

The Learning Resource Metadata Initiative, describing learning resources with schema. org, and more?

Phil Barker & Lorna M. Campbell



cetis

Centre for Educational Technology,
Interoperability and Standards

Introduction



Lorna M. Campbell



Phil Barker



Outline

1. Background to LRMI (Lorna)
2. Technical overview (Phil)
3. Example implementations (Lorna, then Phil)
4. What next? (Phil , then everyone)



Background



Learning Resource Metadata Initiative



LRMI

Learning Resource Metadata Initiative



HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC)



Spurred by schema.org

"Schema.org is a joint initiative by Google, Yahoo, Microsoft Bing, Yandex and W3C that aims to help search engines interpret information on web pages to improve the display of search results, making it easier for people to find the information they are looking for on the web."

schema.org



What is LRMI? (take 1)



- Learning Resource Metadata Initiative.
- Three phase project funded by Bill and Melinda Gates Foundation.
- Co-led by Creative Commons and the Association of Educational Publishers (AEP) (part of Association of American Publishers).
- Working group included educators, publishers, metadata specialists.
- Now governed by the Dublin Core Metadata Initiative.



METADATA
Dublin Core® Metadata Initiative
INNOVATION



But what does LRMI *do*?

LRMI aims to make it easier for teachers and learners to find educational materials through major search engines and specialized resource discovery services.



How does it do that then?

LRMI has extended the schema.org ontology in order to allow the description of educationally important properties of resources to be marked-up in web pages in a manner that is easily understood by search engines.

LRMI has added properties to schema.org to describe items of type CreativeWork.



So what is LRMI? (take 2)

- LRMI is a metadata specification based on schema.org that can be used to describe learning resources.
- LRMI is a community of people interested in using that specification.



Technical Overview



Recap: what does LRMI *do*?

LRMI aims to make it easier for teachers and learners to find educational materials through major search engines and specialized resource discovery services.



Motivation



Photo by Vgrigas

Meet Pam, let's say she wants to teach a lesson about the *Declaration of Arbroath (1320)*



Tyninghame copy of the Declaration of Arbroath
By various Scottish barons



Motivation

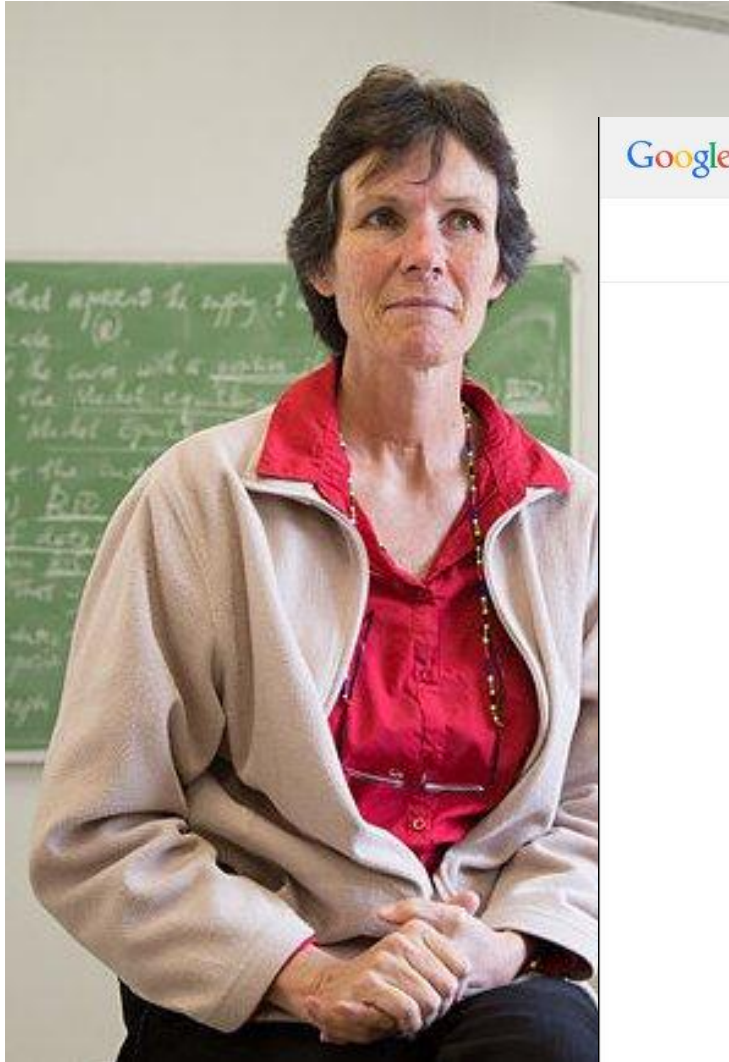


Photo by Vgrigas

She might search Google:

The screenshot shows a Google search interface with the 'Web' tab selected. The search results for 'Declaration of Arbroath' are displayed, showing approximately 113,000 results in 0.32 seconds. The top result is from Wikipedia, followed by The National Archives of Scotland, the Constitution Society, and BBC History. Below the text results, there is a section for 'Images for declaration of arbroath' showing five small thumbnail images of historical documents and manuscripts. A 'Report images' link is visible next to the image thumbnails.

Google Web Images Shopping Videos News More Search tools

About 113,000 results (0.32 seconds)

Declaration of Arbroath - Wikipedia, the free encyclopedia
en.wikipedia.org/wiki/Declaration_of_Arbroath ▼
The **Declaration of Arbroath** is a declaration of Scottish independence, made in 1320. It is in the form of a letter submitted to Pope John XXII, dated 6 April 1320, ...

