

TRUSTED LEARNING ANALYTICS

ITC ILO **INNOVATIVE LEARNING INTERVENTIONS** DIPLOMA PROGRAMME



Learning Analytics in Portalen für Fachinformationen

Prof. Dr. Hendrik Drachsler
@hdrachsler



DIPF

Bildungsforschung
und Bildungsinformation

WhoAmI

- Hendrik Drachsler
Professor Educational Technologies
& Learning Analytics
- Research topics:
Recommender Systems
Learning Analytics
- Application domains:
Schools
HEI
Medical education



Lecture structure



**1. Definition
of trust and LA**

2. Fears of
Learning
Analytics

3. Humboldt-ian
Educational Model

4. New demands
from GDPR 2018

5. Technical
approaches towards
Trusted Learning
Analytics

6. Learning Analytics
in Info portals

A definition of Trust



How do you define trust?

Picture by Terry Johnston

<https://www.flickr.com/photos/powerbooktrance/466709245/>

A definition of Trust



Picture by Terry Johnston

<https://www.flickr.com/photos/powerbooktrance/466709245/>

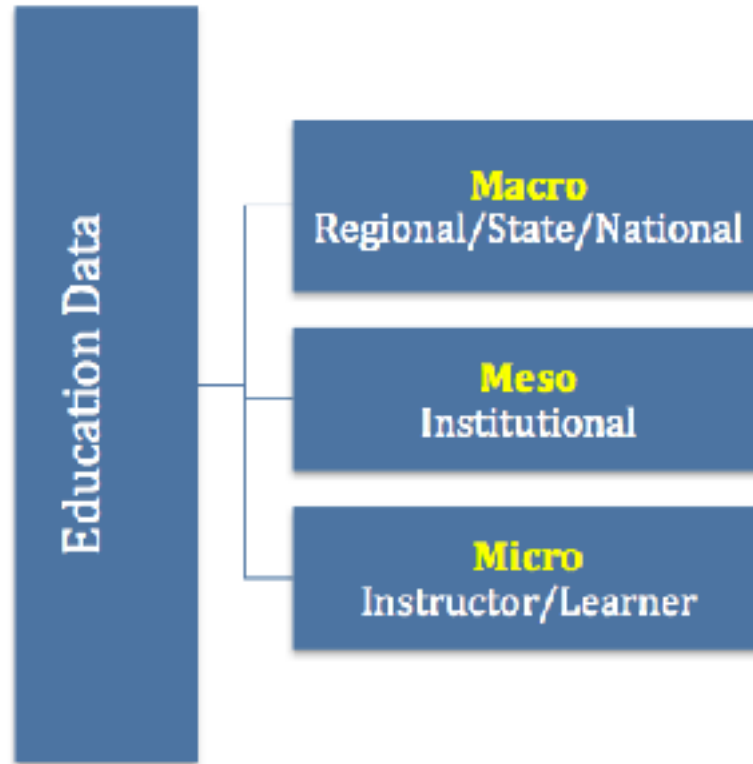
Trust is about a firm belief in the reliability, truth, or ability of someone or something.

A trustful relation is mutually based on

- openness
- truth
- reliability
- integrity
- belief
- faith
- freedom of **suspicion**

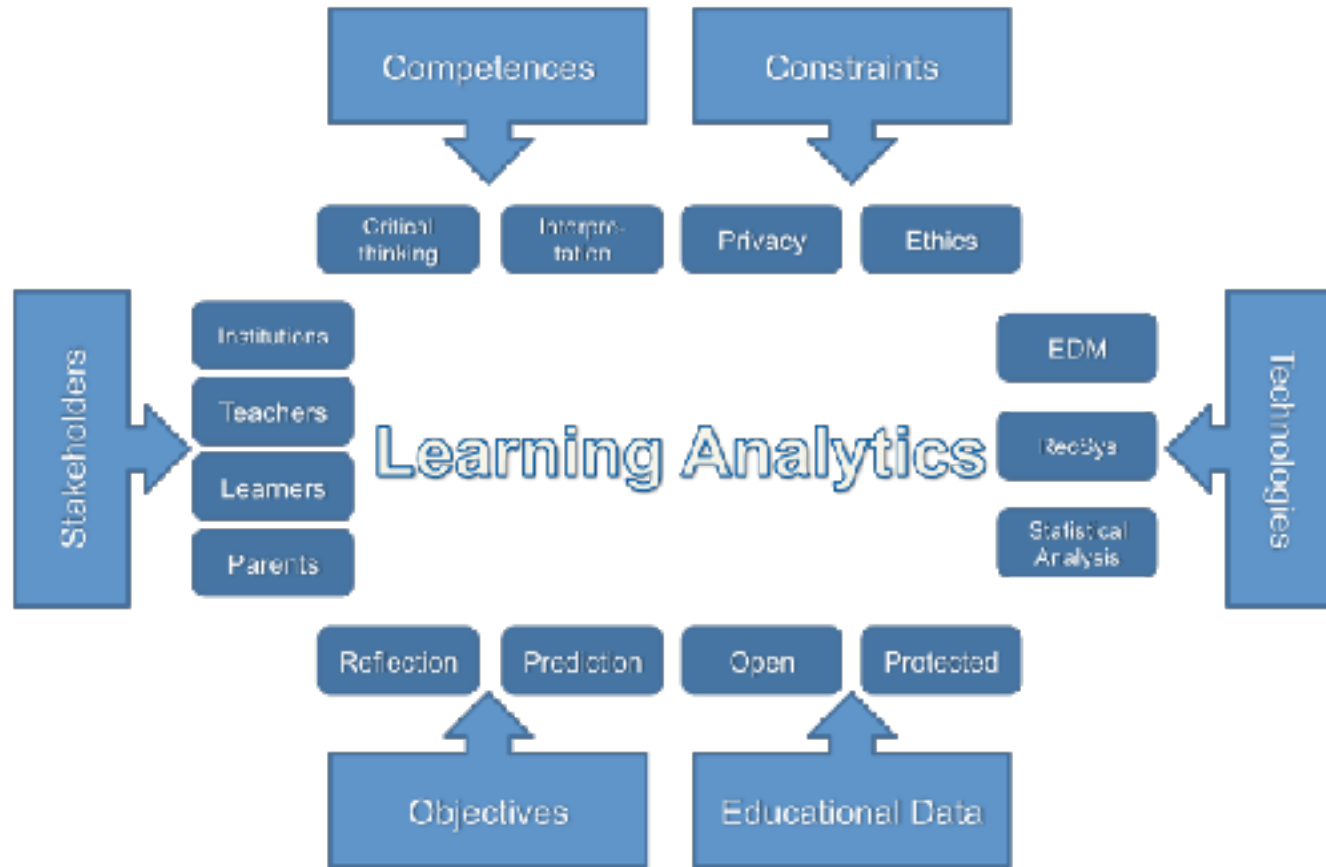
What are Learning Analytics for you?

