

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/268799850>

# A Linked-Data based infrastructure for the retrieval of educational tools

Article in IEEE Learning Technology Newsletter · January 2011

CITATION

1

READS

57

6 authors, including:



[Adolfo Ruiz-Calleja](#)

Tallinn University

69 PUBLICATIONS 648 CITATIONS

[SEE PROFILE](#)



[Guillermo Vega-gorgojo](#)

University of Valladolid

93 PUBLICATIONS 1,136 CITATIONS

[SEE PROFILE](#)



[Juan I. Asensio-Pérez](#)

University of Valladolid

205 PUBLICATIONS 3,957 CITATIONS

[SEE PROFILE](#)



[Miguel L. Bote-Lorenzo](#)

University of Valladolid

120 PUBLICATIONS 2,026 CITATIONS

[SEE PROFILE](#)

## *A Linked-Data based infrastructure for the retrieval of educational tools*

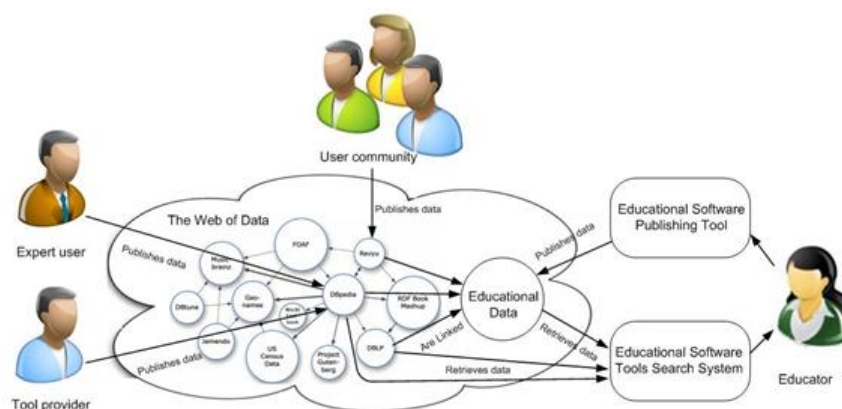
Nowadays, Information and Communication Technologies (ICTs) are becoming ubiquitous in education [1]. The emergence of the Web 2.0 movement [2] and the proliferation of Web-based applications have boosted the adoption of ICTs to support learning scenarios. In this sense, tools not specifically designed for educational purposes have been successfully introduced in the classroom, as in the case of wikis or blogs [3]. Given this situation, there are many opportunities to leverage current learning scenarios with technology, although teachers need some support to be aware of available tools that can be employed in their classroom.

Specifically, there are very few search systems that guide teachers in the retrieval of educational tool information; that is why most teachers use general purpose search engines, such as Google, when they are looking for education-specific software tools. General purpose search engines provide low precision since they index a huge amount of information that is irrelevant when looking for educational tools. Another possibility is to use domain-specific search engines; they can collect domain knowledge and they only index software tools that can be used in learning settings. Therefore, the results provided by this kind of search engines are more precise and relevant for educators. However, there are very few educational tool search engines and all of them work with isolated data silos that need to be manually updated.

An example of an educational tool search engine is Ontoolsearch (<http://www.gsic.uva.es/ontoolsearch>), which uses Ontoolcole, an ontology that describes a software tool taxonomy based on the educational tasks that tools can support. Nevertheless, since Ontoolsearch gets information from a data silo, it is unable to automatically import information from external sources, which makes it a very-hard-to-sustain information source. For example, the tool “Microsoft Word” was described in Ontoolsearch but a new version appeared; even if the information related to this new version is published in some accessible data sources (e.g. Wikipedia) it has to be manually published in Ontoolsearch by the search engine administrator.

