

EduOntoWiki: The Evolution of an Ontology on Educational Sciences Towards a Socio-Relational Environment

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Abstract. The starting point for our project is the realization of an ontology of education sciences, about the concepts of "planning", "communication" and "evaluation". This was a result of the active involvement of both a community of practice of academics and one of actors (teachers and trainers) from different educational fields. It is this important social/relational aspect, which turned out to be increasingly significant in the course of this research, which led us to systematically further our knowledge and study of the relations of a community in the process of knowledge construction also as regards its permeability towards other social and educational contexts.

1 Ontologies and Communities

Our research hypothesis is that only the transition from a technology-driven model to a community-driven model, where knowledge is constructed and formalised inside and outside communities of practice, can make ontological supports integrated within open learning systems, significant from a pedagogic point of view. The direction that the most promising, current research is taking indeed involves the study of the relations which unite the various communities and make them permeable in such a way that they can reciprocally share knowledge, contextualising it and enriching it with new meanings, and in the final analysis facilitating the solution of complex problems through the discovery of creative solutions.

On the basis of these premises, we will seek to verify whether a social theory of learning can effectively lead to the overcoming of rigid borders between training/educational systems, work environments and social activities, and thus "free" learning so it is no longer seen to be linked to a specific area or moment of one's life, but actively constructed in the inter-community interactions of a lifelong learning continuum. What will be investigated in particular are the "negotiational" interrelations between people who, in various guises, are members of different communities, people who share an active interest for all training environments and who are bring valuable examples of "good practice" even if they belong to different contexts. The main aim of this research is to provide systematic procedures to try and codify the

semantics of these processes, fostering the subsequent retrieval of knowledge which always accompanies these, and which constitutes a necessary added value.



Fig. 1. An example of the EduOntoWiki environment describing the concept of assessment/evaluation (<http://multifad.formazione.unipd.it:8080/eduonto>).

2 EduOntoWiki

The solution which we are proposing consists in the transformation of the ontologies in an "EduOntoWiki" system so the perspective will change from ontologic/formal to ontologic/relational. The Wiki learning environment has been chosen because it allows easy and immediate insertion, modification and sharing of texts and materials: as, for instance, in the case of the "Wikipedia", an experiment for the creation and up-keeping of an encyclopedia which is open to contributions from everyone. Our initial "vision" indeed conceived of the instrument as a description of a specific knowledge domain, even if it is mediated by a discussion inside a community of practice. However this was not yet sufficient to stimulate reciprocal learning processes since learning is also an intra-community social/relational event (Wenger, 1998), the multiple contexts in which learning situates itself are valuable alternative representations (Lave, 1988) and, finally, narrative is a form through which knowledge is specified in a natural way (Bruner 2001).

2.1 The functions of EduOntoWiki

The main functions of EduOntoWiki provide a community tool kit to create/modify ontological structures. There is an "ontology moderator" who try to mediate between people, in order to carefully implement the ontology concepts. This kind of figure is

required because it can assure a shared vision, so ontologies reveals important *side-effects*: first a definition of a common lexicon (Wenger, 1998), second to enable the explicitation of tacit knowledge, and last, a shared meta-model with relations between concepts. The functions are related to: Instances of Ontology, Relationship among Concepts and Social Networks.

The instances of ontology

The instances are meant as concrete and factual elements, associated to a specific concept: in this category for example appear bibliographic references, links and eventual Learning Objects presented on Web or in the same server and also the comments made by those who consulted that concept and wanted to contribute in clarifying some aspects or presenting problems thus stimulating a discussion. One part that we retain to be of great importance for a didactical use, is represented by the “Personal Experience” section: here, whoever retains it opportune can write their own personal experiences about a concept connected to ontology. In the example in fig. 2, a participant of a Master in Distance Learning Tutoring, of the University of Padova, has inserted considerations about his own experience regarding the concept of “Portfolio” which is included in the ontology structure of Evaluation.



