Learning Analytics
Dream, Nightmare or Fairydust?

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Introducing a new Analytics Platform...
“Some have tried to argue that this technology doesn't work out cost effectively when compared to conventional tests... but this misses a huge point. More often than not, we test after the event and discover the problem — but this is too late..”
Aquarium Analytics!

the biggest innovation in aquatics has arrived.

Understanding what is happening inside your aquarium is vital to ensuring that the aquatic life remains healthy. This revolutionary water monitoring device allows you to continuously track the changes in the water parameters, alerting you to the problems before they affect the fish. Protect your fish with a seneye monitor.
Aquarium Analytics!

the biggest innovation in aquatics has arrived.

Understanding what is happening inside your aquarium is vital to ensuring that the aquatic life remains healthy. This revolutionary water monitoring device allows you to continuously track the changes in the water parameters, alerting you to the problems before they affect the fish. Protect your fish with a seneye monitor.
How is your aquatic ecosystem?

“This means that the keeper can be notified before water conditions directly harm the fish—an assured outcome of predictive software that lets you know if it looks like the pH is due to drop, or the temperature is on its way up.

This way, it’s a real fish saver, as opposed to a forensic examiner, post-wipeout.”

(From a review of Seneye, in a hobbyist magazine)
How is your learning ecosystem?

This means that the teacher can be notified before learning conditions directly harm the students — an assured outcome of predictive software that lets you know if it looks like engagement is due to drop, or attainment is on its way up.

This way, it’s a real student saver, as opposed to a forensic examiner, post-wipeout.
First-to-market immaturity, tricky install process...

...but when it’s done calibrating and the dashboard springs to life, there’s an exciting sense of control – BUT you still need to know what ‘good’ looks like.
What do we mean by Learning Analytics?
Learning analytics

“Learning Analytics is concerned with the collection, analysis and reporting of data about learning in a range of contexts, including informal learning, academic institutions, and the workplace.

It informs and provides input for action to support and enhance learning experiences, and the success of learners.”

2nd Int. Conf. Learning Analytics & Knowledge 2012
## Learning “vs” Academic Analytics

<table>
<thead>
<tr>
<th>TYPE OF ANALYTICS</th>
<th>LEVEL OR OBJECT OF ANALYSIS</th>
<th>WHO BENEFITS?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Analytics</td>
<td><strong>Course-level</strong>: social networks, conceptual development, discourse analysis, “intelligent curriculum”</td>
<td>Learners, faculty</td>
</tr>
<tr>
<td></td>
<td><strong>Departmental</strong>: predictive modeling, patterns of success/failure</td>
<td>Learners, faculty</td>
</tr>
<tr>
<td>Academic Analytics</td>
<td><strong>Institutional</strong>: learner profiles, performance of academics, knowledge flow</td>
<td>Administrators, funders, marketing</td>
</tr>
<tr>
<td></td>
<td><strong>Regional (state/provincial)</strong>: comparisons between systems</td>
<td>Funders, administrators</td>
</tr>
<tr>
<td></td>
<td><strong>National and International</strong></td>
<td>National governments, education authorities</td>
</tr>
</tbody>
</table>
“Academic Analytics”

• Stage 1—Extraction and reporting of transaction-level data
• Stage 2—Analysis and monitoring of operational performance
• Stage 3—What-if decision support (such as scenario building)
• Stage 4—Predictive modeling and simulation
• Stage 5—Automatic triggers of business processes (such as alerts)

What this talk is not...

The future is analytics!
Step this way…
The future is analytics!
Step this way...
Learning Analytics
dream
dream

Nightmare
dream

Nightmare

Fairydust
Big Data & Analytics: Very Big Buzzwords
SAS and Education

SAS® Education Analytical Suite

**CHALLENGES**

- Inaccurate and inconsistent data and reports.
- Inefficient and time-intensive reporting processes.
- Difficult to analyze data for academic research.
- Need sophisticated analytic tools to incorporate into classroom curricula.

http://www.sas.com/industry/education/highered
IBM TechTrends2011 report: Analytics fastest growing tech

The 2011 IBM Tech Trends Report

Tech Trends of today. Skills for tomorrow.

