Linked Data for Professional Education (LD4PE)

An IMLS funded Project

What Is LD4PE?

- Linked Data for Professional Education (LD4PE) is a project under the jurisdiction of the DCMI Education & Outreach Committee, funded by the Institute of Museum and Library Services (IMLS).
  - The intent is that the LD4PE website will continue to be supported by DCMI and its members as part of DCMI's larger education and outreach activities, and be used in other activities as appropriate once the project is completed.
- The project has developed a Web-based Linked Data platform to support the structured discovery of the learning resources available online by open educational resource (OER) and commercial providers.
  - At the heart of the Linked Data project and website is a competency framework for Linked Data that supports indexing learning resources according to the specific competencies, skills, and acquired abilities they address.
  - To do this, the LD4PE website itself leverages Linked Data technology by assigning global identifiers (URIs) to statements of competency, then citing those URIs in metadata descriptions of learning resources.

Who Is Involved?

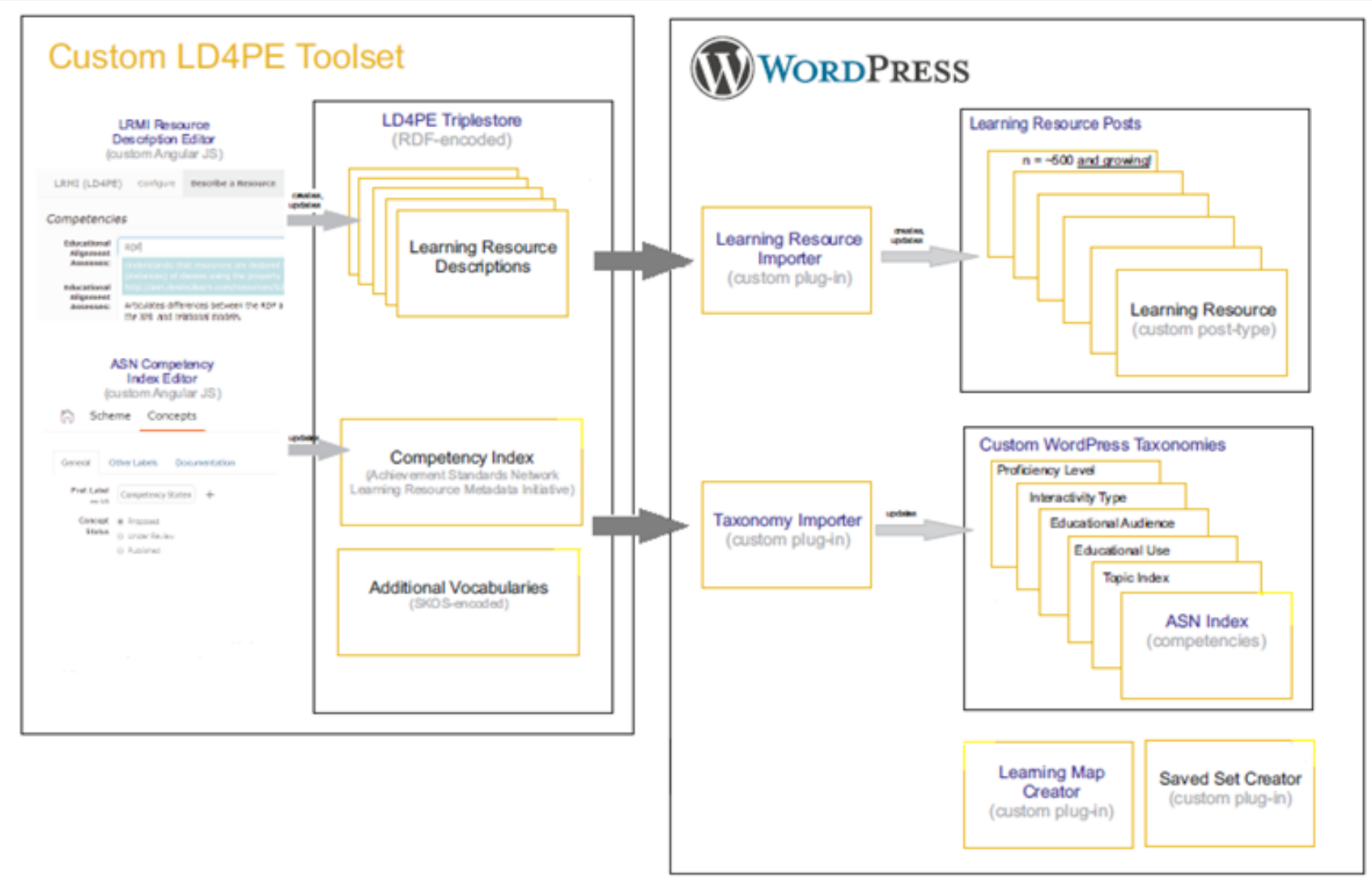
Key Project Personnel

- University of Washington
  - Michael Crandall
  - Stuart Sutton
  - David Talley
  - Abi Evans
- Kent State University
  - Marcia Zeng
  - Sean Dolan
- DCMI
  - Stuart Sutton
  - Tom Baker
  - Joseph Chapman
- Content Partners
  - Elsevier
    - Michael Lauruhn
  - Access Innovations
    - Marjorie Hlava
  - Synaptica
    - David Clarke
  - Sungkyunkwan University
    - Sam Oh
  - OCLC
    - Eric Childress

Project Deliverables

- **Competency Framework.** A "Competency Index for Linked Data" based on the Achievement Standards Network Description Language (ASN-DL) for describing formally promulgated competencies and benchmarks.
- **Toolkit.** An openly available, web-based tool set to support the generation of RDF metadata describing : (a) learning resources; and (b) ASN-based competency frameworks and SKOS-based concept schemes.
- **Learning Resource Descriptions.** A set of cataloged learning resources that have been mapped to the competencies and benchmarks of the Competency Index to support competency-based resource discovery by teachers, trainers and learners.
- **LD4PE Website.** A website to be managed by DCMI as part of its educational agenda for open discovery of competency-based learning resources, access to the toolkit, learner trajectory maps, and supporting resources.
- **Best Practices.** Readily accessible best practice documentation for all processes, from community-based competency framework development and learning resource description through learner trajectory creation.

Architecture



Linked Data Competency Index:
Mapping the field for teachers and learners

Thomas Baker
Dublin Core Metadata Initiative

Linked Data Competency Index

The Linked Data Competency Index provides:

- a concise and readable map of concepts and skills
- related to practices and technologies of Linked Data
- for benefit of interested learners (and teachers).

“Competency Index”

A **thematic set of competencies** organized by

- **Topic**
  - **Competency**: a tweet-length phrase about knowledge or skills that can be learned
    - **Benchmark**: an action that demonstrates accomplishment in a given competency

Linked Data Competency Index
Example

- **Topic**: Querying RDF Data
  - **Competency**: Understands that a SPARQL query matches an RDF graph against a pattern of triples with fixed and variable values
  - **Competency**: Understands the basic syntax of a SPARQL query
    - **Benchmark**: Uses angle brackets for delimiting URIs.
    - **Benchmark:** Uses question marks for indicating variables.
    - **Benchmark**: Uses PREFIX for base URIs.

LD4PE Competency Index
Example topic

- **Topic**: **Querying RDF Data**
  - **Competency**: Understands that a SPARQL query matches an RDF graph against a pattern of triples with fixed and variable values
  - **Competency**: Understands the basic syntax of a SPARQL query
    - **Benchmark**:Uses angle brackets for delimiting URIs.
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    - **Benchmark**: Uses PREFIX for base URIs.

6 topic clusters
30 topics
95 competencies

LD4PE Competency Index
Overview of topics

- **Fundamentals of Resource Description Framework**
  - Identity in RDF
  - RDF data model
  - Related data models
  - RDF serialization
- Fundamentals of Linked Data
  - Web technology
  - Linked data principles
  - Linked Data policies and best practices
  - Non-RDF Linked Data
- **RDF vocabularies and application profiles**
  - Finding RDF-based vocabularies
  - Designing RDF-based vocabularies
  - Maintaining RDF vocabularies
  - Versioning RDF vocabularies
  - Publishing RDF vocabularies
  - Mapping RDF vocabularies
  - RDF application profiles
- **Creating and transforming RDF Data**
  - Managing identifiers (URIs)
  - Creating RDF data
  - Versioning RDF data
  - RDF data provenance
  - Cleaning and reconciling RDF data
  - Mapping and enriching RDF data
- **Interacting with RDF Data**
  - Finding RDF Data
  - Processing RDF data using programming languages
  - **Querying RDF Data**
  - Visualizing RDF Data
  - Reasoning over RDF data
  - Assessing RDF data quality
  - RDF Data analytics
  - Manipulating RDF Data
- **Creating Linked Data applications**
  - Storing RDF data

Linked Data Competency Index

Competencies and benchmarks

- **Topic**: Querying RDF Data
  - **Competency**: **Understands** that a SPARQL query matches an RDF graph against a pattern of triples with fixed and variable values
  - **Competency**: **Knows** the basic syntax of a SPARQL query
    - **Benchmark**: **Uses** angle brackets for delimiting URIs.
    - **Benchmark: Uses** question marks for indicating variables.
    - **Benchmark**: **Uses** PREFIX for base URIs.

LD4PE Exploring Linked Data

620 resources described

http://explore.dublincore.net/explore-learning-resources-by-competency/

Explore Learning Resources by Competency

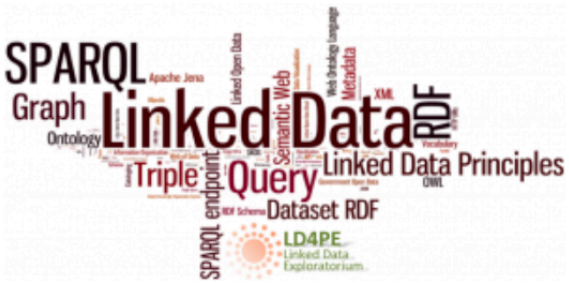
Search ...

Browse by Competency

How does this work?

