



## SHARE.TEC: A TERMINOLOGICAL APPROACH TO TEACHER EDUCATION

*Elisa Lavagnino*  
CeRTeM Università degli Studi di Genova  
Telecom Bretagne

*Stefania Bocconi, Jeffrey Earp, Luigi Sarti*  
ITD – CNR Genova

**ABSTRACT:** This contribution falls at the intersection between the fields of terminology and the sharing of information in a multicultural context, with particular reference to the field of Teacher Education (TE). The Share.TEC project aims to develop services to support the sharing and reuse of digital resources among European TE practitioners; it addresses a number of problems related to multicultural differences, such as the organization of the various national education systems, or differences in TE approaches and practices. To help users draw inspiration from and possibly reuse diverse digital resources, Share.TEC addresses the reality of pluralism in TE terminology and the coexistence of diverse TE organizational systems and settings across Europe.

*Keywords:* Teacher education, termonotography, conceptualization, multiculturalism, multilingualism.

### 1. Share.TEC: a European platform for teacher education

Share.TEC stands for “Sharing Digital Resources in the Teaching Education Community”, a 3-year project (2008 to 2011) co-funded by the European Community’s eContentPlus programme. Share.TEC is devoted to fostering a stronger digital culture in the TE field and to supporting the development of a Europe-wide perspective among those working in and with the TE community. To do this, Share.TEC is developing an online platform which helps practitioners across Europe search for, learn about and exchange resources of various kinds, and also supports the sharing of experience about the use of those resources. The system offers personalized, culturally-sensitive brokerage for the retrieval of relevant digital content and will seek to nurture a more Europe-wide perspective among those working in and with the TE community. In order to meet these ambitious objectives, the Share.TEC system is endowed with a semantic layer, namely the Teacher Education Ontology (TEO). Communication and the possibility to share contents in multilingual/multicultural environments is becoming increasingly important to develop education.

TE regards the policies and procedures designed to equip prospective and practising teachers with the knowledge, attitudes, behaviours and skills they require to perform their tasks effectively in the classroom, school and wider community.

Teacher education plays a very significant role in increasing and maintaining the quality of teachers and contents. When developing national or European policies on teacher quality, it is important to incorporate professional and academic perspectives on teachers’ professionalism and teacher development.

The impact of new cultures and globalisation on curriculum and pedagogy is leading to new collaborations and partnerships between universities, schools and other social service

agencies. The consequences are the creation of new community configurations for teachers' work, generational and cultural change in schools, and the creation of new teacher education institutions supporting the implementation of technologies in education. To be prepared for engaging with this multidisciplinary milieu, teachers need a European perspective of the TE domain. At the very least, this requires a practical grasp of what is going on in different TE contexts throughout Europe and a sense of how these are organized. But a comparative analysis of European teacher education systems and practices is not an easy task. Similarities mainly regard the level of practices, as regards curriculum contents and delivery within programs. As far as teacher education systems are concerned, differences are mainly found on the level of national policies and regulations.

Despite the need for a more international perspective, education systems remain nationally oriented: TE doesn't embrace innovation easily, it is culturally bound and focuses on the local target.

In this context the difficulties in sharing digital resources at the European level are generated by the fact that resources are scattered, not structured and not easy to search. The general lack of sufficient meta-information makes it difficult to find resources given the problem of multicultural and languages boundaries. The relation between language, culture, and national identity is crucial in the Share.TEC project, which has been developed in order to facilitate the sharing of information. Countries develop their education systems differently. These divergences concern both the cultural and the language level and are connected to the conceptual representation of the domain.