Images for declaration of arbroath Report images

More images for **declaration of arbroath**

Declaration of Arbroath - The National Archives of Scotland
www.nas.gov.uk/about/090401.asp ▼
13 Jan 2012 - This is a translation of part of the **Declaration of Arbroath**, foremost among Scotland's state papers and perhaps the most famous historical ...

Declaration of Arbroath 1320 - Constitution Society
www.constitution.org/scot/arbroath.htm ▼
The **Declaration of Arbroath** was and has been unequalled in its eloquent plea for the liberty of man. From the darkness of medieval minds it shone a torch upon ...

BBC - History - Scottish History
www.bbc.co.uk/history/.../features_independence_arbroath.shtml ▼
The **Declaration of Arbroath** is without doubt the most famous document in Scottish history. Like the American Declaration of Independence, which is partially ...



Motivation



Photo by Vgrigas

There are many educational parameters Pam might use to narrow the search results to those which are more appropriate, but Google doesn't support them. She is forced into a fragmented world of specialist search services based on (often siloed) metadata.



Secondary /

History teaching resources

23,201 Free history resources: history lesson plans, history worksheets, history revision, history teaching ideas and much more.

Last updated: 16 June 2014

Delve into the past and take your students on a time-travelling trip without leaving their seats with our collection of free history teaching resources devised by teachers, for teachers.



Our most recent collections include a look back to [the Crusades](#) as well as [Black History Month resources](#). You can also search for highly-rated resources, history worksheets and lesson plans and material for history revision to find out how to bring new life to your lessons.

History Week

Join us between 16 and 20 June as we have a look at the changes to the national curriculum for history

Teaching the First World War

Commemorate the First World War centenary with these teaching resources and activities

KS3 (ages 11-14)

American & French
Revolutions
British Isles / United
Kingdom union
Castles
Changing lifestyles in
modern age
Charles II & Restoration
Cromwell & The
Commonwealth
Elizabeth I
Industrial change 1750-1900
Key Medieval events
Life in the Middle Ages
Medieval Monarchs
Norman Conquest
Other topics KS3
Rise of Dictators 20th
century
The British Empire
The Early History of Islam
The Medieval Church
The Renaissance
The Crusades

KS4 (ages 14-16)

Britain 1905-1986
Britain at War
British Social & Economic
History after 1750
Crime & Punishment
through time
Elizabethan England 1558-
1603
Germany 1918-39
International History 1900-39
Medicine & public health
Mormon history
Romans
Russia / USSR 1914-41
The American West
The Cold War
The Middle East 1956-1979
USA 1919-1942
USA after 1945

Post 16

20th century issues
Angevin Kings & Empire
1154-1216
Anglo French Rivalry 1413-
1443
Anglo Saxons & Vikings
Aspects of Britain 1830-
1951 part 1
Aspects of Britain 1860-
2007
Britain 1603-1689
British Empire & Africa
British Empire & aspects of
Britain 1714-1870
China 1900-1976
Crown & Parliament in
England, France & Spain
Crusades 1095-1204
England 1348-1381
England 1455-1547
France 1661-1815
Germany 1871-1991
International Politics 1879-
2001

Why can't Google do this?



Author J. Cetis?

[\[PDF\] Open educational resources—Opportunities and challenges for higher education](#)

[J CETIS - 2008 - muele.mak.ac.ug](#)

Page 1. 1 Open Educational Resources – Opportunities and Challenges for Higher Education
Li Yuan; Sheila Mac eill; Wilbert Kraan JISC CETIS 1. Introduction Higher education institutions around the world have been using the Internet and other digital ...

Cited by 69 Related articles All 14 versions Cite Save More

[\[PDF\] Learning Material Application Profile Scoping Study—final report](#)

[P Barker, J Cetis - JISC CETIS, 2008 - publications.cetis.ac.uk](#)

1. Summary This report details the findings of a scoping study carried out for the JISC to investigate a potential metadata application profile for learning materials. The objective of the study was to synthesize and analyse the advice that is currently available to managers ...

Cited by 3 Related articles All 6 versions Cite Save More

[The JISC Design for Learning Experience: Perspectives on Creating, Developing and S for Learning.](#)

[S MacNeill, L Corley, J CETIS - ICALT, 2008 - doi.ieeecomputersociety.org](#)

Abstract This paper will provide a summary of the current effort in the UK, through the Joint Information Systems Committee (JISC) funded Design for Learning Programme, to synthesise the approaches of e-Learning developers providing systems, services and ...

Cited by 2 Related articles All 4 versions Cite Save More

Screen shot from Google Scholar. NB, J CETIS = JISC CETIS, the author's affiliation



Why can't Google do this?

People search for things not strings

<http://googleblog.blogspot.co.uk/2012/05/introducing-knowledge-graph-things-not.html>

Google (and other search engines) recognise that they need help in identifying what thing a string they index refers to.



What the human sees

cetis publications

Publications from the Centre for Educational Technology, Interoperability and Standards

[Publications](#)

[About Cetus publications](#)

[Publications by year](#)

[Cetus sites](#)

Learning Resource Metadata Initiative: using schema.org to describe open educational resources.