+ New Comp Index (620)
  + Fundamentals of Resource Description Framework (218)
  + Fundamentals of Linked Data (135)
  + RDF vocabularies and application profiles (181)
  + Creating and transforming Linked Data (82)

To Explore Linked Data learning resources, select a competency assertion or topic statement in the adjacent panel to view a listing of associated learning resources.

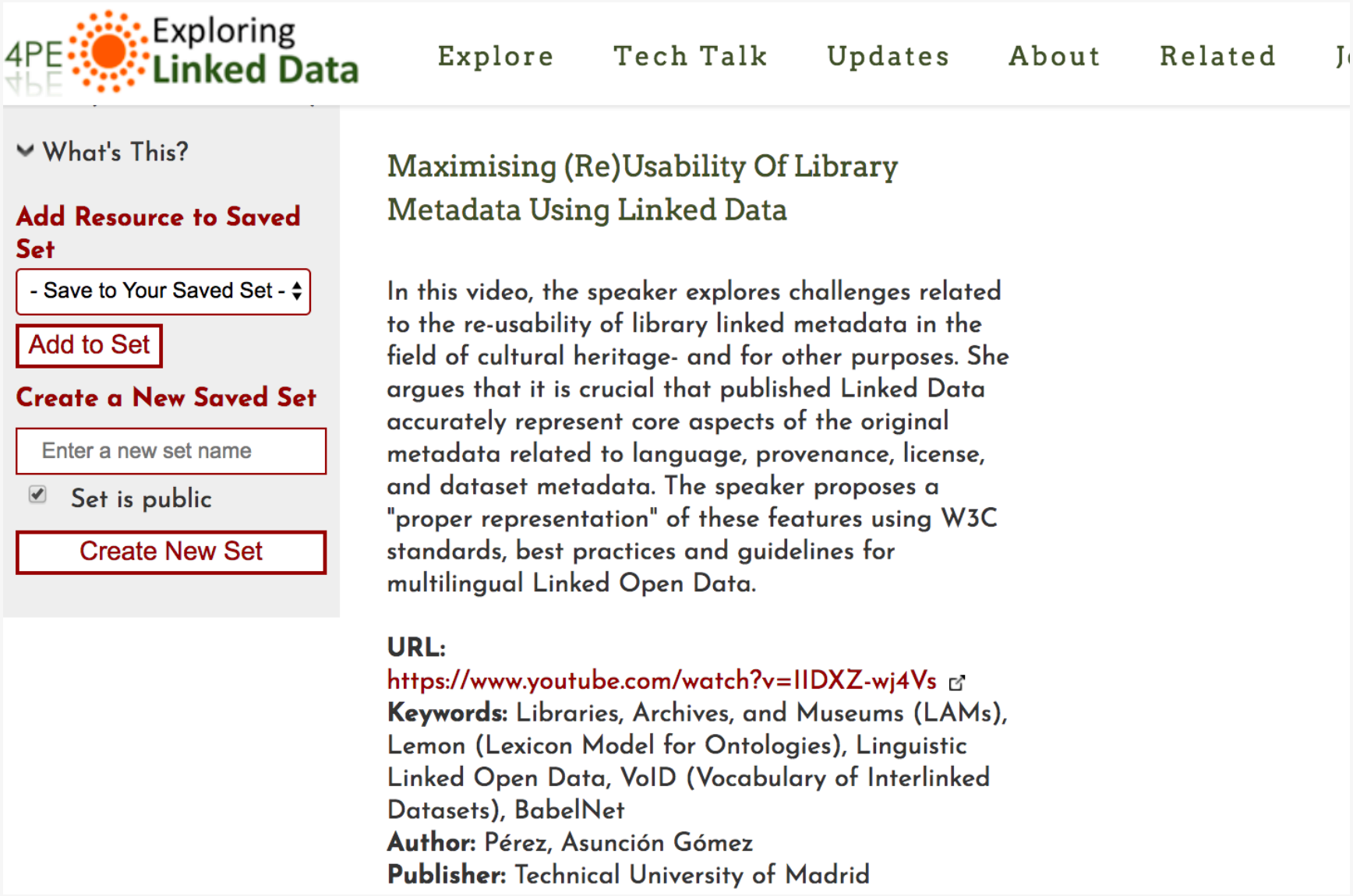


The *Competency Index for Linked Data* (CI) constitutes a set of topically arranged assertions of the knowledge, skills, and habits of mind required for professional practice in the area of Linked Data.

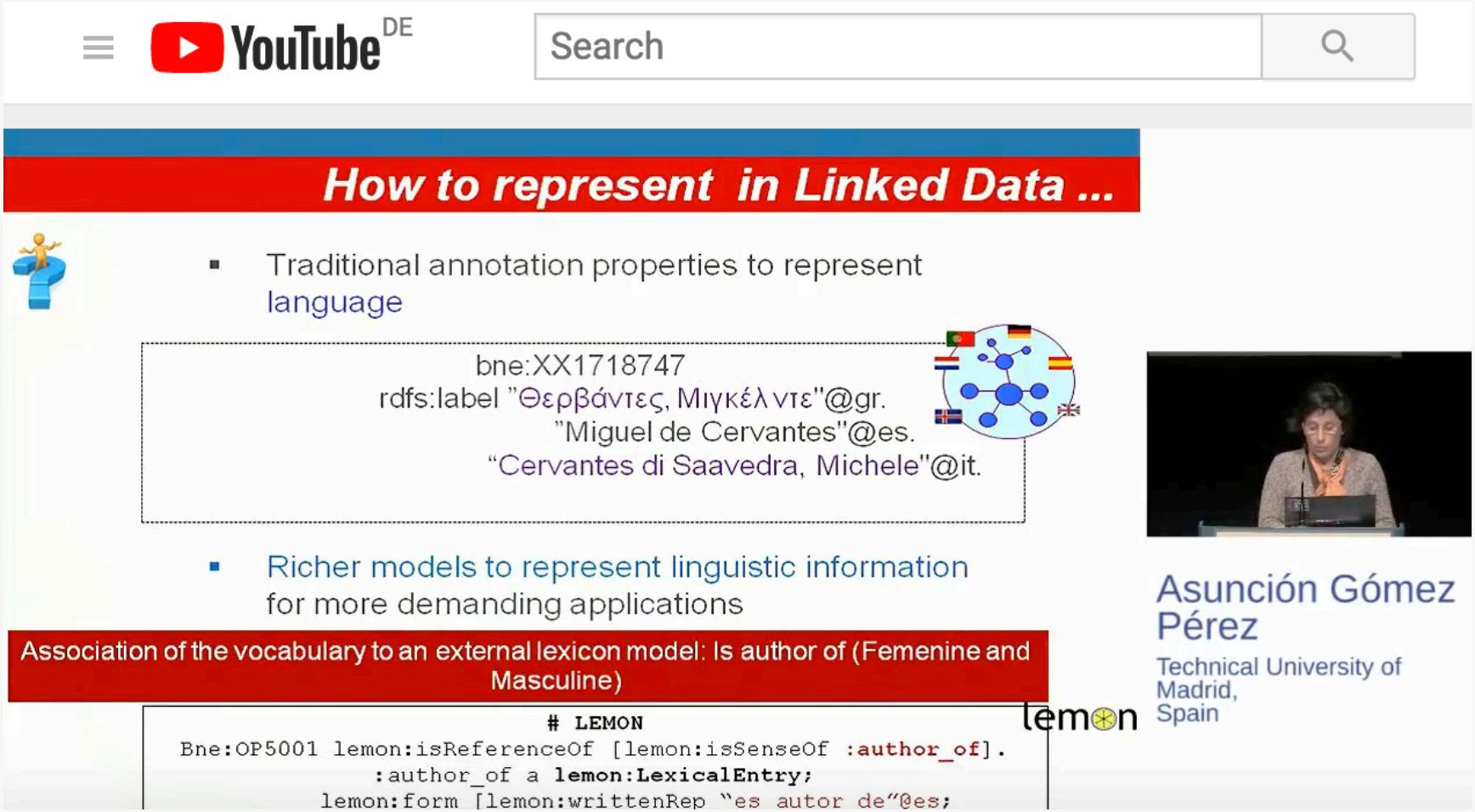
This structure is illustrated in the adjacent panel. CI development is expected to openly crowd-source expertise in the development processes under the guidance of the project's CI Editorial Board (CIEB).
Learn more about the Competency Index.

IMPORTANT NOTES:

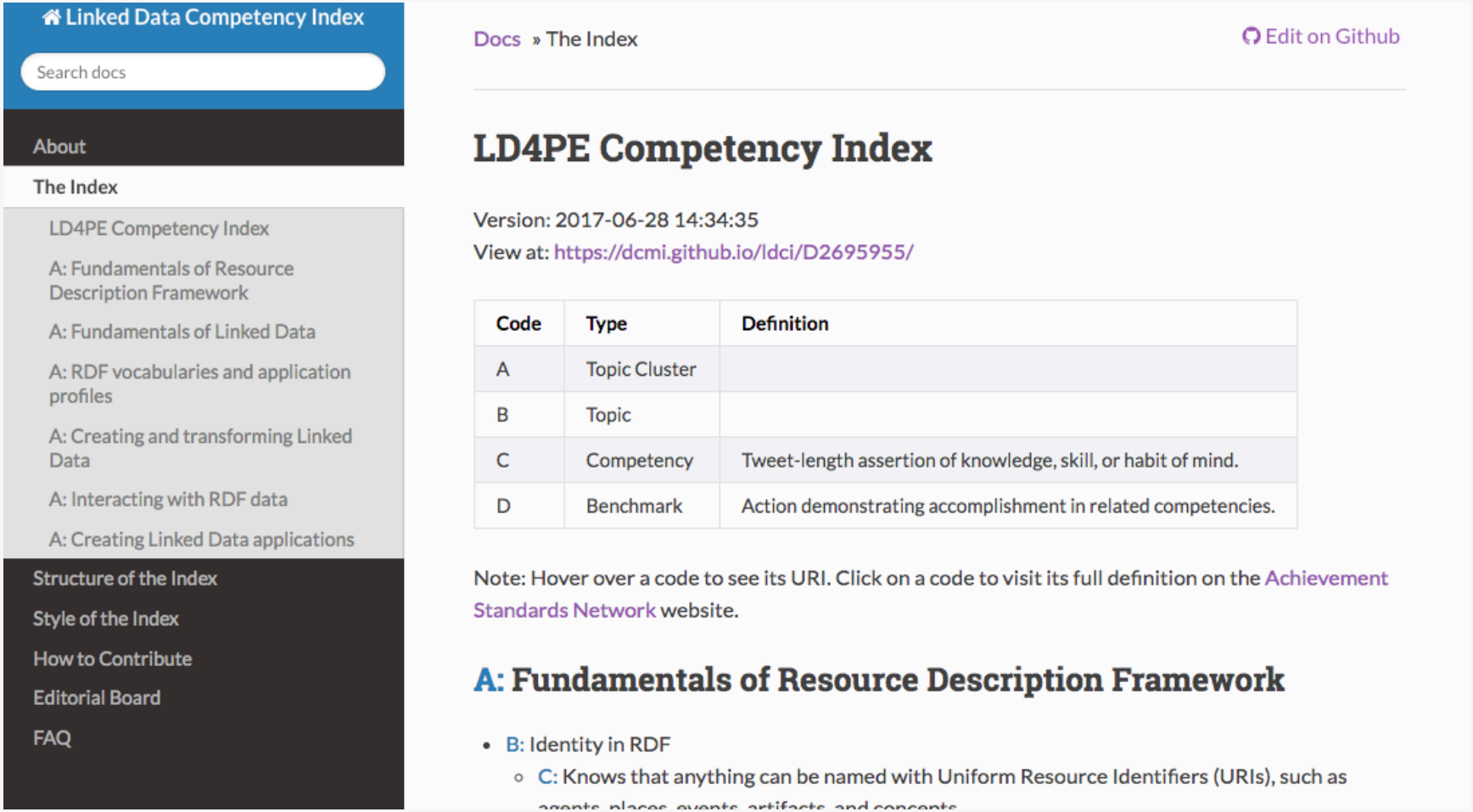
Example: YouTube video tagged using LDCI