IBM Watson

This year, the possibilities of business analytics reached the public consciousness like never before with the unveiling of IBM Watson.

IBM Watson uses sophisticated analytics to understand the meaning and context of human language. With this capability – unprecedented in history – IBM Watson’s analytics technology can draw upon tremendous stores of data to instantly recommend responses to questions. In fact, the IBM Watson technology is able to sift through an equivalent of about one million books or roughly 200 million pages of data, analyze this information and provide responses in less than three seconds.
IBM TechTrends 2011 report: Analytics fastest growing tech

Survey respondents identified education as the industry with the biggest opportunity for IBM Watson’s abilities, with healthcare and aerospace/defense a close second and third, respectively. But how can the

...but do they know anything about the roles of language in learning?
Personal, volunteered Big Data is about to explode
Explosion of data sharing about ourselves: personal health

Welcome to the first Quantified Self conference!

Quantified Self 2011 is a conference for users and tool makers interested in self-tracking systems. It will be a "working meeting" for the QS community (14 groups worldwide), where we will gather, inspire, and learn from each other as we share and collaborate on self-tracking projects. We will also explore the potential effects of self-tracking on ourselves and society.
Explosion of data sharing about ourselves: location

iPhone Location Data Visualization
Based on the donated and anonymized data of 881 iPhones
Big Data & Analytics: Very Big Buzzwords

Educational Institutions
Your Educational Institution’s Response?

Your Learners’ Response?

LEARNING ANALYTICS
Time-to-Adoption Horizon: Four to Five Years

Learning analytics promises to harness the power of advances in data mining, interpretation, and modeling to improve understandings of teaching and learning, and to tailor education to individual students more effectively. Still in its early stages, learning analytics responds to calls for accountability on campuses across the country, and leverages the vast amount of data produced by students in day-to-day academic activities. While learning analytics has already been used in admissions and fund-raising efforts on several campuses, “academic analytics” is just beginning to take shape.

EDUCUSE

http://www.educause.edu/Resources/Browse/Analytics/16961

Analytics - 80 Resources

Analytics is used in a higher education environment to analyze various data points to make informed decisions. Key analytics include Academic Analytics, Business Intelligence and Learning Analytics. Below are examples that further discuss the emerging use of analytics in higher education.

- The Power and Potential of Analytics in Higher Education: EDUCAUSE Live! No panelist was able to discuss the higher education ecosystem of analytics and the interrelationships of data between reports to query and inform stakeholders about student outcomes. The session spotlighted the executive competencies of analytics leaders, including institutional capacity, talent, collaborative skills, and balancing institutional needs.
Right here
Right now
Using pupil progress charts

Hover over the pupil progress chart below to find out what the colours represent. Then think about the task before selecting Play to view and listen to the animation. A text only version and transcript is available for download.

Task

Looking at the data in the pupil progress chart.

What are your initial thoughts?
What extra information do you want to find out before you draw conclusions?

When you are ready select ‘Play’ to hear the headteacher's initial thoughts.
Analytics in your VLE: *joules*: analytics for Moodle

