Learning Analytics: Utopia or Dystopia

Prof. dr. Paul A. Kirschner
Distinguished University Professor
Open University of the Netherlands
Thanks
Disclaimer

This keynote is not about:

• Privacy issues / Data protection / Big Brother
• Ethical aspects / questions
• Legal aspects / questions
• Commercial interests / Business optimisation
• Technology, Techniques, Dashboards, etcetera
• …

To paraphrase Bill Clinton: It’s the learning, people!
DATA GROWTH

X axis: Year
Y axis: Global data
Unit of measurement: Zettabytes
1ZB = 1,000^7 bytes

Note: Post-2013 figures are predicted. Source: UNECE

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Whenever you hear someone say "learning analytics," try substituting "statistical analysis" in your head. Do they still sound exciting?

Vertaal vanuit het Engels

21-04-16 01:00
Your task Mr. Phelps – Mission Impossible?
Learning

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1. **Frontal lobe**
The frontal lobes store semantic and episodic memories.

2. **Motor cortex**
The motor cortex is involved in storing procedural memories.

3. **Cerebellum**
The cerebellum plays an important role in the storage of procedural memories.

4. **Hippocampus**
The hippocampus plays a pivotal role in the formation of new long-term semantic and episodic memories.

5. **Amygdala**
The amygdala is vital to the formation of new emotional memories.

6. **Temporal lobe**
The temporal lobe is involved in the formation and storage of long-term semantic and episodic memories and contributes to the processing of new material in short-term memory.

7. **Prefrontal cortex**
The prefrontal cortex is involved in the storage of short-term memories.
Learning Sciences
The five steps of Learning Analytics

Act  Predict  Refine  Report  Capture

Academic Analytics
Learning Analytics Model (Siemens, 2013)

(Siemens, 2013)
This workshop will run as a pre-conference event at ICLS14
http://www.isls.org/icls2014/

Collaborative Notes (password: practice)
Workshop Evaluation Form

Learning Analytics sits at the intersection of the learning sciences and computational data capture and analysis. Analytics should be grounded in the existing literature with a view to data 'geology' over 'mining'. This workshop explores how analytics may extend the common notion of activity trace data from processes to encompass practices, with a working distinction for discussion as:

- Process – series of related actions engaged in as part of learning activities
DYSTOPIA
Dystopia 1: Myopic vision of what learning is

Learning Analytics Model

(Siemens, 2013)
Learning Analytics Model

(Siemens, 2013)
Missing link?

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Learning Sciences theory as missing link

- Variables to include in a model
- Potential confounds, subgroups, or covariates in the data
- Which results to attend to
- Framework for interpreting results
- How to make results actionable
- Generalisation of results to other contexts and populations
Dystopia 2: Theory Free / Theory Poor LA

Not only true of the US elections

Unencumbered By The Thought Process
What are we looking for?
Dystopia 3: Looking at wrong or invalid variables

Meaningful variables?

“Implicitly, I’m more auditory myself.
Really? I’m a visual learner.”

“Here presently is no empirical justification for tailoring instruction to students’ supposedly different learning styles.”
Dystopia 4: Seeing Correlation as Causal

I used to think correlation implied causation.

Then I took a statistics class. Now I don’t.

Sounds like the class helped. Well, maybe.
Spurious correlations

http://tylervigen.com/spurious-correlations

http://tylervigen.com/discover

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http://tylervigen.com/spurious-correlations
http://tylervigen.com/discover
Worldwide non-commercial space launches
 correlates with
 Sociology doctorates awarded (US)
 Correlation: 78.92% (r = 0.78915)

Data sources: Federal Aviation Administration and National Science Foundation

Per capita consumption of mozzarella cheese
 correlates with
 Civil engineering doctorates awarded
 Correlation: 95.86% (r = 0.958648)
WHAT WERE THEY THINKING???
Dystopia 5: Unintended and unwanted effects

Unintended consequences

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http://interactioninstitute.org/unintended-consequences/

