



Data in Schools Symposium, University of Technology Sydney • 9<sup>th</sup> Nov 2018

[#UTSDatainSchools](#)

# Learning Analytics & AI go to School

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**UTS:  CIC**  
CONNECTED INTELLIGENCE CENTRE

 **W.v.Ravenstein**  
@Wiswijzer2 Follow

Opmerkelijk: check het enorme verschil tussen weten en meten....  
[#learninganalytics pic.twitter.com/PfrAGAEGsP](https://pic.twitter.com/PfrAGAEGsP)

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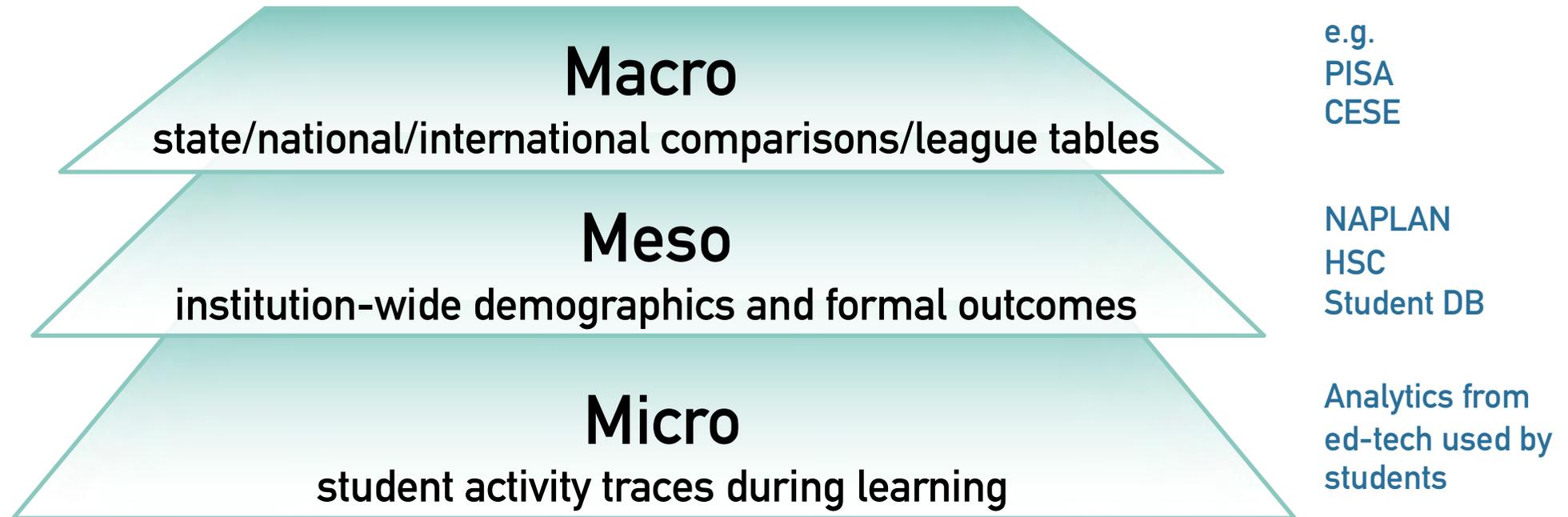


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3:31 PM - 20 Dec 2013 Flag media

“Note: check the huge difference between knowing and measuring...”

# Analytics in education



# Analytics in education

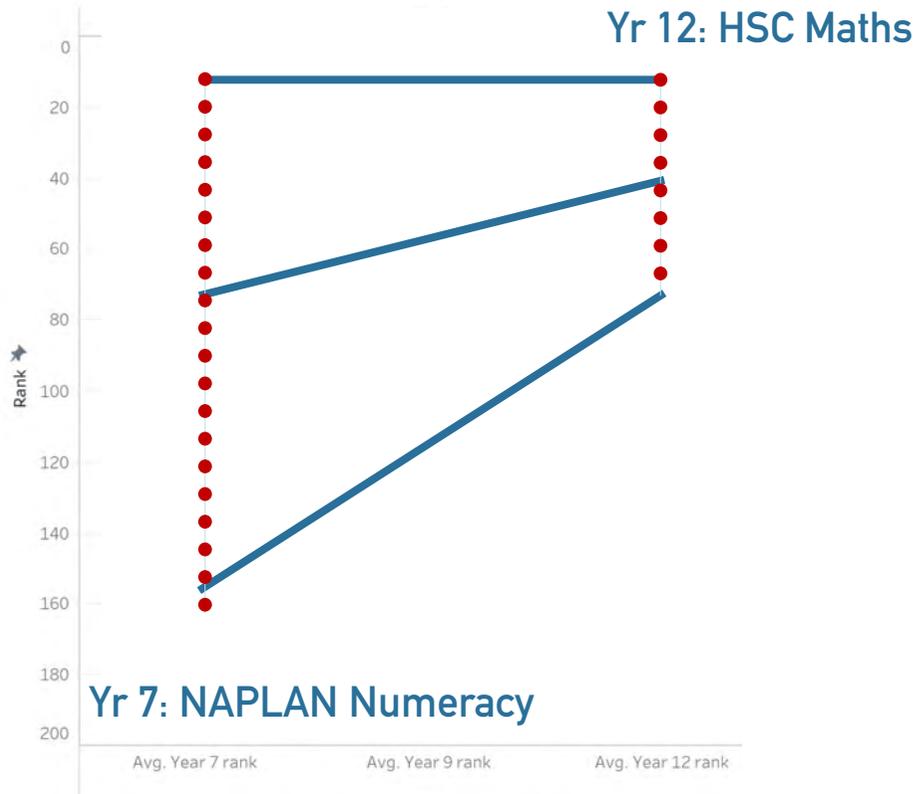


# A local example: Does NAPLAN predict HSC?

Mount St. Benedict school & UTS (Dorotea Baljevic, Master of Data Science & Innovation)

Rank of student path from Year 7 to Year 12

Naplan to HSC (Numeracy/Mathematics)  
2010, 2012 Cohort

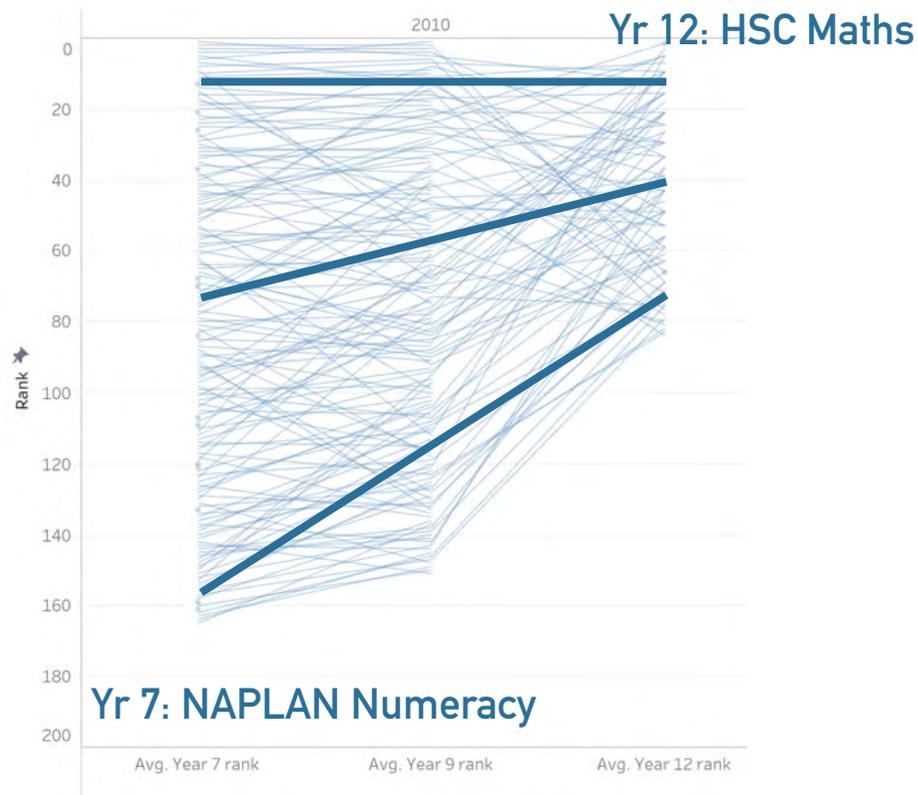


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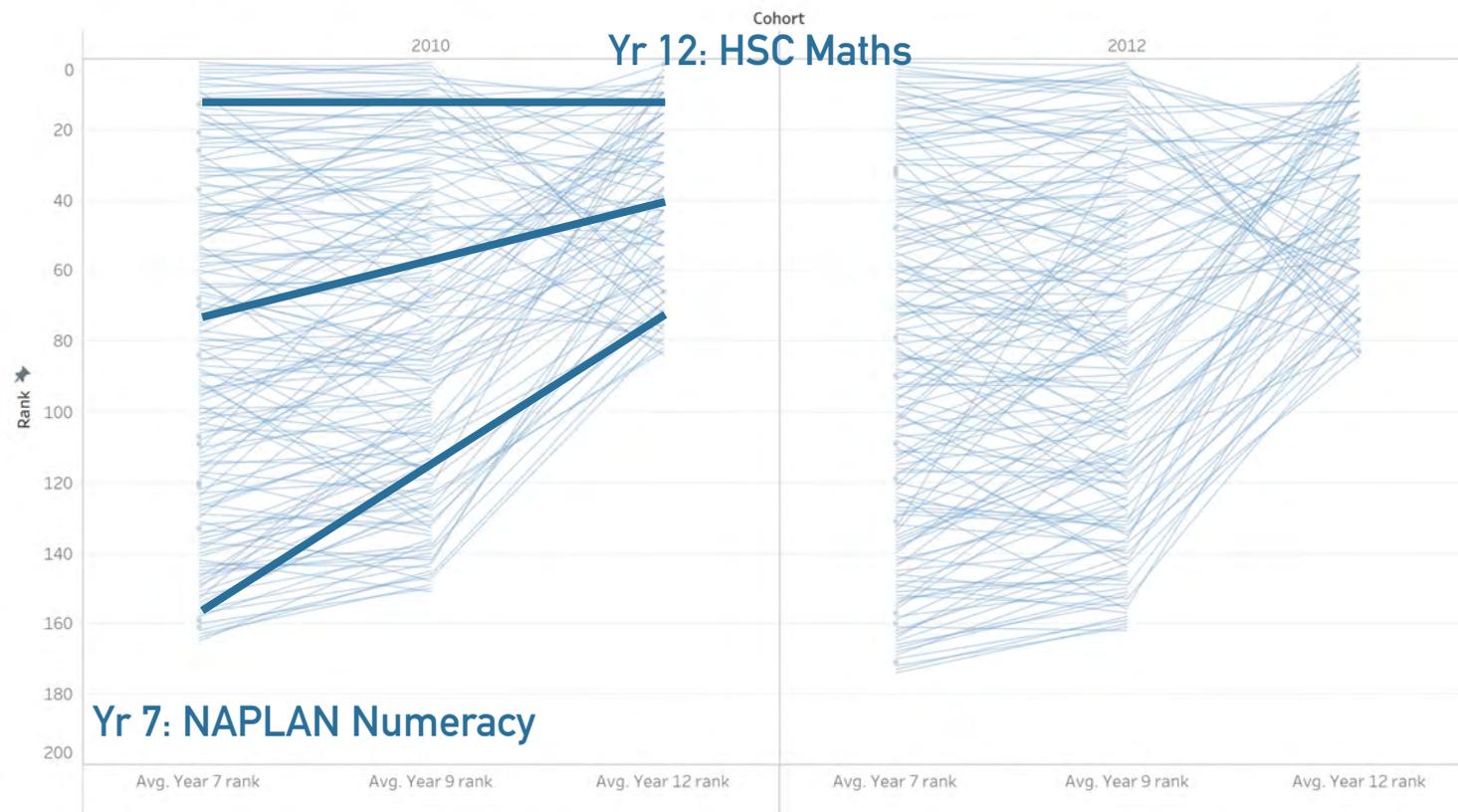
# NAPLAN Numeracy did predict HSC Mathematics

Mount St. Benedict school & UTS (Dorotea Baljevic, Master of Data Science & Innovation)

Rank of student path from Year 7 to Year 12

Naplan to HSC (Numeracy/Mathematics)

2010, 2012 Cohort



## Key Finding

Overall rankings do not seem to cross over and students who are high performers continue to rank highly, and vice versa, for Maths