Analytics in your VLE: OU VLE Reporting & Tracking tools

Summary stats on number of *views, edits and posts* to: Forum, Wiki, Blog, Structured Content, Quiz, External Quiz, Google Docs, Elluminate sessions...
Analytics in your VLE: Blackboard: feedback to students

http://www.blackboard.com/Platforms/Analytics/Overview.aspx
Analytics in your VLE:
Grockit: feedback to students prepping for standardized tests

https://grockit.com/research

<table>
<thead>
<tr>
<th>Sections &amp; Skills</th>
<th>Questions Answered</th>
<th>Average Time</th>
<th>Accuracy (Percent Correct)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GRE</strong></td>
<td>450</td>
<td>0:57</td>
<td>73%</td>
</tr>
<tr>
<td>Verbal</td>
<td>382</td>
<td>0:53</td>
<td>72%</td>
</tr>
<tr>
<td>Contrast</td>
<td>15</td>
<td>1:21</td>
<td>40%</td>
</tr>
<tr>
<td>Continuation</td>
<td>8</td>
<td>1:04</td>
<td>50%</td>
</tr>
<tr>
<td>Two Blank</td>
<td>43</td>
<td>1:13</td>
<td>53%</td>
</tr>
<tr>
<td>Sentence Completion</td>
<td>67</td>
<td>1:08</td>
<td>58%</td>
</tr>
<tr>
<td>Analogies</td>
<td>78</td>
<td>0:50</td>
<td>62%</td>
</tr>
<tr>
<td>One Blank</td>
<td>24</td>
<td>0:57</td>
<td>67%</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>291</td>
<td>0:47</td>
<td>72%</td>
</tr>
<tr>
<td>Antonyms</td>
<td>167</td>
<td>0:40</td>
<td>77%</td>
</tr>
<tr>
<td>Short Passage</td>
<td>25</td>
<td>1:20</td>
<td>84%</td>
</tr>
</tbody>
</table>
Analytics in your VLE: Desire2Learn visual analytics

http://www.desire2learn.com/demos/Analytics/

Online tools

Students
Social analytics start to become a commodity service

http://www.mzinga.com/software/tour.asp
My OU Story app: emotional state

Tony Hirst, Liam Green-Hughes, Stuart Brown
http://apps.facebook.com/myoustory
context

context

context
Video conferencing analytics
OU KMi’s Flashmeeting
Video conference spoken foreign language tutorials
— which mentor would you want to have?...
Video conferencing analytics
OU KMi’s Flashmeeting
Video conference spoken foreign language tutorials
— which mentor would you want to have?...
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Video conference spoken foreign language tutorials
—— which mentor would you want to have?...
Video conferencing analytics
OU KMi’s Flashmeeting
Video conference spoken foreign language tutorials
— which mentor would you want to have?...

Mentor 1 is doing the best job: at this introductory level, students need intensive input and flounder if left
Beyond data dashboards: predictive modelling
Probability models help us to identify patterns of success that vary between:

- student groups / areas of curriculum / study methods

Benefits

- provide a more robust comparison of module pass rates
- support the institution in identifying aspects of good performance that can be shared, and aspects where improvement could be realised

Best predictors of future success: previous OU study data – quantity and results
Purdue University Signals
Real time traffic-lights in the student VLE, based on a predictive model

http://www.itap.purdue.edu/studio/signals
Premise: **academic success** is defined as a function of **aptitude** (as measured by standardized test scores and similar information) and **effort** (as measured by participation within the CMS).

Using factor analysis and logistic regression, a model was tested to **predict student success based on**:

- ACT or SAT score
- Overall grade-point average
- CMS usage composite
- CMS assessment composite
- CMS assignment composite
- CMS calendar composite


Predicted 66%-80% of struggling students who needed help
this all feels rather traditional — isn’t there a learning revolution going on?!
“We are preparing students for jobs that do not exist yet, that will use technologies that have not been invented yet, in order to solve problems that are not even problems yet.”

“Shift Happens”
http://shifthappens.wikispaces.com
Learning analytics for this?

“The test of successful education is not the amount of knowledge that pupils take away from school, but their appetite to know and their capacity to learn.”

Sir Richard Livingstone, 1941
As these reshape our conception of the future of learning – they must also reshape our conception of the future of learning analytics... 

Tectonic shifts in the learning landscape...

