

# Using Linked Data in Learning Analytics

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# Using Linked Data in Learning Analytics

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## ABSTRACT

“Using Linked Data in Learning Analytics” is a tutorial targeting researchers in Learning Analytics interested in exploiting linked data resources, developers of Learning Analytics solutions that could benefit from Linked Data and data owners wanting to understand how linked data can help the analysis of their data in relation to other sources of information. The tutorial is described in more details at <http://linkedu.eu/event/lak2013-linkeddata-tutorial/>, where learning material related to the topic of the tutorial will also be disseminated.

## Categories and Subject Descriptors

H.3.1 [Information Storage and Retrieval]: Content Analysis and Indexing

## General Terms

Design, Experimentation

## Keywords

learning analytics, data mining, linked data, visualisation, tutorial

## 1. WHY LINKED DATA

Linked Data [5] is a set of principles and technologies aimed at using the architecture of the web to share, expose and integrate data in a global, collaborative space. The success of the idea is undeniable, with a large variety of organisations (including governments, broadcasters, museums, libraries and, of course, universities [2]) now exposing their data through Linked Data technologies online for everybody to use. This massive movement towards the Web of

Data naturally impacts on Learning Analytics activities (see the LAK 2012 workshop on Learning Analytics and Linked Data [4]), by providing not only new, more flexible ways of integrating and manipulating data, standardising datasets, but also a vast sources of data that can enrich to analysis and mining activities for example with information regarding the learner’s context (location, time, related events, institutions, etc.) and the resources related to the learning experience (open educational resources, books and base material, cultural resources, etc. – see for example [3])

## 2. AIM OF THE TUTORIAL

This tutorial provides Learning Analytics practitioners with the basic knowledge and skills required to exploit the new possibilities offered by linked data, especially through exploiting the wealth of data sources already available in the linked data cloud. It introduces the basic technologies and practices generally associated with Linked Data, including graph-based data modelling with RDF<sup>1</sup> and relevant vocabularies (see [1]), data discovery on the linked data cloud and the use of linked data endpoints (with SPARQL<sup>2</sup>). As the focus of the tutorial is on the concrete use of these technologies and practices within a Learning Analytics scenario, a large part of the sessions are dedicated to hands-on exercises with data and use cases of relevance to Learning Analytics (from [LinkedUniversities.org](http://LinkedUniversities.org), [LinkedEducation.org](http://LinkedEducation.org), and the [LinkedUp](http://LinkedUp.org) support action<sup>3</sup>).

In addition to addressing the basic skill-set a Learning Analytics practitioner might require in their use of Linked Data, the tutorial focuses on practical ways in which Linked Data resources can be exploited in Learning Analytics processes, especially through common tools interfacing with Linked Data technologies. This is achieved through hands-on tasks where these tools are used to analyse data originating and/or integrated with the Linked Data cloud. Such tasks range from the manipulation of data in common tools (e.g. spreadsheets), to employing more advanced statistical or network analysis methods with R<sup>4</sup>, Tableau<sup>5</sup> and Gephi<sup>6</sup>,

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<sup>1</sup><http://www.w3.org/RDF/>

<sup>2</sup><http://www.w3.org/TR/rdf-sparql-query/>

<sup>3</sup><http://linkedup-project.eu>

<sup>4</sup><http://www.r-project.org/>

<sup>5</sup><http://www.tableausoftware.com/>

<sup>6</sup><https://gephi.org/>

through interfaces to import Linked Data.

### 3. CONNECTION WITH LINKEDUP

The tutorial is supported by the LinkedUp support action, which provides illustrative scenarios and the corresponding datasets, with the benefit of being concretely “endorsed” by members of the network of organisations associated to LinkedUp. Indeed, one of the key product of LinkedUp is a data repository providing a structured and organised collection of datasets of relevance for education, that are properly catalogued and mapped.

In addition, LinkedUp is organising a large scale competition for applications of web data-related approaches for education. The tutorial is an occasion to investigate the base techniques making the development of such applications possible, as well as a way to discuss and brainstorm ideas for novel linked data-based educational services. Concretely, this connection is materialised through the inclusion in the tutorial of results and discussions related the the “LAK Data Challenge”<sup>7</sup>.

### 4. THE LAK DATA CHALLENGE

The LAK Dataset<sup>8</sup> provides access to structured meta-data from research publications in the field of learning analytics. Beyond merely publishing the data, the LAK Data Challenge is meant to actively encourage the use of such data in innovative applications. The LAK Data Challenge is sponsored by the LinkedUp support action and is co-located with the ACM LAK13 Conference<sup>9</sup>.

The main objective of the challenge is to understand what analytics on learning analytics can tell us: How can we make sense of this emerging field’s historical roots, current state, and future trends, based on how its members report and debate their research This may include submissions which cover the analysis and assessment of the emerging LAK community in terms of topics, people, citations or connections with other fields; Innovative applications to explore, navigate and visualise the dataset (and/or its correlation with other datasets); Usage of the dataset as part of recommender systems, etc.

### 5. OVERVIEW OF THE TUTORIAL

The tutorial is a mix of presentations, interactive sessions and hands-on activity. Below is a rough outline:

- **Introduction to Linked Data and relevance to Learning Analytics:** A brief presentation of the basic notions of linked data and on the way it can be used within a Learning Analytics process.
- **Linked Data for Learning Analytics Scenario:** Together with the participants, list ways in which data available on the linked data cloud could be integrated/useful to a Learning Analytics process. Inspecting the Linked Data cloud, identify the types of data that could be useful in such scenarios.

<sup>7</sup><http://www.solaresearch.org/events/lak/lak-data-challenge/>

<sup>8</sup><http://www.solaresearch.org/resources/lak-dataset/>

<sup>9</sup><http://lakconference2013.wordpress.com/>

- **Basics of manipulating linked data:** Hands-on tasks guided by the given scenario (first shortly presented).
- **Using linked data in analytics tools:** Presentation of available toolset and hands-on tasks on using these tools in the given scenario, with the given data as well as other data identified in the previous parts.
- **Getting Data for Education with LinkedUp:** More detailed tasks focusing on the use of the LinkedUp data pool to address the data needs of the use case scenarios identified in the previous parts.
- **Evaluating Linked Data Applications with LinkedUp:** Tasks on using the LinkedUp Evaluation framework for assessing applications of the Web of Data in educational scenarios.
- **The LinkedUp - LAK Corpus Challenge:** Moving towards more concrete examples of use of linked open data for education and analytics, this part includes presentations and demonstrations from the LAK Corpus Challenge.
- **Going Further:** Presentation of existing initiatives such as [LinkedUniversities.org](http://LinkedUniversities.org) and [LinkedEducation.org](http://LinkedEducation.org), the LinkedUp challenge, summer schools and courses on Linked Data, etc. that can help moving beyond the content of the proposal in the exploitation of linked data in leaning analytics scenarios.

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This tutorial is supported by the LinkedUp support action – Linking Web Data for Education Project; SOLAR<sup>10</sup> – Society for Learning Analytics Research; and EATEL SIG data-TEL<sup>11</sup>.

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<sup>10</sup><http://www.solaresearch.org>

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