Learning Analytics

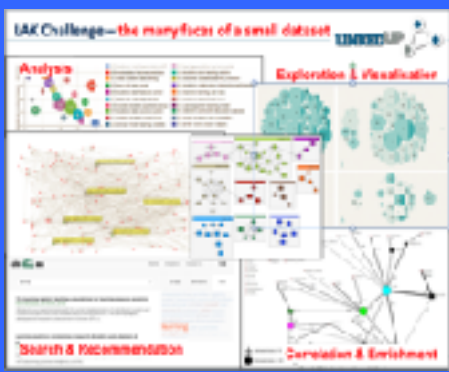


Greller, W. & Drachsler, H. (2012). **Turning Learning into Numbers. Toward a Generic Framework for Learning Analytics.** Journal of Educational Technology & Society. http://ifets.info/journals/15_3/4.pdf

A definition of Learning Analytics



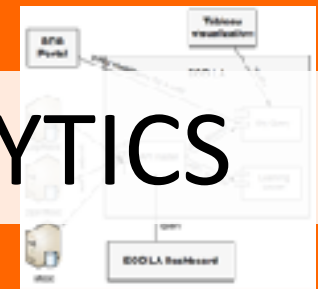
Greller, W. & Drachsler, H. (2012). Turning Learning into Numbers. Toward a Generic Framework for Learning Analytics. *Journal of Educational Technology & Society*, 15(3), 42–57. http://ifets.info/journals/15_3/4.pdf



- D** **DESCRIPTIONS** - Offer a wide variety of data profiles and data types to be used in the analysis.
- E** **EXPLORATION** - Offer a wide variety of data profiles and data types to be used in the analysis.
- L** **LINKS** - Offer a wide variety of data profiles and data types to be used in the analysis.
- I** **INTERPRETATION** - Offer a wide variety of data profiles and data types to be used in the analysis.
- C** **COMPARISON** - Offer a wide variety of data profiles and data types to be used in the analysis.
- A** **ANALYSIS** - Offer a wide variety of data profiles and data types to be used in the analysis.
- T** **TRUSTED LEARNING ANALYTICS** - Offer a wide variety of data profiles and data types to be used in the analysis.
- E** **EVALUATION** - Offer a wide variety of data profiles and data types to be used in the analysis.

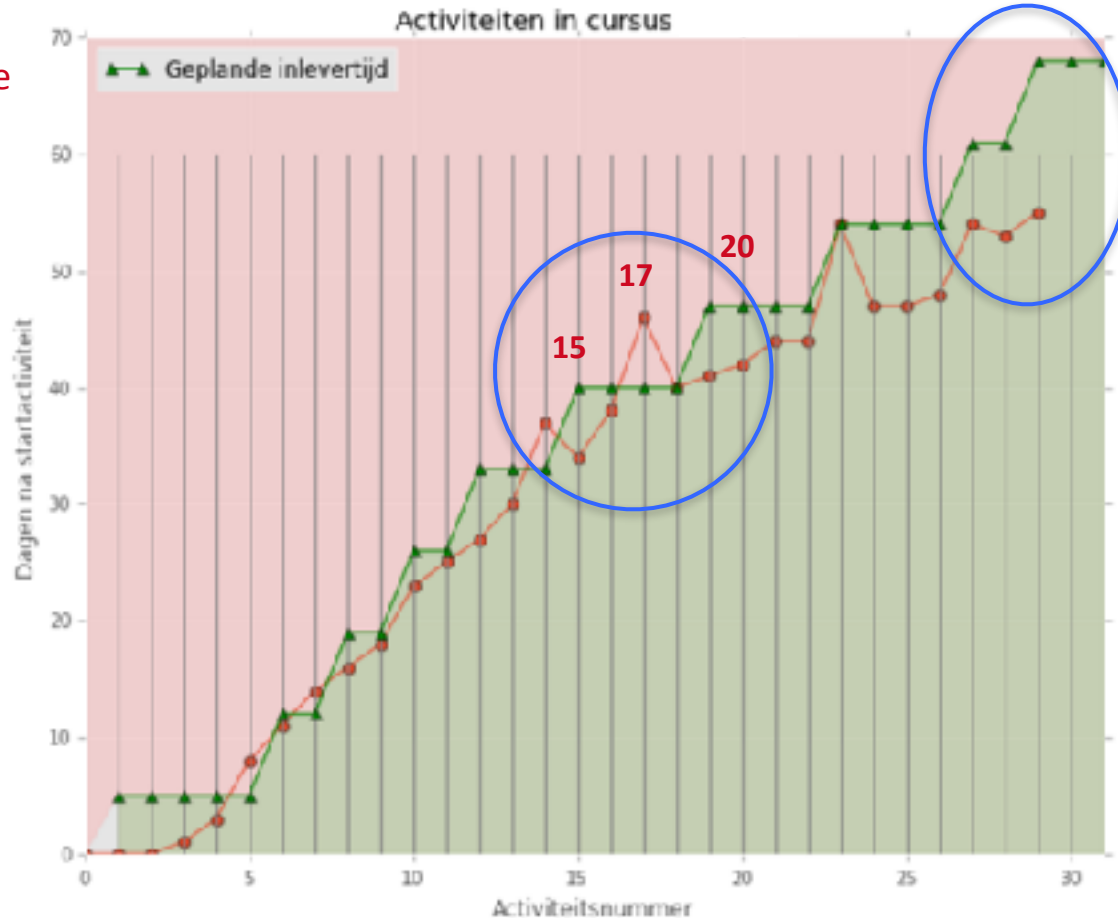


TRUSTED LEARNING ANALYTICS



New insights

Studytime
in days

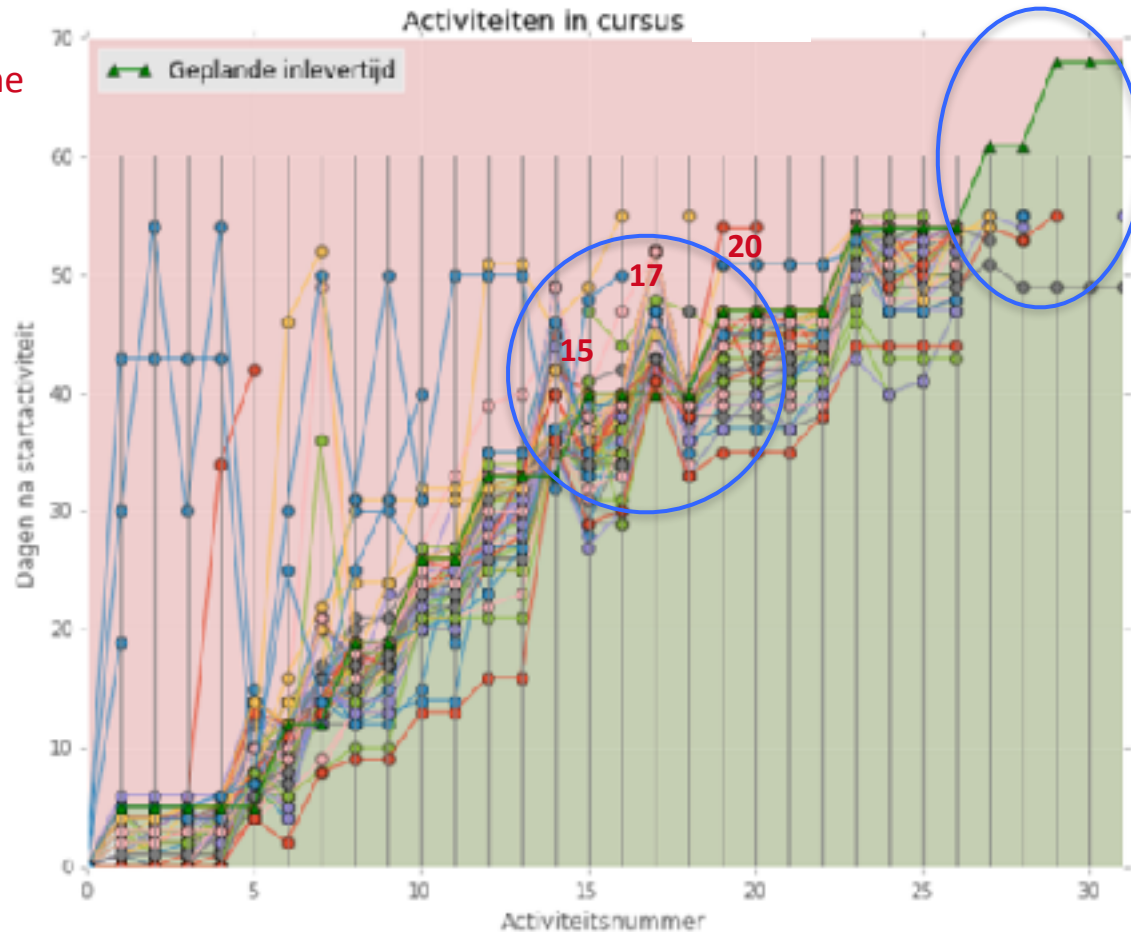


Learning
Activities

Graph by Rob Koper. **Data science voor de realisatie van online activerend onderwijs.** Presentation given at Dag van het Onderwijs (5 November 2015). Heerlen. The Netherlands

