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

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EUNIS 2015, Abertay University, Dundee
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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

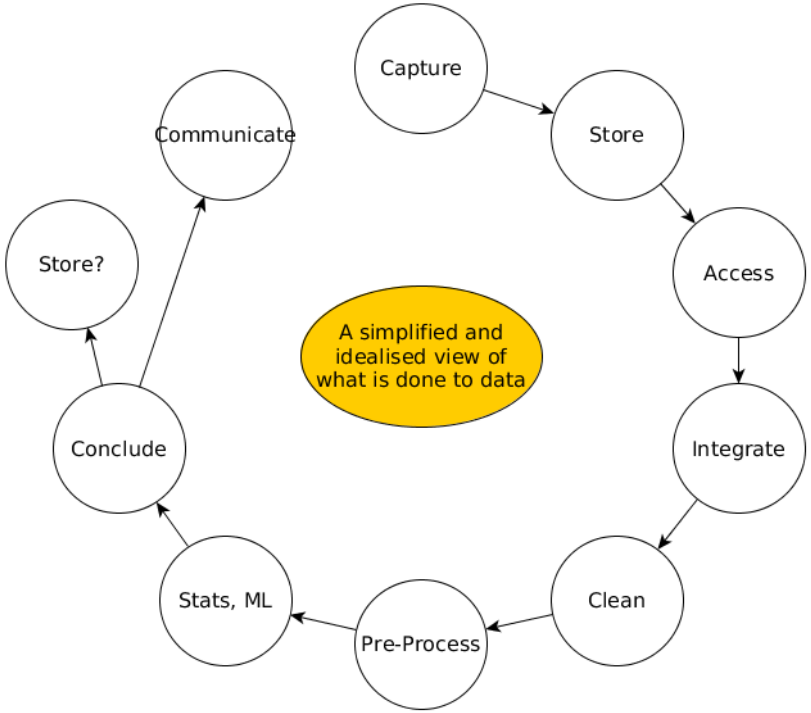
Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs.

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



Focus = timeliness and efficiency
+ audit and accountability

Data Sources

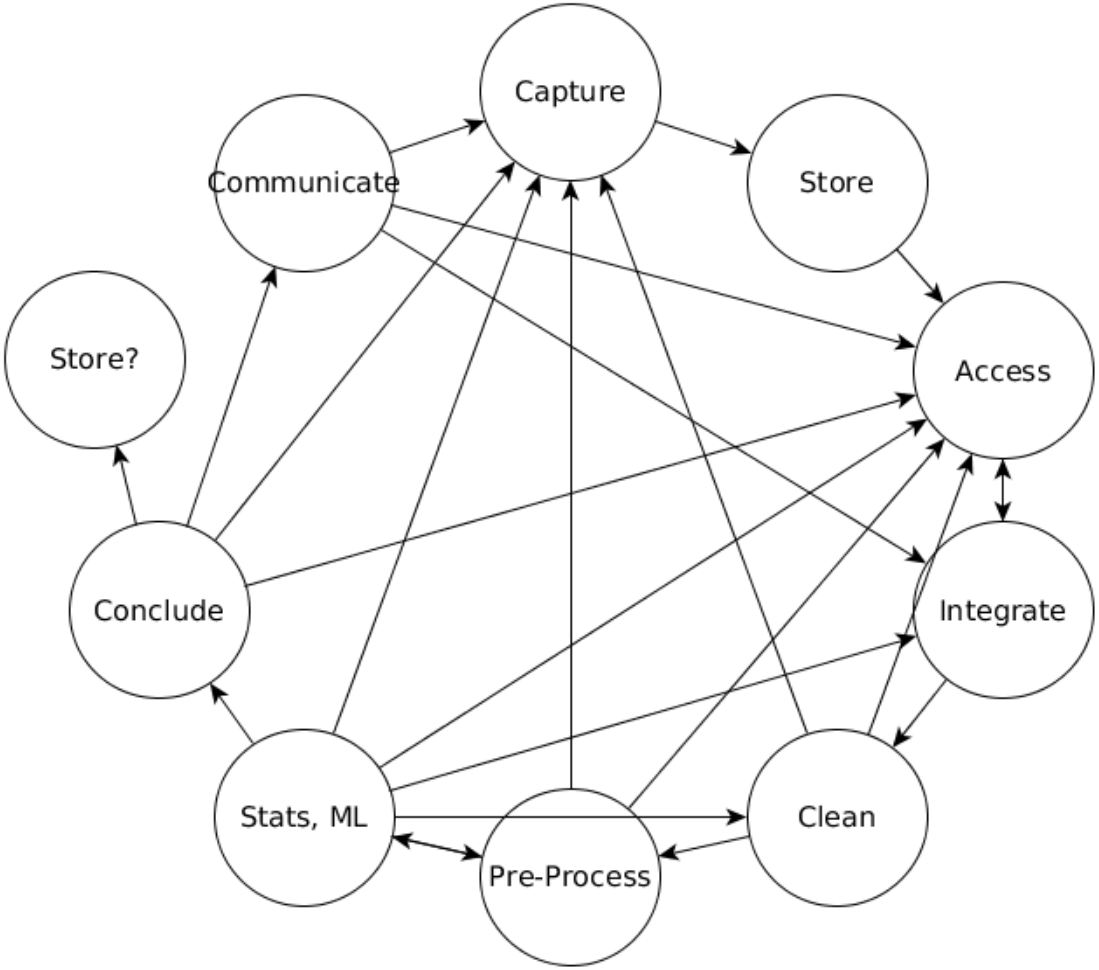
- Student activity traverses multiple kinds of application
- Cross-cohort activity spans multiple equivalent applications