*N.B. it seems that students move to other schools post Year 9*

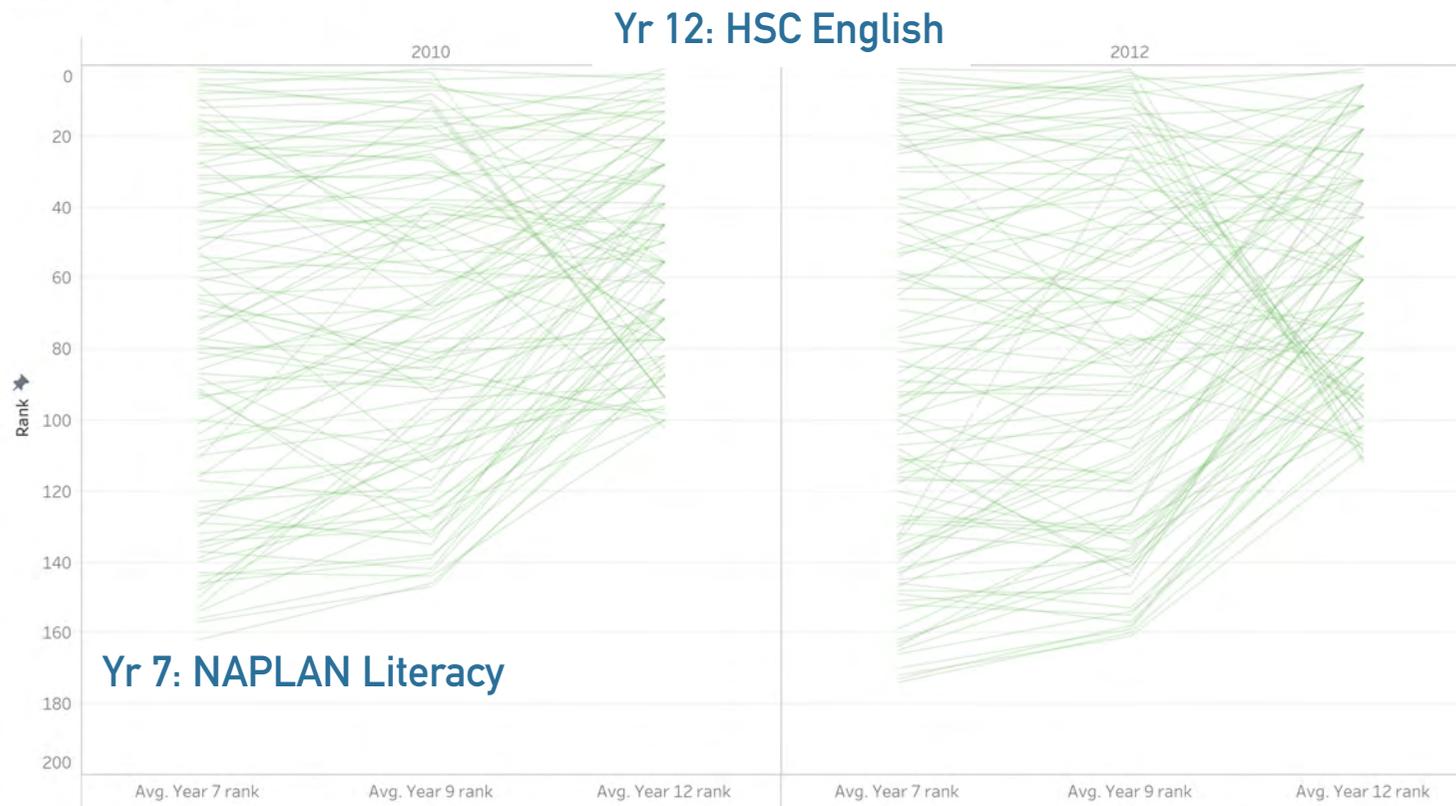
# NAPLAN Literature did NOT predict HSC English

Mount St. Benedict school & UTS (Dorotea Baljevic, Master of Data Science & Innovation)

Rank of student path from Year 7 to Year 12

Naplan to HSC (Literature/English)

2010, 2012 Cohort



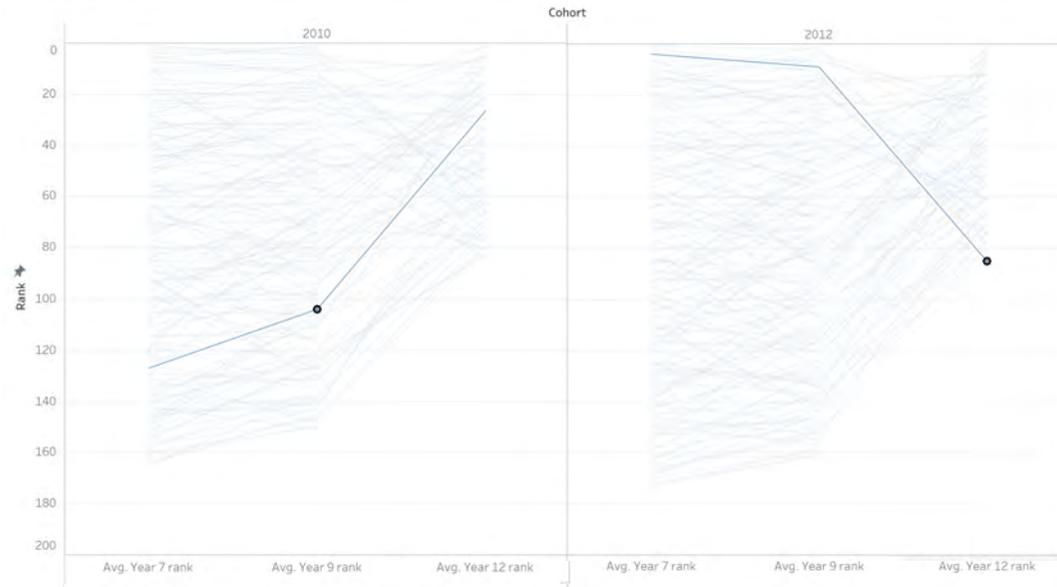
# Is this intelligence actionable?

Would it help you to know that (statistically) a student is predicted to do poorly (or well) in HSC Maths? What would you do differently?

What if they're  
'atypical'?

e.g.

Naplan to HSC (Numeracy/Mathematics)  
2010, 2012 Cohort



## Student 1 Example

Year 7: 7<sup>th</sup> percentile  
Year 12: 4<sup>th</sup> percentile

## Student 2 Example

Year 7: Top (1<sup>st</sup>) percentile  
Year 12: Last (10<sup>th</sup>) percentile

# What do conventional meso-level analytics tell us about...

What are students struggling with this week?

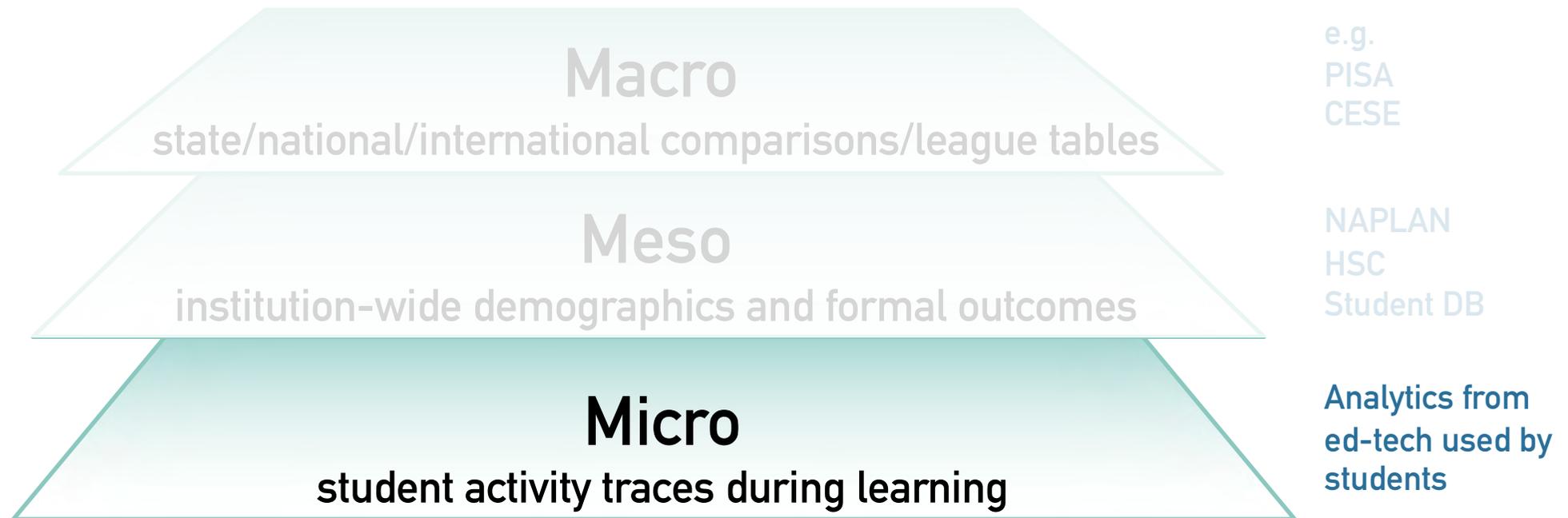
Student readiness for a lesson?

Students' learning strategies

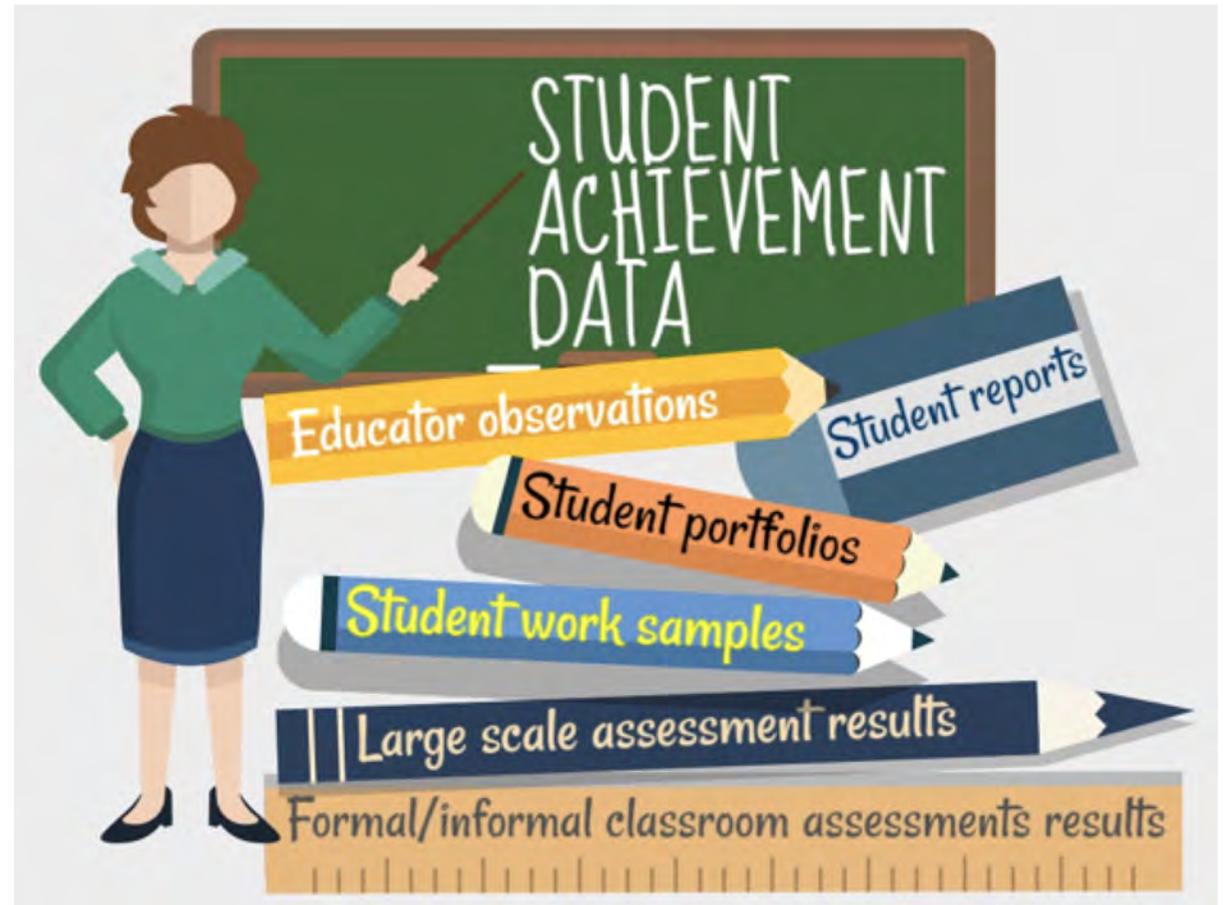
Students' collaboration skills, or resilience?

# Nothing.

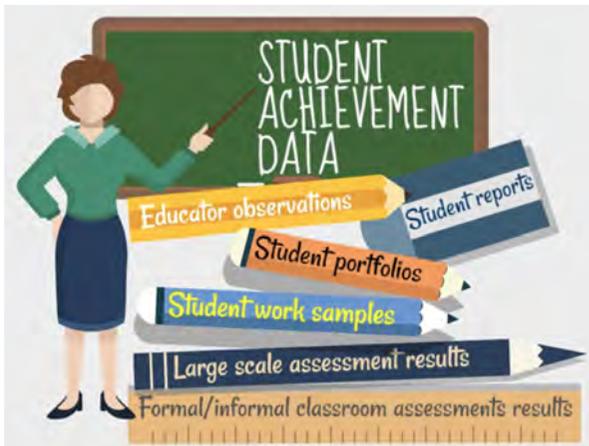
# Analytics in education



# Analytics in education



# Every educational product now comes with a “dashboard”... = “we can count stuff”. Does this tell us much about learning?