**TECH:** cloud, personalised, real time, multimedia, mobile...

**FREE/OPEN:** is increasingly expected – I might pay later

**SOCIAL LEARNING:** innovation now depends on it

**VALUES:** autonomy, diversity, self-expression, participation

**POST-INDUSTRIAL:** new institutional roles in post-industrial education

Taken together, these are profound shifts in power, relationships, economics, infrastructure...

As these reshape our conception of the future of learning – they must also reshape our conception of the future of learning analytics...
analytics for C21 skills?
learning how to learn?
authentic enquiry?

social capital critical questioning argumentation
citizenship habits of mind resilience
collaboration creativity metacognition
identity readiness sensemaking
engagement motivation emotional intelligence
Analytics for learning dispositions and transferable skills
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>No, not at all like me</th>
<th>A little bit like me</th>
<th>Quite a lot like me</th>
<th>Yes, very much like me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I like it when I have to try really hard to understand something.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>When I am really interested in something I find it easy to learn.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>There is at least one person at home who is an important guide for me in my learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I like to question the things that I am learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I prefer to work on a problem on my own.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Validated as loading onto 7 dimensions of “Learning Power”

- Being Stuck & Static ↔ Changing & Learning
- Data Accumulation ↔ Meaning Making
- Passivity ↔ Critical Curiosity
- Being Rule Bound ↔ Creativity
- Isolation & Dependence ↔ Learning Relationships
- Being Robotic ↔ Strategic Awareness
- Fragility & Dependence ↔ Resilience

Univ. Bristol and Vital Partnerships provides practitioner resources and tools to support their application in schools and the workplace.
ELLI generates a 7-dimensional spider diagram of how the learner sees themself.

The Learning Warehouse
ELLI Profile <learner identifier>

- Changing and learning
  - Very much like me
- Critical Curiosity
- Meaning Making
- Learning relationships
- Strategic Awareness
- Creativity
- Resilience

Basis for a mentored-discussion on how the learner sees him/herself, and strategies for strengthening the profile.

Bristol and Open University are now embedding ELLI in learning software.
Adding imagery to ELLI dimensions to connect with learner identity

<table>
<thead>
<tr>
<th>Changing and Learning</th>
<th>Morphing Zone</th>
<th>Maggie Simpson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Relationships</td>
<td>Team Zone</td>
<td>Apu</td>
</tr>
<tr>
<td>Meaning Making</td>
<td>Jigsaw Zone</td>
<td>Nelson</td>
</tr>
</tbody>
</table>
Working with Gappuwyiyak School, N. Territory AUS
(Ruth Deakin Crick, University of Bristol)


Changing & Learning: The Drongo - Guwak

Strategic Awareness: Emu - Wurrpan

Meaning Making: The Pigeon - Nabalawal

Critical Curiosity: Sea Eagle - Djert

Resilience: Brolga - Gudurrku

Learning Relationships: The Cockatoo - Ngerrk

Creativity: Bower Bird - Djurwirr
ELLI generates cohort data for each dimension

<group identifier> Learning Power

- Changing & Learning
- Critical Curiosity
- Meaning Making
- Creativity
- Resilience
- Learning Relationships
- Strategic Awareness
...drilling down on a specific dimension
EnquiryBlogger: Tuning Wordpress as an ELLI-based learning journal

Standard Wordpress editor

Categories from ELLI

Plugin visualizes blog categories, mirroring the ELLI spider
EnquiryBlogger dashboard
Learning Emergence

more on analytics for learning to learn and authentic enquiry

Deep Learning

Ruth Deakin Crick: Introducing ELLI from CarnegieViews on Vimeo.
Analytics for learning conversations
Effective learning conversations display some typical characteristics which learners can and should be helped to master.

Learners’ written, online conversations can be analysed computationally for patterns signifying weaker and stronger forms of contribution.
Socio-cultural discourse analysis
(Mercer et al, OU)

- **Disputational talk**, characterised by disagreement and individualised decision making.