Focus = what is meaningful

* - as opposed to learning analytics/science research

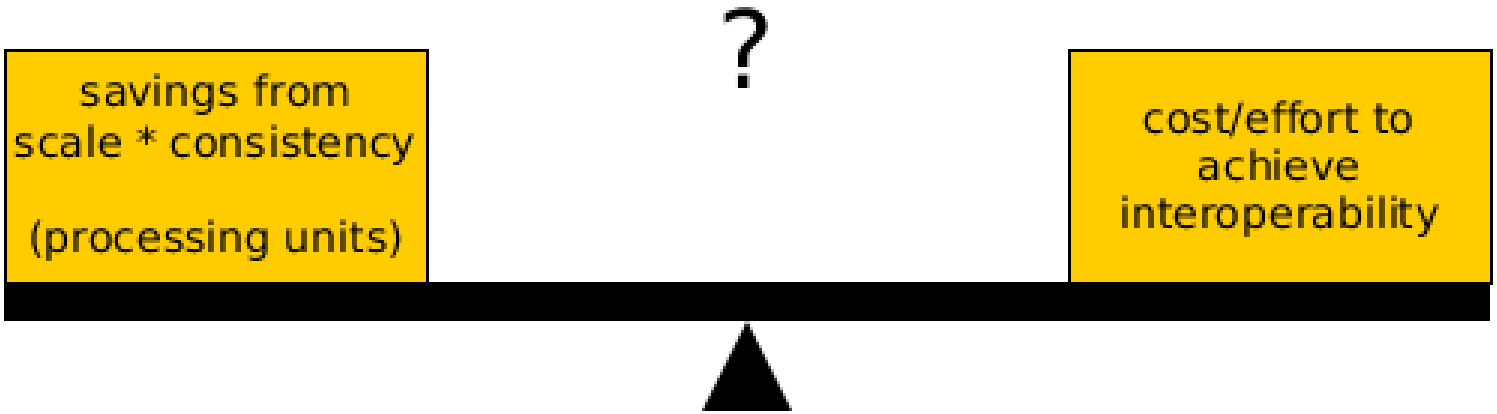
The Data Isn't All in Blackboard/Moodle/…

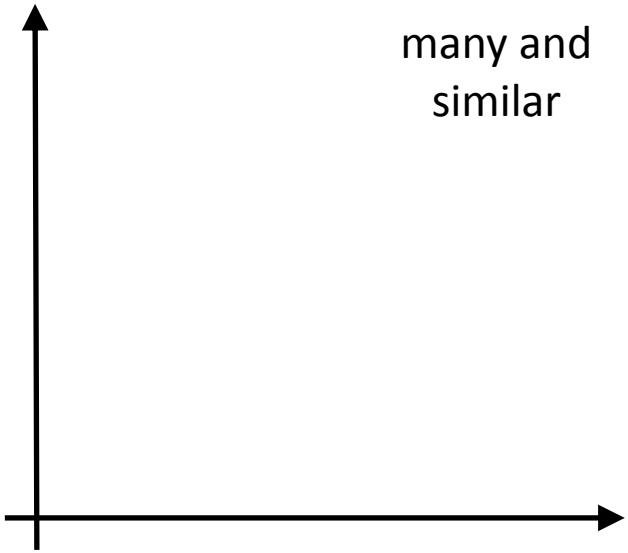
And even if it were, this shouldn't be a black box



Is the Fruit Low-Hanging or High-Up?