**Analytics Overview**

**Business Unit**

- Manufacturing
- Human Resources
- Marketing and Sales
- Learning and Development

**Key Metrics**

- Revenue: \$10,123,751
- Profit: \$2,345,678
- Customer Satisfaction: 4.5/5
- Employee Retention: 92%

**Learning and Development Dashboard**

**Pedagogic behaviour** → **Learning activities** → **Pedagogic consequences**

**360 Connector for Working**

**AlmaLOGIC e-Learning Intelligence Platform**

**Education Data**

- Macro: Regional/State/National
- Meso: Institutional
- Micro: Instructor/Learner

**Student 2 - Observation & Analysis**

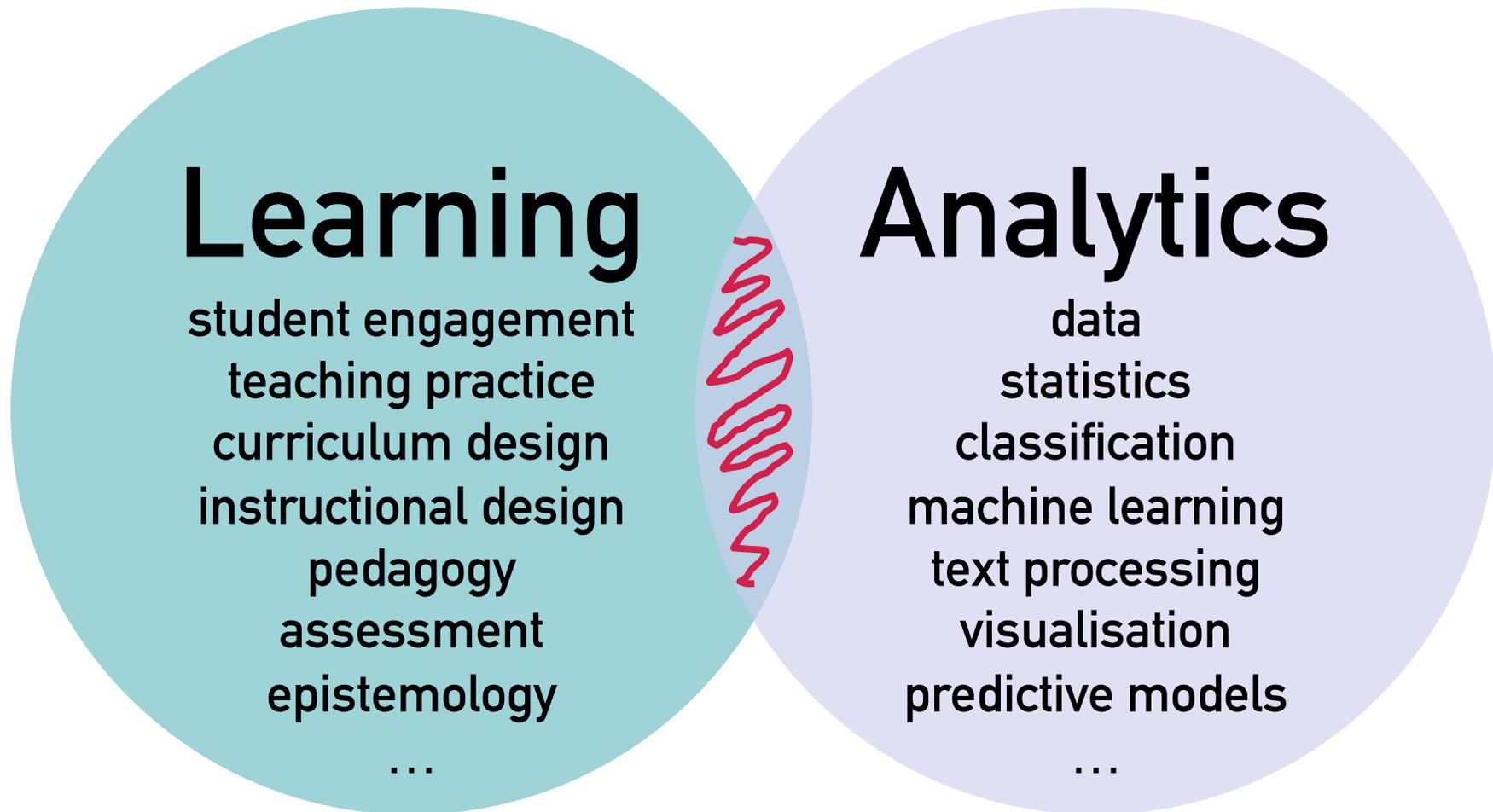
**Week 5**

Activity	Score
Module 5 Instructions	42
Online Streaming	30
Video Downloads	11
Mobile	10
Web-Quest: The Influenza Epidemic of 1918	75
Video Clip: Century - Shall Shock	23
Video clip: Stalin's Purge	9
Module 5: Pictures From The Inter War Years	21
Reaction Paper Assignment: Submit here	31

**Assessment Results**

Question	don't know	not at all	a little	very much	not at all a little	very much
1. Breaches of privacy and intrusion in personal affairs	13.8%	20.3%	42.3%	23.6%	65.8%	34.1%
2. Ethical principles of law, political and religious beliefs, ethnic origin	16.3%	38.2%	38.6%	8.9%	44.9%	45.5%
4. Freedom of expression	17.1%	38.4%	39.1%	15.3%	53.7%	46.4%
5. Ownership rights and intellectual property	13.8%	26.0%	33.3%	26.8%	39.8%	60.1%

# What is Learning Analytics?



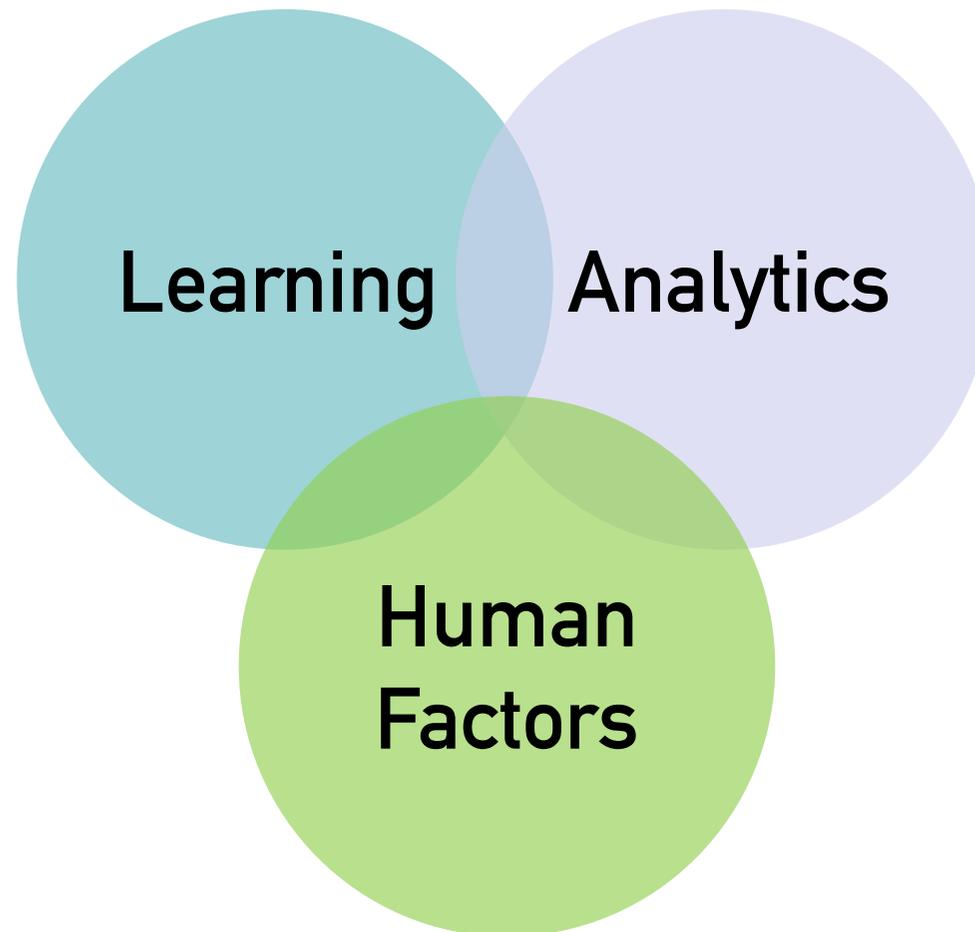
**this is not a straightforward dialogue!**

A key circle is missing...

# Human Factors

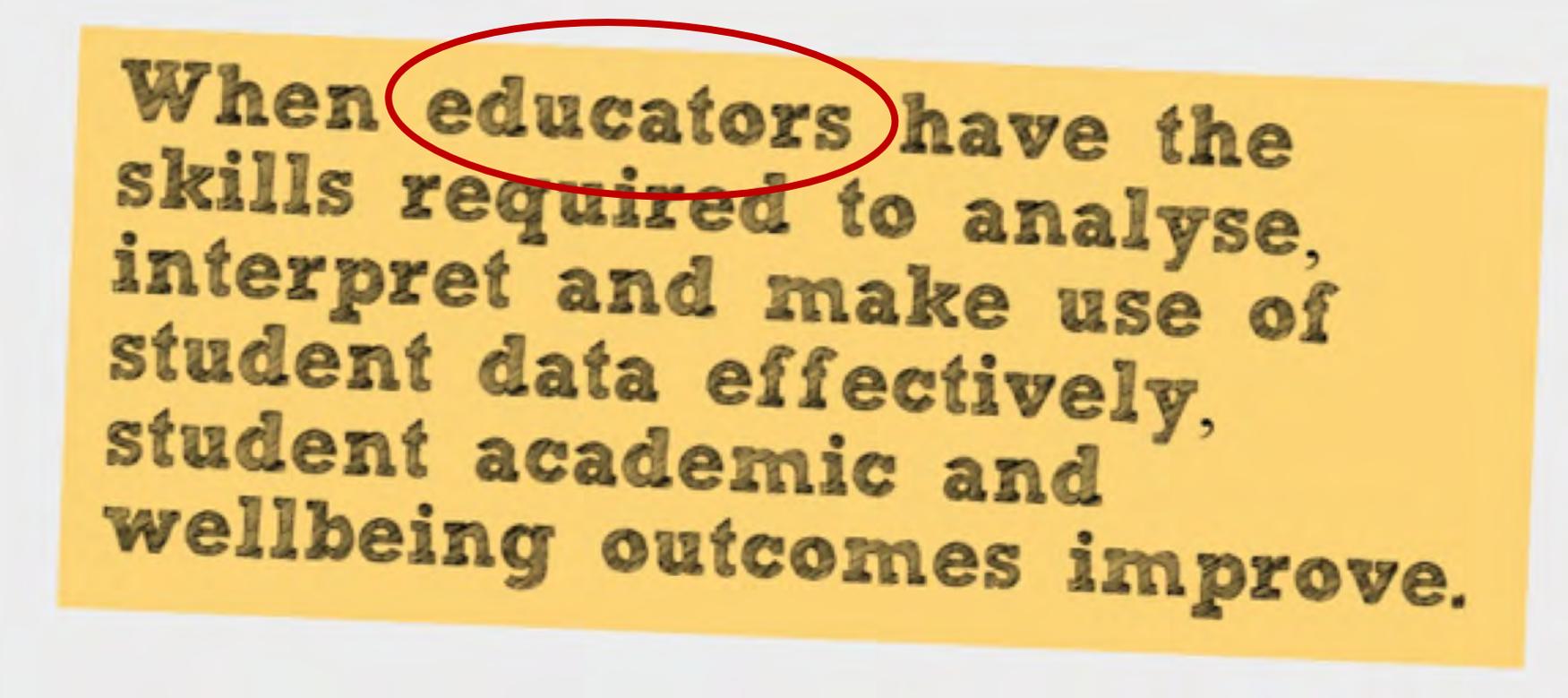
stakeholder involvement  
participatory design cycles  
user interface design  
privacy and ethics  
end-user evaluation  
organisational strategy  
staff training

# Learning Analytics: A Human-Centred Design Discipline



# What's really new about Learning Analytics?

## learners?



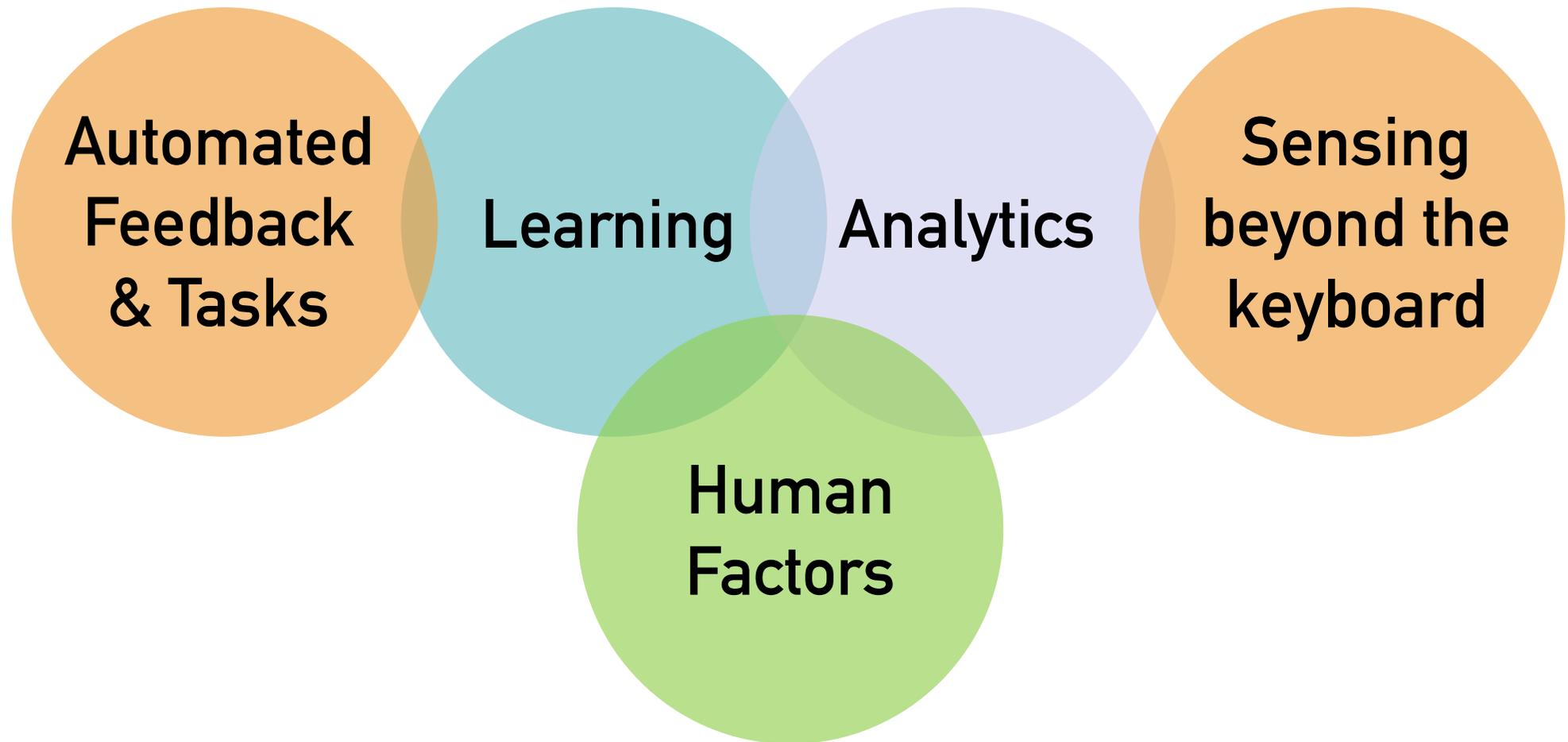
When **educators** have the skills required to analyse, interpret and make use of student data effectively, student academic and wellbeing outcomes improve.