New insights

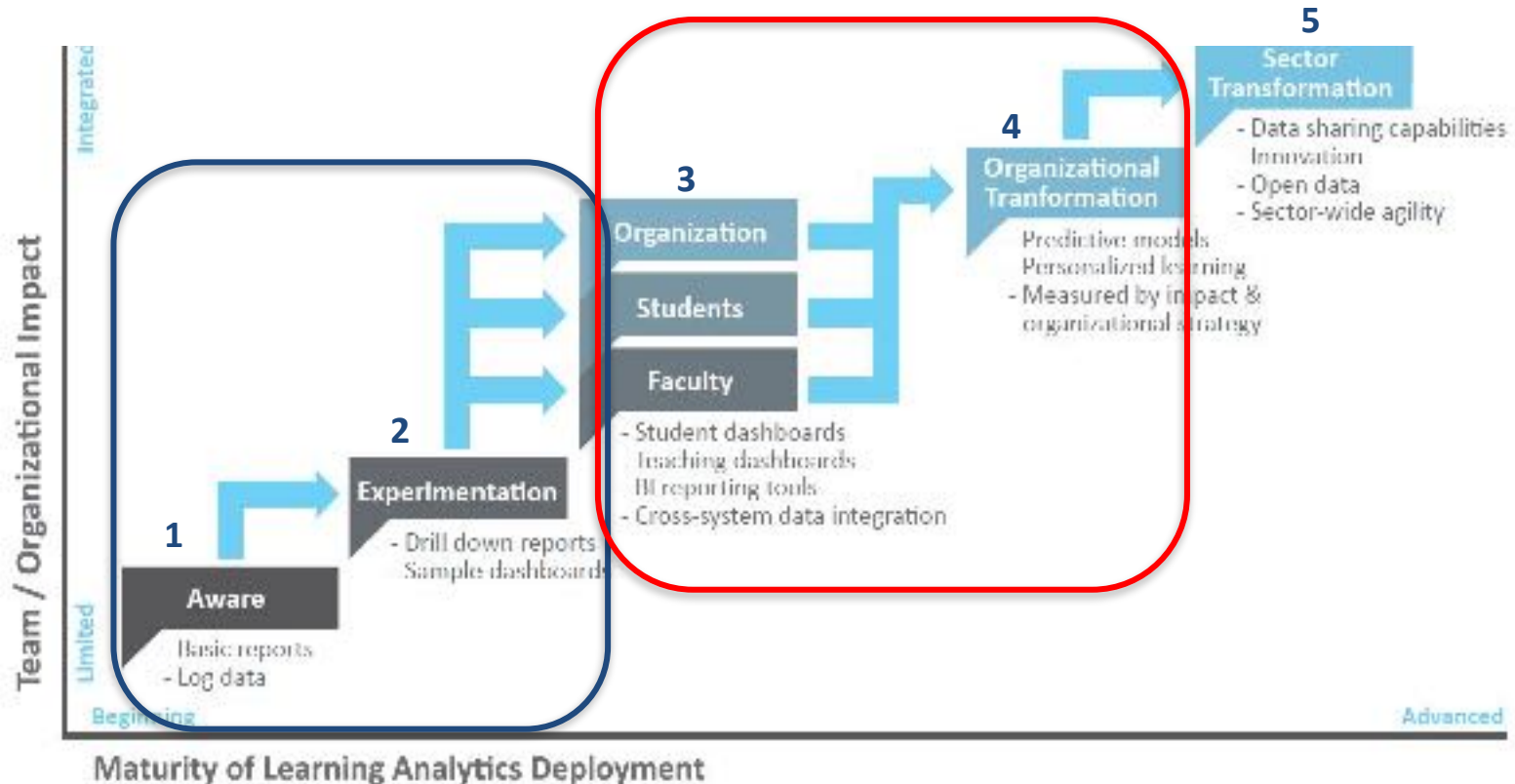
Studytime
in days



Learning
Activities

Graph by Rob Koper. **Data science voor de realisatie van online activerend onderwijs.** Presentation given at Dag van het Onderwijs (5 November 2015). Heerlen. The Netherlands

LA Sophistication Model



Siemens, G., Dawson, S., & Lynch, G. (2014). **Improving the Quality and Productivity of the Higher Education Sector – Policy and Strategy for Systems-Level Deployment of Learning Analytics**. Canberra, Australia: Office of Learning and Teaching, Australian Government. Retrieved from http://solaresearch.org/Policy_Strategy_Analytics.pdf

Lecture structure



1. Definitions

2. Fears of Learning Analytics

3. Humboldt-ian Educational Model

4. New demands from GDPR 2018

5. Technical approaches towards Trusted Learning Analytics

6. Learning Analytics in Info portals

Do you have any concerns when you think about Learning Analytics in K12 or HEI?

People are afraid of AI and digital technologies



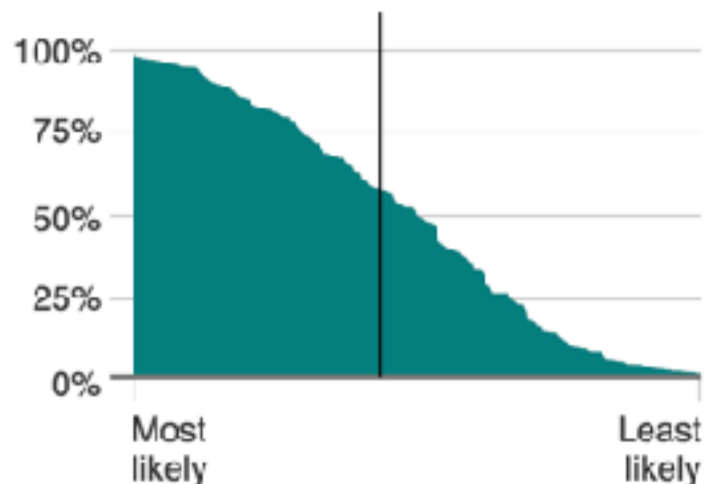
Taxi and cab drivers and chauffeurs

Likelihood of automation?