The Benefits Balance

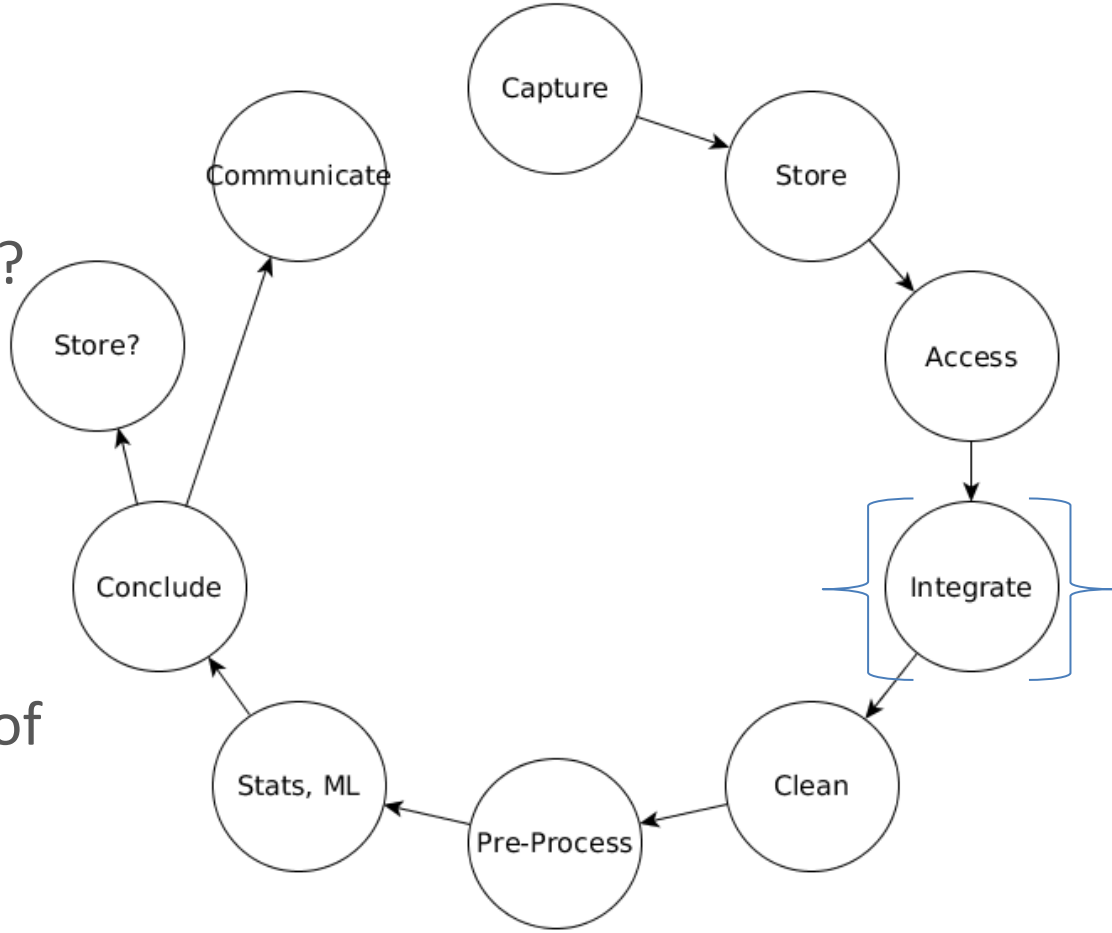




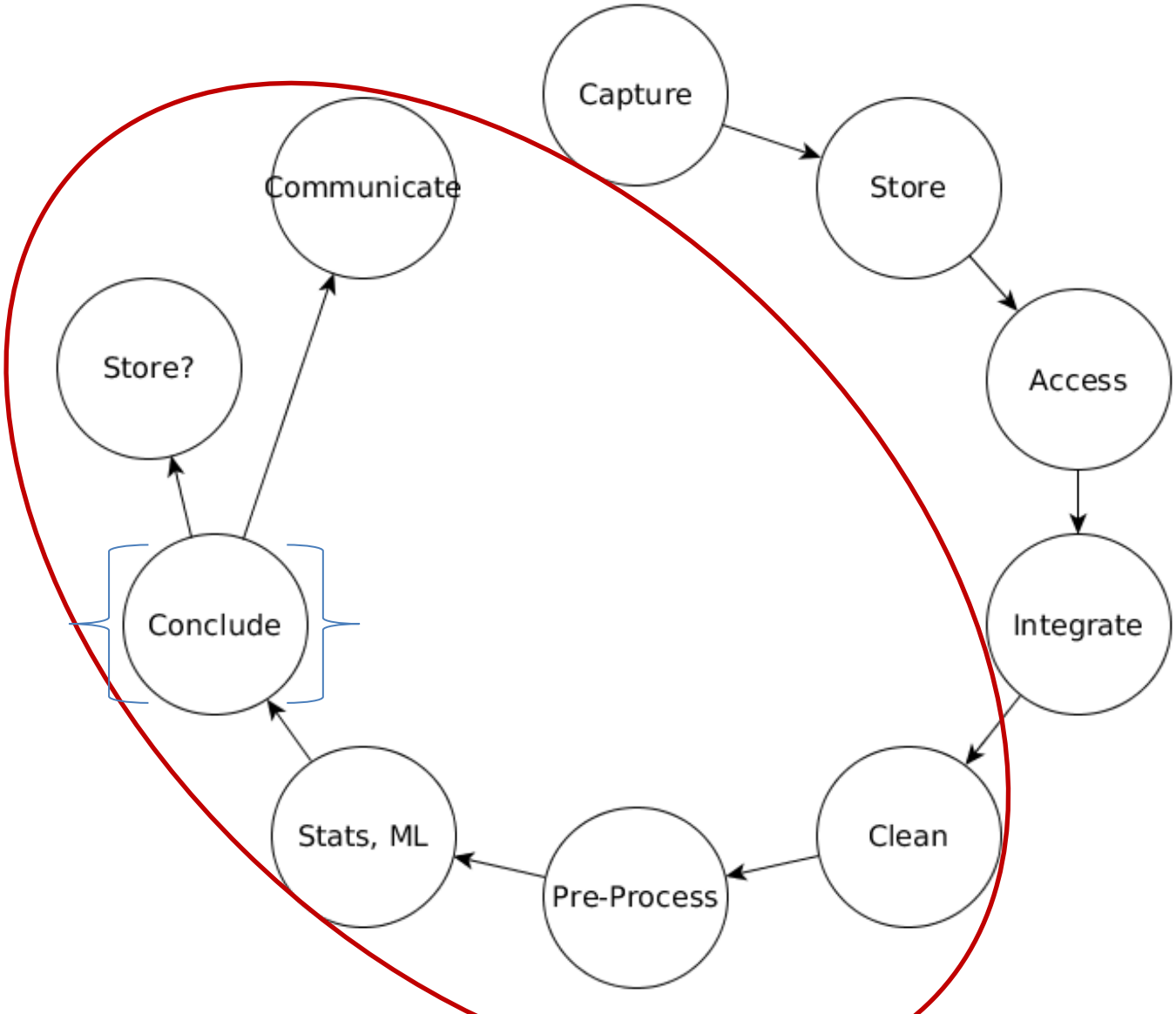
Analytics Process = Low-Hanging?

- 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

PMML
Predictive Model Markup Language

Purpose

Encode in XML:

- Pre-processing
- Predictive models