- **Cumulative talk**, in which speakers build positively but uncritically on what the others have said.

- **Exploratory talk**, in which partners engage critically but constructively with each other's ideas.

Socio-cultural discourse analysis (Mercer et al, OU)

- **Exploratory talk**, in which partners engage critically but constructively with each other's ideas.
  
  - Statements and suggestions are offered for joint consideration.
  
  - These may be challenged and counter-challenged, but challenges are justified and alternative hypotheses are offered.
  
  - Partners all actively participate and opinions are sought and considered before decisions are jointly made.
  
  - Compared with the other two types, in Exploratory talk knowledge is made more publicly accountable and reasoning is more visible in the talk.

Analytics for identifying Exploratory talk

Elluminate sessions can be very long – lasting for hours or even covering days of a conference. It would be useful if we could identify where quality learning conversations seem to be taking place, so we can recommend those sessions, and not have to sit through online chat about virtual biscuits.

Ferguson, R. and Buckingham Shum, S. Learning analytics to identify exploratory dialogue within synchronous text chat. 1st International Conference on Learning Analytics & Knowledge (Banff, Canada, 27 Mar-1 Apr, 2011)
### Defining indicators of *Exploratory Talk*

<table>
<thead>
<tr>
<th>Category</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge</td>
<td>But if, have to respond, my view</td>
</tr>
<tr>
<td>Critique</td>
<td>However, I’m not sure, maybe</td>
</tr>
<tr>
<td>Discussion of resources</td>
<td>Have you read, more links</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Good example, good point</td>
</tr>
<tr>
<td>Explanation</td>
<td>Means that, our goals</td>
</tr>
<tr>
<td>Explicit reasoning</td>
<td>Next step, relates to, that’s why</td>
</tr>
<tr>
<td>Justification</td>
<td>I mean, we learned, we observed</td>
</tr>
<tr>
<td>Reflections of perspectives of others</td>
<td>Agree, here is another, makes the point, take your point, your view</td>
</tr>
<tr>
<td>Time</td>
<td>Contribution</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2:42 PM</td>
<td>I hate talking. :-P My <strong>question</strong> was whether &quot;gadgets&quot; were just basically widgets and we could embed them in various web sites, like Netvibes, Google Desktop, etc.</td>
</tr>
<tr>
<td>2:42 PM</td>
<td>Thanks, that's great! I am sure I understood everything, but looks inspiring!</td>
</tr>
<tr>
<td>2:43 PM</td>
<td>Yes <strong>why</strong> OU tools not generic tools?</td>
</tr>
<tr>
<td>2:43 PM</td>
<td>Issues of interoperability</td>
</tr>
<tr>
<td>2:43 PM</td>
<td>The &quot;new&quot; SocialLearn site looks a lot like a corkboard where you can add various widgets, similar to those existing web start pages.</td>
</tr>
<tr>
<td>2:43 PM</td>
<td><strong>What if</strong> we end up with as many apps/gadgets as we have social networks and then we need a recommender for the apps!</td>
</tr>
<tr>
<td>2:43 PM</td>
<td>My <strong>question</strong> was on the definition of the crowd in the wisdom of crowds we access in the service model?</td>
</tr>
<tr>
<td>2:43 PM</td>
<td>there are various different flavours of widget e.g. Google gadgets, W3C widgets etc. SocialLearn has gone for Google gadgets</td>
</tr>
</tbody>
</table>
Discourse analysis (Xerox Incremental Parser)

Detection of salient sentences based on rhetorical markers:

BACKGROUND KNOWLEDGE:
Recent studies indicate …
… the previously proposed …
… is universally accepted …

NOVELTY:
... new insights provide direct evidence …
... we suggest a new … approach …
... results define a novel role …

OPEN QUESTION:
... little is known …
... role … has been elusive
Current data is insufficient …

CONTRASTING IDEAS:
... unorthodox view resolves …
paradoxes …
In contrast with previous hypotheses …
... inconsistent with past findings …