In order to tackle this data maintenance problem the Linked Data [4] approach has been recently proposed as a way of publishing data to facilitate the automatic access to the information contained in external repositories. The Linked Data methodology consists of four basic principles for publishing data and many providers are linking their datasets according to these principles, building the so-called Web of Data (see <http://linkeddata.org/>). Indeed, there are updated descriptions of software tools in some repositories of the Web of Data, such as DBpedia (<http://dbpedia.org/>). However, in the current state of the Web of Data, descriptions of software tools from an educational point of view are scarce (e.g. which educational tasks could be carried out using a particular tool?). Nevertheless, and following the same Linked Data principles, it would be possible to create datasets with education-specific information about software tools. That information could therefore be linked with existing non-educative descriptions of those same tools already available in third-party, potentially updated datasets of the Web of Data. Thus, an educational tool search system using the Web of Data could benefit from this distributed data publication and maintenance approach so as to get a better precision in the results (education-specific information is available) based on more easily updated data (non-educative information is maintained by third-parties).

Figure 1 depicts the linked-data based proposed infrastructure for the retrieval of educational tools. The figure underlines the main actors and components needed to support the publication, linking, updating and searching of education-specific information about software tools. This data is enriched by linking it to an “Educational Data” set that describes the educational capabilities of the tools. Using such infrastructure, a search tool would be able to automatically retrieve updated information about software tools. Moreover, the system includes a publishing tool that allows teachers to create or modify the educational descriptions of the tools; thus, it will be possible to create a community of teachers that enrich the data about software tools available on the Web.



**Figure 1. Main actors and components of the proposed infrastructure.**

The work already done focuses on the development of the “Educational Data” dataset. For this purpose the Ontoolcole ontology is used as the data model since there is no other ontology specifically developed to describe educational software tools. A key step in the “Educational Data” source development was to define the relationships between Ontoolcole concepts and the conceptualizations of external data. Using these relationships, a software agent can automatically match software tools published in external sources to the educational concepts defined by Ontoolcole.

For example, the relationship ‘All the tools described in DBpedia as “Word\_Processor” support the task defined in Ontoolcole as “Writing”’ can be defined; after that, when educators search for tools that allow their students to write, they will retrieve updated information about several tools from DBpedia. However, since DBpedia does not provide all the data that would be desired about software tools, no results will be found when asking more expressive questions (e.g. ‘Tools that support the collaborative edition of documents that can be exported as HTML’). That is why current work aims to design the “Publishing Tool”, where teachers could publish new educational metadata related to software tools. For example, a teacher can publish ‘Google Docs supports the collaborative edition of text documents’ and another teacher (or a technical user) ‘Google Docs is able to export data in ODT, RTF, PDF and HTML’. This way, when other teacher asks the aforementioned question, he will realize that Google Docs is a good choice.

### References

- [1] Sutherland, R., Robertson, S., and John, P. (2009). Improving classroom learning with ICT. Routledge, New York, NY, USA.
- [2] O'Reilly, T. (2005). What is Web 2.0. Design patterns and business models for the next generation of software. URL: <http://oreilly.com/web2/archive/what-is-web-20.html>, last visited December 2010.

11/07/2017

lttf.ieee.org/issues/january2011/IEEE-LT-Jan11.htm

- [3] Richardson, W. (2010). Blogs, wikis, podcasts, and other powerful web tools for classrooms. Corwin Press, Thousand Oaks, CA, USA, third edition.
- [4] Berners-Lee, T. Linked Data - Design Issues (2006). URL: <http://www.w3.org/DesignIssues/LinkedData.html>, last visited December 2010.

**Adolfo Ruiz-Calleja**  
GSIC-EMIC  
University of Valladolid  
[adolfo@gsic.uva.es](mailto:adolfo@gsic.uva.es)

**Guillermo Vega-Gorgojo**  
GSIC-EMIC  
University of Valladolid  
[guiveg@tel.uva.es](mailto:guiveg@tel.uva.es)

**Juan Ignacio Asensio-Pérez**  
GSIC-EMIC  
University of Valladolid  
[juaase@tel.uva.es](mailto:juaase@tel.uva.es)

**Miguel Luis Bote-Lorenzo**  
GSIC-EMIC  
University of Valladolid  
[migbot@tel.uva.es](mailto:migbot@tel.uva.es)

**Eduardo Gómez Sánchez**  
GSIC-EMIC  
University of Valladolid  
[edugom@tel.uva.es](mailto:edugom@tel.uva.es)

**Carlos Alario Hoyos**  
GSIC-EMIC  
University of Valladolid  
[calahoy@gsic.uva.es](mailto:calahoy@gsic.uva.es)