Example: YouTube video tagged using LDCI



https://dcmi.github.io/ldci/D2695955/



Linked Data Competency Index

Search docs

About

The Index

- LD4PE Competency Index
- A: Fundamentals of Resource Description Framework
- A: Fundamentals of Linked Data
- A: RDF vocabularies and application profiles
- A: Creating and transforming Linked Data
- A: Interacting with RDF data
- A: Creating Linked Data applications

Structure of the Index

Style of the Index

How to Contribute

Editorial Board

FAQ

Docs » The Index

Edit on Github

LD4PE Competency Index

Version: 2017-06-28 14:34:35

View at: https://dcmi.github.io/ldci/D2695955/

Code	Type	Definition
A	Topic Cluster	
B	Topic	
C	Competency	Tweet-length assertion of knowledge, skill, or habit of mind.
D	Benchmark	Action demonstrating accomplishment in related competencies.

Note: Hover over a code to see its URI. Click on a code to visit its full definition on the Achievement Standards Network website.

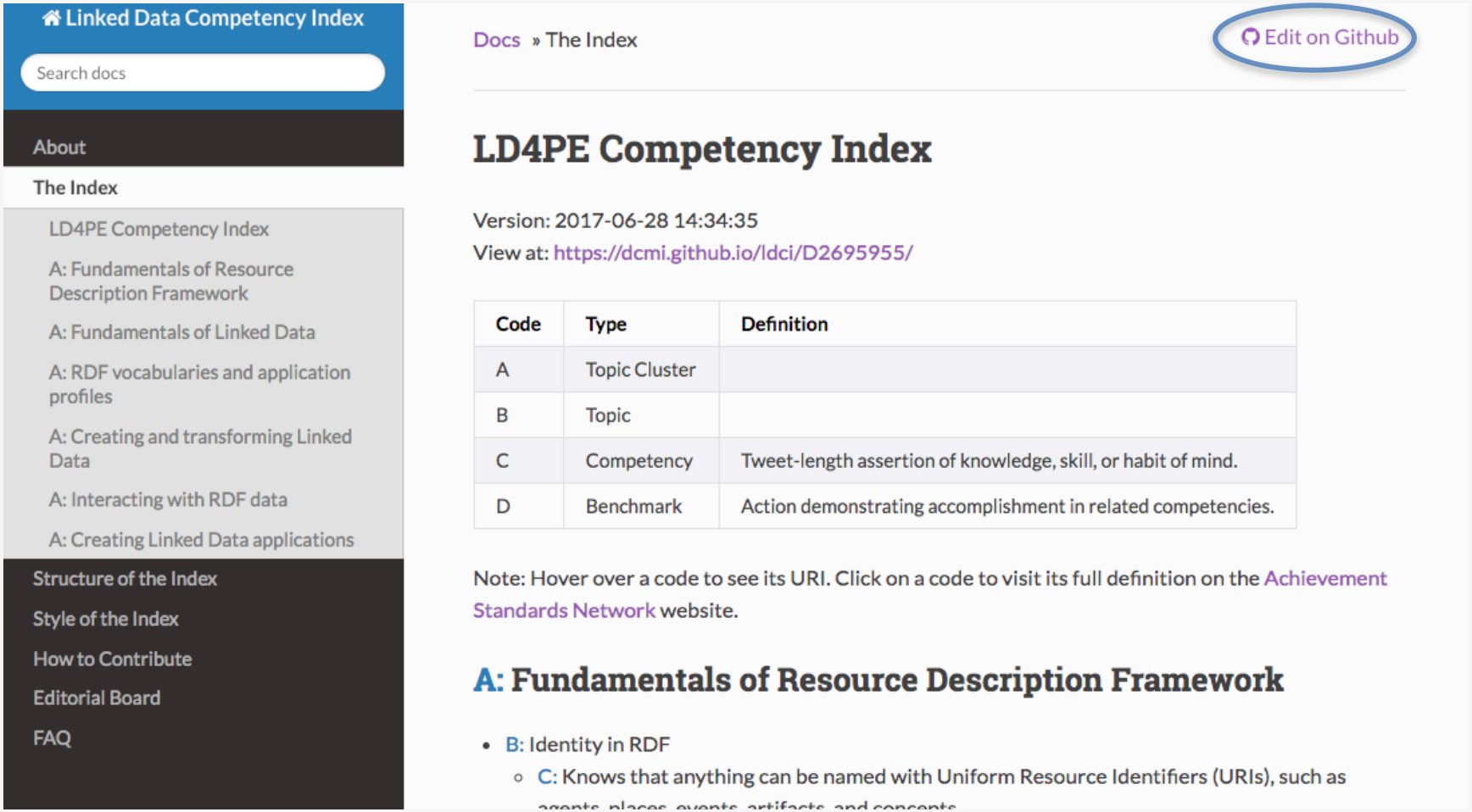
A: Fundamentals of Resource Description Framework

- B: Identity in RDF
  - C: Knows that anything can be named with Uniform Resource Identifiers (URIs), such as agents, places, events, artifacts, and concepts

Linked Data Competency Index in Chinese

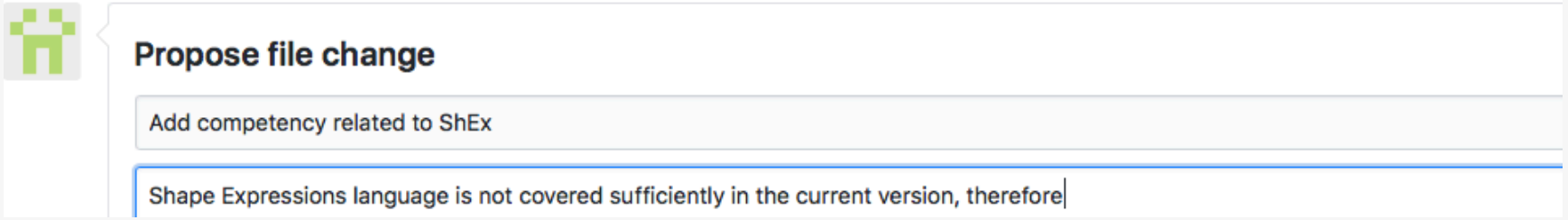
https://dcmi.github.io/ldci-zh/D2695955-zh/

Crowdsourcing LDCI maintenance



Users can propose new competencies

```
real, imagined, or conceptual.
27      * [C:](http://asn.desire2learn.com/resources/S2709298) Understands that resources are declared to be members (instances) of classes using the property rdf:type.
28      * [C:](http://asn.desire2learn.com/resources/S2709299) Understands the use of datatypes and language tags with literals.
29      * [C:](http://asn.desire2learn.com/resources/S2709997) Understands blank nodes and their uses.
30      * [C:](http://asn.desire2learn.com/resources/S2710003) Understands that QNames define shorthand prefixes for long URIs.
31          * [D:](http://asn.desire2learn.com/resources/S2710007) Uses prefixes for URIs in RDF specifications and data.
32      * [C:](http://asn.desire2learn.com/resources/S2731549) Articulates differences between the RDF abstract data model and the XML and relational models.
33      * [C:](http://asn.desire2learn.com/resources/S2731551) Understands the RDF abstract data model as a directed labeled graph.
34      * [C:](http://asn.desire2learn.com/resources/S2731552) Knows graphic conventions for depicting RDF-based models.
35          * [D:](http://asn.desire2learn.com/resources/S2731553) Can use graphing or modeling software to share those models with others.
36      * [C:](http://asn.desire2learn.com/resources/S2709875) Understands a named graph as one of the collection of graphs comprising an RDF dataset, with a graph name unique in the context of that dataset.
37      * [C:](http://asn.desire2learn.com/resources/S2731590) Understands how a namespace, informally used in the RDF context for a namespace URI or RDF vocabulary, fundamentally differs from the namespace of data attributes and functions (methods) defined for an object-oriented class.
38  * [B:](http://asn.desire2learn.com/resources/S2696012) Related data models
39      * [C:](http://asn.desire2learn.com/resources/S2731554) Grasps essential differences between schemas for syntactic validation (e.g., XML) and for inferencing (RDF Schema).
40      * [C:](http://asn.desire2learn.com/resources/S2731555) Differentiates hierarchical document models (eg, XML) and graph models (RDF).
```



LD4PE Competency Index

Who can use it?