# What's really new about Learning Analytics?

“The potential of learning analytics is arguably far more significant than as an enabler of data-intensive educational *research*, exciting as this is.

The new possibility is that **educators and learners** — the stakeholders who constitute the learning system studied for so long by researchers — are for the first time able to see their **own processes and progress** rendered in ways that until now were the preserve of researchers outside the system.” (p.17)

## So where does Artificial Intelligence fit in?



## So where does Artificial Intelligence fit in?

**AI**

now the computer  
has **greater agency**

e.g.

“adaptive learning”: tune the task  
to each learner’s current ability

give personalised feedback based  
on the learner’s progress

chatbots/avatars

**AI**

now the computer can  
**sense more of the human world**

e.g.

speech, gestures, posture,  
physiology, facial expression...

+ mobile and sensor data:  
use of physical tools,  
location, other apps...

**mastering core mathematics  
through practice on increasingly  
challenging examples  
with automated feedback  
and human coaching**

**good evidence: human + AI tutors  
perform better than human alone**

# StatTutor: intelligent tutoring for statistics

The screenshot shows the StatTutor interface. On the left is a navigation pane with a 'WORK PLAN' section containing: 'Understand the Problem' (checked), 'Question 1' (selected), 'Q2', 'Reflect on Question' (checked), 'Analyze Data' (expanded) with sub-items 'Plan Analyses' (checked), 'Exploratory Analysis' (checked) including 'Determine displays and measures', 'Conduct Analysis', and 'Report Results'; 'More Formal Analyses' including 'Determine more formal analyses', 'Conduct Analysis', and 'Report Results'; 'Draw Conclusions' (expanded) with 'Summarize'. The main area has tabs for 'Problem', 'Questions', 'Variables', and 'About'. Under 'Questions', two questions are listed. Below them is a section titled 'Determine Displays and Measures (Question One)'. It asks for a meaningful display and a numerical summary, with a list of options: Side-by-side boxplots, Scatterplot, Two-way table, Piechart, and Histogram. A hint box at the bottom says 'Hint: Think about how you classified the relevant variable for this question.' and has a 'get next hint' button.

“In this study, results showed that OLI-Statistics students [blended learning] learned a full semester’s worth of material in half as much time and performed as well or better than students learning from traditional instruction over a full semester.”

Lovett, M., Meyer, O. and Thille, C., (2008). The Open Learning Initiative: Measuring the Effectiveness of the OLI Statistics Course in Accelerating Student Learning. *Journal of Interactive Media in Education*, (1), p.Art. 13. DOI: <http://doi.org/10.5334/2008-14>

# ASSISTments for Homework Support Project

Neil Heffernan's R&D program:  
<http://www.neilheffernan.net>

<https://www.assistments.org>

LEARNING INCREASE WITH IMMEDIATE FEEDBACK ON TEXTBOOK AND SKILL HOMEWORK

THE USE OF ASSISTMENTS CAUSED 75% MORE LEARNING THAN IN A TYPICAL YEAR

This finding resulted in \$7 million in new funding from IES. Go to our [recruitment website](#) to find out how teachers in your district can get free training and participate in the followup to this study.



The screenshot shows a comparison of learning outcomes between two groups. On the left, a control group is represented by a blue background with 10 yellow stars and 10 yellow speech bubbles. On the right, an experimental group using ASSISTments is represented by an orange background with 10 green stars and 10 green speech bubbles. A play button is visible in the center of the screenshot.

“I am proud to share the reporting on an efficacy trial conducted by SRI of ASSISTments. These results ...showed ASSISTments caused 75% more learning than is typical in a year.”

Roschelle, J., Feng, M., Murphy, R. F., & Mason, C. A. (2016). Online Mathematics Homework Increases Student Achievement. *AERA Open*, 2, (4), 1-12. <http://doi.org/10.1177/2332858416673968>

<http://www.aboutus.assistments.org/homework-immediate-feedback---1-year-study.php>

# ASSISTments for Homework Support Project

Student/Problem --- [Unanonymize]	Average↕	PRABFCGH↕	PRABFCGJ↕	PRABFCGK↕			
Problem Average <a href="#">Graph</a>	72%	82%	42%	81%			
Common Wrong Answers		A., 50% <a href="#">+feedback</a>	C., 42% <a href="#">+feedback</a> A., 34% <a href="#">+feedback</a> D., 23% <a href="#">+feedback</a>	B., 76% <a href="#">+feedback</a>			
		B.	B.	A. , C. , D.	B.		A. , B. , D.
	2%	✓ B. 100%	✓ B. 100%	✓ A. , C. , D. 100%	✓ B. 100%		
<a href="#">XXXXXXXX</a>	23%	✓ B. 100%	✗ A. 0%	✗ A. , C. 33%	✓ B. 100%	A. 0%	B. , D. 66%

Percent correct per problem. This data identifies class weakness helping you drive your instruction.

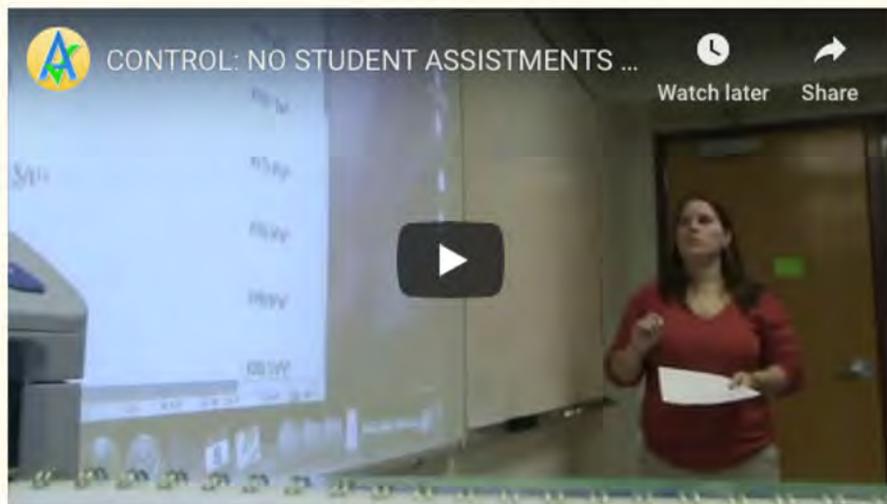
Common Wrong Answers present clues as to why students answer incorrectly.

76% of the incorrect answers were B. The percent will be in red if it is over 50%.

# ASSISTments for Homework Support Project

## WITHOUT THE REPORT

Teacher begins homework review by displaying answers and having students review their work. Then students ask questions if they want.



*"Get out your homework form last night. Here are the answers, use them to check your work. Raise your hand if you have a question."*

## WITH THE REPORT

Teacher begins by displaying the report and asking about the common wrong answer, then reviewing the problems with low percent correct.



*"Let's start with this question since only 27% of you got it correct. Why did 56% of you make the same common wrong answer of  $1/9 \wedge 10$ ?"*

<http://www.aboutus.assistments.org/getting-started-textbook.php>

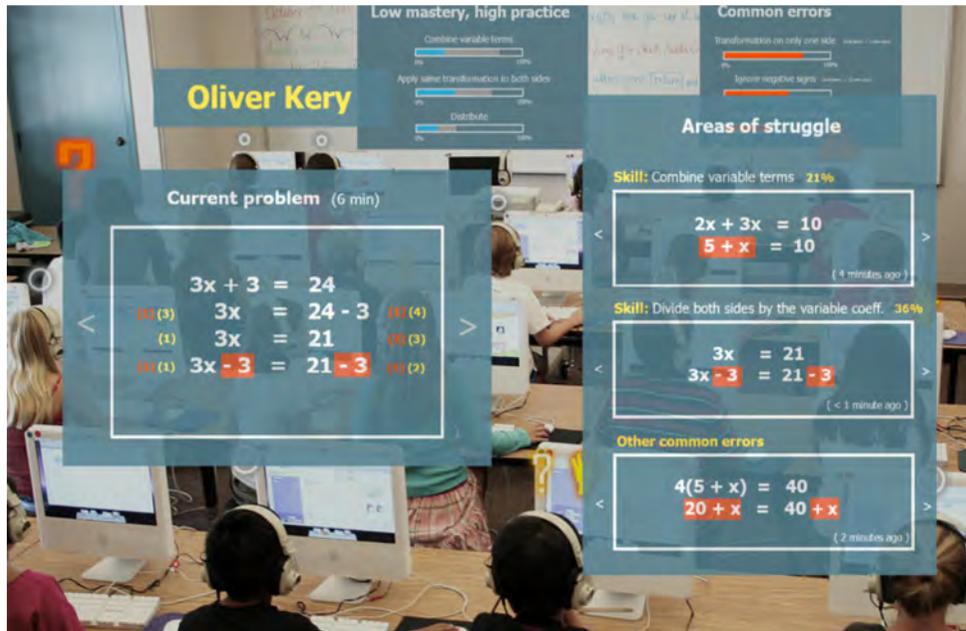
# What if teachers could see student progress in the classroom as they looked around?



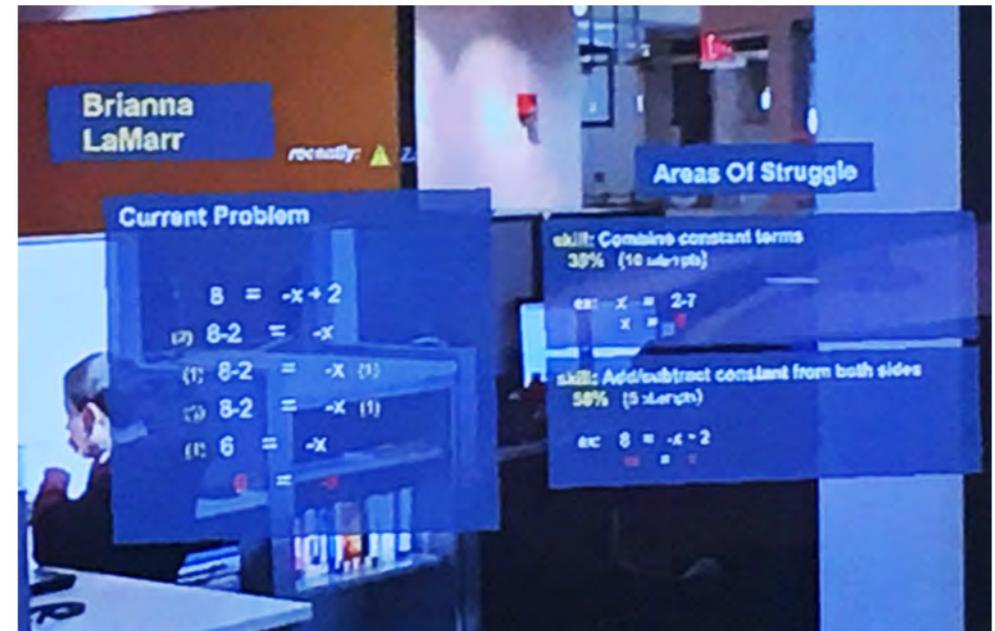
Design mock-up of what a teacher might see via augmented reality smart glasses – classroom overview –

Software prototype

# What if teachers could see student progress in the classroom as they looked around?



Design mock-up of what a teacher might see via augmented reality smart glasses – focus on a student –



Software prototype

but adaptive tutors are expensive  
to develop, and restricted to  
subjects in which the level of  
mastery can be modelled

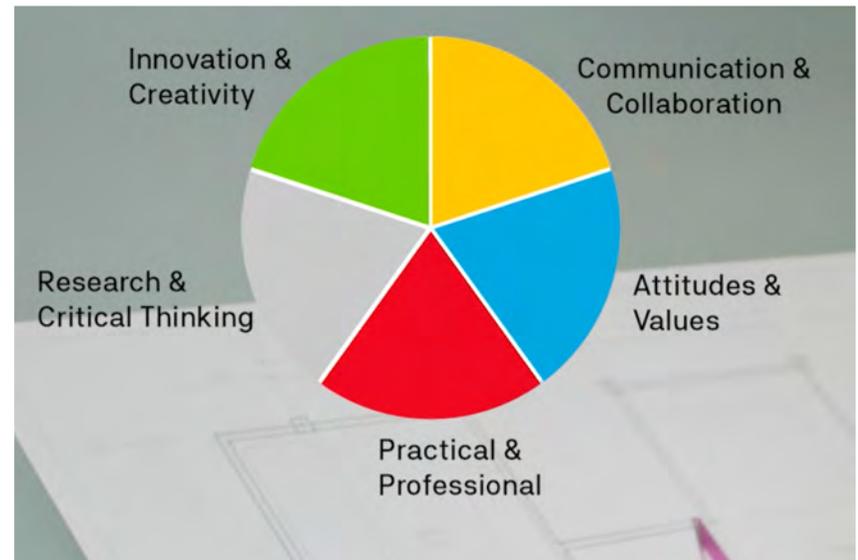
- hence the STEM domination in this field
- there are unambiguously correct answers, and huge demand

can analytics help to track student qualities like  
*communication skills, practical skills,*  
*values, critical thinking, creativity?*

# How can we shift assessment from Grade Focus to understanding what it means?

Categorise assessment criteria to link to a range of attributes / capabilities to spread the single mark

68%  
Credit





<http://academ.com.au/review>



Darrall Thompson (UTS) and the REVIEW team at Liverpool Boys High School

Roles Classes 4 Tasks Teams Marking Publish Reports Student Results Peer Rating Survey

Year: 2018 Term: 2018 Semester 1 (15)

Subject → Liverpool Boys Pilot (LiverpoolBoysREVIEW)  
7-1 PROA ENCAPSULATE ME (7-1 PROA)

Task: - all tasks

Subject Class: - all classes

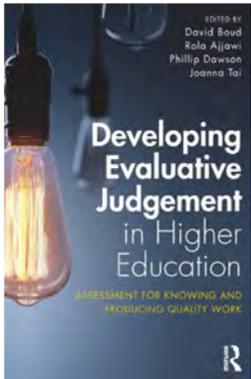
Capabilities weightings

**Subject Description**

Students will complete a detailed autobiography recounting four events in their life. This must be written to engage the reader and inform others about their life, events and history.