It's too close to call (57%)

How this compares with other jobs:

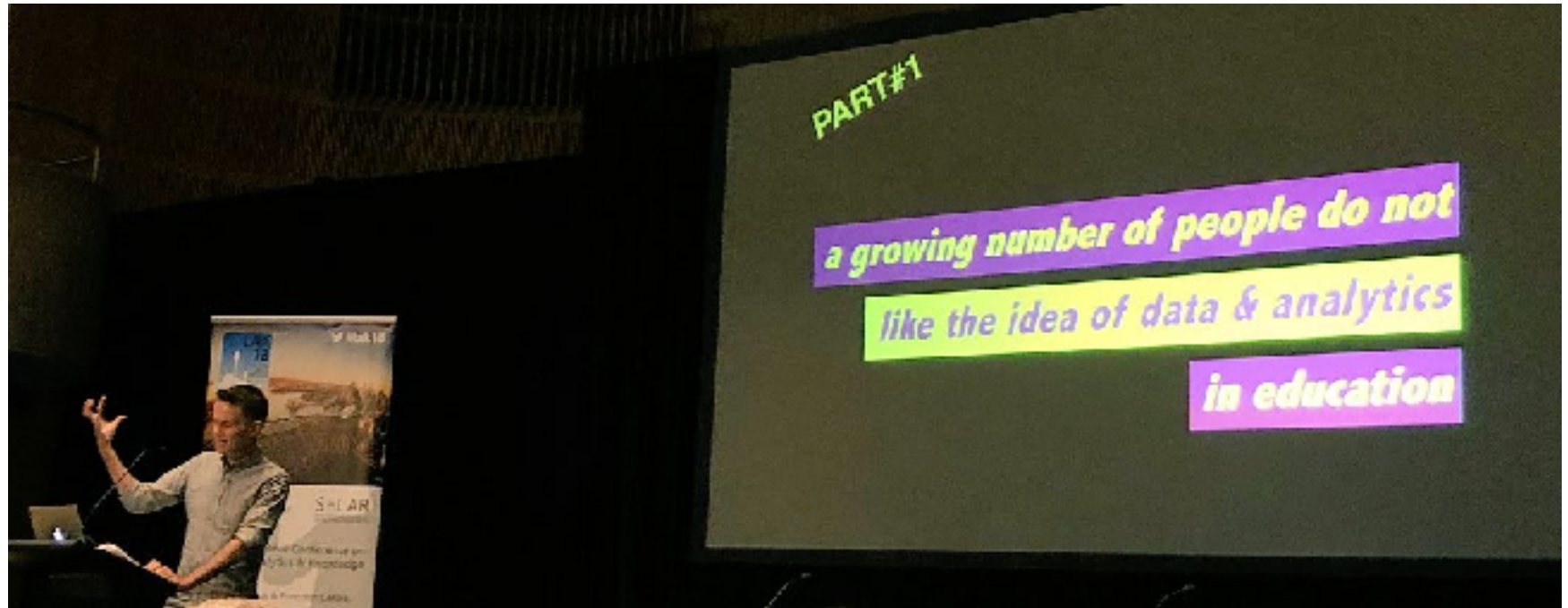
159th of 366



[Share my result](#)



Keynote Neil Selwyn @ LAK 2018, Sydney, Australia



Learning Analytics has a trust problem ...

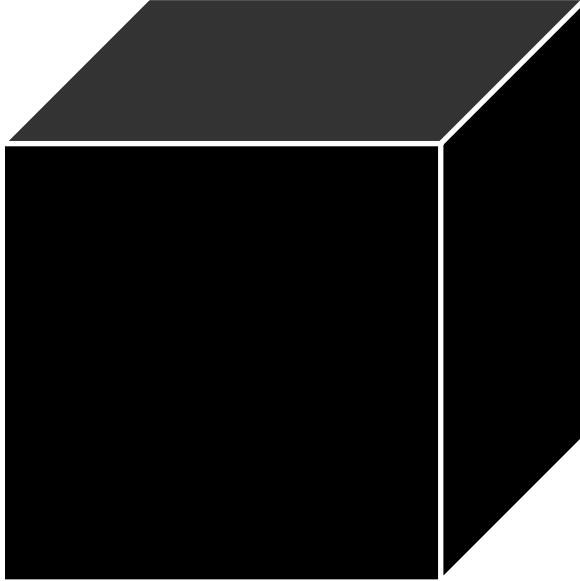
Keynote Neil Selwyn @ LAK 2018, Sydney, Australia



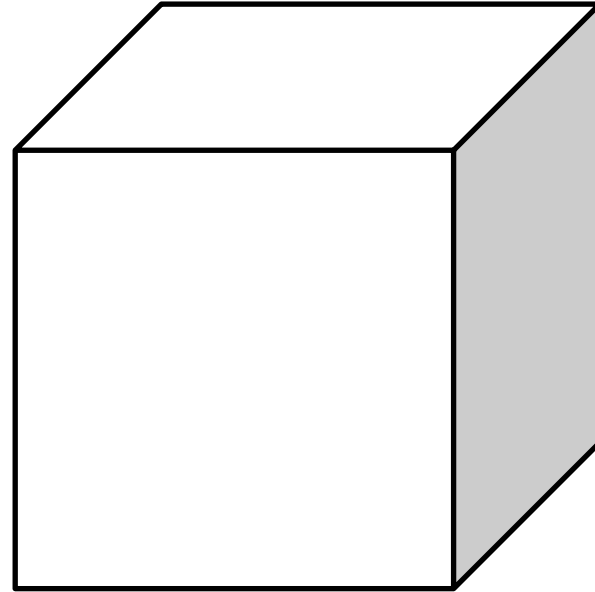
... because Learning Analytics has the potential of becoming a high stakes assessment.



Black box vs. White box



Unknown algorithms
Unknown data collection
Automated decisions
No access to raw data
No control who uses it



Open algorithms
Transparent indicators
No automated decisions
Full access to data
Knowing who accesses your data



news

OpenSCHUFA – shedding light on Germany's opaque credit scoring

Why we started OpenSCHUFA, why you should care about credit scoring & how you can help.

AlgorithmWatch on February 21st, 2018

Educational Example

BK DATA

InBloom Student Data Repository to Close

By NATASHA SINGER APRIL 23, 2014 1:21 PM 24 Comments



PARENTS BEWARE!

New York State is planning to share your child's confidential information with private corporations
New York State has agreed to share confidential student and teacher data with a Gates-funded corporation called inBloom Inc.

Ignoring the fears and public perception of the application of analytics can lead to a lack of acceptance, protests, and even failure of entire LA implementations.

30 states participated, in 2013 data about millions of children
have been stored

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Is the German Education system prepared for the challenges of the data-driven society?