- Results

http://www.dmg.org

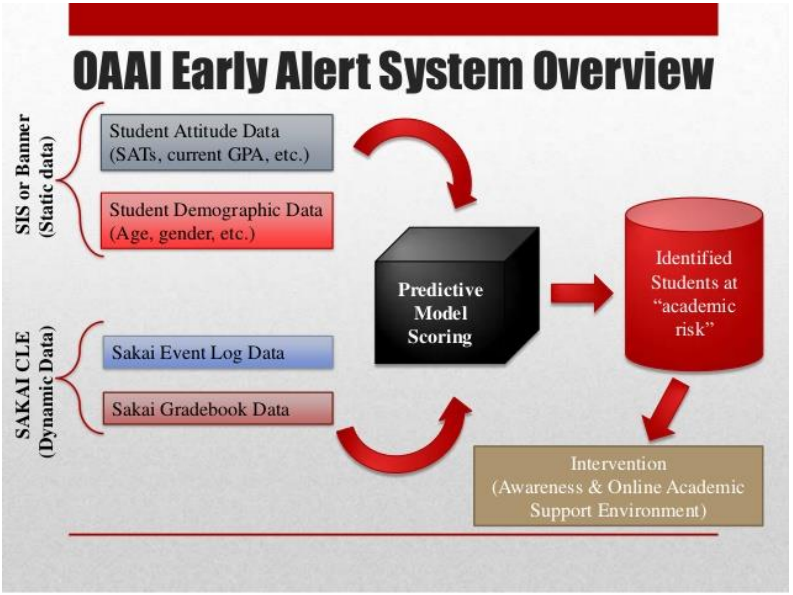
DATA MINING GROUP

Association Rules
Baseline Models
Cluster Models
General Regression
k-Nearest Neighbors
Naive Bayes
Neural Network
Regression
Ruleset
Scorecard
Sequences
Text Models
Time Series
Trees
Vector Machine