By Phil Barker, Cetus, School of Mathematical Computer Sciences, Heriot-Watt University
Lorna M Campbell, Cetus, Institute for Educational Cybernetics, University of Bolton. April 2014

Abstract

This paper discusses the Learning Resource Metadata Initiative (LRMI), an international project that aims to facilitate the discovery of educational resources through the use of embedded metadata that can be used by search engines (e.g. Google, Yahoo, Bing, Yandex) to refine the search services they

Screen shot of a description of a conference paper



What the computer sees

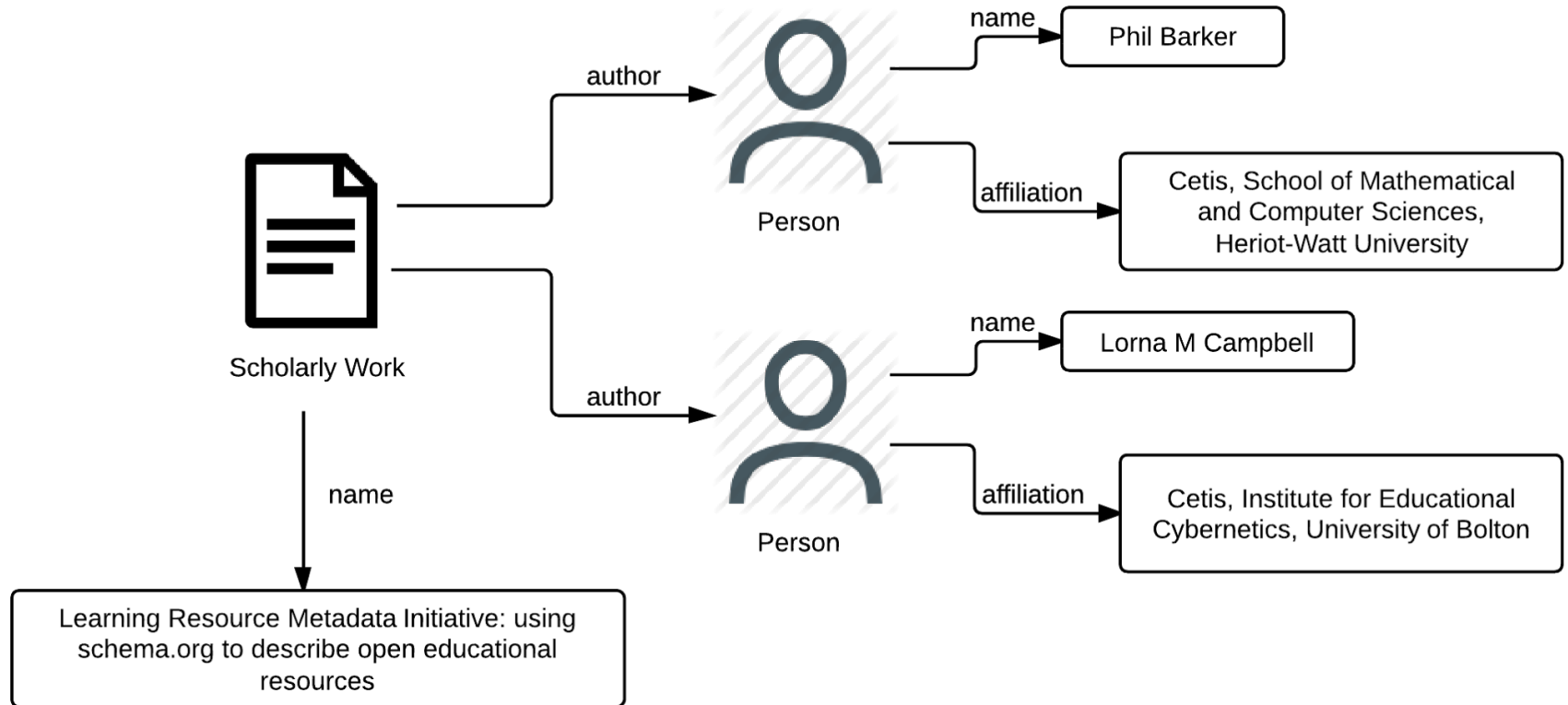
<h1>Learning Resource Metadata Initiative: using schema.org to describe open educational resources</h1>

<p>By Phil Barker, Cetis, School of Mathematical and Computer Sciences, Heriot-Watt University</p>

<p>Lorna M Campbell, Cetis, Institute for Educational Cybernetics, University of Bolton. April 2014</p>