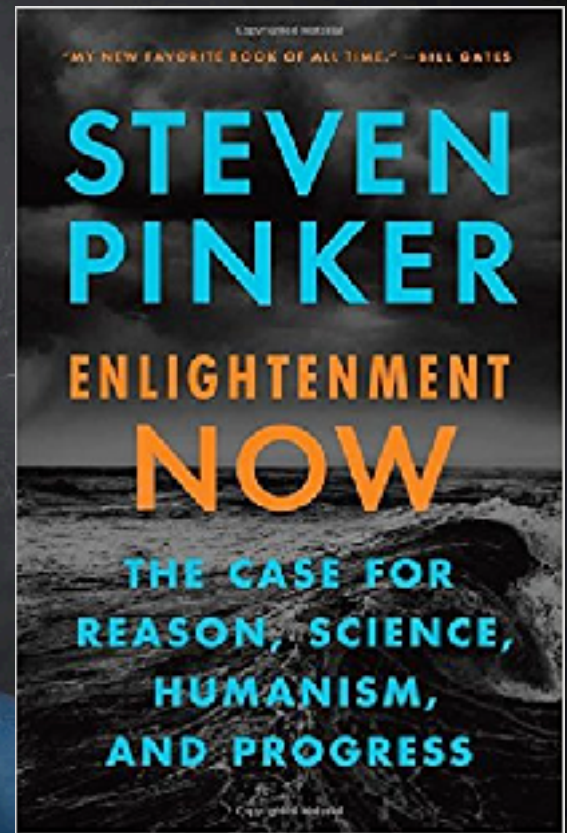
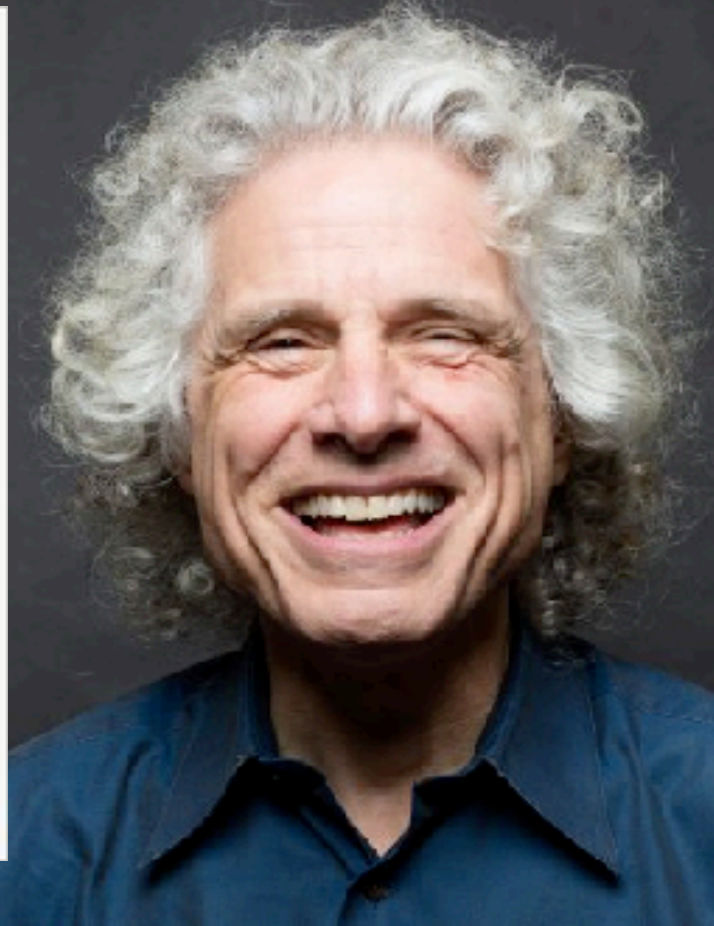
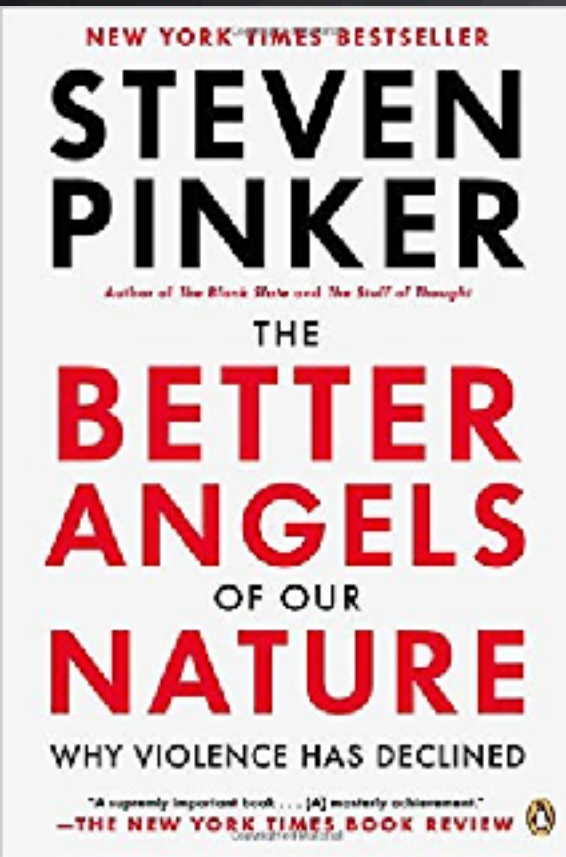
Humboldt-ian Model in the age of Big Data



Designed an education system ...

- based on **unbiased knowledge** (objective analytics but also critical reflection)
- **combining research and teaching**
- **allowing students to choose their own course of study** (personalization)
- develop **autonomous reflected individuals** (self-regulated learning)
- education beyond vocational training only
- **comprehensive general learning** (lifelong learning)
- **cultural knowledge** (formative feedback vs. summative assessment)

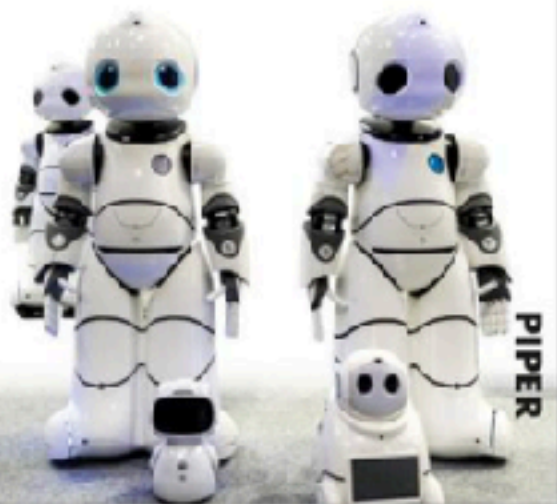
Humanismus & Enlightenment NOW



Julian Nida-Rümelin
Nathalie Weidenfeld

DIGITALER HUMANISMUS

Eine Ethik für das Zeitalter der
künstlichen Intelligenz



Digitaler Humanismus

Julian Nida-Rümelin, Nathalie Weidenfeld

Eine Ethik für das Zeitalter der künstlichen Intelligenz



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Sachbuch

PIPER



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GDPR 2018

The EU General Data Protection Regulation (GDPR) is the most important change in data privacy regulation in 20 years - we're here to make sure you're prepared.

“the biggest change to data protection law for a generation”

**Elizabeth Denham,
Information Commissioner**

**TIME UNTIL GDPR ENFORCEMENT
UTC**

74:11:13:02
Days Hrs Mins Secs

GDPR 2018

- Right to be informed
- Right of access
- Right to rectification
- Right to erasure
- Right to restrict processing
- Right to data portability
- Right to object automated decision making



Do your Learning Technology systems support these rights?

Some things are already on its way

- D** **DETERMINATION** – Why you want to apply Learning Analytics?
 - ▶ What is the added value (Organisational and data subjects)?
 - ▶ What are the rights of the data subjects (e.g., EU directive 95/46/EC)
- E** **EXPLAIN** – Be open about your intentions and objectives
 - ▶ What data will be collected for which purpose?
 - ▶ How long will this data be stored?
 - ▶ Who has access to the data?
- L** **LEGITIMATE** – Why you are allowed to have the data?
 - ▶ Which data sources you have already (aren't they enough)?
 - ▶ Why are you allowed to collect additional data?
- I** **INVOLVE** – Involve all stakeholders and the data subjects
 - ▶ Be open about privacy concerns (of data subjects)
 - ▶ Provide access to the personal data collected (about the data subjects)
 - ▶ Training and qualification of staff
- C** **CONSENT** – Make a contract with the data subjects
 - ▶ Ask for a consent from the data subjects before the data collection
 - ▶ Define clear and understandable consent questions (Yes / No options)
 - ▶ Offer the possibility to opt-out of the data collection without consequences
- A** **ANONYMISE** – Make the individual not retrievable
 - ▶ Anonymise the data as far as possible
 - ▶ Aggregate data to generate abstract metadata models (These do not fall under EU Directive 95/46/EC)
- T** **TECHNICAL** – Procedures to guarantee privacy
 - ▶ Monitor regularly who has access to the data
 - ▶ If the analytics change, update the privacy regulations (new consent needed)
 - ▶ Make sure the data storage fulfills international security standards
- E** **EXTERNAL** – If you work with external providers
 - ▶ Make sure they also fulfil the national and organisational rules
 - ▶ Sign a contract that clearly states responsibilities for data security
 - ▶ Data should only be used for the intended services and no other purposes

Drachsler, H. & Greller, W. (2016). *Privacy and Analytics – it's a DELICATE issue. A Checklist to establish trusted Learning Analytics*. 6th Learning Analytics and Knowledge Conference 2016, April 25-29, 2016, Edinburgh, UK.