## **2. Share.TEC: a multilingual and multicultural goal**

Multiculturalism has many facets. A key aspect of multiculturalism in TE is preparing teachers to live and work effectively in a multicultural society. Although in Share.TEC we recognize the fundamental importance of educating teachers to diversity and social change, this dimension goes beyond the project's specific mission. The aims of Share.TEC are rather to build an advanced user-focused system which aggregates metadata, providing personalised, culturally-sensitive brokerage and supporting the development of a Europe-wide perspective among those working in and with teacher education. Share.TEC is meant to facilitate access to and reuse of resources from different cultural and educational contexts, resources that reflect different TE knowledge and practices deriving from different TE cultures. In other words, the system allows users to use their own language and terminology when searching for TE related resources. The results obtained are not necessarily confined to the user's specific context of practice, but may also refer to the other education systems covered in the project. This brokerage is performed by the system without presenting the user with problems concerning the equivalence between concepts in different contexts. So Share.TEC's multicultural dimension could be seen as precursory to the broader and more complex process of educating teachers to diversity and social change. To clarify this idea, here is an example that explains our point of view:

Mary is a teacher educator with a background in Educational Technologies; she is in charge of the MA "ICT and Education (Distance Learning)" course at the University of Leeds (UK), Faculty of Education, Social Sciences and Law. Mary has registered on the Share.TEC system, and has partially filled in her profile, providing general information on her background, her professional status, her language and her interest in the "ICT and

Education” field. For a couple of months, Mary has been using the Share.TEC system, mostly to search for introductory material about ICT and education. Mary is preparing a lesson on the usage of synchronous CMC tools in teaching. She decides to look for suitable material in the Share.TEC repository: she only specifies “synchronous CMC” as a keyword in her query.

In the next section, we present how this problem has been managed in Share.TEC by applying a termontography approach.

### 3. The termontography approach in Share.TEC

Nowadays, societies are increasingly linked and the need to share information and above all a way to transfer it is becoming a crucial aspect of communication.

Terminology is the discipline concerned with the study and the compilation of specialized terms. It can be defined as a standard in multilingual communication and guardian of cultures.

Ontologies have to overcome the problem of multiculturalism by integrating a terminological analysis in order to add a multilingual layer in their structure. A term in a lexon base is the lexical representation of a concept. It may be either linguistic or non-linguistic and can have only one meaning given the context in which it occurs. The starting points in a terminological work are multilingual corpora. The problem at this point is to match correspondence between concepts belonging to different cultures: terminographers may have terms in the terminological resource which do not have a match in every language. Multilingual textual material may detect variations in domains and between related categories and may reflect and represent these variations in a way which is ideal for immediate ontology upload. In other words, the idea is to start from a categorisation framework containing all the culture- and language-independent categories of the domain. These categories may be called a *unit of understanding* (Temmerman, 2000).

The interaction between ontology and terminology allows users to overcome the limits imposed by their culturally embedded national education systems.

Multilingual and cultural diversities represent a real problem in alignment of concepts in different systems. The problem of alignment cannot simply be solved by looking for the translation equivalents of each concept lexicalised in a source language. Moreover cultures may perceive seemingly equivalent categories differently.

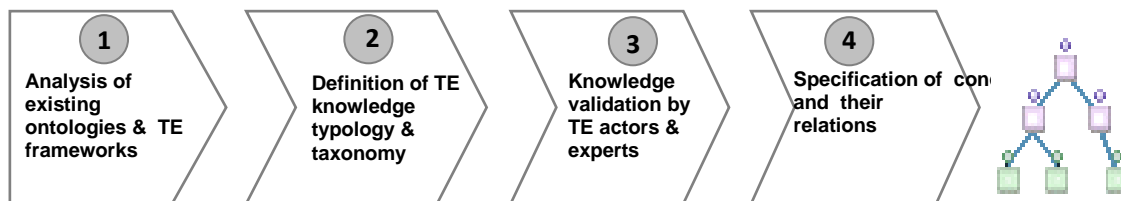
In order to solve problems relating to culturally oriented concepts in different languages, we based our study on *the termontography approach*. This is a multidisciplinary approach in which theories and methods for multilingual terminological analysis belonging to the sociocognitive approach (Temmerman 2000) are combined with methods and guidelines for ontological analysis (Gómez-Pérez et al. 1996; Fernandez et al. 1997; Sure & Studer 2003). It is a methodology for knowledge management and representation for specific domains of experience, combining domain expertise with information provided in natural language. Multilingual problems are part and parcel of the analysis.

