The power of learning analytics for teaching and academic development?

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Professor of Learning Analytics
A special thanks to Avinash Boroowa, Shi-Min Chua, Simon Cross, Doug Clow, Chris Edwards, Rebecca Ferguson, Mark Gaved, Christothea Herodotou, Martin Hlosta, Wayne Holmes, Garron Hillaire, Simon Knight, Nai Li, Vicky Marsh, Kevin Mayles, Jenna Mittelmeier, Vicky Murphy, Quan Nguyen, Tom Olney, Lynda Prescott, John Richardson, Saman Rizvi, Jekaterina Rogaten, Matt Schencks, Mike Sharples, Dirk Tempelaar, Belinda Tynan, Lisette Toetenel, Thomas Ullmann, Denise Whitelock, Zdenek Zdrahal, and others...
What is the first thing that comes to mind when you hear the term "Learning Analytics"?

When poll is active, respond at PollEv.com/bartrienties552

Text BARTRIENTIES552 to 020 3322 5822 once to join
What is wrong with this holy grail?

1. There is a male teacher
2. There is no connection from the student to the teacher
3. There is no connection from the student to the dashboard
4. There is no circular flow
5. All above
6. Wrong: this is the holy grail
Big Data is messy!!!
Option 1: Do a long solo from beginning of the race:
Boston Mayor Cup 2015: Emma Grant

Option 2: Be the strongest on final climb: WC 2012
Marianne Vos

Option 3: Wait and be the fastest in final peloton sprint:
2013 Marianne Vos

Option 4: Break away from peloton in final lap like WC
2017 Chantal Blaak
Based upon the data, Bart won the Eurotransplant road race because he:

1. Did a long solo from the start of the race like Emma
2. Was the strongest on final climb like Marianne
3. Was the strongest in the bunch sprint like Marianne (again)
4. Broke away from peloton like Chantal
5. This is impossible to tell from this data
Prof Paul Kirschner (OU NL)
“Learning analytics: Utopia or dystopia”, LAK 2016 conference

“I’m searching for my keys.”
Learning Design is described as “a methodology for enabling teachers/designers to make more informed decisions in how they go about designing learning activities and interventions, which is pedagogically informed and makes effective use of appropriate resources and technologies” (Conole, 2012).
### Open University Learning Design Initiative (OULDI)

<table>
<thead>
<tr>
<th>Type of activity</th>
<th>Assimilative</th>
<th>Finding and handling information</th>
<th>Communication</th>
<th>Productive</th>
<th>Experiential</th>
<th>Interactive/Adaptive</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of activity</td>
<td>Attending to information</td>
<td>Searching for and processing information</td>
<td>Discussing module related content with at least one other person (student or tutor)</td>
<td>Actively constructing an artefact</td>
<td>Applying learning in a real-world setting</td>
<td>Applying learning in a simulated setting</td>
<td>All forms of assessment, whether continuous, end of module, or formative (assessment for learning)</td>
</tr>
</tbody>
</table>

**Examples of activity**

- **Assimilative:** Read, Watch, Listen, Think about, Access, Observe, Review, Study
- **Finding and handling information:** List, Analyse, Collate, Plot, Find, Discover, Access, Use, Gather, Order, Classify, Select, Assess, Manipulate
- **Communication:** Communicate, Debate, Discuss, Argue, Share, Report, Collaborate, Present, Describe, Question
- **Productive:** Create, Build, Make, Design, Construct, Contribute, Complete, Produce, Write, Draw, Refine, Compose, Synthesise, Remix
- **Experiential:** Practice, Apply, Mimic, Experience, Explore, Investigate, Perform, Engage
- **Interactive/Adaptive:** Explore, Experiment, Trial, Improve, Model, Simulate
- **Assessment:** Write, Present, Report, Demonstrate, Critique