Evidence

ZEMENTIS
Adaptive Decision Technology

R



Google Cloud Platform

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...

http://json-stat.org/

Evidence

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

More Examples and Evidence

Alphabet Soup:

- ARFF
- CSV+
- DSPL
- Odata
- RDF Data Cube
- SDMX
- VTL

http://bit.ly/wp7-ssqrg

What About Source Data? Low or High?

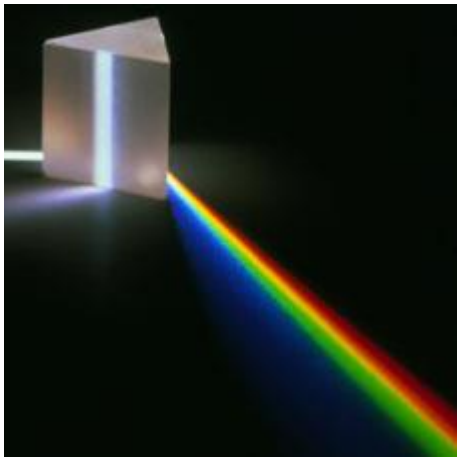
Issue: Learning Analytics requires data from learning activities. User-centred, not application-centred. Maybe highly-contextualised.

Specificity & Context

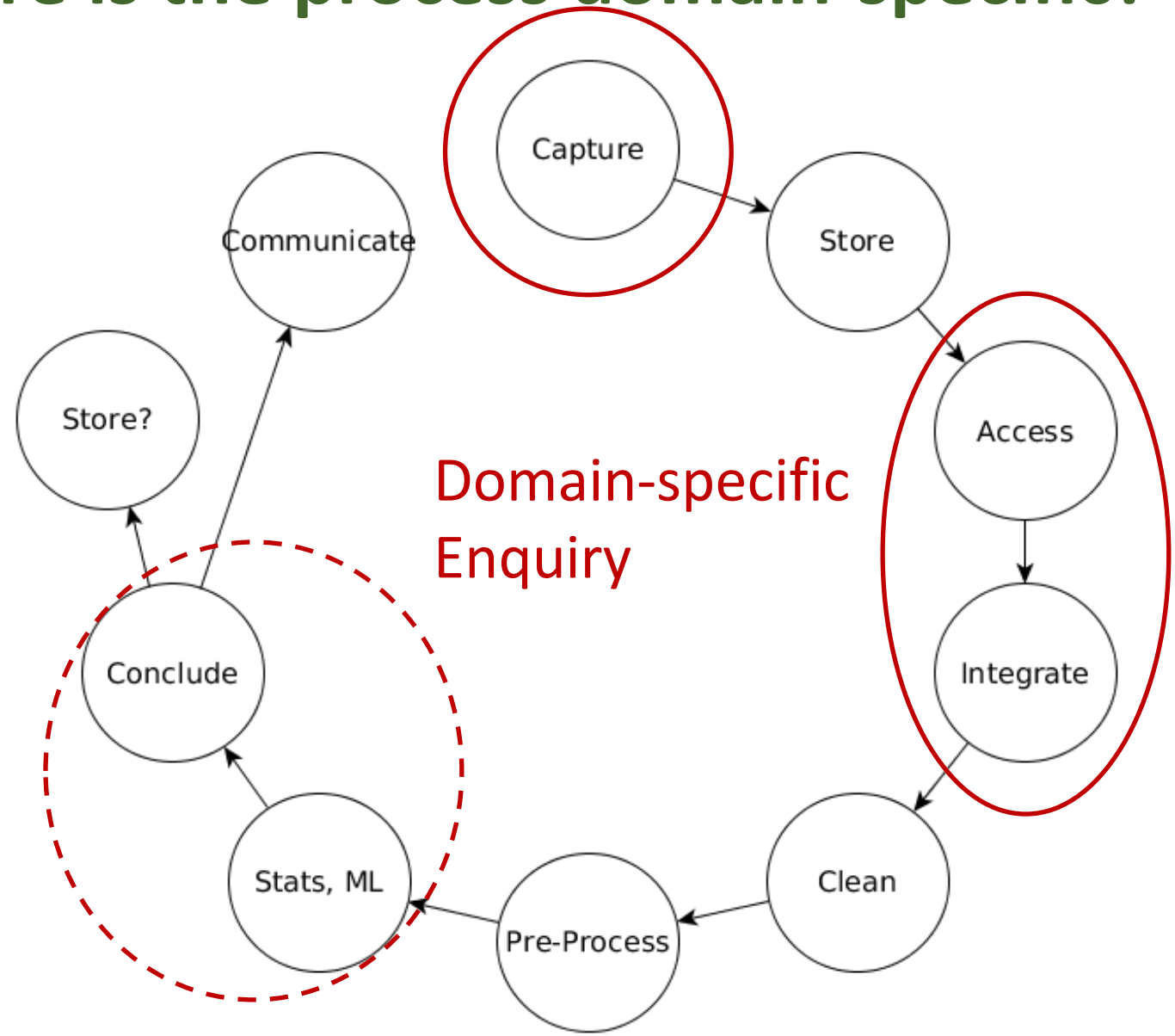
Consistency & Scale

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?



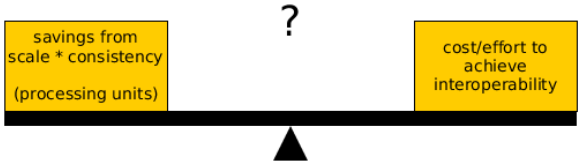
Where is the process domain-specific?