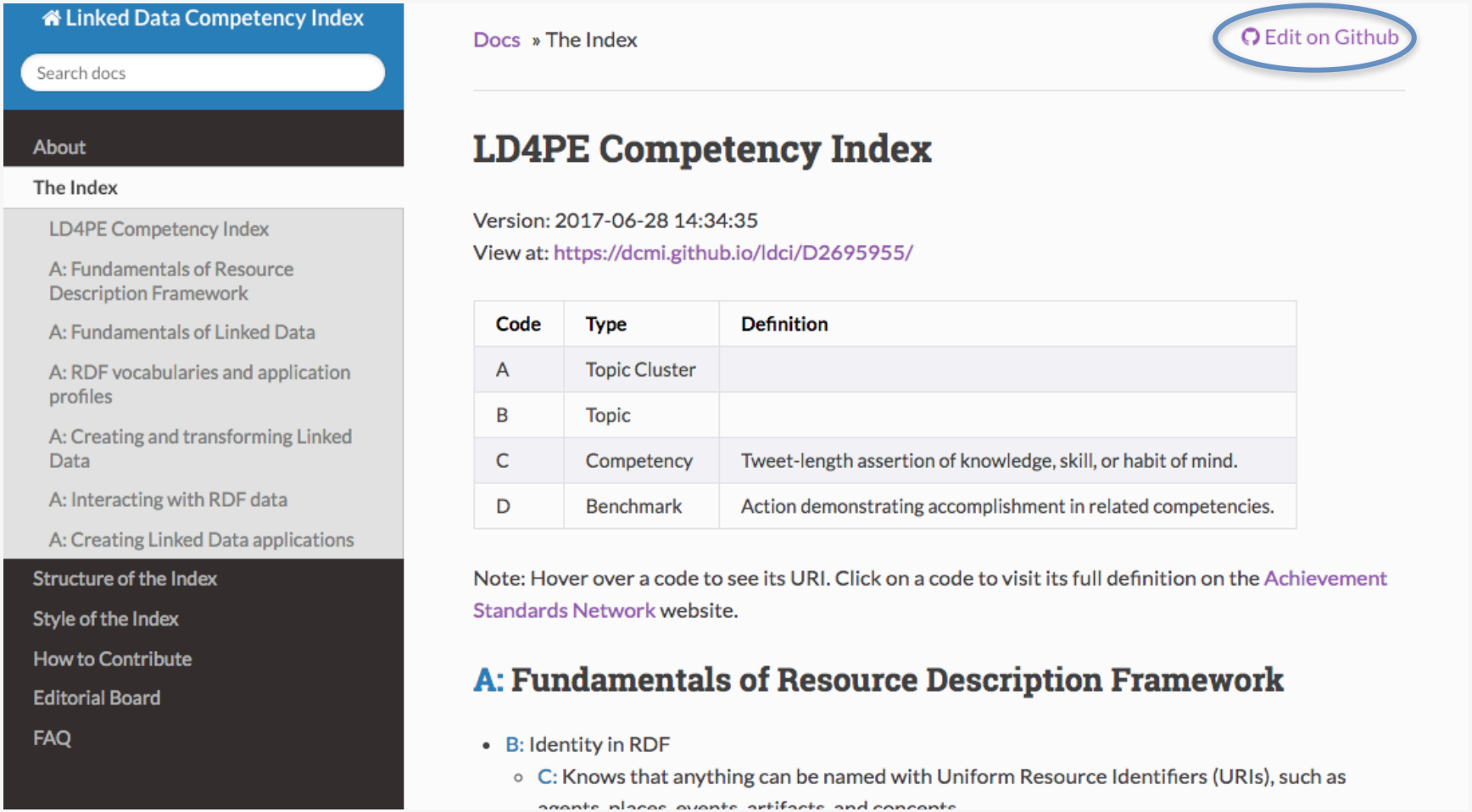
- **Students**: help choose courses that cover what you want to learn.
- **Instructors**: design a course, syllabus, homework, quizzes, exams.
- **Employers**: write a job description.
- **Self-learners**: explore technologies and methods related to Linked Data.

LD4PE Competency Index

Learning tailored to the individual

- Since 1800s: “industrial” classroom:
  - instructors lecture (“sage on the stage”)
  - students listen and take notes
  - achievement measured by a grade on the exam
- Trend: learning tailored to the individual:
  - students watch the lectures online *before* class
  - students pursue customized learning objectives
  - instructors give individualized help (“guide at the side”)
  - learners learn at own pace
  - life-long learning
  - achievement measured in competencies acquired

LDCI is work in progress!
Follow us on Github!



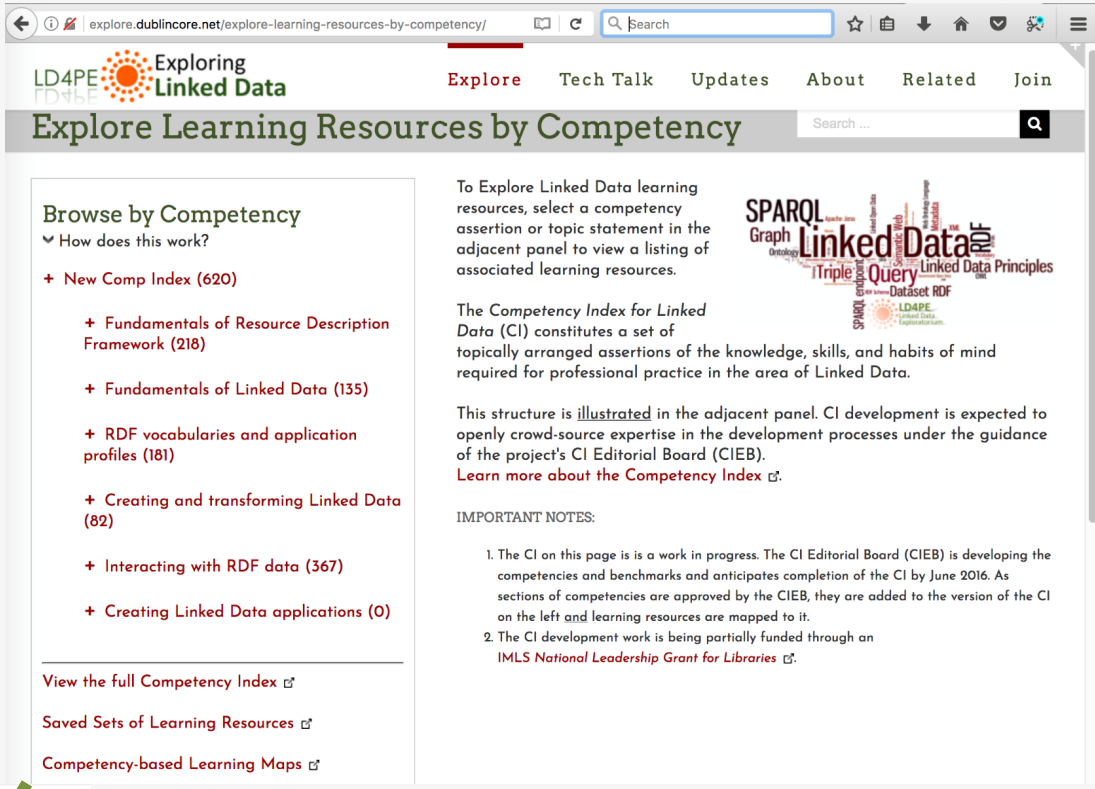
How Can I Use LD4PE in self-learning, teaching, and training?

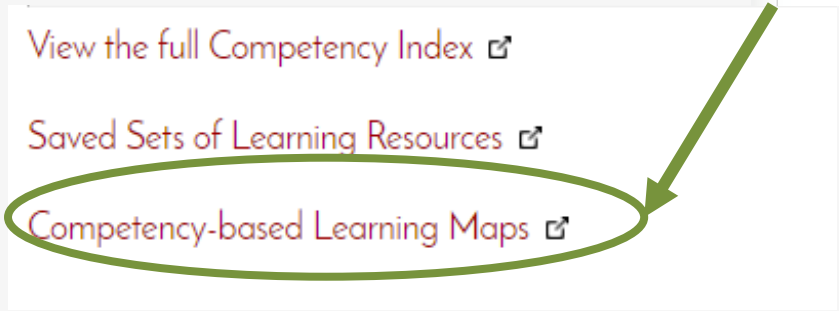
Marcia Zeng
Kent State University

1. **Learning Maps** -- competencies
2. **Saved sets** – resources
3. **OCLC Dataset** -- A dataset to try, with sample queries and a guide sheet.

1. Learning Maps

- Logical sequences; Paths or Trajectories to follow
- Competencies targeted to specific audience or theme
- Each item links to a list of resources which teach the competency