Online at:

<http://www.laceproject.eu/ethics-privacy/>



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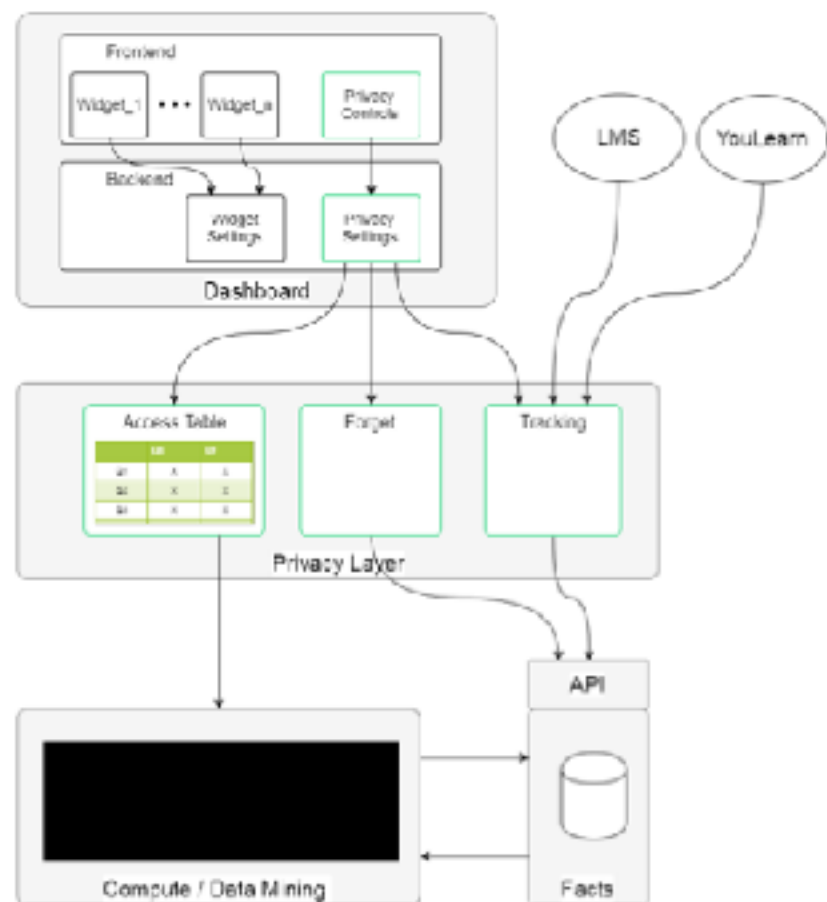
4. New demands from GDPR 2018

5. Technical approaches towards Trusted Learning Analytics

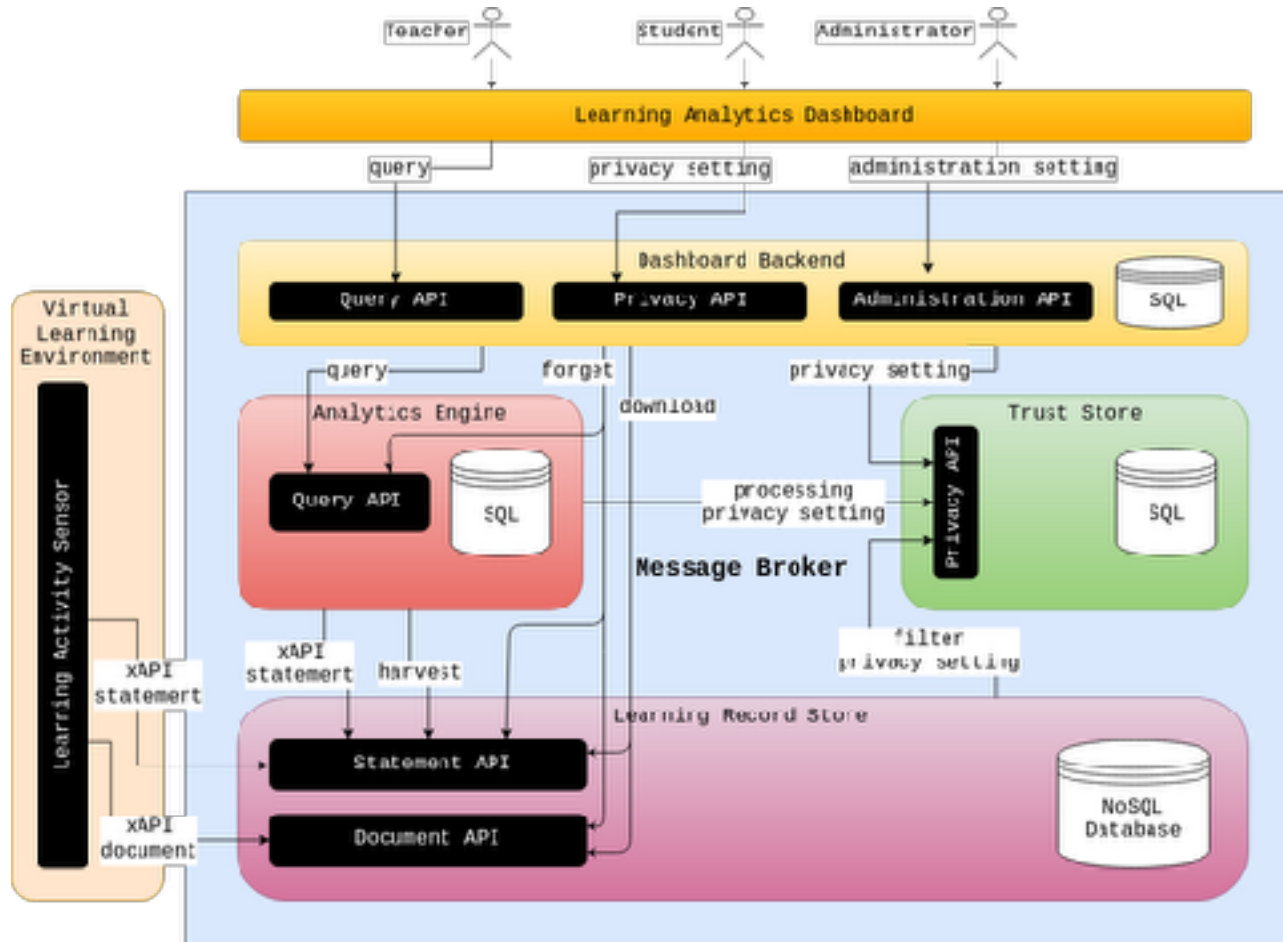
6. Learning Analytics in Info portals

Trusted Learning Analytics Infrastructure

- T-4-LA, first GDPR 2018 conform Big Data Infrastructure
- Joined project with GU und OU
- Among 'traditional' learning data we also aim to collect multimodal data.