What the computer needs

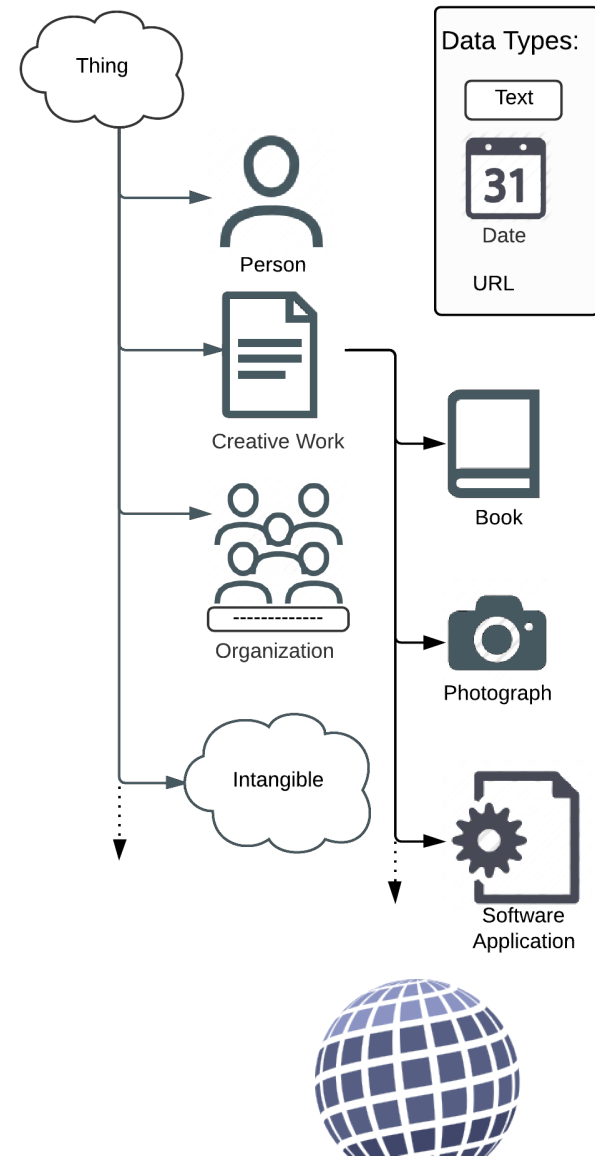


What schema.org provides

An agreed hierarchy of resource types.

An agreed vocabulary for naming the characteristics of resources and the relationships between them.

Which can be added to HTML (as microdata, RDFa or JSON-LD) to help computers understand what the strings or text mean.



What schema.org provides

```
<div itemscope itemtype="http://schema.org/ScholarlyArticle">
<h1 itemprop="name">Learning Resource Metadata Initiative: using
schema.org to describe open educational resources</h1>

<p itemprop="author" itemscope
  itemtype="http://schema.org/Person">
  <span itemprop="name">Phil Barker</span>,
  <span itemprop="affiliation">Cetis, School of Mathematical and
Computer Sciences, Heriot-Watt University</span></p>

<p itemprop="author" itemscope
  itemtype="http://schema.org/Person">
  <span itemprop="name">Lorna M Campbell</span>,
  <span itemprop="affiliation">Cetis, Institute for Educational
Cybernetics, University of Bolton</span></p>
</div>
```

NB: The syntax shown here is microdata, schema.org also supports RDFa Lite 1.1 and JSON-LD



LRMI

schema.org didn't have a way of naming the educational parameters that could have helped Pam narrow her search, so LRMI added them:

- Educational alignment (more later)
- Educational use
- Interactivity type
- Is based on url
- Learning resource type
- Time required
- Typical age range
- Use rights URL
- Educational role (of target audience)

✓ **DONE**
Added to schema.org
April 2013*

<http://dublincore.org/dcx/lrmi-terms/>

*except use rights URL



Educational alignment

An alignment to an established educational framework,
e.g.

- Shared curriculum or syllabus
- Shared framework of competency requirements
- Set of educational levels
- Modules making up a course

Allows encoding of statements like

“this resource teaches X”

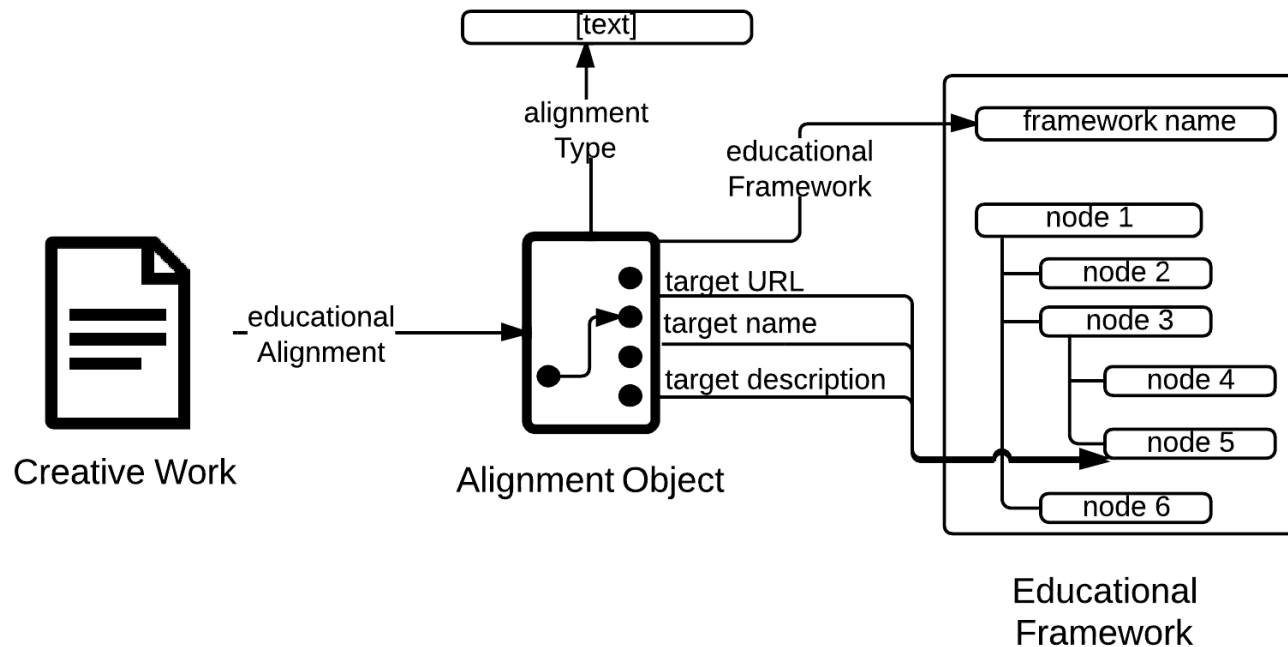
“this resource assess X”