SIGNIFICANCE:
studies ... have provided important advances
Knowledge … is crucial for … understanding
valuable information ... from studies

SUMMARIZING:
The goal of this study …
Here, we show …
Altogether, our results … indicate

GENERALIZING:
... emerging as a promising approach
Our understanding … has grown exponentially …
... growing recognition of the importance …

SURPRISE:
We have recently observed …
surprisingly
We have identified … unusual
The recent discovery … suggests intriguing roles

Ágnes Sándor & OLnet Project: http://olnet.org/node/512

Learning Analytics stories from the near future
In your last discussion with your mentor, you decided to work on your resilience by taking on more learning challenges.

Your ELLI Spider shows that you have made a start on working on your resilience, and that you are also beginning to work on your creativity, which you identified as another area to work on.

Course Application: Analytics Report

Application from Ali Bloggs to study Z0001

This applicant has a high risk profile:
1. No academic study for last 15 years
2. Low socio-economic background
3. English as a second language
4. Weak ICT skills
5. His responses to the learning styles survey indicate a loner, rather than a collaborative learner, known to be a disadvantage on this course

Without a Grade 3 tutor (advanced skills in 1-1 support), based on the last 5 years data there is a 37% chance of dropping out by Week 6. Recruiting this tutor will take you over budget.

Recommended decision: REJECT

[ACCEPT] [REJECT]
“Hi Sue,

In the last 2 weeks, it looks like you’ve been really stretching yourself. You seem to have been working on your critical thinking, with that challenge to Mike’s assumption, and the evidence-based claim about nuclear waste in your blog.

Check out Donna Winter, who seems to have very different views to yours on global warming. How would you assess her position?

In your next video conference tutorial, try to improve on the last three when you seem to have contributed only once each time.”
“Did you know that two other people you know have used the Smith & Jones 2009 framework graphic?

Finally, you seem to have really become a pivotal member of the Local-Global Climate Network. Good work: only a month ago you were on the edge!

Why not reflect in your blog on how these groups are helping you in your long term goal to Work for the UN in Africa?”
Learner 2020 Project:
Analytics report to Rachel Richards:

3761 students are working from 27 resources, 4 of them provided by the course.

Presentation of SNA viz. to Experimental Grp.1 resulted in 79% of outlying community members taking at least 1 of the recommended actions and moving themselves to more strategic positions in the network: 35% towards the centre, 17% to broker with another relevant network, and 27% with a low-relevance network.

Currently, this represents a statistically significant effect according to Hypothesis 1 (p<0.05)
Dear Les,

Please find below key headlines [full report]:

• **29 students** have engaged in at least one empathic conversation with a peer. This is below the 5 year mean for 2012-17, but 10% better than last year. Your arrival on the course has made an impact!

• **13 students** display low resilience when stretched, at levels predictive of failure to complete. Please review the mentoring recordings to verify that appropriate interventions are in place.

• **Biometric data** indicate abnormally high levels of distress in **3 students** whenever team working is mentioned.
Closing thoughts
Who gets to define, and hold, the magnifying glass?
Learning Analytics should provide mirrors for learners to become more reflective, and less dependent
As Big Data and Analytics mature we will see the convergence of…
As Big Data and Analytics mature we will see the convergence of... voluntarily shared learner data
As Big Data and Analytics mature we will see the convergence of...
Power Learning Analytics Pedagogy Principles
timely interventions  empowered, reflective learners

a living evidence-base  open interoperable LA

regressive pedagogy  learners disempowered

HEI “vs” learner interests

over-optimistic, decontextualised claims about predictive power
Simon Buckingham Shum
Knowledge Media Institute, The Open University UK

Slides now up: simon.buckinghamshum.net
@sbskmi

This keynote is dedicated to my Father

Jonathan Chung-Hin Shum
4 Jan. 1930 – 27 Nov. 2011