Figura 2 An example of “personal experience” inside the concept of “Portfolio” part of the ontology on assessment/evaluation

This type of instance gives an important link to the real world of current ontology concepts, otherwise abstract and decontextualized. Moreover, the items of personal comments contribute in giving an emotive component to each concept, exactly because it was first hand experience. From a theoretical point of view, this approach is very close to constructivist theories of learning and especially the situated cognition theory whereby learning is important especially if represented in a real life context

[Brown, 1989] that help the acquisition of knowledge in relation to when, how and where to use it efficiently with real examples.

Relationship among concepts

An important part of each ontology consists in the manifestations of the ties (relationships) that exist between one or more concepts. Also in EduOntoWiki it is possible to include relationships through a simple syntactic structure mask according to the triple scheme "subject-predicate-object". The subjects and objects are identified by labels of each concept present in ontology that has been selected, whereas the predicates are made up of a collection of verbal expressions inserted by the users. In the case of evaluation ontology an example of relationship is as follows:

a) "The cumulative evaluation certifies the competences".

"Cumulative evaluation" and "competences" are both concepts of ontology, and the relationship between them is established as such by the predicate "certify". In the future development of EduOntoWiki, the possibility of suggesting synonyms of predicates to the user is foreseen so as to diminish the possibility of excessive multiplication of terms.

The functions for Social Networks

Each person subscribed to EduOntoWiki can fill in a personal description form, along the lines of the FOAF semantic standard, which allows you to declare your affiliation to more than one community of practice and/or learning. In the form, some fields are for an explicit description of the principle techniques/methods for the problem solving of that specific subject area of knowledge of which the user is expert, but it can be useful also in other contexts. Another important aspect of the EduOntoWiki project focalises right on the analysis of the relationships of a community in the knowledge construction process also as a permeability of the same towards other social and educational structures.

The assumption is that only the passage from a technology-driven model to a community-driven one, where the knowledge is both internally and externally constructed and formalized among communities of practice, can render the ontological supports integrated in an open learning environment important from a pedagogical point of view. In fact, the most recent and promising direction of research involves the study of the so-called "complex constellations of communities of practice" (Wenger, 2004), definition adopted to describe relationships linking various communities rendering them permeable so that they reciprocally share knowledge, contextualizing and enriching it with new meanings, and at the end, favouring the solution to complex problems discovering creative solutions.

What we propose therefore consists in the transformation of the "EduOntoWiki" system from an ontological/formal one to an ontological/relational one through the involvement of a group of people belonging to different social communities inviting them to use the learning environment of EduOntoWiki. The possible candidates in the specific world of training and education are, for example, the operative teacher com-

munities and tutor communities engaged in training in and also the professional communities, achievable through training courses run by the University (Master), that widen horizons to the working world. It is hoped that these different realities can start up a virtuous process of reciprocal cross-fertilization able to favour the transfer of competences, processes, models and therefore in the end, also an enrichment of the domain of ontology.

2.2 Choice of key concepts.

The first choice in methodological order has been assumed in relation to the key concept organization of the scientific domain considered: we have distinguished between “evaluation process” and “system evaluation” and starting from this first allocation, the concepts of a “top-down” modality have been identified and specified, organized in classes and subclasses using the “who”, “what”, “how”, “when”, “why” and “where” categories, meant as universal concepts. The classification of the domain of knowledge by means of the categories can result in a simplifying mechanism, but it is functional to the objective of ‘mapping’ the scientific domain coherently to the empiric tension of the didactics that recognizes the same evaluation as a science linked to reaction: “who” evaluates referring to an object (thing), using specific tools (how), in a given time span (when), pursuing finalities (why) within a precise context (where).

2.3 Graphic representation of concepts.

After, the concepts have been represented through a *mental hierarchical* map, starting from the concepts of superior order (more comprehensive and general) to arrive at the concepts of inferior order (more specific and less general). In a following stage, when the relationships between concepts will be included, the graphic representation of ontology will take on the shape of a mental map, linear and associationist, and at the same time a conceptual one, in which the relationships between the ties determine the formation of a network and shatter the hierarchical structure.