Task Name	Weight	Enrolled	Self	Staff	Pub	Download Class Marking
<b>P1: Autobiography</b> Students will complete a detailed autobiography recounting four events in their life. This must be written to engage the reader and inform others about...	35%	95	80	95	95	select a class
<b>P2: Cap</b> Students will design a name plate and various logos that represent themselves through the use of colour and visuals. These will then be applied to the...	15%	95	76	95	95	select a class
<b>P3: Poetry and Composition</b> Students will write a poem that reflects their life and who they are. This will then be set to music which the students create on an iPad using Garage...	15%	95	71	95	95	select a class
<b>P4: Speech</b> Students will present a speech explaining the significance of their name plate and logos and how they represent them as an	10%	95	8	95	95	select a class

Students self-assess, and then get to see how well their evaluative judgement is developing – against their actual grade



Student Has Not Left Comment

★ **Ability to organise selected information into a clear, neat and visually appealing structure that is appropriately labelled and coloured.**  
 Student drew each image of their chosen food in their periodic table neatly. Each image was labelled and coloured appropriately. Student generated a creative, unique title using their design skills. The design of the periodic table was clearly labelled and well-designed overall. SC4-9WS, SC4-7WS, Art – 4.1  
**Developing**

Student Has Not Left Comment

optional student task comment

Weight 55%

student's self-assessment

teacher's assessment

class average

★ **Evidence that the student has refined their final product and made positive improvements on their drafts based on teacher and peer critiques.**  
 In producing their final Periodic Table, students have completed many drafts and received feedback. The final Periodic Table of Food should represent the improvements made based on initial feedback, edits and critiques. SC4 - WS9d, WS7.1d, WS7.1b, WS7.1c, WS7.2b, Art – 4.1EN4-3B  
**Developing**

Student Has Not Left Comment

optional student overall comment

Weight 10%

Student Has Left Overall Comment

*the most important skill i learnt when completing my periodic table of food was how to put 3 groups of elements separately together. i also learnt how to use the colours and editing. i did my best work on putting them in order. i found it very difficult to find a lot of food to put in. i really enjoyed being critiqued because it was very fun. i was very proud of my work being exhibited because it looks good. critiquing was an important part of my project*

Penalty 0 percent of total

Final Grading: Developing

40.00

final grade calculated from the above grades

can analytics help to cultivate student qualities  
like *self-regulation, agency, curiosity,*  
*resilience...?*

# Assessing learning dispositions: Crick Learning for Resilient Agency survey (CLARA)

	No, not at all like me	A little bit like me	Quite a lot like me	Yes, very much like me
I make connections between what I am learning and what I have learned before.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoy trying out new ways of learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know I can find a way of solving a problem if I have enough time to think.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sometimes good ideas just come into my head.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Remembering what I already know often helps me to learn something new.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a sense of myself getting better at learning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I find something really hard to learn, I usually think it's because I'm not very clever.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<https://utscic.edu.au/tools/clara> • <http://clara.learningemergence.com>

Deakin Crick, R., Huang, S., Ahmed Shafi, A. and Goldspink, C. (2015). Developing Resilient Agency in Learning: The Internal Structure of Learning Power. *British Journal of Educational Studies*: 62, (2), 121-160. <http://dx.doi.org/10.1080/00071005.2015.1006574>

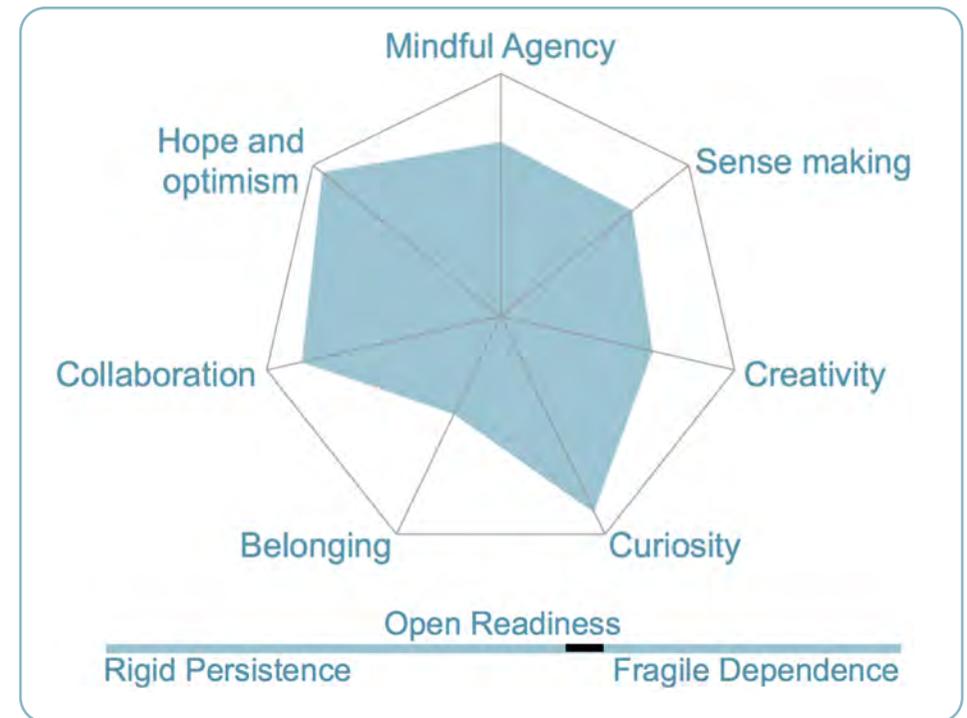
# Immediate visual analytic generated by CLARA

## Survey

	No not at all like me	A little bit like me	Quite a lot like me	Yes very much like me
1. Talking things through with my colleagues helps me to learn.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I enjoy discussing difficult problems with my friends.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I often look back and think about what I have learned.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I always approach learning in the same way.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. There is at least one person in my community/social network who is an important guide for me in my	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



## Feedback to Stimulate Self-Directed Change



## A framework for reflection and coaching

Deakin Crick, R., Huang, S., Ahmed Shafi, A. and Goldspink, C. (2015). Developing Resilient Agency in Learning: The Internal Structure of Learning Power. *British Journal of Educational Studies*: 62, (2), 121-160. <http://dx.doi.org/10.1080/00071005.2015.1006574>

# Scaling CLARA in UTS

- Approx. 3000 student profiles
- For the 921 students with both pre- and post-subject profiles, there were significant positive changes on all 8 dimensions.
- We can also derive through cluster analysis significantly different cohort profiles: 4 examples
- Next step: explore the relationships of these self-reported profiles to student outcomes



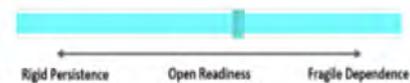
n=876

n=548



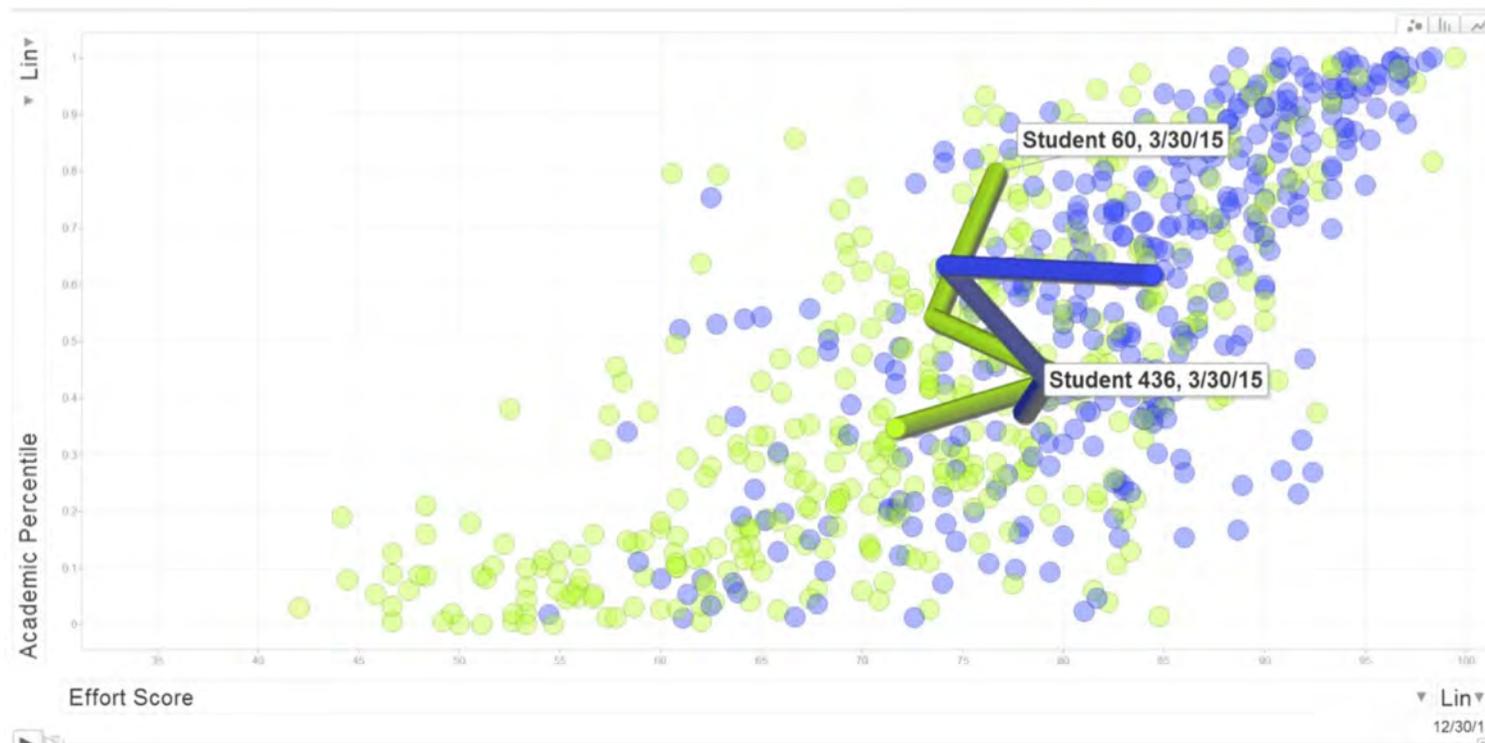
n=957

n=602



# Student Effort (x) vs Grade (y)

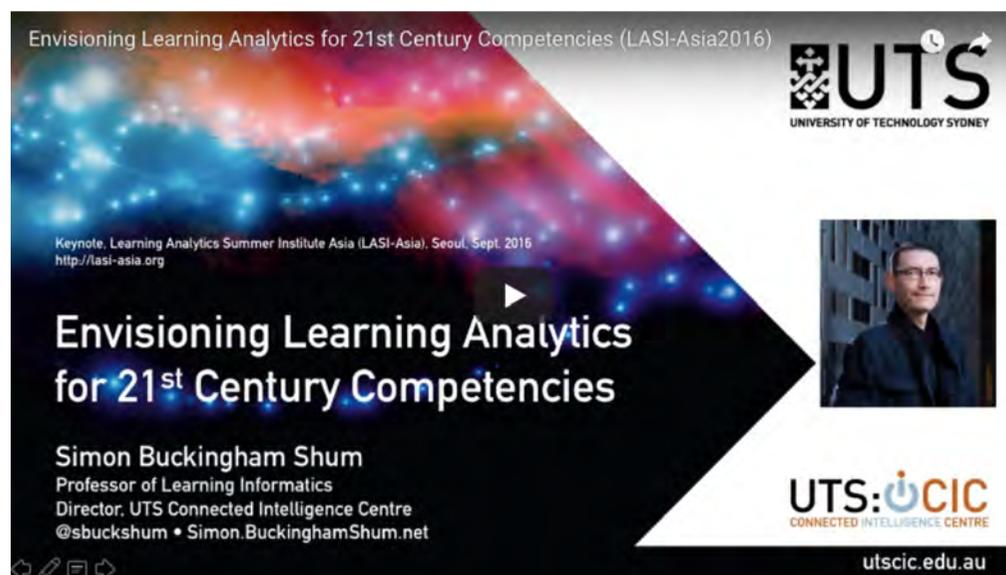
Animating the transitions from teacher observational assessments of “effort” over the semester: basis for a conversation with student and parents



Nagy, R. (2016). Tracking and visualizing student effort: Evolution of a practical analytics tool for staff and student engagement. *Journal of Learning Analytics*, 3(2), 165–193. <http://dx.doi.org/10.18608/jla.2016.32.8>  
UTS:CIC seminar: <https://utscic.edu.au/events/niccic-redlands-school-8-june-2016>

<https://www.efforttracking.com>  
<https://vimeo.com/168306314>

# More on analytics for C21 competencies



<https://utscic.edu.au/lasi-asia-keynote2016>



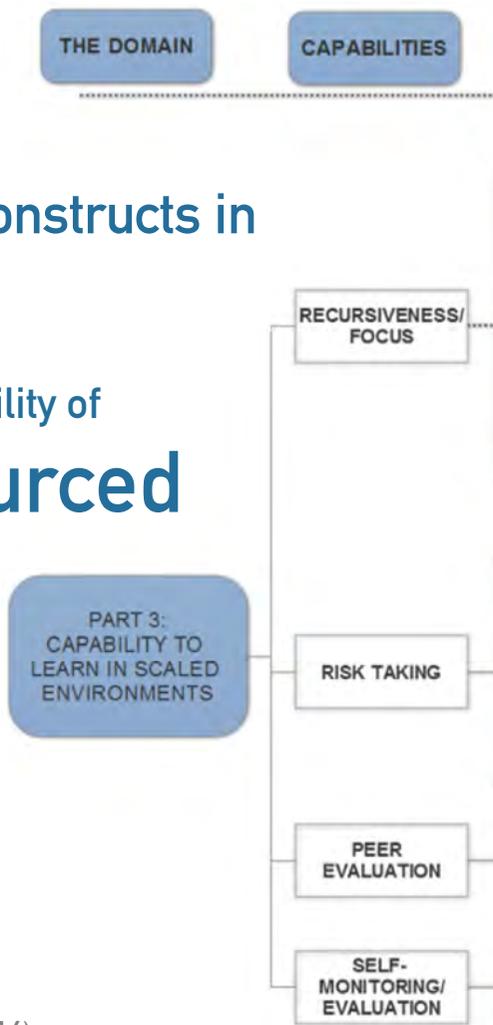
Learning Analytics for 21<sup>st</sup> Century Competencies. (Eds.) Buckingham Shum S. & Deakin Crick, R. (2016). *Journal of Learning Analytics (Special Section)*, 3(2), pp. 6-212. <http://dx.doi.org/10.18608/jla.2016.32.2>

# “from clicks to constructs”

how exactly do we bridge  
from system logs  
to educational qualities?