“this resource requires knowledge of Y”



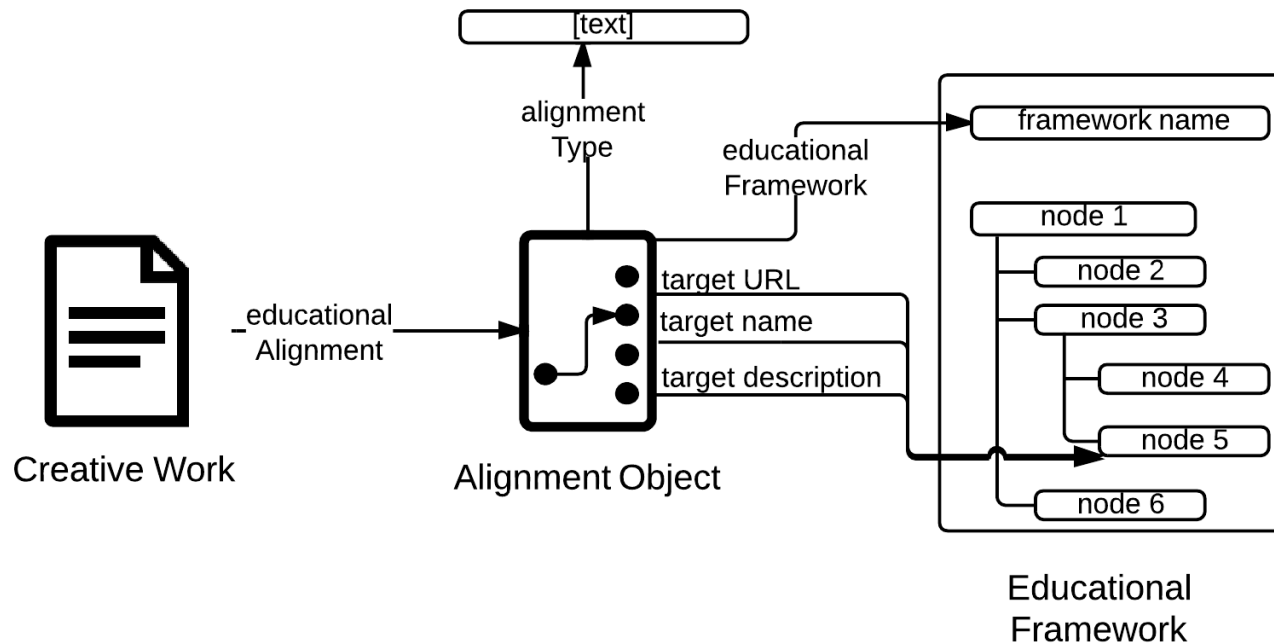
Educational alignment

An alignment to an established educational framework



Educational alignment

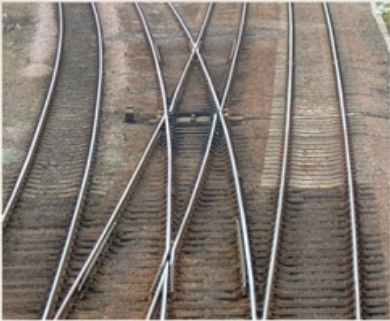
LRMI elements identify something in an educational framework, they do not describe it.



An example alignment



Angle between 2 lines



Angle between 2 Lines

Preliminary Extension Mathematics

Date: Tuesday 10th May 2011

slideshare

1 / 33

Share Save

Angle between 2 lines from Simon Borgert

View resource

What others are saying about this resource

- ★ A Year 1 BSc Materials Science and Engineering (Biomaterials) student at University of Sheffield recommended this for the Mathematics (Materials) module 16 Nov 2014. 0 0
- ♥ A Year 1 BSc Materials Science and Engineering (Biomaterials) student at University of Sheffield favoured this resource 16 Nov 2014.

Share

Like 12 Share 0 Share 1 Tweet 0

Screenshot from <https://kritikos.liv.ac.uk/details/?uri=http://www.slideshare.net/SimonBorgert/angle-between-2-lines>



An example alignment



Angle between 2 lines

A thumbnail image of a slide showing a photograph of train tracks intersecting at a crossroads.

Angle between 2 Lines
Preliminary Extension Mathematics
Date: Tuesday 10th May 2011

slideshare

1 / 33

Share Save

View resource

What others are saying about this resource

- ★ A Year 1 BSc Materials Science and Engineering (Biomaterials) student at University of Sheffield recommended this for the Mathematics (Materials) module 16 Nov 2014. 0 0
- ♥ A Year 1 BSc Materials Science and Engineering (Biomaterials) student at University of Sheffield favoured this resource 16 Nov 2014.