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Goal orientation

<table>
<thead>
<tr>
<th></th>
<th>Mastery goals</th>
<th>Performance goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach-oriented</td>
<td>Motivated to truly master academic tasks</td>
<td>Motivated to demonstrate that they have more ability or competence than others</td>
</tr>
<tr>
<td>Avoidance-oriented</td>
<td>Motivated to seek to avoid misunderstanding given tasks</td>
<td>Motivated to avoid appearing incompetent or stupid in the eyes of others.</td>
</tr>
</tbody>
</table>

Pigeonholing / Profiling / Stereotyping
INTERMEZZO
As played by Fats Waller

Music by
THOMAS "FATS" WALLER

Andantino (\( \dot{=} 90 \))

mp
dolce

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Utopia 1: Knowing what will happen (and when and why)

Predict

“IT’S TOUGH TO MAKE PREDICTIONS, ESPECIALLY ABOUT THE FUTURE.”
—Yogi Berra
### Simple data

**Table 2**

*Types of Data Available for Learning Analytics*

<table>
<thead>
<tr>
<th>Data Generated by LMS</th>
<th>Data Generated by Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Times Resource Accessed</td>
<td>Grades on Discussion Forum</td>
</tr>
<tr>
<td>Date and Time of Access</td>
<td>Grades on Assignment</td>
</tr>
<tr>
<td>Number of Discussion Posts Generated</td>
<td>Grades on Tests</td>
</tr>
<tr>
<td>Number of Discussion Posts Read</td>
<td>Final Grades</td>
</tr>
<tr>
<td>Types of Resource Accessed</td>
<td>Number (and Type) of Questions Asked in a Discussion Forum</td>
</tr>
<tr>
<td></td>
<td>Number of Emails Sent to Instructor</td>
</tr>
</tbody>
</table>

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Dietz-Uhler & Hurn (2013). Using Learning Analytics to Predict (and Improve) Student Success: A Faculty Perspective
EARLI SIG 27 ONLINE MEASURES OF LEARNING PROCESSES
LEARNING PROCESSES MATTER
29.11-1.12.2016. UNIVERSITY OF OULU, FINLAND
Utopia 2: Custom tailored learning and instruction

Adapt / Personalise?

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Learning / study strategies

- Highlight/underline
- (Self) Testing
- Summarise
- Elaborative questions
- Generate keywords
- Distribute practise
- Restudy
- Explain
- Visualise
- Variable practise

Dr. Gino Camp – Welten Institute, OUNL
Variability of practise

a-a-a-b-b-b-c-c-c-d-d-d-d versus a-b-c-d-a-b-c-d-a-b-c-d
Utopia 3: The right thing for the right learner at the right time

Recommend / Advise / Intervene

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Collaborative Filtering – Item-Item similarity
(You like Godfather so you will like Scarface - Netflix)

Collaborative Filtering – User-User Similarity
(People like you who bought beer also bought diapers - Target)

Model Based
Training SVM, LDA, SVD for implicit features

Social+Interest
Graph Based (Your friends like Lady Gaga so you will like Lady Gaga, PYMK – Facebook, LinkedIn)

Attribute-based recommendations
(You like action movies, starring Clint Eastwood, you might like “Good, Bad and the Ugly” Netflix)

Item Hierarchy
(You bought Printer you will also need ink - BestBuy)
Classification system*

* Drachsler et al., Panorama of Recommender Systems to Support Learning
Utopia 4: Enlightening the learner

Feedback
Effective Feedback

Where am I going? How am I going? Where to next?

Each question works at four levels

- Task Level: How well are the tasks understood/performed?
- Process Level: The main process needed to understand/perform tasks
- Self-regulation level: Self-monitoring, directing, and regulating of actions
- Self Level: Personal evaluations and affect (usually positive) about the learner

Utopia 5: Simply the best

A better learning environment

- Course improvement
- Feedback for staff (instructors, tutors)
- Grouping students
- Planning and scheduling
- Resource allocation
- Etcetera
Multimodal data, LA, dashboards for (S)SRL

http://www.slamproject.org/blog
The problem with worst case scenario's is that they actually occur. This isn't mere fancy.
Learning isn’t a means to an end; it is an end in itself.

(Robert A. Heinlein)
JCAL special issue

“Learning analytics in massively multi-user virtual environments and courses"

Available online
CODE: JCALLAK16