*The termontography method combines top-down and bottom-up approaches. An initial framework of categories and inter-categorical relationships is being developed top-down. Then, it will gradually evolve in*

*an enriched and more fine-grained network of semantic relations, reflecting culture-specific categorisations, as the knowledge elicited via textual material is then confronted with the categorical frame.*<sup>1</sup>

In the Share.TEC project this aspect was structured according to the following phases:

- 1) the termontological analysis phase - in order to define the scope of the domain and the requirements of its users, we studied existing ontologies and TE frameworks. At this stage of Share.TEC, similarities and differences at the European level were not dealt with.
- 2) the information gathering phase - we proposed a first draft list of concepts to TE experts from the different countries represented in the project consortium, in order to identify relations and linking concepts referring to the TE domain.
- 3) the verification phase - at this point, validation of how TE works in different countries was crucial to the progress of the project. The TE experts were asked to verify if TEO could provide a valid reference framework for representing their national context.
- 4) the mapping phase - the ontology was adopted as an abstract structure against which national contexts were mapped.



**Figure 1: the Share.Tec approach**

#### **4. TEO: a Teacher Education Ontology**

The Share.TEC system is endowed with a semantic layer for context-aware description of digital content and profiling of users. This layer also supports implementation of personalised services and adaptive user applications (inferential search, ranking, recommending, etc.).

The means that have been developed for achieving this are an ontology, namely the Teacher Education Ontology (TEO), and a metadata model for describing TE-related resources.

In the European context, effective communication and shared understanding can be difficult to achieve. Accordingly, TEO seeks to reduce conceptual and terminological confusion by identifying and properly defining a set of concepts (and their relations) relevant to TE in Europe. The result should be a non-ambiguous and consistent vocabulary for identifying

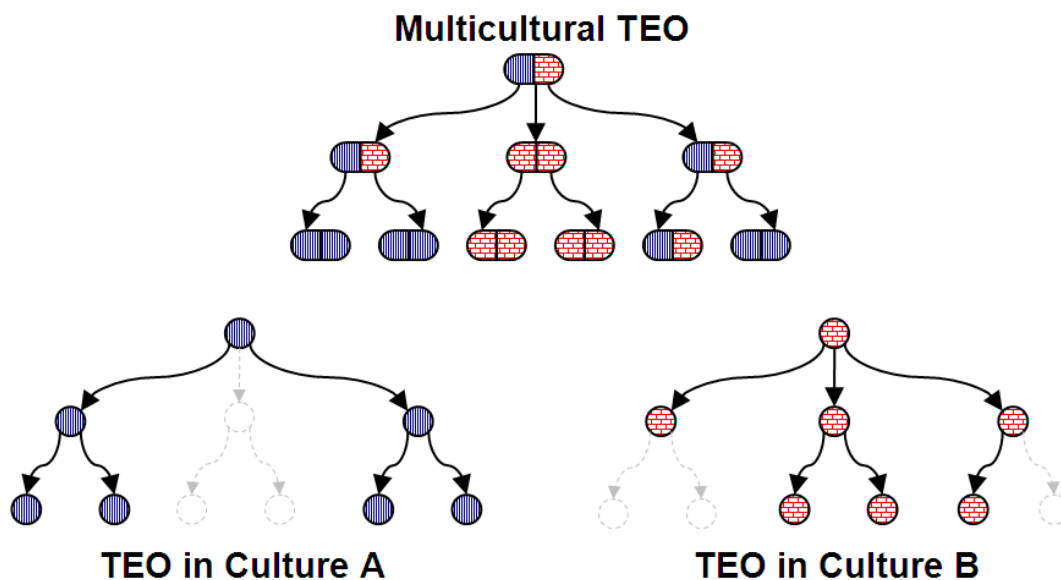
<sup>1</sup> Temmerman, R. 2000. *Towards New Ways of Terminology Description. The sociocognitive approach.*

those concepts, and a framework on which culturally and linguistically diverse versions of that vocabulary can be mapped.