Share

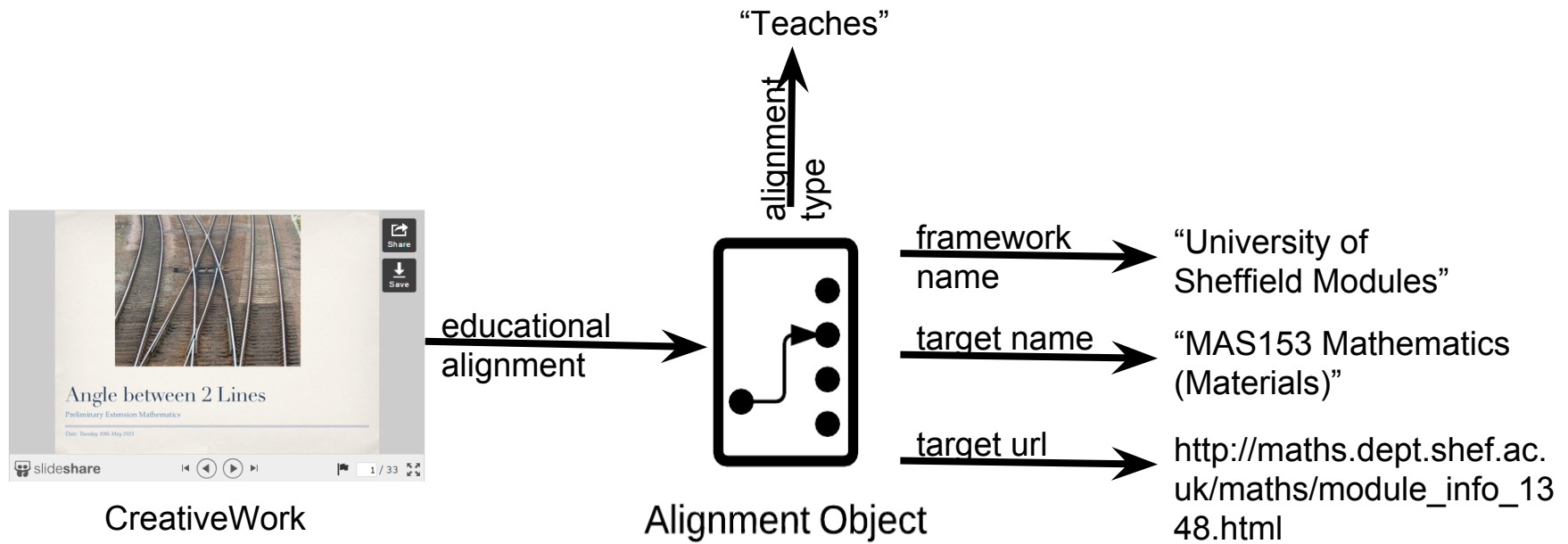
Like 12 Share 0 Share 1 Tweet 0

Angle between 2 lines from Simon Borgert

Screenshot from <https://kritikos.liv.ac.uk/details/?uri=http://www.slideshare.net/SimonBorgert/angle-between-2-lines>



An example alignment



★ A Year 1 BSc Materials Science and Engineering (Biomaterials) student at University of Sheffield recommended this for the Mathematics (Materials) module 16 Nov 2014. 👍 0 🗑️ 0



Other example alignments

| alignment type | framework name | target name | target URL |
|---------------------|---|--|---|
| teaches | Common Core | CCSS.MATH.CONTENT.7.RP.A.2.A | http://www.corestandards.org/Math/Content/7/RP/#CCSS.Math.Content.7.RP.A.1 |
| educational level | Scottish Credit and Qualifications Framework | Level 10 | ? |
| reading level | Lexile | 880L | https://map.lexile.com/880 |
| assesses | UK Standard for Professional Engineering Competence | E1 Comply with relevant codes of conduct | ? |
| educational subject | Joint Academic Coding Scheme | N323 Actuarial science | ? |



LRMI

schema.org didn't have a way of naming the educational parameters that could have helped Pam narrow her search, so LRMI added them:

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✓ **DONE**
Added to schema.org
April 2013*

<http://dublincore.org/dcx/lrmi-terms/>

*except use rights URL



So...

- LRMI have enhanced schema.org so that it better supports description of learning resources.
- What is really needed for its success is for
 - 1) more resource dissemination channels to use it &
 - a) more search services.



Example Implementations



Funded Implementation Projects

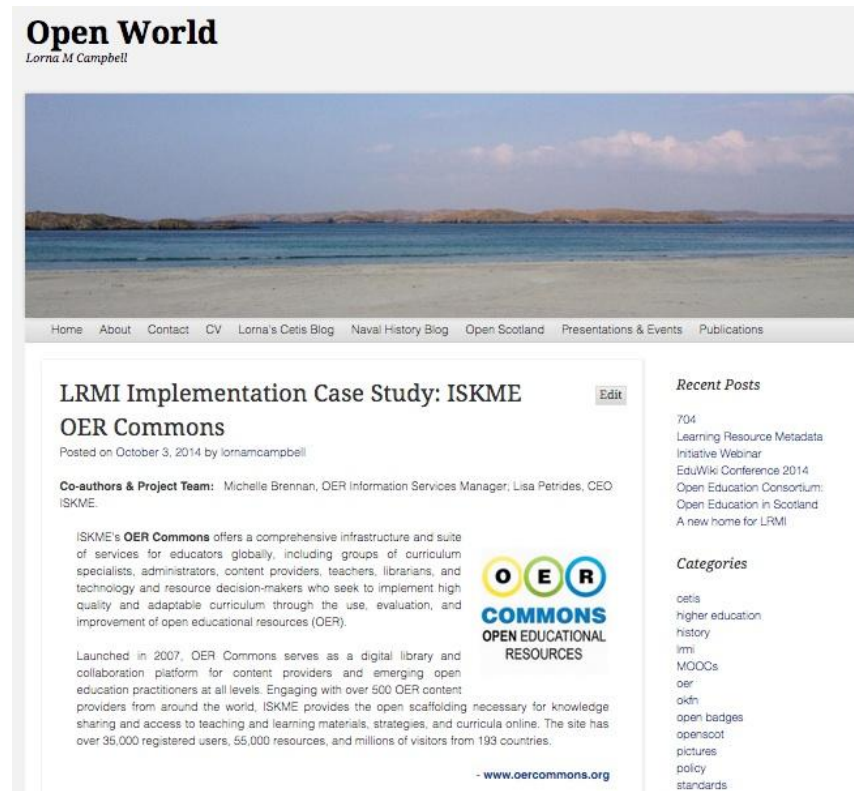
During LRMI Phase 2 the Hewlett & Gates Foundations funded 10 OER platforms to implement LRMI