2.4 Definition of the key concepts and instances

For each concept identified, using specific bibliographic material, brief definitions were formulated and instances of a ‘normative’ character were gathered, enabling to follow up the defined concepts also in function to the diverse scientific paradigms (behaviour, pragmatism, constructiveness). Such instances are distinguished into: ‘statements’, ‘notes’, ‘observations’, ‘bibliography’ and ‘sitography’. The statement is an example of a definition coming from an important source; the note is an assertion that includes further information to that appearing in the concept definition and the observations are realized as problematic elements that do not necessarily come from an important source, but are more bent on opening up a debate about the considered themes. Lastly, the bibliography, just like the sitography, is an instance that gives functional references for the specific in-depth of the examined concepts.

We have distinguished the normative instances, developed in the initial work phase, from the instance in a strict sense, that coincide with the 'empiric evidence', the events or real objects that render the invariable characteristics connoted to a concept real. As underlined in the previous paragraphs, it will be interesting to plan the development of a descriptive and experiential dimension of the instances, in such a way that the concepts are correlated to the 'empiric' events of the training practice, proposing examples of evaluation, describer and indicator tools really used in a context, hetero and self-evaluation experience, study cases, etc., coherently to the principle whereby learning is realized starting from the experience with meanings linked to ourselves and to the world around us [Wenger, 1998].

2.5 Identification of the relationships among concepts.

The concepts were placed in semantic relationship among themselves by means of the introduction of "predicates", or rather, those fundamental parts of the phase that defines conditions or qualities of the subject (ref. paragraph 1.3.2). The study of relationships among concepts calls for an epistemological order. On one hand the epistemology that avails in the language and instruments of research and counter distinguishes the diverse scientific paradigms, and on the other, epistemology meant as an unavoidable personal process [Bateson, 1976] that draws out conceptions of reality and knowledge linked to real life experiences and emotions of the subjects. Scientific paradigms, conceptions of reality and formative processes and empiric data, trace diverse and at times conflicting relationships among the concepts.

Reflecting about the relationships among concepts stimulates confrontation among the diverse cohesion systems that sustain the scientific paradigms, including our personal conceptions of reality that emerge from the instances; it also allows us to dare with unusual and "strange" relationships among the concepts of a same domain of knowledge and diverse dominions, to undertake deductive and inductive research paths, and to promote the meeting also sustained by the information deriving from the empiric events (the instances). The analysis of the relationships among concepts or the proposal of new relationships, make ontology a "pallet of hypothesis" to confute or strengthen through discussion and negotiation of importance within the learning community, thus responding to the need of constructive-improving processes of knowledge and practice. It is an activity that aims at problem solving, but also at recognizing and placing problems in dialogued, situated and dynamic terms.

So ontology wants to be a system for managing knowledge in a dynamic and open way. The completion-completeness immanent to the term "ontology" is in steady becoming, negotiated by one or more communities of practice and/or learning.

Conclusions

An important challenge highlighted by international research on the theme, consists in the fact that inter-communitarian relationships are not easy to manage and formulize insofar as the members can only count on a shared conjunction of meanings and

practices which is relatively limited. Inter-operability among communities, that our EduOntoWiki environment wants to favour, is therefore strictly tied to a negotiation of meanings, identities and roles (e.g. see the semantic standard, Friend Of a Friend-FOAF) that is condensed in the "instances" of the various ontology mainly meant as a narration of personal, contextual experiences and situated in a precise space, time and place. The scientific community's interest concerning Social Networks is well documented and is fulfilled in the study of "social" software with great success such as LinkedIn, Friendster or Orkut (Google). It is not by chance that the Social Network software is now seen as a necessary extension to the recent Blog phenomenon.

In conclusion, the aim is to verify if, and in what way it is possible that this process of narrative clarification processes can carry the formulising of the "descriptive instances" to spontaneous formulising, on behalf of the community members, of "normative instances", or rather re-usable models in multiple experiential contexts for resolving analogous problems.

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