TEO's common layer captures relevant TE concepts in an abstract manner that is as independent as possible of partners' national-cultural contexts. TEO is designed to represent concepts and build relations between entities defining the domain of Teacher Education. It supports:

- language-neutral conceptual taxonomies;
- hierarchal searching and filtering;
- dynamic multilingual user interface;
- stability and system independence with respect to future changes in TEO.

The internal logical structure of a TEO entity is designed with a minimalistic approach in mind – the simplest structure that facilitates all required functionality. Each TEO entity is represented as an individual node interconnected with other nodes through relations and that contains a list of translations of the concept represented.



**Figure 2: multicultural conceptual representation**

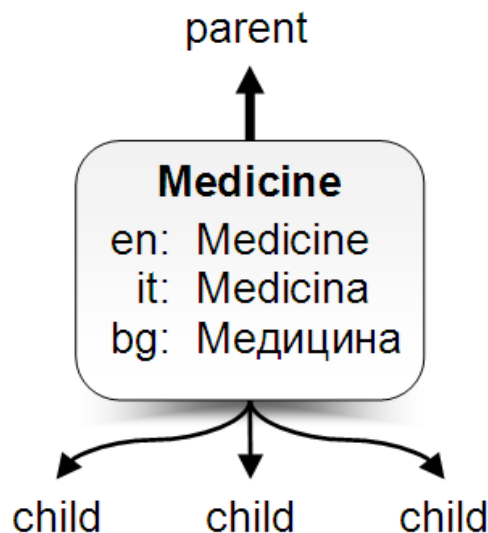
The simplest level of cultural extension is one-to-one correspondence between a common-layer term and an equivalent term expressed in a partner language, i.e. translation. But the multicultural dimension may lead to different representations of the conceptual systems of a certain domain from country to country. Specifically, a concept in culture A may be associated to more than one concept in culture B, to part of a concept or to no concept at all. Moreover, two concepts that are non-equivalents in the respective cultures may be terminologically identified by cognates, i.e. terms that are seemingly “equivalent” in the two languages, thus posing the risk of false matching. This has the following implications:

- there are concepts that do not exist in all cultures;
- there are concepts that exist in all cultures, but have distinct nuances;
- multiculturalism is dynamic;

- a person searching within own culture should not notice multiculturalism. (**figure 2**)

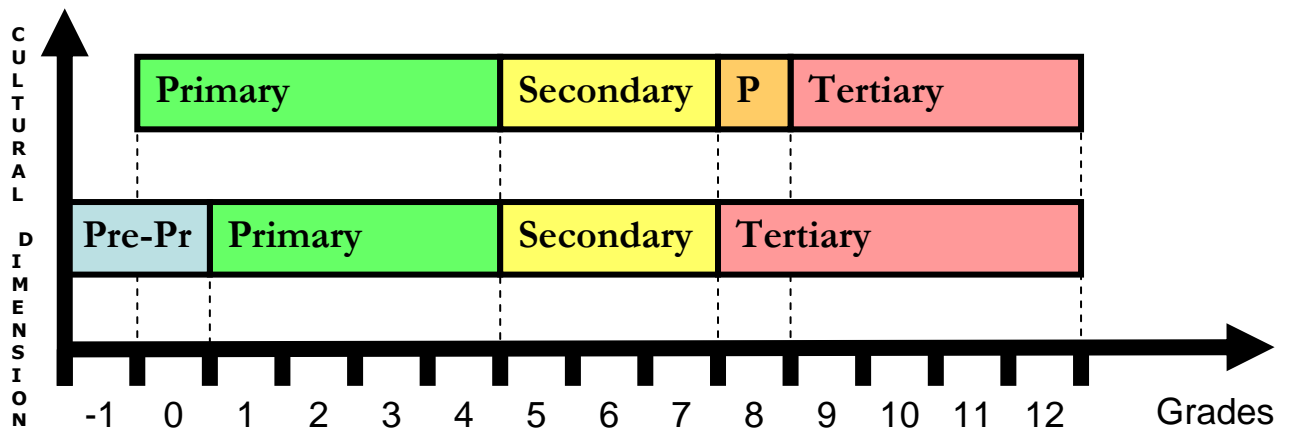
In order to address this problem, we structured a level of cultural independent conceptualization which helps to find equivalent non isomorphic concepts. This level works as a sort of modulation of semantic differences, allowing the creation of relations between the conceptual systems of different cultures.