- Curriki
- Gooru
- OER Commons
- OpenStax CNX
- Open Tapestry
- Jorum
- MERLOT
- P2PU
- PhET Interactive Simulations
- Untrikiwiki



Implementation Case Studies

- Case studies of all 10 implementations available on Open World blog: <http://lornamcampbell.wordpress.com/tag/lrmi-implementation/>
- Synthesis to follow shortly.



Open World
Lorna M Campbell

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LRMI Implementation Case Study: ISKME OER Commons

Posted on October 3, 2014 by lornamcampbell

Co-authors & Project Team: Michelle Brennan, OER Information Services Manager; Lisa Petrides, CEO ISKME.

ISKME's **OER Commons** offers a comprehensive infrastructure and suite of services for educators globally, including groups of curriculum specialists, administrators, content providers, teachers, librarians, and technology and resource decision-makers who seek to implement high quality and adaptable curriculum through the use, evaluation, and improvement of open educational resources (OER).

Launched in 2007, OER Commons serves as a digital library and collaboration platform for content providers and emerging open education practitioners at all levels. Engaging with over 500 OER content providers from around the world, ISKME provides the open scaffolding necessary for knowledge sharing and access to teaching and learning materials, strategies, and curricula online. The site has over 35,000 registered users, 55,000 resources, and millions of visitors from 193 countries.

OER COMMONS
OPEN EDUCATIONAL
RESOURCES

www.oercommons.org

Recent Posts

- 704 Learning Resource Metadata Initiative Webinar
- EduWiki Conference 2014
- Open Education Consortium: Open Education in Scotland
- A new home for LRMI

Categories

- cetis
- higher education
- history
- lrmi
- MOOCs
- oer
- okdn
- open badges
- openscot
- pictures
- policy
- standards



Implementation Synthesis Findings

- Few platforms used LRMI as their native metadata schema.
- Most used internal custom metadata schema and transformed to LRMI.
- Most rely on third parties for metadata creation - metadata is harvested or created by users.
- Volume and quality of metadata varies widely.
- Few have metadata curation workflows.
- Not always easy to embed LRMI microdata in resource pages, but...
- Few reported problems with implementing LRMI.



Other Implementations

- BBC Knowledge & Learning Beta - <http://www.bbc.co.uk/education>
- Open University OpenLearn - <http://www.open.edu/openlearn/>
- Solvonauts Open Search Engine - <http://solvonauts.org/>
- CTE Online - <https://www.cteonline.org/>
- Awesome Stories - <https://www.awesomestories.com/>
- Various publishers, including Pearson.
- Educational metadata in draft EPUB3 EDUPUB Profile is based on LRMI properties.



Other Implementations



- The learning registry
<http://learningregistry.org/>
- “a new approach to capturing, connecting and sharing data about learning resources available online.”
- Significant for its extensive use of LRMI in the form of JSON-LD records as its base metadata schema.



Implementation by search engines

You won't see implementation by big search engines until there is web-scale implementation by resource providers.

But, what is motivation for resource providers to expose metadata before use by search engines?

Google custom search engine potentially offers a “boot strap”.



Google custom search engine

Google custom search allows you build a Google-powered search limited to a list of domains or schema.org types, and filtered according to schema.org properties.


For example:

- limit searches to pages that have an Alignment Object (pages that describe learning resources)
- filter by alignment with what you want to be learnt



Google custom search engine

Sites to search


Search the entire web but emphasise included sites 

Label sites by search

Add

Delete

Filter

Label 

<

>

You have not included any sites.

[Advanced](#)

Restrict Pages using Schema.org Types

Restrict pages from the above site list to only those that contain Schema.org types from the list below.

You can add up to ten (10) schema.org types to your Search Engine. Note that when you add a node, all its children are included automatically, so you do not need to add them again. For example, if you add CreativeWork, you do not need to add Book, ImageObject, VideoObject etc. separately.

AlignmentObject

Update



Google custom search engine

Custom Search



- New search engine
- ▼ Edit search engine
 - LRMI Demo Search ▾
 - Setup
 - Look and feel
 - Search features**
 - Statistics and Logs
 - Business
- Help
- Send Feedback

Promotions

Refinements

Auto-complete

Synonyms

Advanced

Let users filter results according to categories you provide. [Learn more](#)

Add

Delete

1-4 of 4

<

>

☐ Refinement

☐ GCSE

☐ Intermediate university level

☐ Introductory university level

☐ US grade 6

Max top refinements to show for a search [?]

All ▾

Enable Facet Search [?]

OFF



Google custom search engine

Custom Search

New search engine

▼ Edit search engine

LRMI Demo Search Engine

Setup

Look and feel

Search features

Statistics

Business

► Help

Send Feedback

Edit refinement

* GCSE

How to search sites with this label?

☒ Give priority to the sites with this label.

☐ Search only the sites with this label.