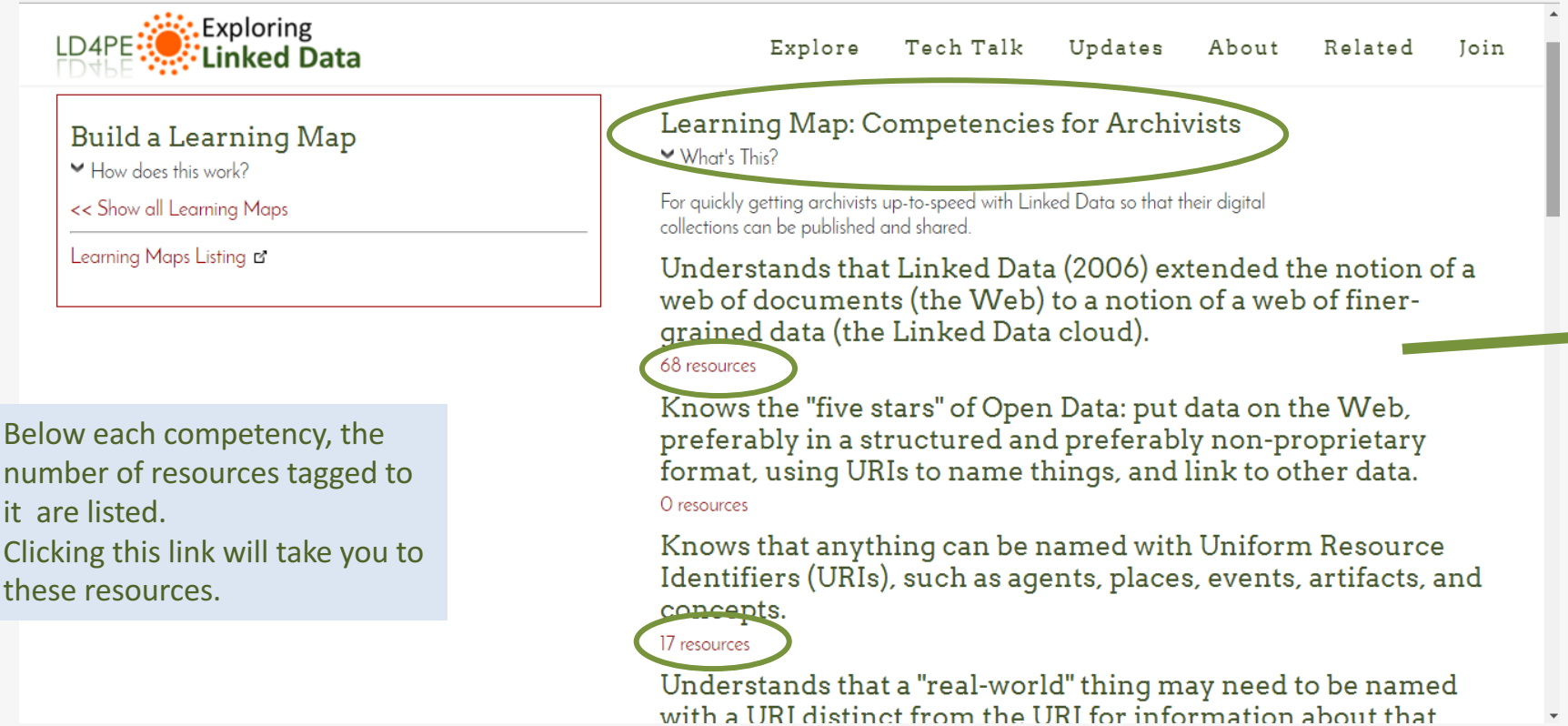


Newly Created Map

See a list of the learning maps at http://explore.dublincore.net/explore-learning-resources-by-competency/learning-maps/

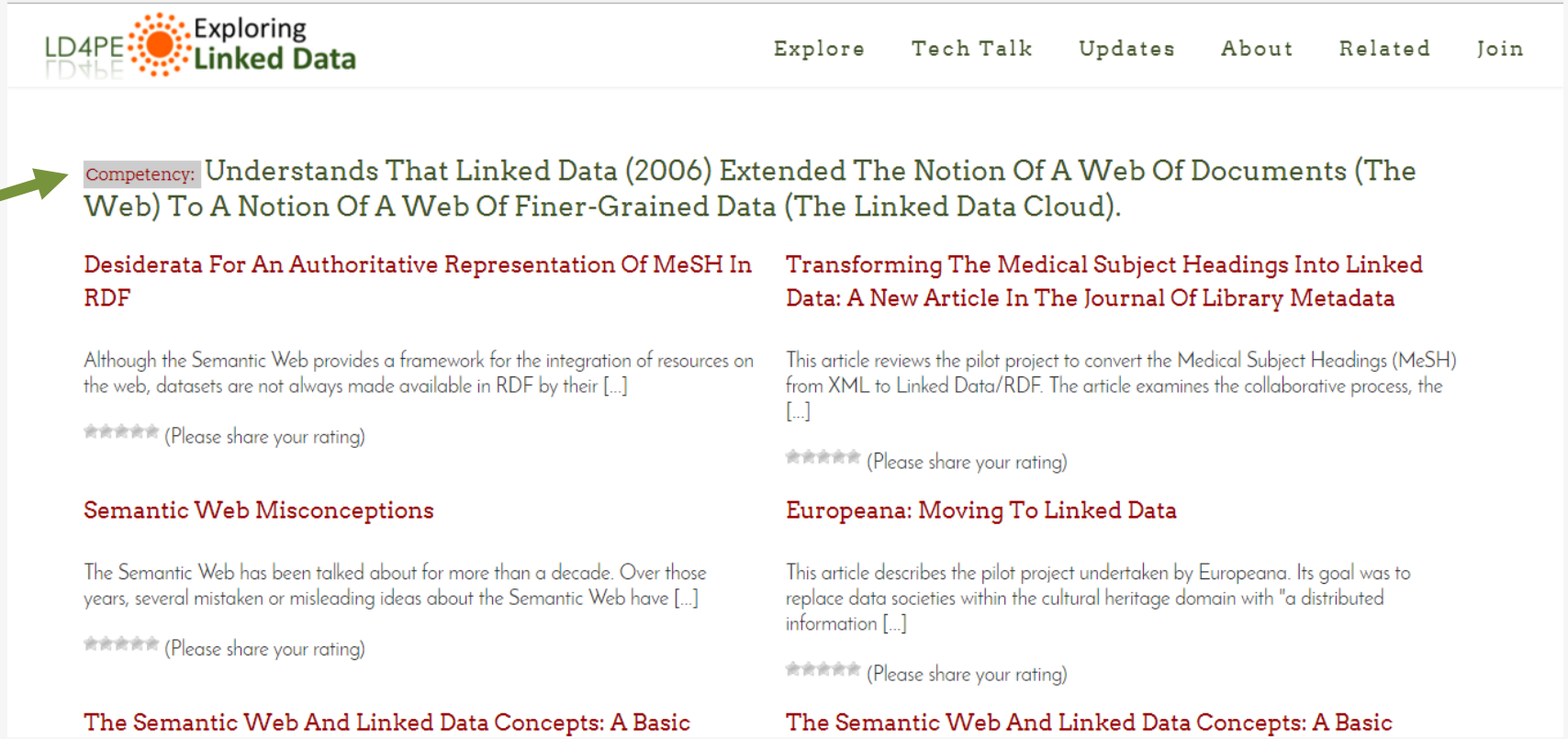
Example: Individual Learning Map Page

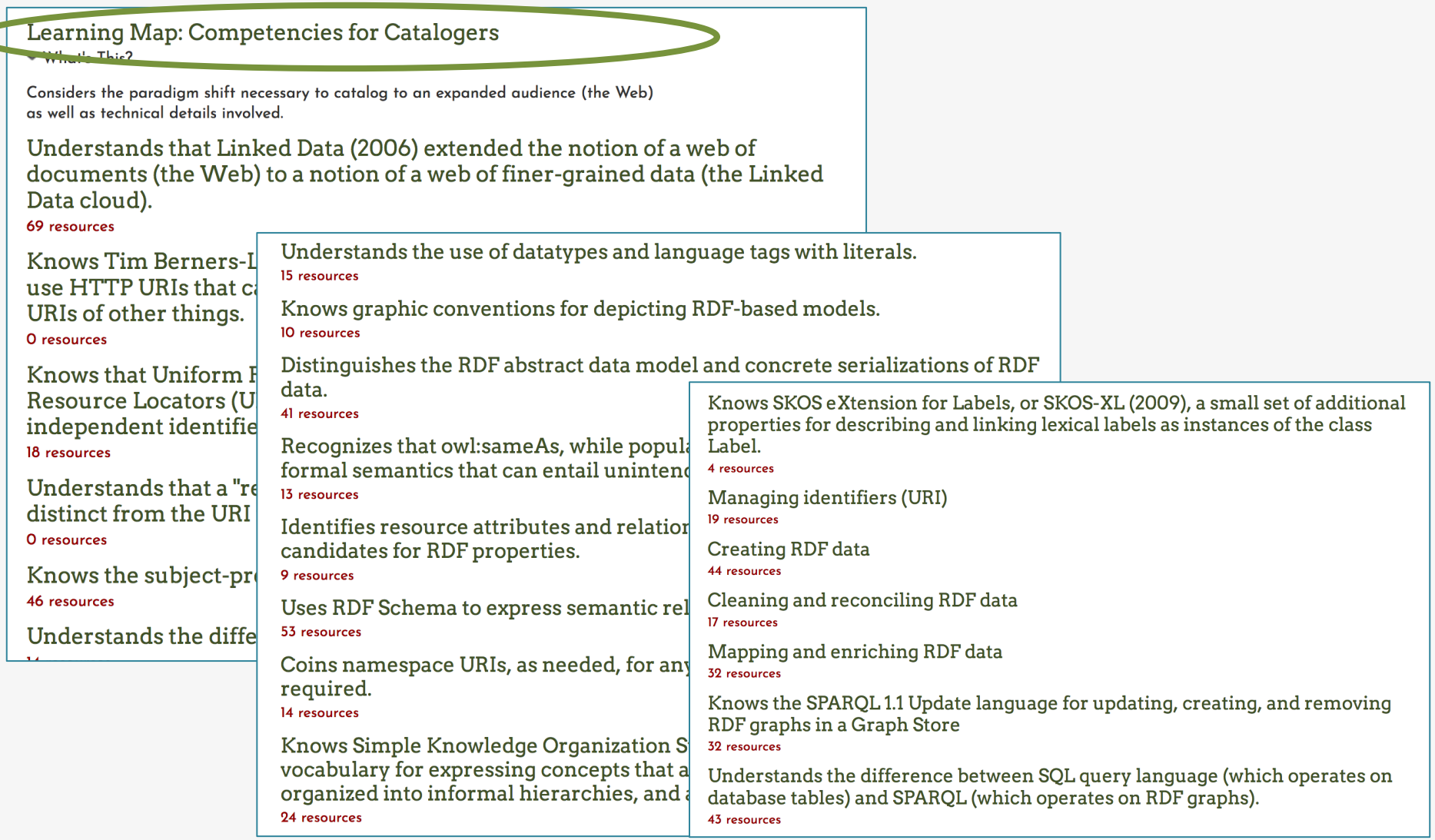
-- a learning map prepared for archivists – what are the key competencies?