Each node in TEO contains a set of terms corresponding to the node concept which are expressed in all the system-supported languages. For instance, the *Medicine* concept is endowed with *rdfs:comments* (the labels) that contain the various terms used to express that concept in English, Spanish, Bulgarian, etc. This makes the internal representation of data language-independent and links various terms corresponding to the same concept. The same correspondences are used in the opposite direction, i.e. to translate concepts into users' native languages. The Share.TEC end-user system is intended to be multilingual, and texts will be translated on-the-fly while the screen forms are dynamically built. (**figure 3**).



**Figure 3: a conceptual node in TEO.**

Where a given concept is peculiar to a specific national context or culture, and therefore has no direct translation into all the languages that are available in the ontology, it is represented by an individual instance. The current node structure can handle synonyms by providing more than one term corresponding to the concept for a given language. Figure 4 shows an example set of concepts featuring a range of mapping relationships that cannot be handled by simple one-to-one translation alone.. Here there is an example of complete mapping, , mapping to more than one concept, mapping partly to another concept and partly to nothing, and a concept existing in only one culture.



**Figure 4: Different cultural dimensions**

In these cases, TEO helps to find equivalents. In other words, TEO goes back to its neutral conceptualization level, which easily maps national concepts and finds equivalents, as show in figure 5.

TEO	n/a	Primary	Secondary	Pr	Tertiary		
	n/a	Primus	Primus	Secundus	Pre-Tertius	Tertius	Translations in language S
	C0	C1	C2	C3	C4	C5	Level of cultural independent conceptualization
	Pre-Primo	Pre-Primo	Primo	Secundo	Tertio	Tertio	Translations in language O
	Pre-Pr	Primary	Secondary	Tertiary			

**Figure 5: The level of cultural independent conceptualization**

Searching for secundo will map to C3 and will find secundo and secundus. Searching for primus will map to C1 and C2 and will find primus, primo and pre-primo. Searching for primo will map to C2 and will find primo and primus. Searching for pre-primo will map to C0 and C1 and will also find pre-primo and primus.

If we reconsider the case of Mary presented in the previous section, we can assume that thanks to TEO, the Share.TEC system can determine that “Undergraduate” is a sub-class of “TeacherEducationInstitution”, and can widen the search to include results that are related to this broader context, maybe attributing a lower rank to those resources that do not strictly match the explicit query requirements. As a result of her search, Mary gets a number of references to English-language material related to the “synchronous CMC” topic.

## 5. Conclusion

In this paper, we discussed the ongoing development of the Share.TEC system. In particular we described the Teacher Education Ontology (TEO), how it works, and how the termontography approach has been adopted to address multilingual and multicultural issues .

One of the key roles of the resulting semantic layer in the system is to underpin a metadata model specific to the Teacher Education field.. This model supports a metadata migration process which makes it possible to represent different concepts belonging to different cultures. Concepts are represented by nodes placed at an abstract level where cultural and linguistic boundaries are embedded.

This metadata model guarantees formulation of an unambiguous terminology for describing our ontology and allows us to all concepts belonging to different education systems, to establish equivalents and to share information at a multinational level.

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<sup>2</sup> <http://www.share-tec.eu>



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