what the terms describing the data mean both on the syntactic and semantic levels (Hendler, 2001). An important role in the development of the Semantic Web is played by ontologies (Gruber, 1993). The term is borrowed from philosophy but it is used in a different and more pragmatic sense: they are an explicit specification of a conceptualization, that is, a formal description of concepts and relationships that can exist in a knowledge domain, that is intended as a knowledge base to be shared and re-used in the real world. These ontological structures will, for instance, allow us to no longer surf the universe of documents on the Web through hypertext links from text to text, but from concept to concept; or even to retrieve information in a relevant way without the “noise” that characterizes search engines. In order to achieve this aim, formalized languages have been created (XML, RDF) to mark texts semantically. These languages, which are able to codify knowledge through domain ontologies, can be easily understood both by humans and by ad hoc programs such as semantic browsers (Dzbor, Domingue, & Motta, 2003) or by specific software agents.

The importance of ontologies has been recognized in different research fields, and even from an operational point of view the current application areas are different: from medicine to knowledge content standardization, from legal information systems to biological and geographical information systems, from e-commerce to natural language processing, and finally education (Devedzic, 2004). Our current research project is aimed at extending and integrating the construction and evolution of a semantic learning space that is backed up by ontological structures relative to educational sciences (Petrucco, 2003) based on an active consent of communities of practice.

## THE EduOntoWiki PROJECT

The different training and background of those who contribute to educational theory, the different cultures they belong to, and the rapid development of scientific work today require the development of a series of shared conceptual schemas. It is important then to generate these schemas not as general principles but as justified, motivated, documented and finally usable schemas as control “criteria” of pedagogic discourse. As an ontology is basically a conceptual organizer of scientific discourse, it is a formidable support to hermeneutic work.

Within this context we developed the idea to build an ontology of education. The project takes into account the state of the art of educational research in Italy, France, Spain, Germany, England and Spain. The three thematic areas studied, at least in this first step of the project, are: *didactic planning*, *educational communication*, and *assessment and evaluation*. The ontology is “negotiated” in working exchanges and dialogical moments in order to develop a circularity of information flow within the virtual community of the experts involved in the project and other actors participating.

The project has been developed with the immediate aim of building an integrated semantic learning environment called “EduOntoWiki” (<http://multifad.formazione.unipd.it/eduonto>), a wiki-based environment where it is possible to construct, discuss, and contextualize ontologies suitable for describing the actors, processes and technologies of educational sciences. A wiki was chosen because it enables easy and immediate insertion, modification and sharing of texts

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