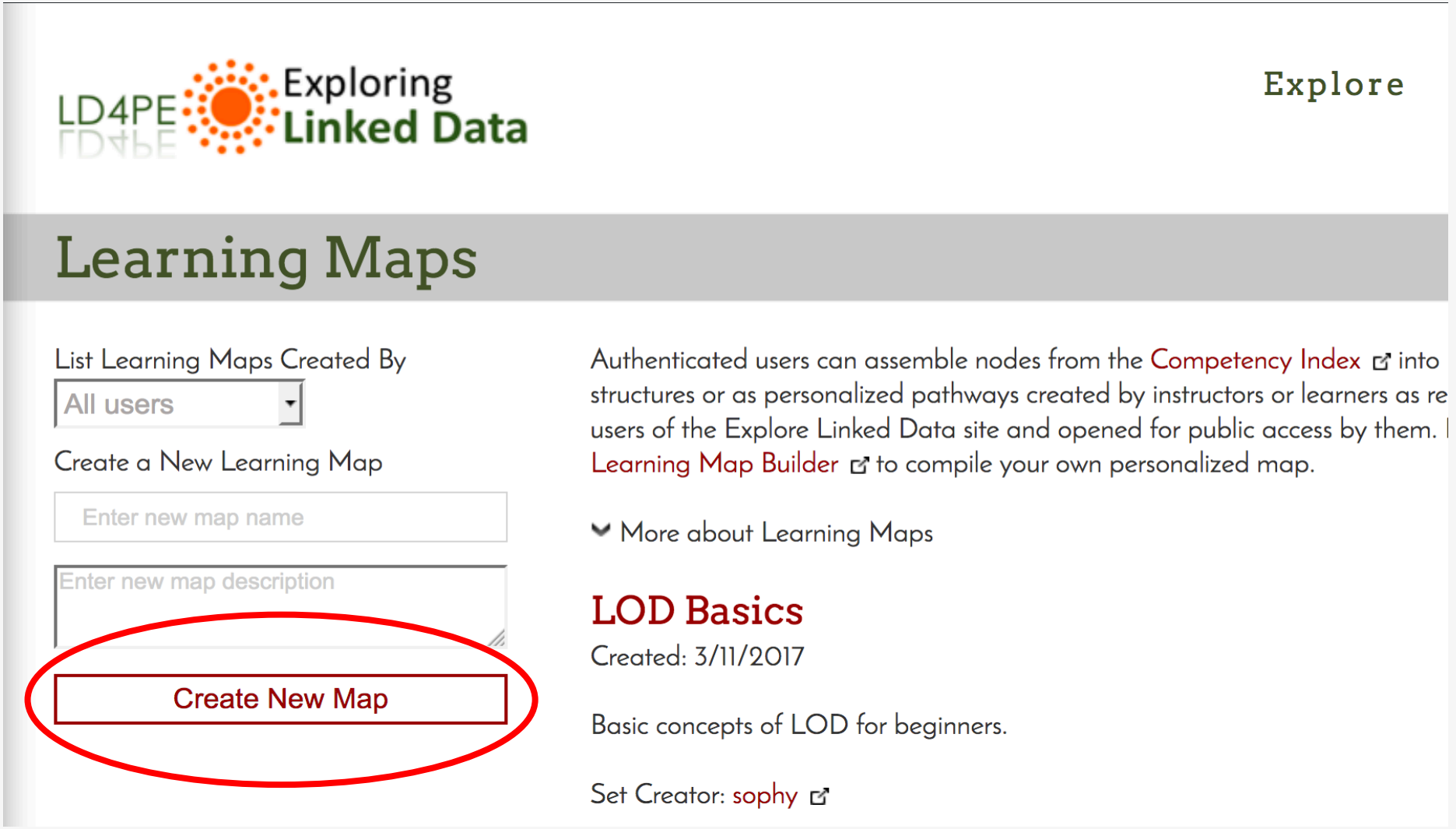
- Below each competency, the number of resources tagged to it are listed.
- Clicking this link will take you to these resources.

Competency Page with List of Tagged Resources



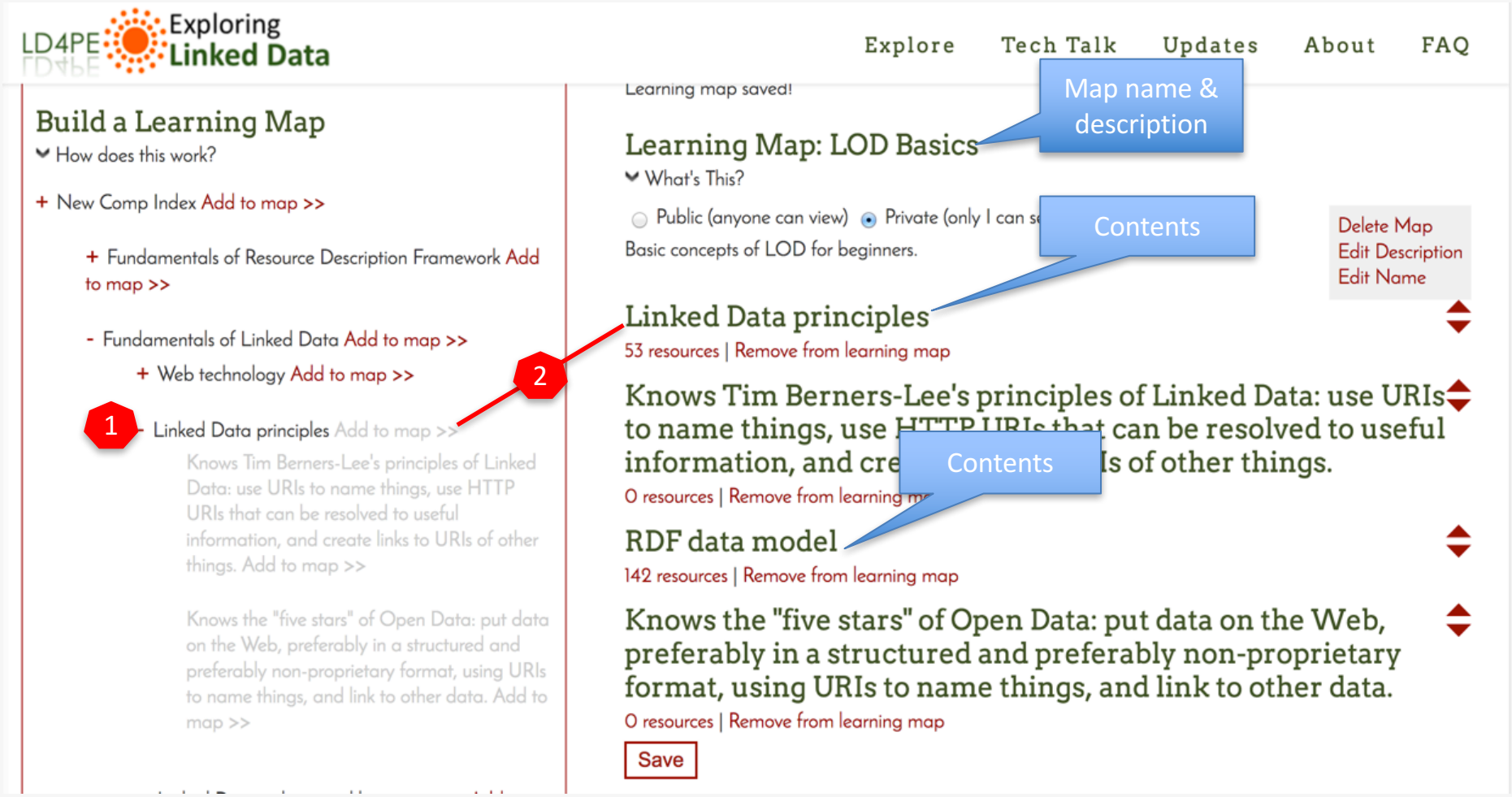

Learning Map: Competencies for Catalogers
What's This?
Considers the paradigm shift necessary to catalog to an expanded audience (the Web) as well as technical details involved.
Understands that Linked Data (2006) extended the notion of a web of documents (the Web) to a notion of a web of finer-grained data (the Linked Data cloud).
69 resources
Knows Tim Berners-L
use HTTP URIs that c
URIs of other things.
0 resources
Knows that Uniform R
Resource Locators (U
independent identifie
18 resources
Understands that a "re
distinct from the URI
0 resources
Knows the subject-pr
46 resources
Understands the diffe
Understands the use of datatypes and language tags with literals.
15 resources
Knows graphic conventions for depicting RDF-based models.
10 resources
Distinguishes the RDF abstract data model and concrete serializations of RDF data.
41 resources
Recognizes that owl:sameAs, while popul
formal semantics that can entail unintenc
13 resources
Identifies resource attributes and relatior
candidates for RDF properties.
9 resources
Uses RDF Schema to express semantic rel
53 resources
Coins namespace URIs, as needed, for any
required.
14 resources
Knows Simple Knowledge Organization S
vocabulary for expressing concepts that a
organized into informal hierarchies, and a
24 resources
Knows SKOS eXtension for Labels, or SKOS-XL (2009), a small set of additional properties for describing and linking lexical labels as instances of the class Label.
4 resources
Managing identifiers (URI)
19 resources
Creating RDF data
44 resources
Cleaning and reconciling RDF data
17 resources
Mapping and enriching RDF data
32 resources
Knows the SPARQL 1.1 Update language for updating, creating, and removing RDF graphs in a Graph Store
32 resources
Understands the difference between SQL query language (which operates on database tables) and SPARQL (which operates on RDF graphs).
43 resources

Making new maps



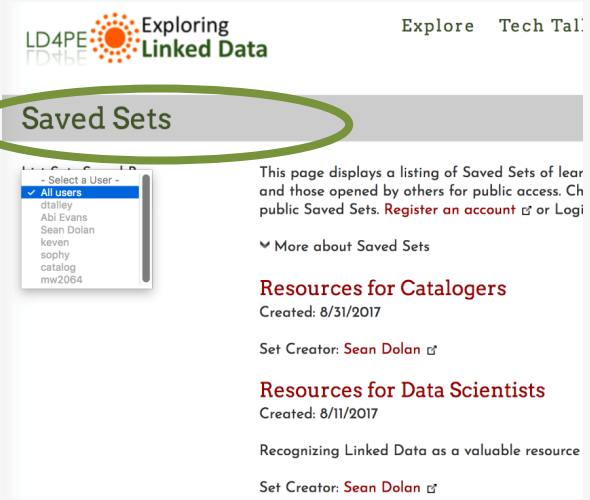
1. Select the competency and benchmarks you need