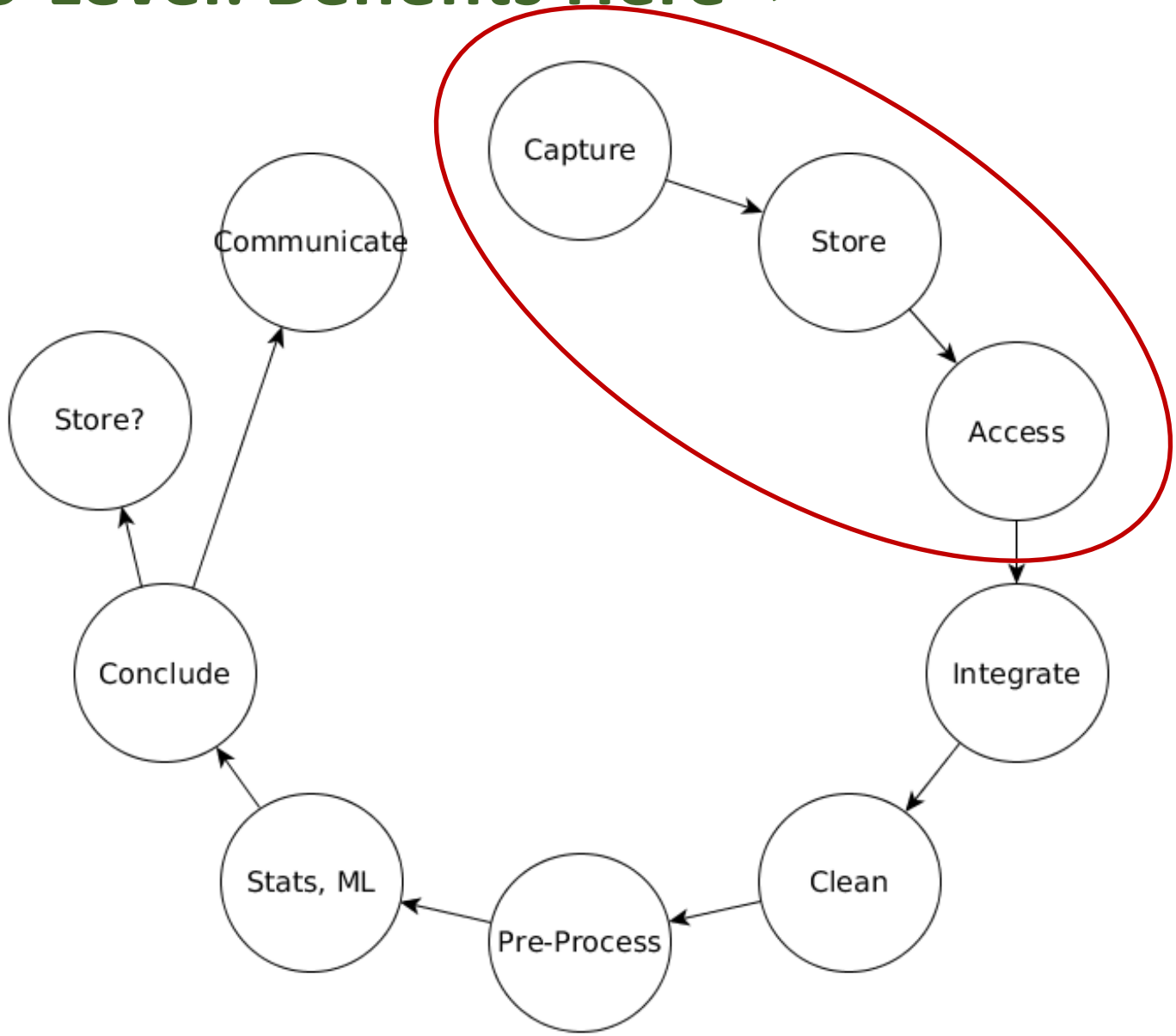
More Generic is Lower Down

- 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=>



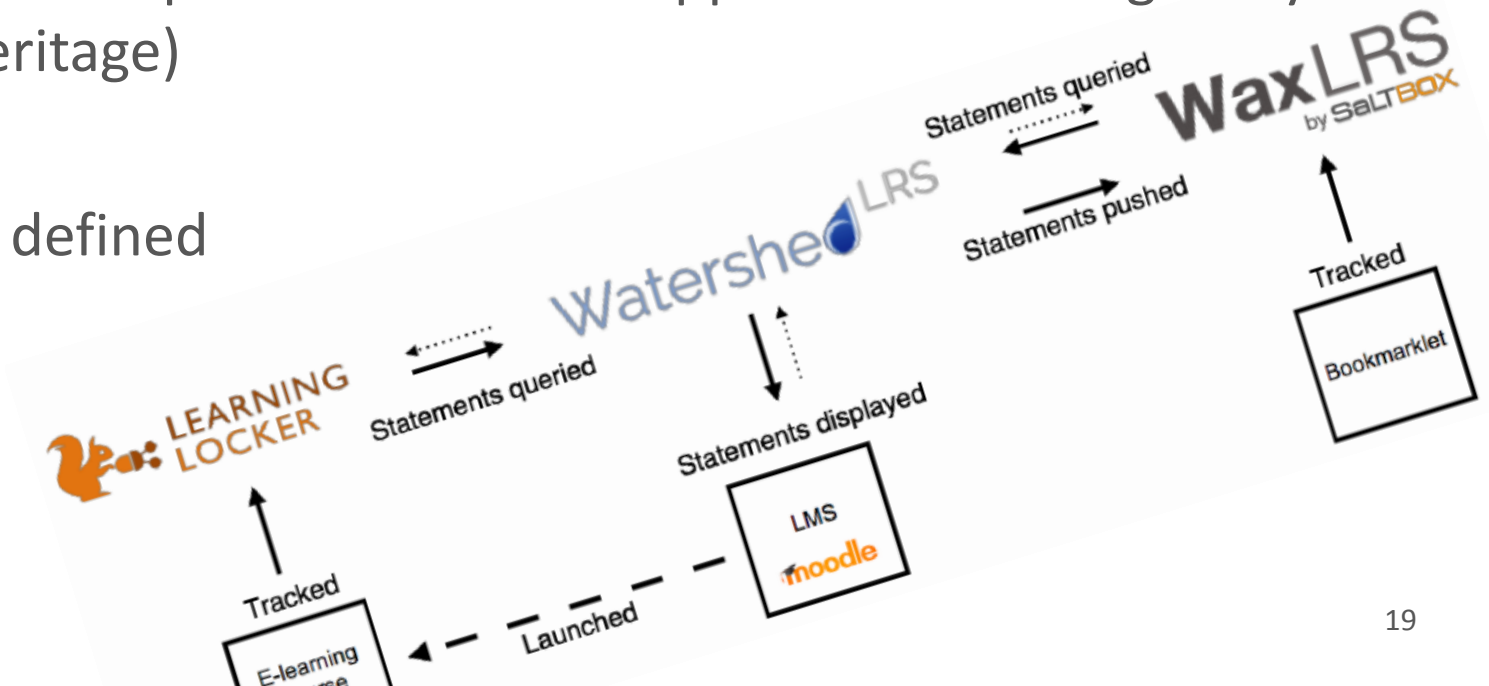
The Lowest Fruit? Experience API

Purpose

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

Evidence

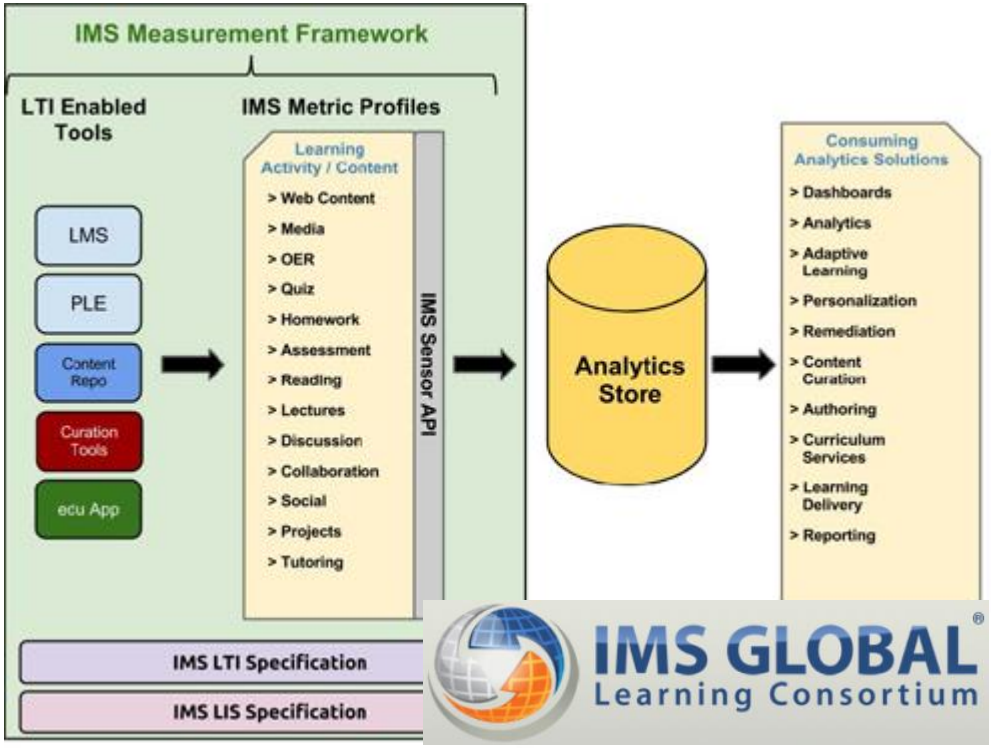
- Widely used as an "I/O format"
- Lacking evidence of cross-application learning analytics.



ADL Experience API is Not the Only Game

- IMS Caliper
- Contextualised Attention Metadata
- PSLC TMF

XES
Extensible Event Stream