Trusted Learning Analytics Infrastructure



Ciordas-Hertel, G.,
Schneider, J., &
Drachsler, H.
(submitted).

**Towards a Trusted
Learning Analytics
Big Data
Infrastructure.**

EC-TEL conference
2018, Leeds, UK.

Learning Analytics Indicator Repository

The screenshot displays a user interface for the Learning Analytics Indicator Repository. On the left, there is a navigation menu with categories like 'Metrics' and 'Reports'. The main content area is titled 'Data Storage Information' and 'Your Rights'. It lists several rights: 'Right To Be Informed', 'Right To Be Forgotten', 'Right To Object', and 'Right To Rectification'. Below these, there is a video player showing a video titled 'GDPR - Right to Rectification' with the text 'RIGHT TO RECTIFICATION AND RESTRICTION'. At the bottom, there is a consent form with 'Accept' and 'Decline' buttons. On the right side, there is a 'Detail' section with a list of indicators and a 'visibility' section with a list of items.

Metrics

- Usage
- Commenting
- Forum
- Learning Environment Interaction
- Feedback Usage
- Learning Preferences
- Access Activity
- Writing Analysis
- Time Taken
- Assignment/Exam Behaviour
- Overall Performance
- Recommendations
- Knowledge Level
- Quizzes
- Access Data
- Personal Profile
- Usage Data

Reports

GDPR - Right to Rectification

RIGHT TO RECTIFICATION AND RESTRICTION

Your Rights

- Right To Be Informed
- Right To Be Forgotten
- Right To Object
- Right To Rectification

You may request at any time from the Trusted Learning Analytics environment that your data may be rectified if any inaccurate personal data. You will be provided with a contact form for this purpose. Re-watch the following video for further information regarding your right to rectification.

GDPR - Right to Rectification

RIGHT TO RECTIFICATION AND RESTRICTION

Detail

- Language Used in Forums
- Feature Analysis of Text of user Motivation in the Course
- Word Choice
- Original Features of Written Text
- Topic Complexity
- Document Structure of Written Text
- Semantic Similarity between Texts from different students
- Non-Analytic of Group Chat
- ML Analysis of Essay
- ML Analysis of Video Annotations
- ML Analysis of Constructed Response
- Semantic Analysis of Video Comments
- Key-Stroke Analysis During Writing
- Discussion Behaviour

visibility

- Hide
- Hide
- Hide
- Hide
- Hide
- Hide
- Hide

Consent Form:

- I understand that declining this consent will not in any way affect the quality of my learning experiences in any way.
- I have read all the aforementioned sections. I understand what data will be collected of me, how it will be used and processed and by whom.

Buttons: Accept Decline

Biedermann, D
The Learning A

2018, Leeds, UK.

Learning Analytics Indicator Repository

Papers

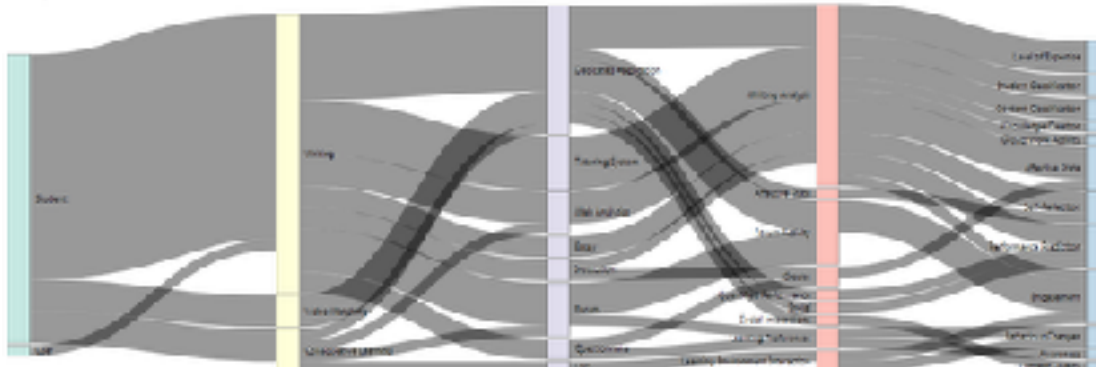
Models	
Analysis of the Effects of Video Use and Instruction to Support Reflective Learning	10.1145/2567574.2567590
Peer assessment based on ratings in a Social Media Course	10.1145/2507574.2507668
Assessing Elementary Students' Science Competency with Text Analytics	10.1145/2567574.2567620
Investigating Sorecom and Engagement during Writing Using Multiple Sources of Information: The Esas, The Wikis, and Keytrikes	10.1145/2880851.2881919
Assessment of Language in Authentic Science Inquiry Reveals Subtle Differences in Epistemology	10.1145/3007983.3017415
Algorithmic Identification of Academic Support in Undergraduate Writing	10.1101/279643194 45152+4,8

Download: 1 file

Selected Approach

```
graph LR; Students((Students)) --> Writing((Writing)); Writing --> Engagement((Engagement)); Engagement --> QuantitativePerformance((Quantitative Performance)); Engagement --> QualitativePerformance((Qualitative Performance)); QuantitativePerformance --> LearningAnalytics((Learning Analytics)); QualitativePerformance --> LearningAnalytics((Learning Analytics));
```

Graph Overview



Biedermann, D.,
Schneider, J., &
Drachler, H.
(submitted).

The Learning Analytics
Indicator Repository. EC-
TEL conference 2018,
Leeds, UK.

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DIPF

Educational Research
and Educational Information

Learning Analytics in information portals

Educational Fingerprinting

Information portals and learning

- Information portals offer a broad variety of information
- Users interact with content to gain information / knowledge



Jisc and Matt Lincoln CC BY-NC-ND



How can we faster adapt information portals to individual learners?

- **Goal:** User centric adaptive (open) educational resources
- **Problem:** First time users without user account
- **Needed:** Previous Knowledge – without manual user input



User:Colin / Wikimedia Commons / CC BY-SA 4.0

Learner Modeling

- **Learner Modeling = Data Collection + Profile Construction (Brusilovsky)**



- **Current approaches:**
 - Learner accounts
 - Ethernet or browser proxy
 - Browser plugin

Current Data Collection Problems

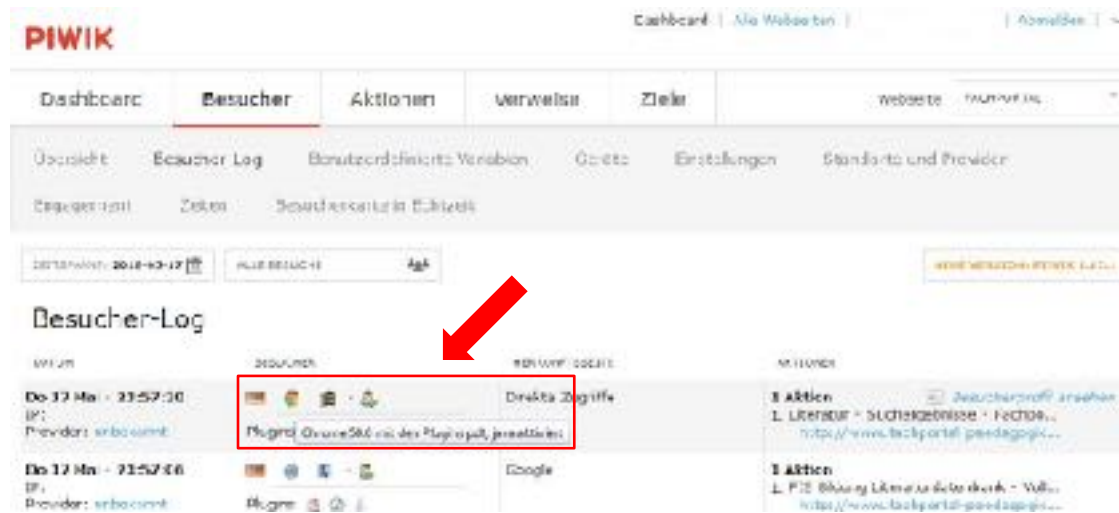
- Interpretation requires data of several sessions
- Accounts require learner login
- Learning Analysis Proxies or Browser Plugins must be set up manually

To experience adaptive content, learners have to be ...