# From clicks to constructs in MOOCs

## Defining a C21 capability of Crowd-Sourced Learning (Part of a larger map)



Milligan, S. and Griffin, P. (2016). Understanding learning and learning design in MOOCs: A measurement-based interpretation. *Journal of Learning Analytics*, 3(2), 88– 115. <http://dx.doi.org/10.18608/jla.2016.32.5>

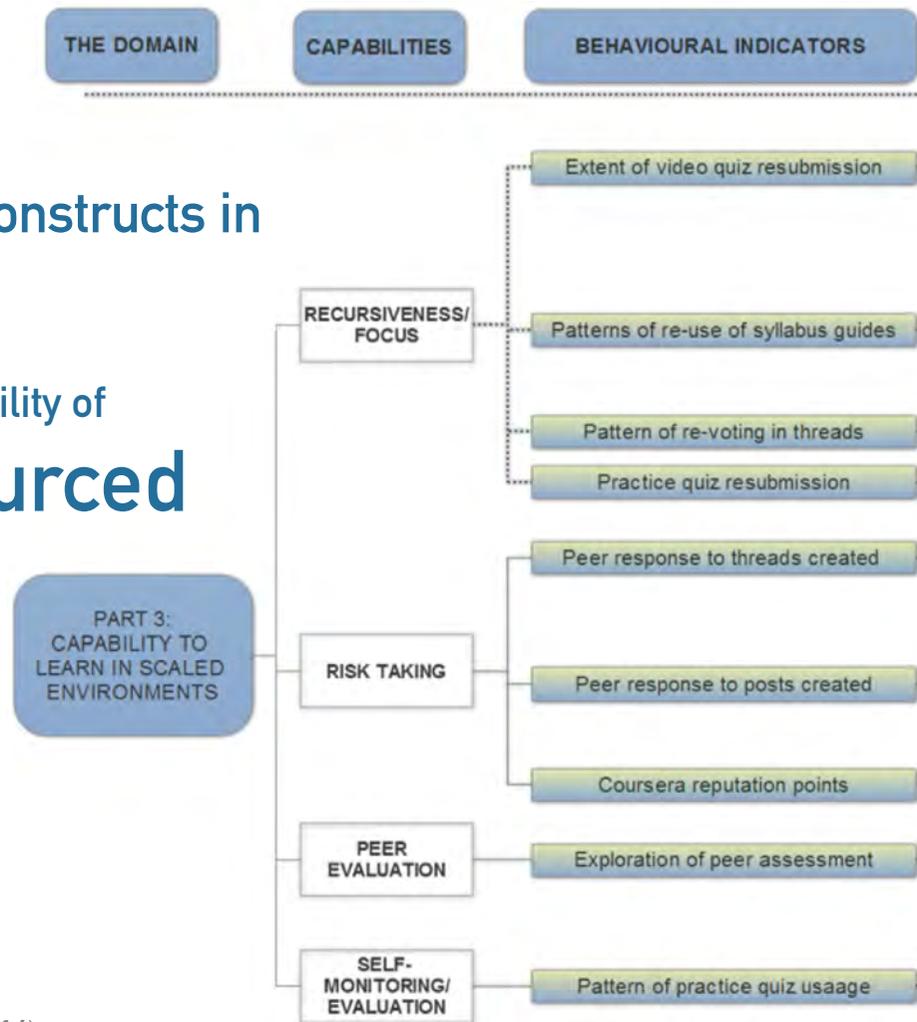
Figure 1: Construct map for the C-SL capability as expressed in MOOC log stream data

## From clicks to constructs in MOOCs

Defining a C21 capability of

# Crowd-Sourced Learning

(Part of a larger map)

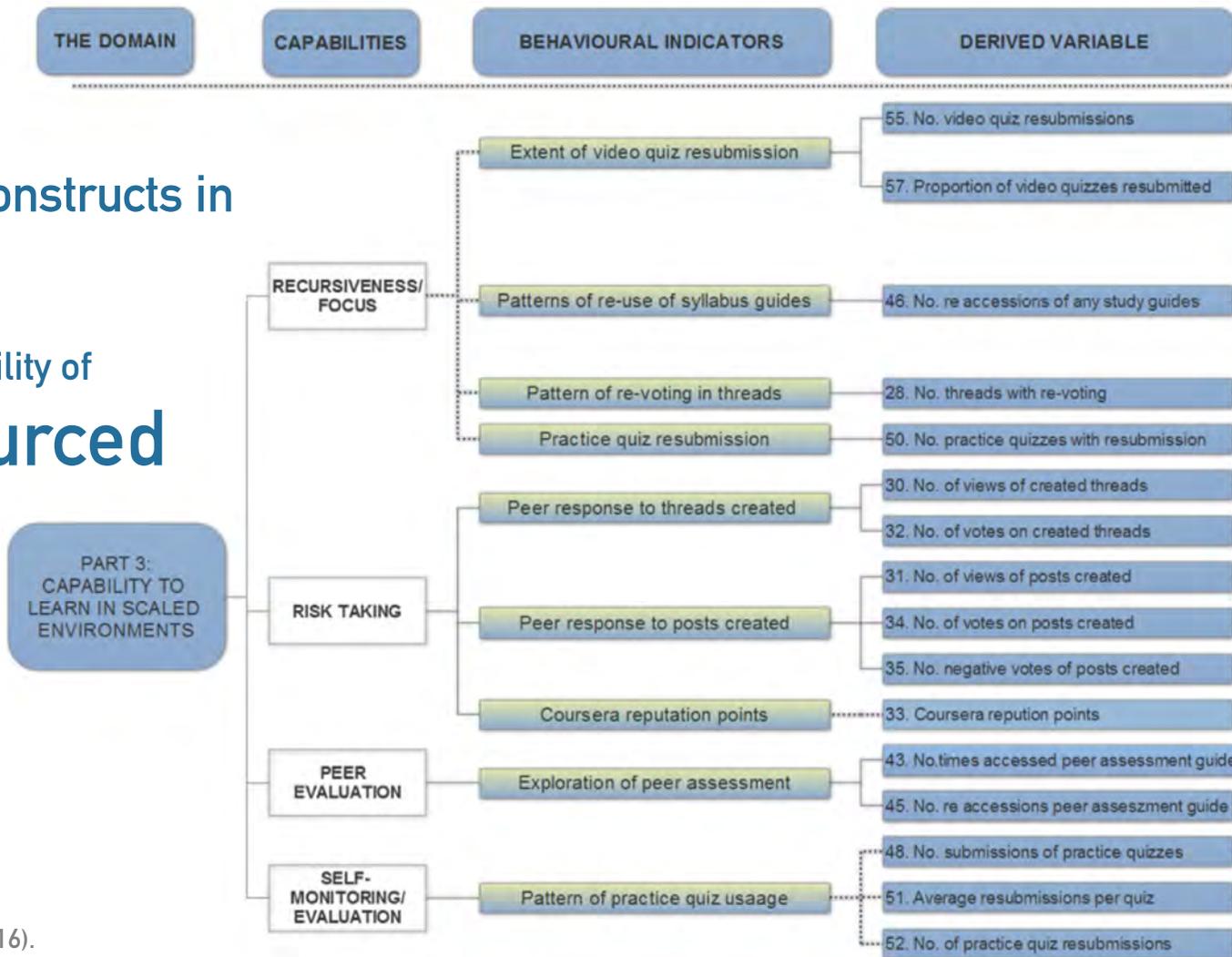


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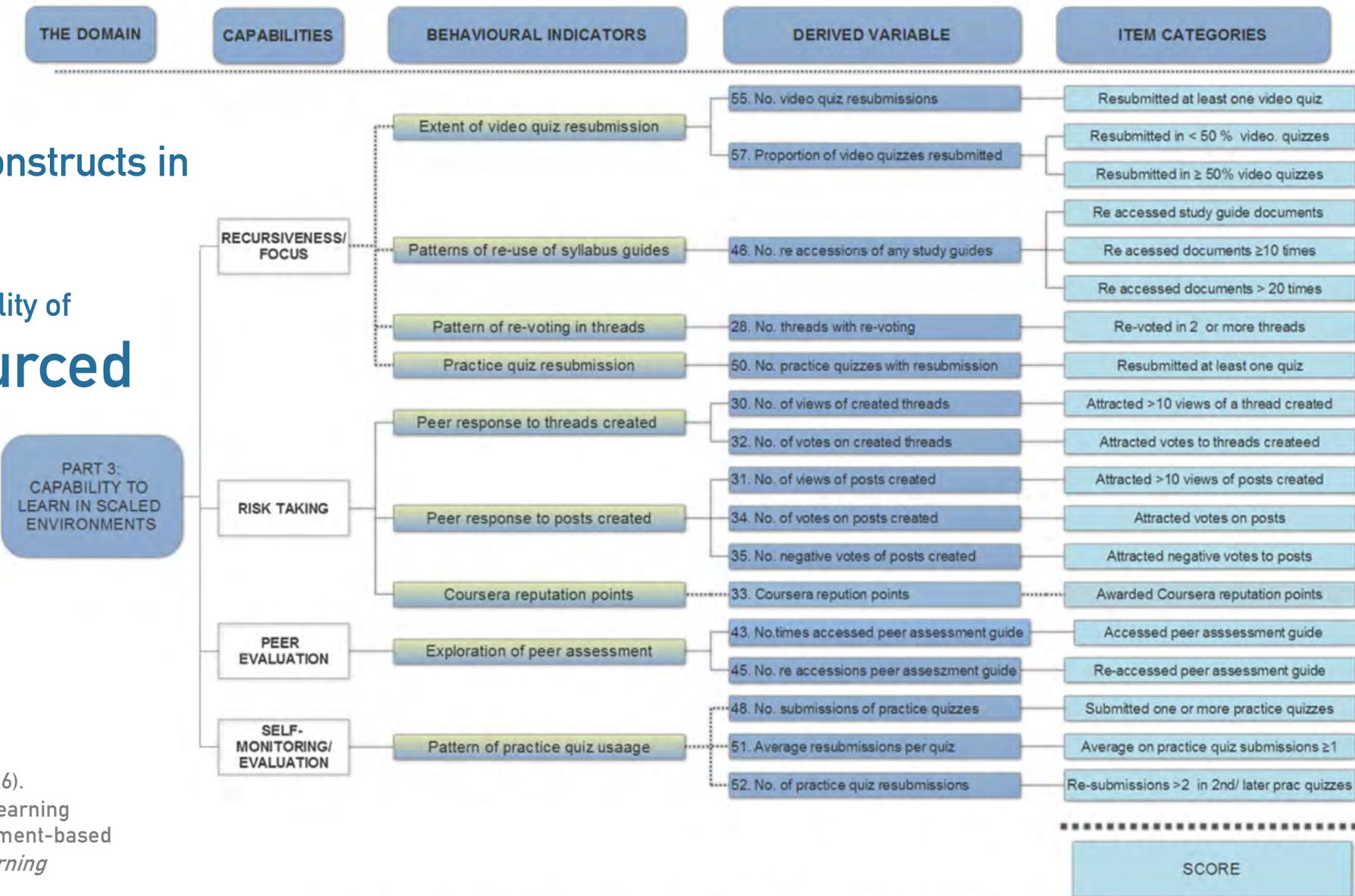


Milligan, S. and Griffin, P. (2016). Understanding learning and learning design in MOOCs: A measurement-based interpretation. *Journal of Learning Analytics*, 3(2), 88– 115.  
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# From clicks to constructs in MOOCs

## Defining a C21 capability of Crowd-Sourced Learning (Part of a larger map)



Milligan, S. and Griffin, P. (2016). Understanding learning and learning design in MOOCs: A measurement-based interpretation. *Journal of Learning Analytics*, 3(2), 88– 115. <http://dx.doi.org/10.18608/jla.2016.32.5>

Figure 1: Construct map for the C-SL capability as expressed in MOOC log stream data

**There's far more to learning than  
having students tethered to screens**

# A field exercise...



# Posture analysis of fieldwork students



Figure 6: 3D change of learners' postures according to learning topics being considered.

