Scalable Learning Analytics and Interoperability – an assessment of potential, limitations, and evidence

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#laceproject
Outline

• Scene setting
  – Meaning of “learning analytics”
  – Why learning analytics => interoperability

• Break down the question
  – Low-hanging fruit
  – Partial solutions
  – Outstanding Issues

• What to do about it
  – Call to action
  – Further reading
What do I Mean “Learning Analytics”? 

Analytics is the process of developing actionable insights through problem definition and the application of statistical models and analysis against existing and/or simulated future data.

Adam Cooper, Cetis Analytics Series

Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs.

Society for Learning Analytics Research
Ergo: it is not trivial in-application graphical visualisations of data
Interoperability is VITAL for Institutional* Learning Analytics

Analytics Process

Data Sources

- Student activity traverses multiple kinds of application
- Cross-cohort activity spans multiple equivalent applications

Focus = timeliness and efficiency + audit and accountability

Focus = what is meaningful

* - as opposed to learning analytics/science research
The Data Isn’t All in Blackboard/Moodle/...

And even if it were, this shouldn’t be a black box
Is the Fruit Low-Hanging or High-Up?
The Benefits Balance

- Savings from scale * consistency (processing units)
- Cost/effort to achieve interoperability

many and similar
Analytics Process = Low-Hanging?

- Where do we have scale?
- ... and where consistency?
- (where could we?)

- Where is there evidence of interoperability?
This can be quite generic
Prime Candidate: Predictive Model Markup Language

Purpose

Encode in XML:
• Pre-processing
• Predictive models
• Results

Evidence

http://www.dmg.org
Emerging: JSON-Stat

Purpose
• Data cube
• Minimal metadata
• Web-dev friendly JSON

JSON-stat is a simple lightweight JSON dissemination format best suited for data visualization, mobile apps or open data initiatives...

Evidence
• Adopted by statistics agencies in the UK, Norway, Sweden, Catalunya, and Galicia
• Javascript toolkit and R package

http://json-stat.org/
More Examples and Evidence

Alphabet Soup:
- ARFF
- CSV+
- DSPL
- Odata
- RDF Data Cube
- SDMX
- VTL

What About Source Data? Low or High?

**Issue:** Learning Analytics requires data from learning activities. User-centred, not application-centred. Maybe highly-contextualised.
A Simple Example of the Issue – Video/Audio Playback

- Are pause and stop different events?
- Is “frame number” a useful index?
- Can a video be “completed”?
- Can engagement be determined?
- When can it be estimated?
Where is the process domain-specific?
More Generic is Lower Down

• Data integration is problematic because of the lack of a common language at domain level.
• BUT: recognise that modeling activity in the teaching and learning domain is work in progress
  – Some deeper domain-level vocabularies, but negligible evidence of use for learning analytics.
  – Click-counts are wholly inadequate.

• => work at “meso-level”
• This is NOT the end-game!
Meso-Level: Benefits Here=>

Diagram:
- Communicate
- Store?
- Conclude
- Stats, ML
- Pre-Process
- Clean
- Integrate
- Access
- Store
- Capture

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The Lowest Fruit? Experience API

Purpose
• Common model for expressing activity as Actor + Verb + Object
• + some domain-specifics (SCORM heritage)
• Verbs (etc) defined elsewhere

Evidence
• Widely used as an “I/O format”
• Lacking evidence of cross-application learning analytics.
ADL Experience API is Not the Only Game

- IMS Caliper
- Contextualised Attention Metadata
- PSLC TMF
Key Messages

- There are mature interoperability specifications for analytics
  - Not learning-specific
  - With implementations in production-grade software e.g. PMML
  - And some more emerging e.g. JSON-Stat

- General purpose specifications (from the education domain) are emerging
  - Most-often identified in discussions
  - Partial evidence
  - E.g. ADL xAPI, IMS Caliper... + XES

- Vocabularies for teaching and learning activities are lacking
  - Existing vocabularies rooted in the software domain
  - ... or not designed with analytics in mind ... or unproven
  - Finding shared vocabularies requires collaboration
  - BUT Vital to long-term vision for learning analytics
Three Calls to Action

PMML etc
• Start adopting
• Specify in procurement
• Share experience, build collective expertise

Domain-models
• Gap analysis
• Share models
• Collaborate

Help Build Evidence (“Meso-level”)
• Good practices
• Issues
Read more...

Learning Analytics Community Exchange
Learning Analytics Interoperability – The Big Picture in Brief
an introductory briefing


Get Involved

http://www.laceproject.eu/join-community/

Specifications and Standards - Quick Reference Guide
Public Draft for Comment

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