<table>
<thead>
<tr>
<th>Week</th>
<th>Assimilative</th>
<th>Finding information</th>
<th>Communication</th>
<th>Productive</th>
<th>Experiential</th>
<th>Interactive/Adaptive</th>
<th>Assessment</th>
<th>Total hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>10</td>
<td>1.5</td>
<td>1</td>
<td>0.6</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
<td>13.35</td>
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<tr>
<td>Week 2</td>
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<td>0.6</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>6.2</td>
<td>15.40</td>
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<tr>
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<td>2.2</td>
<td>2.85</td>
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<td>0</td>
<td>5.3</td>
<td>14.65</td>
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<tr>
<td>Week 4</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Week 5</td>
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<td>0.4</td>
<td>4.3</td>
<td>1.8</td>
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<td>0</td>
<td>3.1</td>
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<td>0</td>
<td>0.7</td>
<td>10.95</td>
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<td>Week 8</td>
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<td>0.7</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
<td>5.95</td>
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<td>0</td>
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<td>0.7</td>
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<td>0</td>
<td>0.1</td>
<td>6.95</td>
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<td>0</td>
<td>0</td>
<td>2.65</td>
<td>15.09</td>
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<td>0.5</td>
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<td>0.6</td>
<td>0</td>
<td>0</td>
<td>1.6</td>
<td>13.08</td>
</tr>
</tbody>
</table>

Total: 131.5 hours (Avg: 12.16, StdDev: 6.28)
Merging big data sets

- Learning design data (>300 modules mapped)
- VLE data
  - >140 modules aggregated individual data weekly
  - >37 modules individual fine-grained data daily
- Student feedback data (>140)
- Academic Performance (>140)
- Predictive analytics data (>40)
- Data sets merged and cleaned
- 111,256 students undertook these modules
<table>
<thead>
<tr>
<th>A</th>
<th>1. Has a lot of stuff and assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>2. Has a lot of assessment</td>
</tr>
<tr>
<td>C</td>
<td>3. Is very interactive</td>
</tr>
<tr>
<td>D</td>
<td>4. Has lots of productive activities</td>
</tr>
</tbody>
</table>
69% of what students are doing in a week is determined by us, teachers!

So what happens when you give learning design visualisations to teachers?

So what happens when you give learning visualisations to teachers?

1. Nothing, as teachers know what they are doing
2. More assimilative activities
3. More socio-constructivist activities (e.g., communication)
4. More assessment
So what happens when you give learning analytics data about students to teachers?

1. How did 240 teachers within the 10 modules made use of PLA data (OUA predictions) and visualisations to help students at risk?

2. To what extent was there a positive impact on students' performance and retention when using OUA predictions?

3. Which factors explain teachers' uses of OUA?
Regression analysis

Which factors better predict pass and completion rates?

Student characteristics:
- Age
- Gender
- New/continuous
- Disability
- Ethnicity
- Education
- IMD band
- Best previous score
- Sum of previous credits

Teacher characteristics:
- Module presentations per teacher
- Students per module presentation
- OUA usage

So after students' initial performance, what is the biggest predictor of passing a module?

1. Age of student
2. Ethnicity
3. Socio-economic background
4. Quality of the teacher
5. The use of OU Analyse by the teacher
Logistic regression results (pass rates)

Significant model (pass: $\chi^2 = 76.391$, $p < .001$, df = 24).

- Nagelkerke’s R2 = .185 (model explains 18% of the variance in passing rates)
- Correctly classified over 70% of the cases (prediction success overall was 70.2%: 33.5% for not passing a module and 88.7% for passing a module).
- Significant predictors of both pass and completion rates:
  - OUA usage ($p = .006$)
  - Best previous module score achieved ($p = .005$)
  - All other predictors were not significant.

Conclusions and moving forwards

1. Teachers and professional development key in world of learning analytics

2. Learning design and teachers strongly influences student engagement, satisfaction and performance

3. Learning analytics can be quite powerful to understand complexities of learning in- and outside class
Conclusions and moving forwards

1. Learning analytics approaches can help researchers and practitioners to test and validate **big and small** theoretical questions

2. I am open for any collaborations or any wild ideas 😊
The power of learning analytics for teaching and academic development?

Slides available on Slideshare: https://www.slideshare.net/BartRienties

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