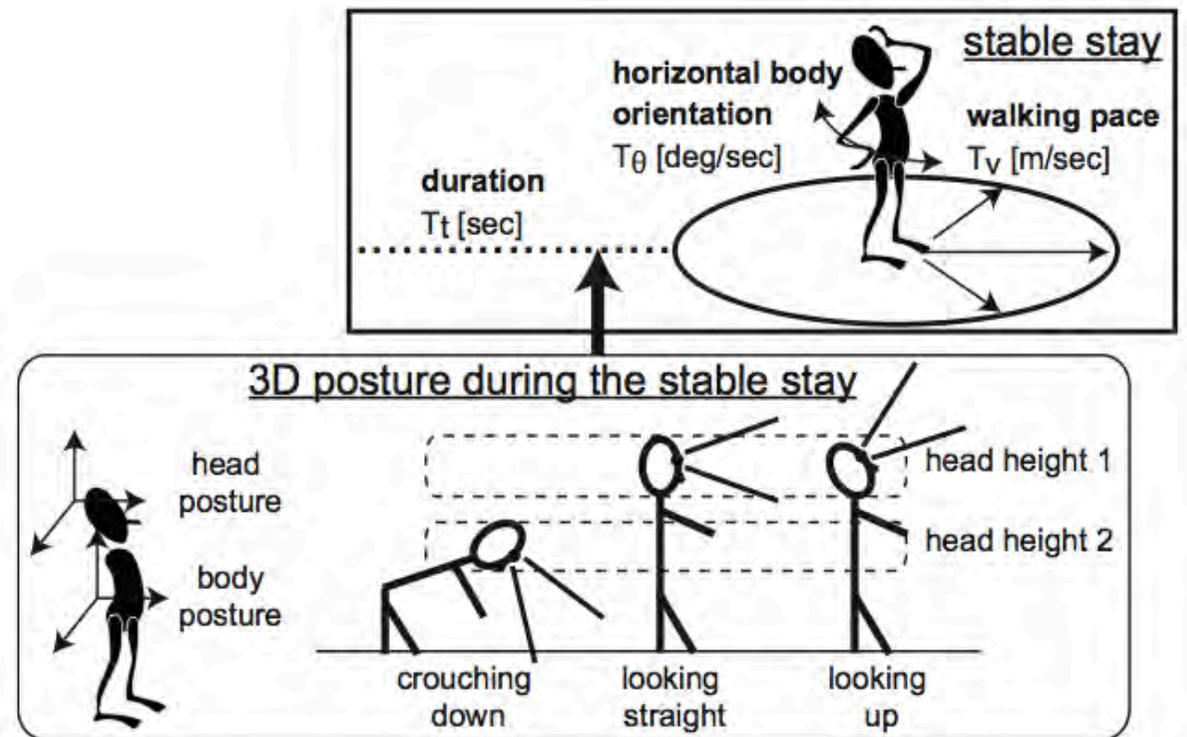


Figure 7: Estimating 3D posture during the state of stable stay.

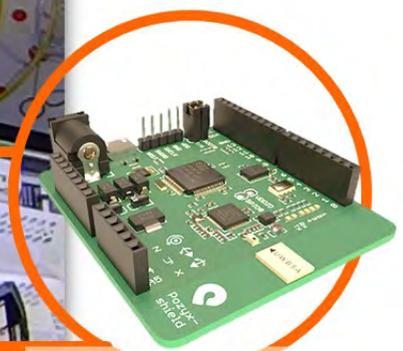
# Multimodal student data from simulations



Omnidirectional  
microphone



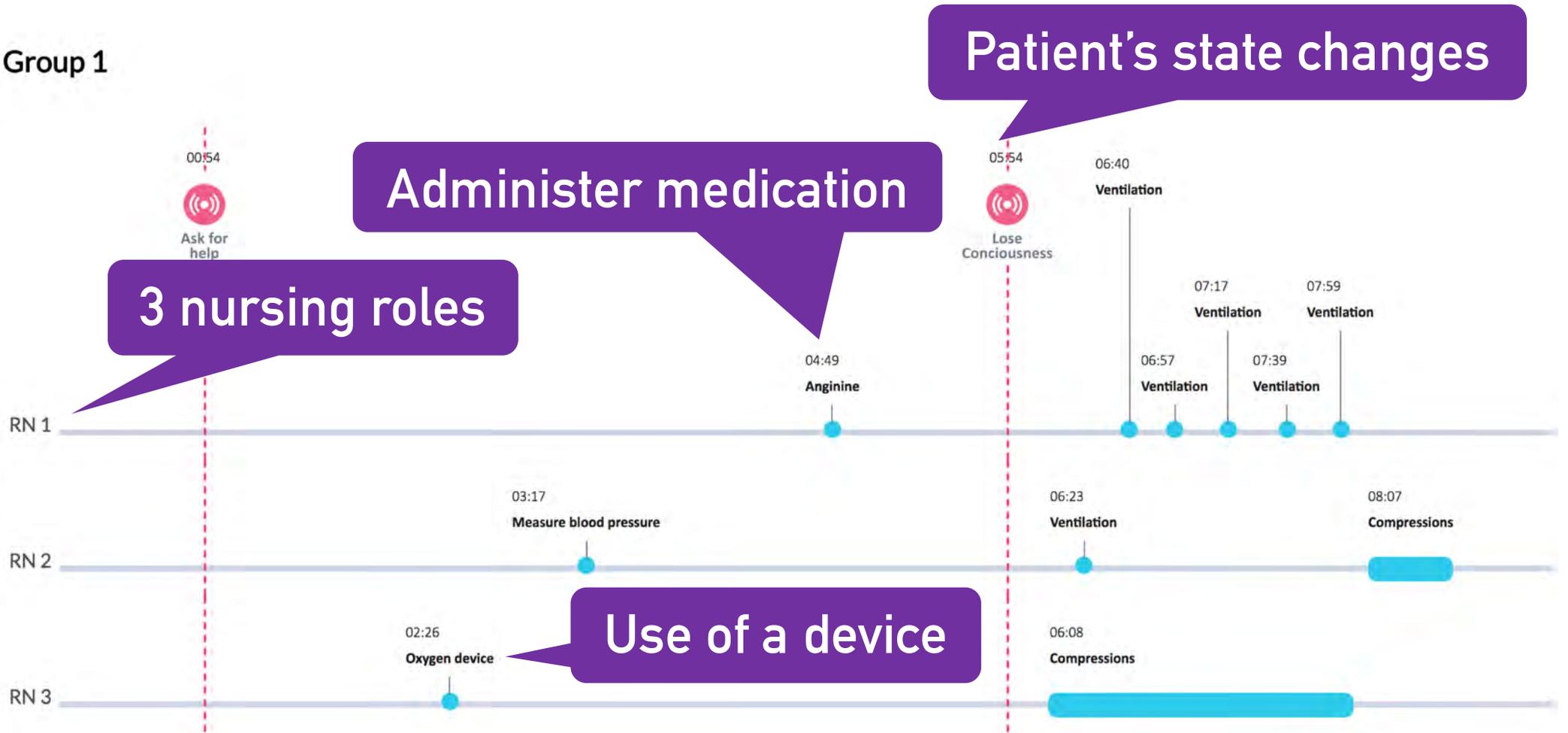
Physiological  
wristbands



Ultra-wideband  
positioning tags

# Automated visualisation of nursing team activity

Group 1

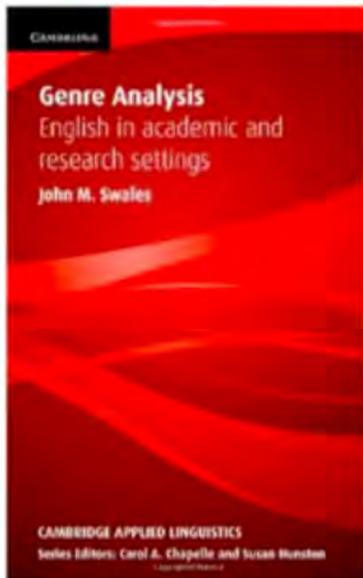


**writing as a window into the  
student's mind**

**crafting arguments...**

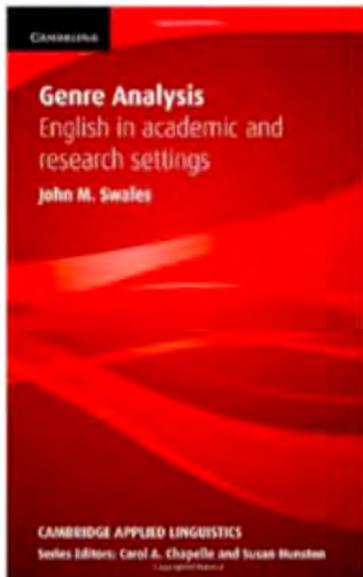
**reflecting deeply on experiences...**

# Improving research writing



- ▣ John Swales examined the introductions to 48 articles in the natural and social sciences.
  - ▣ Sequence of three rhetorical moves through which a writer creates a *research space* for his or her work.
1. **Establish a research territory**
  2. **Establish a niche**
  3. **Occupy the niche**

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## Analytical Report

## Feedback

## Resources

### Move 1: Establishing a research territory

- E Emphasis of a significant or an important idea
- B Background information and reviewing previous work

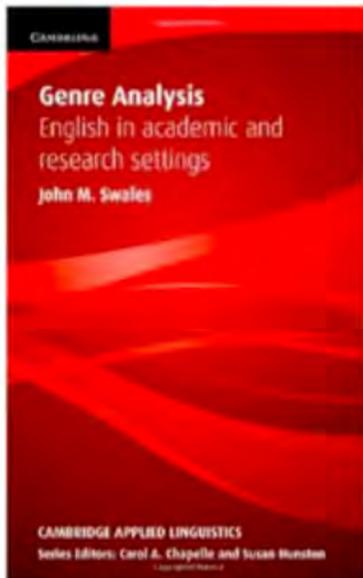
### Move 2: Establishing a Niche

- C Contrasting idea, tension, disagreement or critical insight
- Q Question or gap in previous knowledge

### Move 3: Occupying the Niche

- N Novelty and value of your research
- S Summary of the author's goal or nature of the research, or structure of the paper

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### **E B** ABSTRACT:

It is now widely accepted that timely, actionable feedback is essential for effective learning. In response to this, data science is now impacting the education sector, with a growing number of commercial products and research prototypes providing "learning dashboards", aiming to provide real time progress indicators. **E C** From a human-centred computing perspective, the end-user's interpretation of these visualisations is a critical challenge to design for, with empirical evidence already showing that 'usable' visualisations are not necessarily effective from a learning perspective. Since an educator's interpretation of visualised data is essentially the construction of a narrative about student progress, we draw on the growing body of work on Data Storytelling (DS) as the inspiration for a set of enhancements that could be applied to data visualisations to improve their communicative power. **S** We present a pilot study that explores the effectiveness of these DS elements based on educators' responses to paper prototypes. **S** The dual purpose is understanding

# AcaWriter feedback – an abstract with several moves

## Professional learning abstract

Feedback and Draft Saved 15/08/2018 08:14am

Get Feedback & Save

Download PDF

AcaWriter works fastest with short texts, so if you're only working on a specific section, don't paste in the whole document. It still processes long texts, but it may take a few minutes to get your feedback to you.

**B** *I* U

Professionals are increasingly called upon to work with clients. We employ cultural-historical concepts to reveal how professionals and clients accomplish joint work on problems in services for families with young children. Professional–client interactions in day stay and home visiting services are considered, first focusing on how matters of concern are worked into departures of significance (employing 'D-analysis'), then conceptualising joint professional–parent work in terms of common knowledge and the object of activity. The importance of motives and their alignment is revealed. We show the value of D-analysis in elucidating how common knowledge can be constructed and why this process may be problematic. Finally, we reflect on the fluid and situated nature of this kind of collaborative work.

[Hopwood, N.](#) & Edwards, A. 2017, 'How common knowledge is constructed and why it matters in collaboration between professionals and clients', *International Journal of Educational Research*, vol. 83, pp. 107-119.

### Analytical Report

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# Automated formative feedback on persuasive, evidence-based writing (Law students)

Highlighted sentences are colour-coded according to their broad type

Kingdom, Australia has remained stagnant in its development of third party liability for knowing assistance. This paper seeks to argue that the High Court's preferential use of precedents over legal and equitable principles has hindered the development of third party liability in the knowing assistance of trust or fiduciary duties. This over-refinement of the two

fiduciaries such as lawyers cannot. As assists a solicitor in a breach of fiduciary duty, which could ever apply to relieve the

CONTRAST: Disagreement, tension, options, inconsistency

cessorial liability of a third party, which ct, or the Corporations Act; neither of

It appears that the plainly wrong finding in respect of Bell was based, primarily, on: **C** Drummond AJA's incorrect interpretation of the dishonest and fraudulent design requirement as articulated in Farah ; and the lack of careful formulation of the Bell Test, which fails to appreciate the inconsistent or unsound practical effect of imposing a test – which is to be analogous to that imposed by other legislative provisions – despite those provisions operating in a separate and, in some ways, dissimilar context. The explication of the NSWCA's determination concerning Bell provides

Sentences with Function Keys have more precise functions (e.g. Novelty)

- Summary
- Important
- Both
- B** Background
- C** Contrast
- E** Emphasis
- N** Novelty
- P** Position
- Q** Question
- S** Surprise
- T** Trend

# The Law educator annotates automated feedback using Word to show what it got right and wrong

**Analytical Writing Report — for structured commenting**

This document has a copy of AWA's output from analysing your students' writing. This output is from the *Analytical Writing* tab (ie. not the *Reflective Writing* tab).