2. Click on “Add to map”, now it is added to your map.



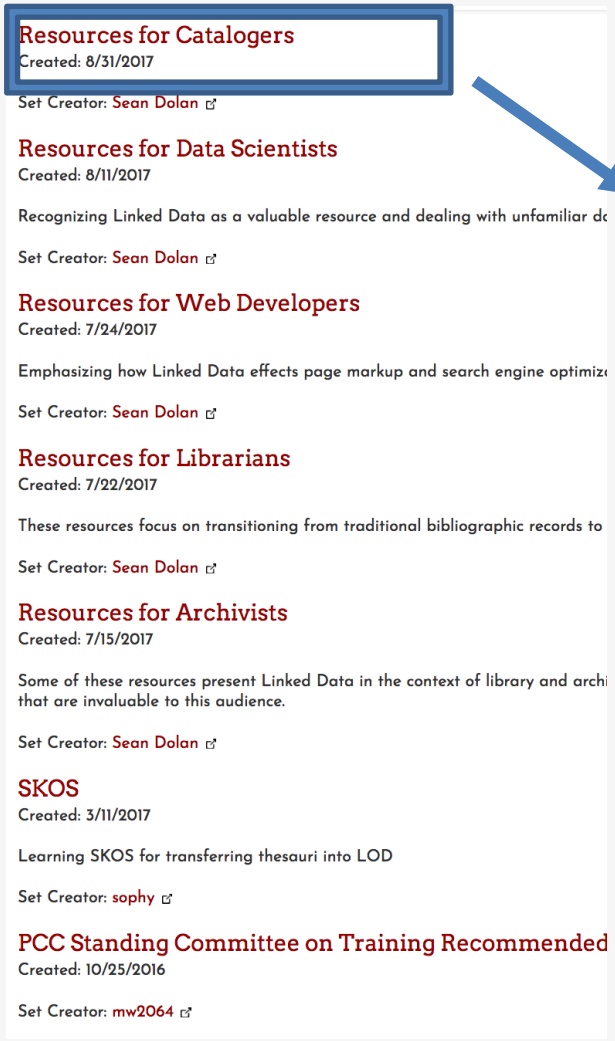
2. Saved Sets

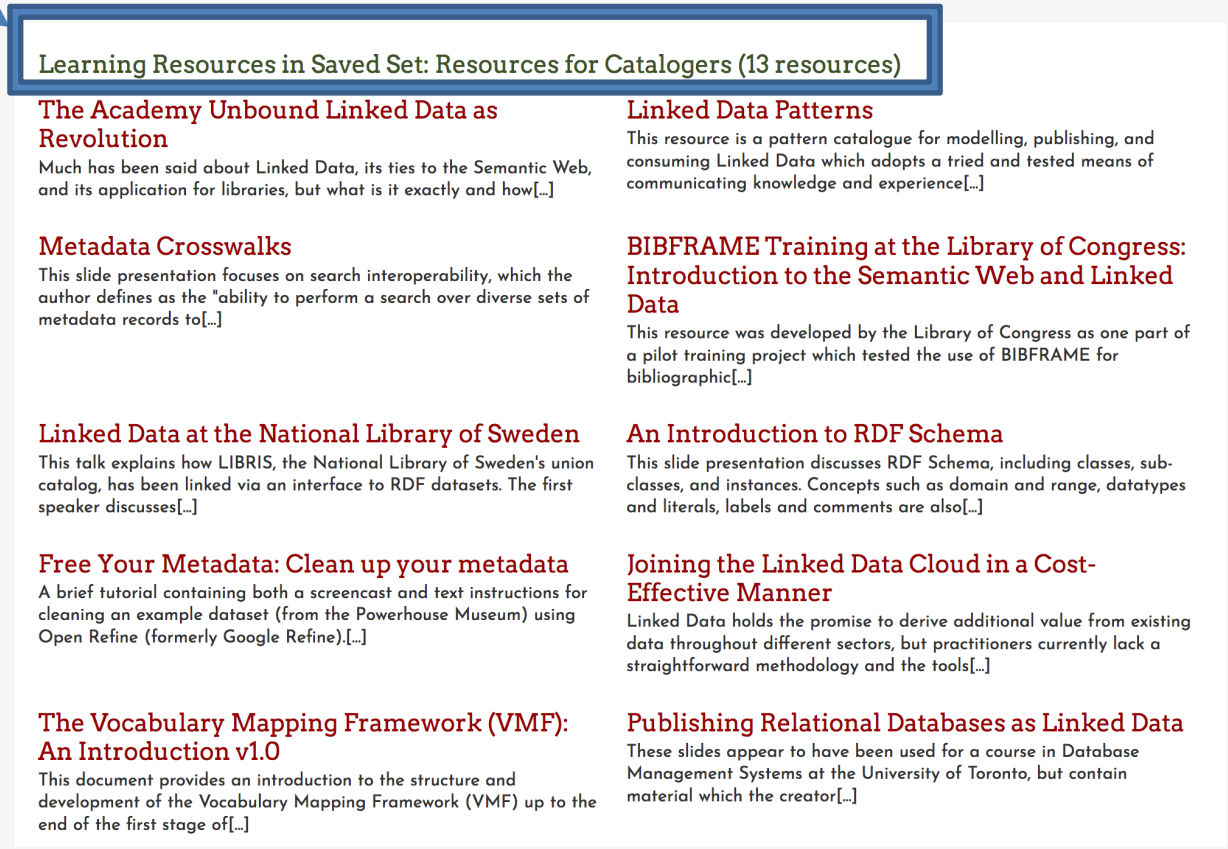
- Curated collection of learning resources
- Targeted to specific audience or theme
- Each item links to resource's description page



http://explore.dublincore.net/explore-learning-resources-by-competency/all-saved-sets

- Authenticated users can save Sets as either Public or Private
- Any user can view Public Sets



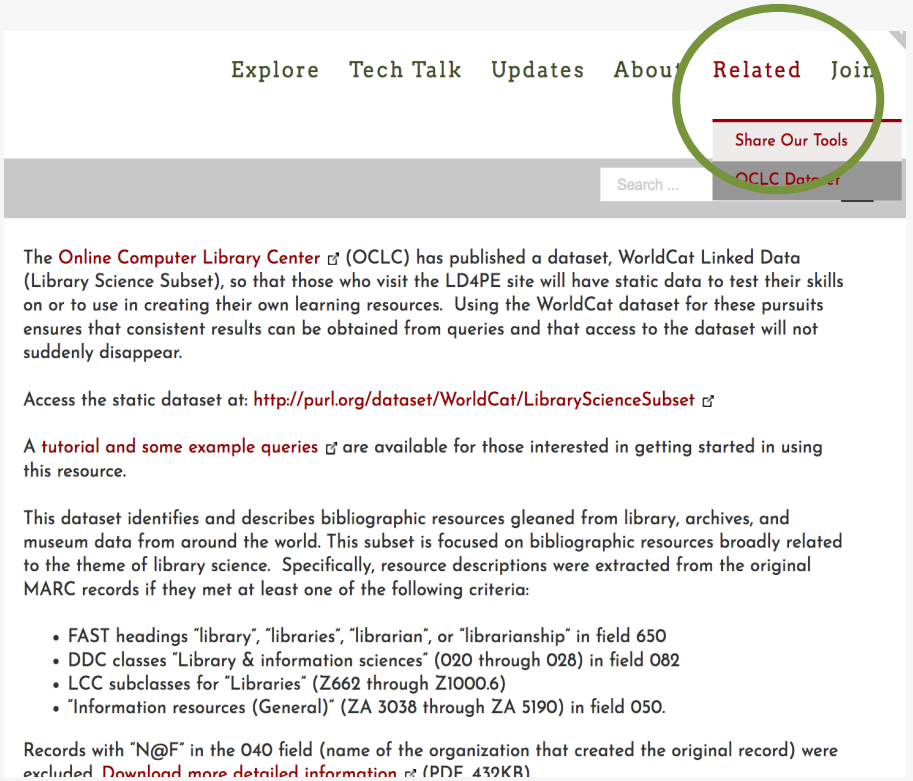


http://explore.dublincore.net/explore-learning-resources-by-competency/all-saved-sets

3. The OCLC Dataset

- Static data to test skills on or to use in creating new learning resources
- Ensures that consistent results can be obtained from queries and that access will not suddenly disappear

- Identifies and describes bibliographic resources gleaned from library, archives, and museum data from around the world.
- Extracted from the original MARC records based on:
  - FAST headings
  - DDC classes
  - LCC subclasses



Access the static dataset at: http://purl.org/dataset/WorldCat/LibraryScienceSubset

DOWNLOAD as:

N-TRIPLES

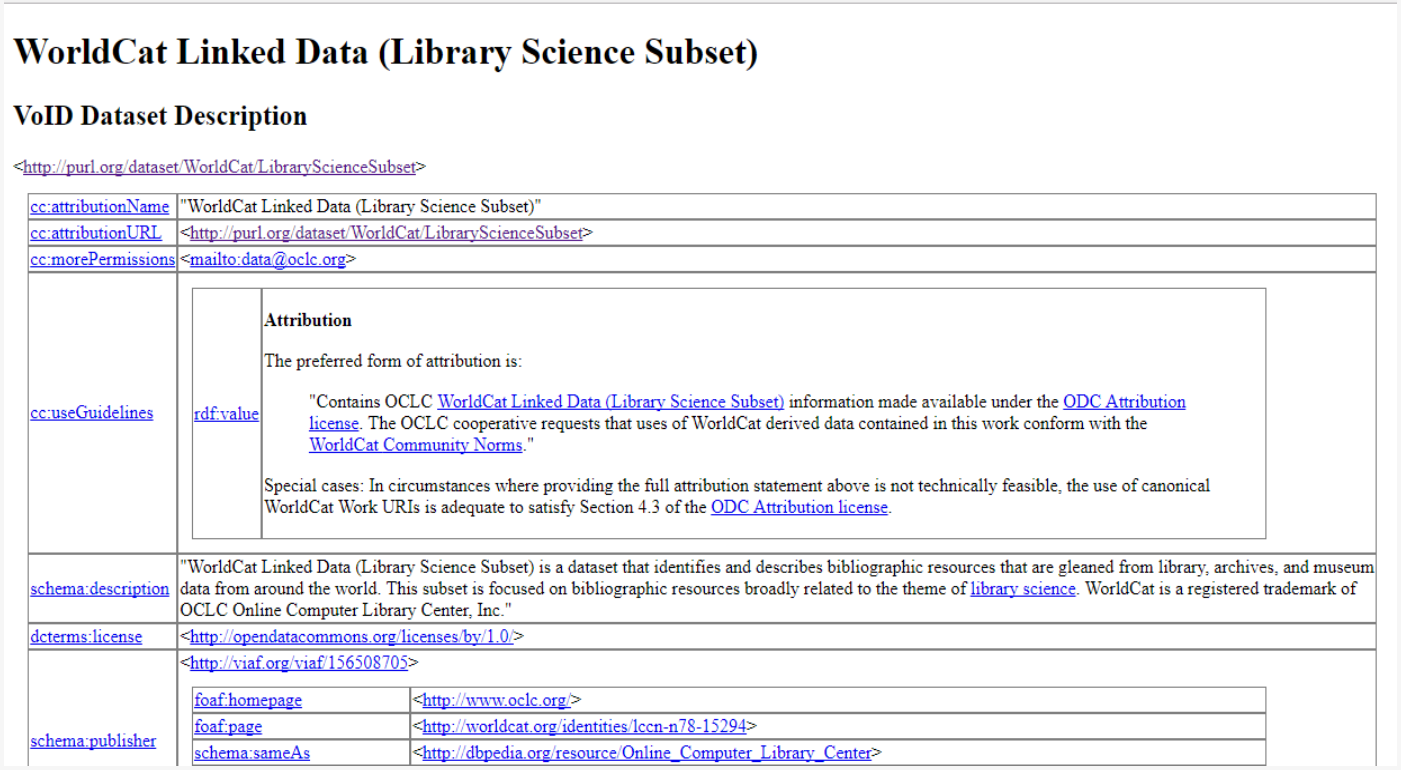
MARC/XML

License:

ODC-BY

AVAILABILITY:

through December 2027



WorldCat Linked Data (Library Science Subset)

VoID Dataset Description

<http://purl.org/dataset/WorldCat/LibraryScienceSubset>

cc:attributionName	"WorldCat Linked Data (Library Science Subset)"
cc:attributionURL	<http://purl.org/dataset/WorldCat/LibraryScienceSubset>
cc:morePermissions	<mailto:data@oclc.org>
cc:useGuidelines	rdf:value: **Attribution** The preferred form of attribution is: "Contains OCLC WorldCat Linked Data (Library Science Subset) information made available under the ODC Attribution license. The OCLC cooperative requests that uses of WorldCat derived data contained in this work conform with the WorldCat Community Norms." Special cases: In circumstances where providing the full attribution statement above is not technically feasible, the use of canonical WorldCat Work URIs is adequate to satisfy Section 4.3 of the ODC Attribution license.
schema:description	"WorldCat Linked Data (Library Science Subset) is a dataset that identifies and describes bibliographic resources that are gleaned from library, archives, and museum data from around the world. This subset is focused on bibliographic resources broadly related to the theme of library science. WorldCat is a registered trademark of OCLC Online Computer Library Center, Inc."
dcterms:license	<http://opendatacommons.org/licenses/by/1.0/>
schema:publisher	<http://viaf.org/viaf/156508705> foaf:homepage <http://www.oclc.org/> foaf:page <http://worldcat.org/identities/lccn-n78-15294> schema:sameAs <http://dbpedia.org/resource/Online_Computer_Library_Center>

ACCESS THE DATASET AT: http://purl.org/dataset/WorldCat/LibraryScienceSubset

TUTORIAL :

- DOWNLOAD DATASET
  - N-Triples
- STORE PERSISTENTLY
  - Apache Jena's TDB (Triple Store)
- Query using SPARQL
  - Command Line using TDBQUERY (similar to ARQ)
  - Interpreting and Storing Results

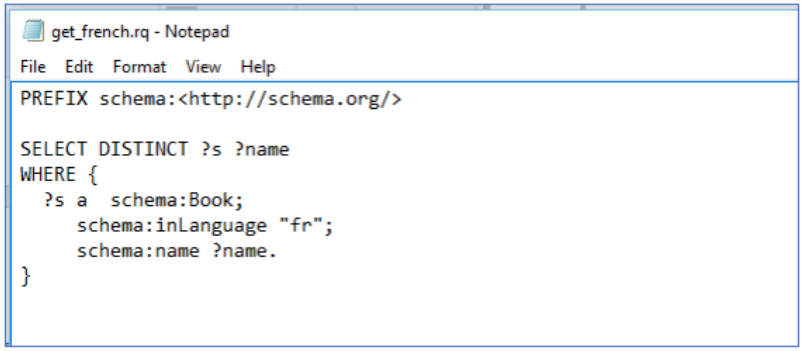


Figure 12: SPARQL query to retrieve all *books* written in *French*

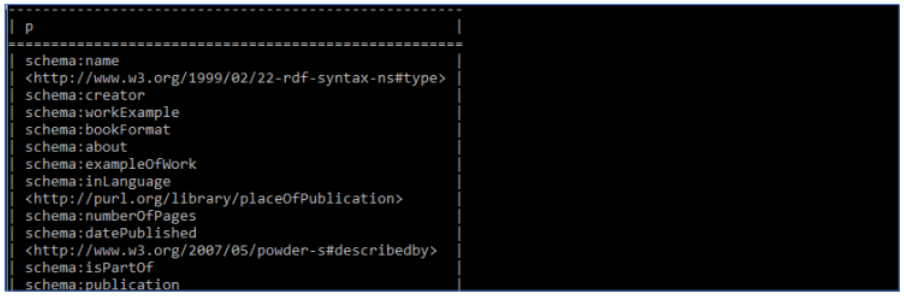
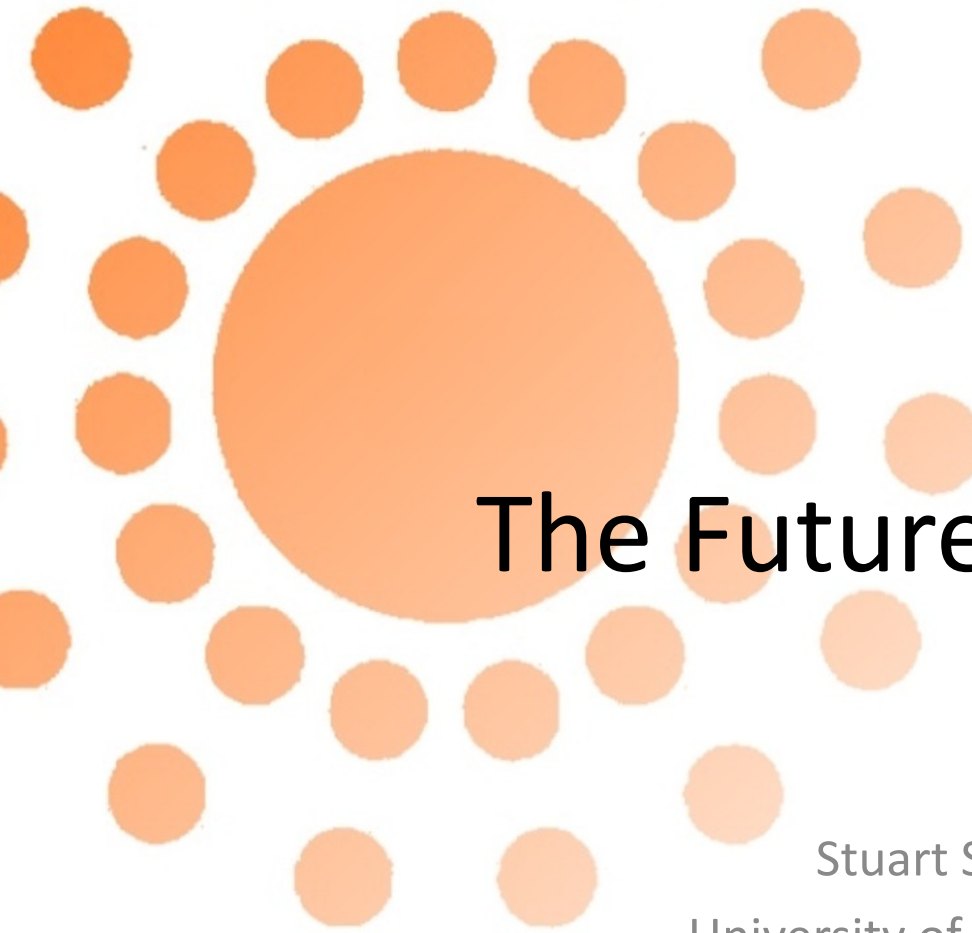


Figure 15: Result set for triple statements sharing subject variable (truncated)

PDFs AVAILABLE:

- Simple Query 1: Union and Shared Subjects
- Simple Query 2: Optional and Turning an Object into a Subject
- Simple Query 3: Negation Using Not Exists and Minus

- Additional SPARQL Exercises
- Answers and Walkthrough



The Future of LD4PE

Stuart Sutton

University of Washington

The Future of LD4PE

- DCMI participation in the LD4PE project
  - From IMLS planning grant to its current realization
  - Why? Opportunity!
    - Opportunity for DCMI to help frame the substance behind metadata best practices—to help identify and describe what it takes for a professional to engage in those practices.
    - Opportunity to pioneer a mechanism to shift development of competency frameworks from a traditional top down, highly structured process to a more dynamic, bottom up, stakeholder-driven process.

The Future of LD4PE

- Engagement beyond Linked Data
  - For DCMI, the Linked Data index has served as a training ground
  - A point of departure for development of competency indexes defining knowledge, skills and acquired abilities in other areas of metadata interest:
    - *Knowledge Organization Systems* development and application
    - *Application Profiles* design and implementation
    - Etc.

QUESTIONS?

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