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

LACE

apereo

Read more...

Learning Analytics Community Exchange

Learning Analytics Interoperability – The Big Picture in Brief

an introductory briefing

http://bit.ly/LAI-BigPicture

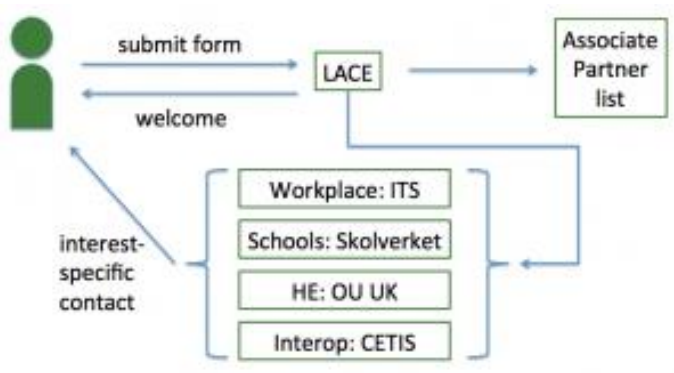
Learning Analytics Community Exchange

Specifications and Standards - Quick Reference Guide

Public Draft for Comment

http://bit.ly/wp7-ssqrg

Get Involved



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

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"Scalable Learning Analytics and Interoperability – an assessment of potential, limitations, and evidence" by Adam Cooper, Cetis, was presented at EUNIS 2015 at Abertay University in Dundee on June 12th 2015.

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Credits

Learn Course At-a-Glance – Blackboard Analytics for Learn
http://www.blackboard.com/Platforms/Analytics/Products/Blackboard-Analytics-for-Learn.aspx

Fruit Tree – CC0 Public Domain

Dogs tug of war – CC BY-NC-ND Emo Skunken
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