Facet Refinement ? OFF

more:p:AlignmentObject-name:GCSE OR more:p:AlignmentObject-targetName:GC

OK Cancel

OFF



Google custom search

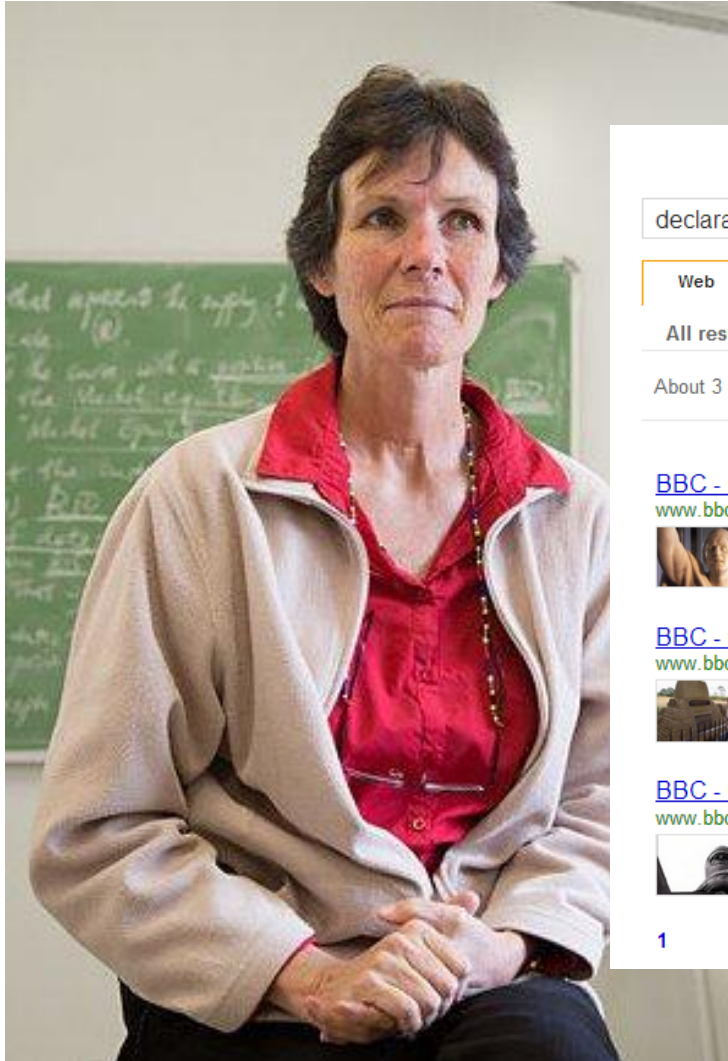


Photo by Vgrigas

declaration of arbroath

Web Image

All results **GCSE** Intermediate university level Introductory university level US grade 6

About 3 results (0.09 seconds) Sort by: Relevance

powered by Google™ Custom Search

[BBC - GCSE History - Declaration of Arbroath](#)
www.bbc.co.uk/education/clips/z3sjtfr
What it meant for Robert the Bruce to be excommunicated and the **Declaration of Arbroath**.

[BBC - GCSE History - William Wallace](#)
www.bbc.co.uk/education/clips/z9v7pv4
Newport's medieval ship - Play Wallace's death. Wallace's death - Play. **Declaration of Arbroath** - All GCSE The Middle Ages (12th to 15th century) videos ...

[BBC - GCSE History - The Battle of Stirling Bridge](#)
www.bbc.co.uk/education/clips/zgy7pv4
Declaration of Arbroath. Play. The early life of Owain Glyndŵr. Play Newport's medieval ship. Newport's medieval ship. All GCSE The Middle Ages (12th ...

1

<http://bit.ly/IrmiProtoSearch>



Google custom search

Google themselves have also had a go...

Custom Search for Education

Curated Index ▼ Search terms **SEARCH**

- Typical age range 13 ▼ Additional filter: clear

- Any
- 11
- 12
- 13
- 14

<http://edu.schema-labs.appspot.com/>



What next for LRMI?



Remember

- LRMI is a metadata specification based on schema.org that can be used to describe learning resources.
- LRMI is a community of people interested in using that specification.



A new home for LRMI

“Effective October 23, 2014, leadership and governance of the Learning Resource Metadata Initiative (LRMI), an education metadata project developed to improve discoverability and delivery of learning resources, have transferred from the Association of Educational Publishers and Creative Commons to the Dublin Core Metadata Initiative (DCMI).”

<http://www.lrmi.net/lrmi-transfers-stewardship>



LRMI in DCMI

- Stability of current specification through DCMI's governance
- RDF expression of current specification
- Coordinate LRMI group with DCMI-Education
- Future developments in accordance with DCMI governance



Future developments?

- Current properties are stable.

However,

- should clarify use of LRMI
 - as web page markup per schema.org?
 - as record format?
- more help on value spaces for properties?
- could extend domain to include events?
- could extend to cover courses?
- react to relevant changes in schema.org?
- other new properties & clarifications?



Further Information

- Phil Barker, Cetis - phil.barker@hw.ac.uk
- Lorna M campbell, Cetis - lorna.m.campbell@icloud.com
- Stuart Sutton, DCMI - sasutton@dublincore.net

- LRMI Googlegroup - lrmi@googlegroups.com
- DCMI-LRMI Taskgroup - dc-lrmi@jiscmail.ac.uk



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- Photo of Pam Robertson, teacher, by Vgrigas (Own work) [CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0>)], via [Wikimedia Commons](#)

Pam really is a teacher but we have no idea whether she would want to teach anything related to the declaration of Arbroath

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