- 1. active**
- 2. continuous users**
- 3. aware, that they can receive adaptive resources in the future**

Fingerprinting

- Known web analytics technology for user identification
- Available ubiquitously
- Uses information of user configuration sent by the browser



The screenshot shows the Piwik dashboard interface. At the top, there are navigation tabs: Dashboard, Besucher (selected), Aktionen, Verweise, Ziele, and WeBSITE. Below these are sub-tabs for 'Besucher-Log', 'Besucherdefinierte Variablen', 'Goals', 'Einstellungen', and 'Standards und Provider'. The main content area displays a table titled 'Besucher-Log' with columns for 'IDVISIT', 'BESUCHER', 'BESUCHER-USERID', and 'AKTIONEN'. The first row of the table shows a visitor from 'Do 17 Mai - 23:57:30' with a 'Provider: snbc.com'. The 'BESUCHER' column for this entry is highlighted with a red box, and a red arrow points to it from the left. The highlighted cell contains browser icons and the text 'Mozilla/5.0 (Windows NT 6.0; rv:3.0; Gecko/20100101; Firefox/3.0)'. The 'AKTIONEN' column for the same entry shows a list of actions, including 'LERNENIT - Suchergebnisse - FACHB...' and 'http://www.talkportal.paedagogi...'.

Scientific Fingerprinting Projects

- Learners are unique due to their web fingerprint

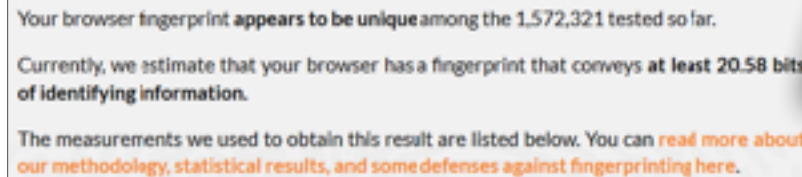
Observed Uniqueness	Panopticlick	Am I Unique?	Cao et al.
N	470.161	118.934	1.903
Unique users	83,6%	89,0%	99,2%
Pub. year	2010	2016	2017



Are you unique?
Yes! (You can be tracked!)

41.64% of observed browsers are Firefox, as yours.
0.21% of observed browsers are Firefox 60.0, as yours.
56.75% of observed browsers run Windows, as yours.
5.52% of observed browsers run Windows 10, as yours.

<https://amiunique.org/>



Your browser fingerprint **appears to be unique** among the 1,572,321 tested so far.

Currently, we estimate that your browser has a fingerprint that conveys **at least 20.58 bits of identifying information**.

The measurements we used to obtain this result are listed below. You can **read more about our methodology, statistical results, and some defenses against fingerprinting here**.

<https://panopticlick.eff.org/>



PANOPTICCLICK
is your browser safe against tracking?

Example Fingerprint

Attribute	Similarity ratio	Value
User agent ⓘ	<0.1%	"Mozilla/5.0 (Windows NT 6.1; WOW64; /60.0"
Accept ⓘ	54.42%	"text/html,application/xhtml+xml,application/javascript;q=0.9,*/*;q=0.8"
Content encoding ⓘ	46.22%	"gzip, deflate, br"
Content language ⓘ	3.91%	"de,en-US;q=0.7,en;q=0.3"
List of plugins ⓘ	<0.1%	"Plugin 0: Shockwave Flash; Shockwave Flash 40.dll. "

Experimental Design

- **Research Question / Hypothesis:**

- Can we provide personalised information to visitors of information portals based on their FP?
- Information portal visitors can be modeled according to their FP.

- **Approach:**

- Identify individual learning models by a questionnaire
- Assign Fingerprinting data to learner models
- Validate extracted correlations by a second user group

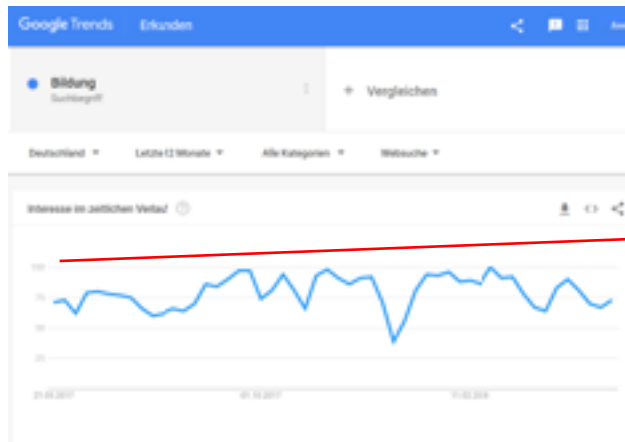
- **Possible Outcome:**

- Different learning behaviour of users with advanced PCs vs. Users with outdated PCs.



Outlook / Vision

- Create a data driven „Bildungsindex“ fed by the search terms and FPs of different users that visit an information portal for education.
- Continuous expert survey to generate an national „Ifo Geschäftsklima Index“ for education



<https://trends.google.de/>



Many thanks for your attention!

Questions now or later:

 @hdrachsler  drachsler@dipf.de

 [Slides: http://bit.ly/TrustedLA](http://bit.ly/TrustedLA)



EC-TEL 2018
THIRTEENTH EUROPEAN CONFERENCE ON TECHNOLOGY ENHANCED LEARNING
Linking technology enhanced learning, teaching with the complexity of 21st century challenges
Leeds, July 02 - 08 September 2018

Conference **Dates** Call for Papers Keynote Speakers Committees Venue EC-TEL 2019

Host Organisation

UNIVERSITY OF LEEDS

Supporting Organisations

DIPF
Deutsches Institut für Fernstudien
Educational Research and Educational Information


GOETHE UNIVERSITÄT FRANKFURT AM MAIN


HTW Chur
Hochschule für Technik und Wirtschaft

Important Dates

Full Papers, Short Papers, Posters & Demonstrations:

- 15 April 2018 - Mandatory submission of an abstract
- 29 April 2018 - Submission of full version
- 27 May 2018 - Notification of acceptance
- 24 June 2018 - Camera-ready versions

Workshop Proposals:

- 8 April 2018 - Submission of workshop proposal
- 6 May 2018 - Workshops notification
- 3 and 4 September 2018 - Workshops

Project Meetings:

- 24 June 2018 - Room reservation for project meetings
- 3, 4, 7 September 2018 - Project Meetings

Conference:

- 24 July 2018 - Early-bird registration ends
- 3 and 4 September 2018 - Workshops
- 6 and 8 September 2018 - Main conference

Supporters:


EUROPEAN ASSOCIATION OF
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TECHNOLOGY ENHANCED LEARNING


SOLAR
SOCIETY for LEARNING ANALYTICS RESEARCH



#ecotel2018

 **Christian Glahn**
@chris128

New Staff on my @glahn
#edtech, #learning & #ipeds
@NICTE11 conference organized
by @edtech@leeds2018.ca!