Your structured feedback (using Word's *Commenting* tool) will greatly assist the improvement of the XIP analytics engine powering AWA. We use a framework summarised below, to compare what AWA 'sees' to what you see.

	KEY:	Analyst	
		Correct	Incorrect
XIP	Selected	tp	fp
	Unselected	fn	tn

- **TP = True Positive:** add margin comments to expressions highlighted that you agree with — optionally add any notes about why you think this is good
- **FN = False Negative:** add margin comments to any expressions you think AWA *should* have highlighted (These help us expand the lexicon used to classify a sentence)
- **FP = False Positive:** add margin comments to any highlighted sentences to show that these should *not* be highlighted (it's 'noise' which we want to try and reduce; perhaps there are technical terms that tricked it?)
- **TN = True Negative:** no need to do anything — AWA left the text white and you agree.

The 3 example comments below are illustrative and should be deleted.

# The Law educator annotates automated feedback using Word to show what it got right and wrong

**Analytical Writing Report — for structured commenting**

This document has a copy of output is from the *Analytical*

Your structured feedback (us improvement of the XIP anal summarised below, to comp

XIP

- **TP = True Positive:** ac with — optionally add
- **FN = False Negative:** should have highlight sentence)
- **FP = False Positive:** ac these should *not* be h perhaps there are tec
- **TN = True Negative:** r agree.

The 3 example comment

The proliferation and prominence of social media in contemporary Australia has stimulated discussion regarding the relationship between social media and the law. In particular, some academics have considered whether social media could be used to address wavering public confidence in the judiciary, which is often construed as an autonomous institution disconnected from the public. Drawing upon the scholarship, this paper will argue that Australian court staff should consider using social media to increase confidence in the judiciary. It will suggest that the courts can achieve this increased public confidence through using social media to enhance their transparency, educate the public about court operations, and explain the legal rationale behind contentious decisions. However, this paper will also reason that the courts need to exercise caution when using social media. The court staff managing social media profiles must ensure that the posted content is reaching the general public, and does not undermine the integrity of the judiciary. Ultimately, this paper will conclude that although the use of social media can be challenging for the courts, the increased public confidence in the judiciary that it can yield is needed.

Philippa Ryan  
TN

Philippa Ryan  
TP

Philippa Ryan  
TN

Philippa Ryan  
TP

Philippa Ryan  
TP

## Align the assessment rubric with the textual features (i.e. rhetorical moves) that the tool can identify

Assessment rubrics: demonstrated qualities / standards	Associated salient sentence type	Examples (the discourse indicating the rhetorical moves is in bold)
<p>Introduction</p> <ul style="list-style-type: none"> <li>• Statement of thesis</li> <li>• Essay plan</li> </ul> <p>Content</p> <p>Development of sustained thesis</p>	<ul style="list-style-type: none"> <li>• <i>Summary and Important</i></li> <li>• <i>Summary</i></li> <li>• <i>Important</i></li> </ul>	<p>(S) (C) <i>Drawing upon the scholarship, <b>this paper</b> will <b>argue</b> that Australian court staff <b>should consider</b> using social media to increase confidence in the judiciary.</i></p> <p>(C) <i>However, the extent to which an intermediate appellate court may undertake to redefine the law as it sees appropriate – particularly when confronted with a judgment of a court of another jurisdiction but with equal standing in the judicial hierarchy – <b>raises various questions.</b></i></p>

## Evaluate with students: what worked well?

**Table 5** Student feedback on the value of AWA highlighting rhetorical moves

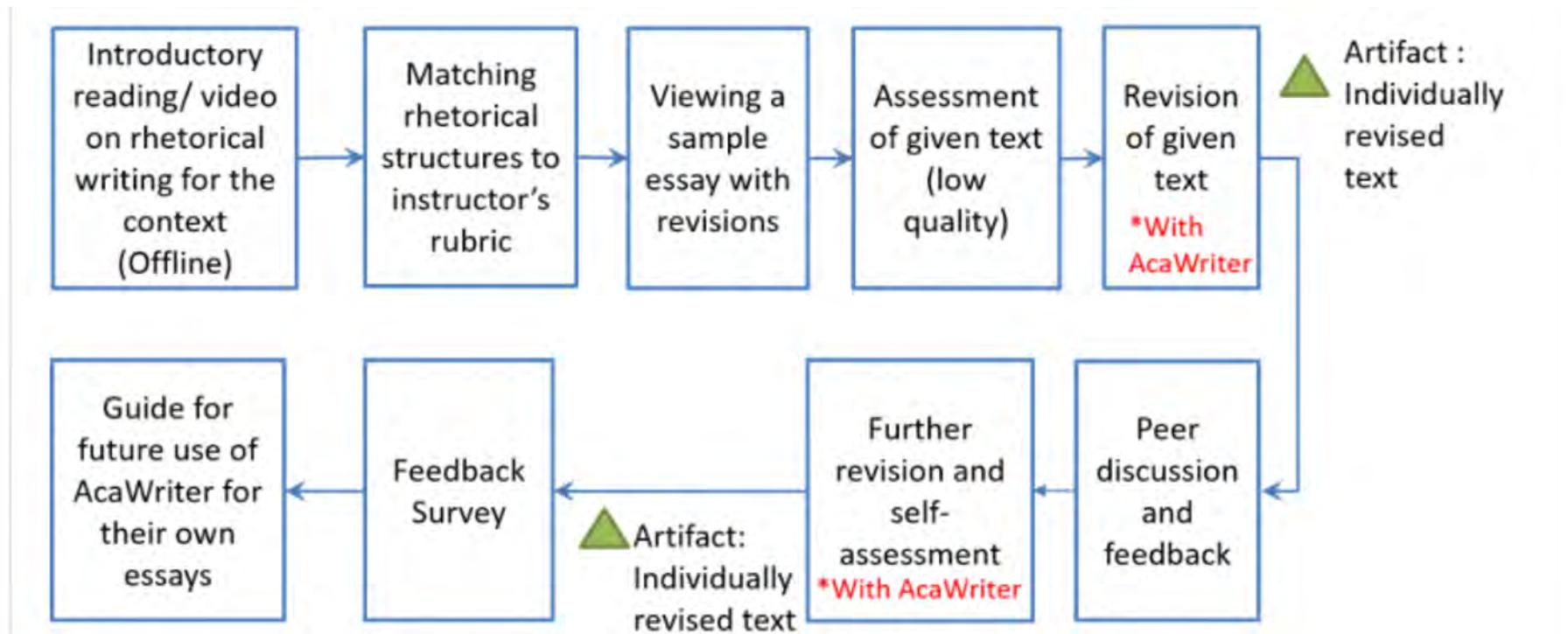
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- “I found it interesting to note that the AWA tool picked up problems with my essay that I had not noticed.”  
*Student 5 reflection notes*
- “I definitely found it useful. It also made me realise that I tend to use bold, certain language in making my point towards the end of each paragraph rather than up front at the beginning (when introducing my point).” *Respondent 5*
- “I also tend to signpost a point with Important language and then actually make the point, rather than just making the point (by that I mean, the sentence highlighted as Important was often the one just before the sentence I would have thought was making the important point, before using this tool).” *Respondent 5*
- “I realise now what descriptive writing is - the software had quite a bit to say about my lack of justification - also true - pressed for time and difficult circumstances have caused this for me in this instance - good to see it sampled.” *Respondent 9*

...but it was far from perfect: see the paper for detailed evaluation results

# Exemplar lesson plan using AcaWriter

<http://heta.io/resources/wawa-improve-sample-text-plus-peer-discussion-civil-law>



# AcaWriter formative feedback on reflective writing

**Key** Auto feedback:  [Get Feedback](#) [Save](#) [Export to PDF](#) [Key](#)

- Words associated with strong feelings
- Expressions indicating belief, learning, or knowledge.
- Expressions indicating self critique
- One or more keywords missing
- ⚡ Sentence too long, might disengage the reader. Try breaking it into smaller sentences
- Initial thoughts and feelings about a significant experience.
- The challenge of new surprising or unfamiliar ideas, problems or learning experiences.
- Deeper reflection, personally applied.
- ▲ How new knowledge can lead to a change

...tly had no idea what sort of  
...nity Pharmacy setting. It has  
...f the expectations of a pharmacist as  
...t as a journey which exposed my  
...tor as someone who guided me to  
...egan to realise that this was only a  
...urt from these experiences is that I  
...oute to the pharmacy by  
...product of my inner passion and  
...re. Various encounters along my  
...s with a new challenge. I initially  
...members of the community were,  
...and understanding of their condition. I  
...to see things from a perspective that  
...strate these notions, I have decided

...had significantly developed during  
...as when I dispensed rosuvastatin for  
...ical placement and by this time I had  
...cess. A female patient came in with a  
...l this medication, I literally just  
...felt extremely nervous. She told me  
...as the first time she was about to  
...mediately felt embarrassed and

### Feedback (Reflective)

■● Prior to starting my clinical placement, I honestly had no idea what sort of challenges *I would* have to face in a Community Pharmacy setting. It has essentially provided me with a perspective of the expectations of a pharmacist as a health care professional.■ I personally saw it as a journey which exposed my strengths and weaknesses.■ I saw my preceptor as someone who guided me to help address my weaknesses.■ However, I began to realise that this was only to a certain extent.■ **The most important thing I learnt from these experiences is that I can only develop my skills if I actively contribute to the pharmacy by demonstrating initiative.**▲ This initiative was a product of my inner passion and motivation to practise as a pharmacist in future.● **Various encounters along my journey proved to me that every day presents with a new challenge.**●▲ *I initially could* not comprehend just how diverse the members of the community were, particularly in regards to their health issues and understanding of their condition.■● **I found that my clinical placement allowed me to see things from a perspective that *I would never have imagined.***■● **In order to illustrate these notions, I have decided to reflect upon two major ideas.**

Effective patient communication was a skill I had significantly developed during my clinical placement. A specific example was when I dispensed rosuvastatin for a patient.■ It was one of the first weeks of clinical placement and by this time I had become quite efficient at the dispensing process. A female patient came in

[About](#) [Contact](#) [Terms of Use](#) [Privacy Policy](#)

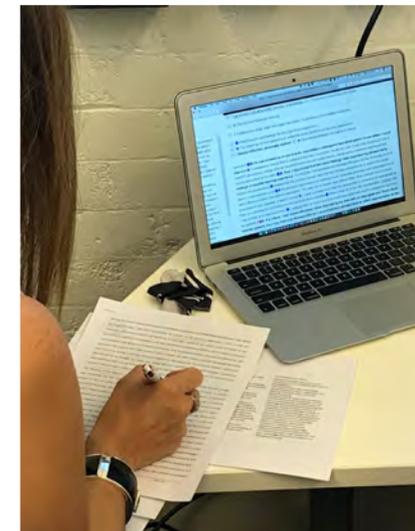
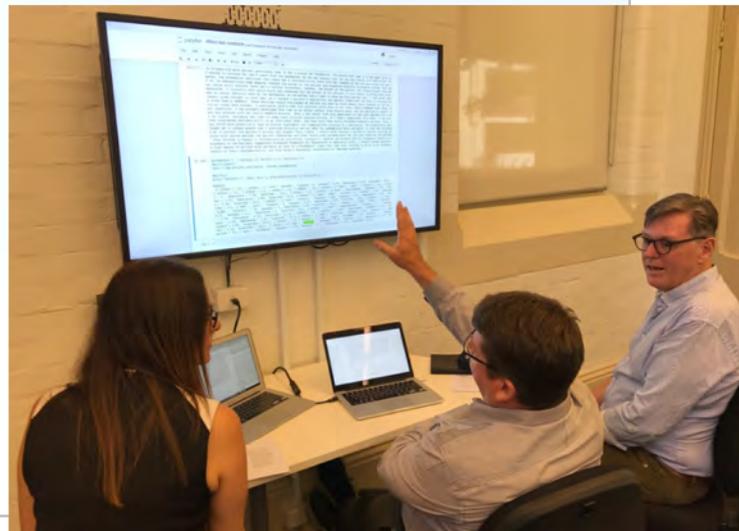
# Participatory prototyping builds trust in the NLP

```
jupyter Affect test notebook Last Checkpoint: 11 hours ago (autosaved)
File Edit View Insert Cell Kernel Widgets Help
+ -> Run Code
In [103]: checkAffect(paras[1],4.5)
26 words matched out of 4035 total words in the text - 0.644361833952912 percent
ability >> 4.85
developed >> 4.5
male >> 4.5
taken >> 4.52
medication >> 4.56
failed >> 5.5
learnt >> 4.8
improved >> 4.61
disrespectful >> 4.65
learning >> 4.8
issue >> 4.55
improve >> 4.61
rush >> 6.55
intriguing >> 5.18
excellent >> 5.15
impressed >> 4.82
admiration >> 5.52
skills >> 4.94
discovered >> 5.7
learning >> 4.8
disrespectful >> 4.65
gave >> 4.57
positive >> 5.5
motivated >> 5.09
```

Learning Analytics researchers work with academics (3 hour workshop)

Goal: calibrate the parser detecting *affect* in reflective writing, working through sample texts

Rapid prototyping with a Python notebook, then integrated into end-user tool for further testing



<http://heta.io/how-can-writing-analytics-researchers-rapidly-codesign-feedback-with-educators>

**personalised feedback  
to 800+ students/week**

**(without needing an expensive  
intelligent tutoring system)**

## An academic's feedback email to a student

Dear yyy,

I had another look at your homework assignments to see how you are going after the StuVac week.

It is quite worrying to see that you still don't seem to be fully engaged in this subject (2.25/48) and follow the material that we have been covered so far. You are also very much behind our problem solving exercises and homework assignments.

It will be very difficult for you to catch with all the material if you don't put in more work right now. If you don't attend UPASS session already, please do so asap.

Kind regards,

xxx

Subject Coordinator

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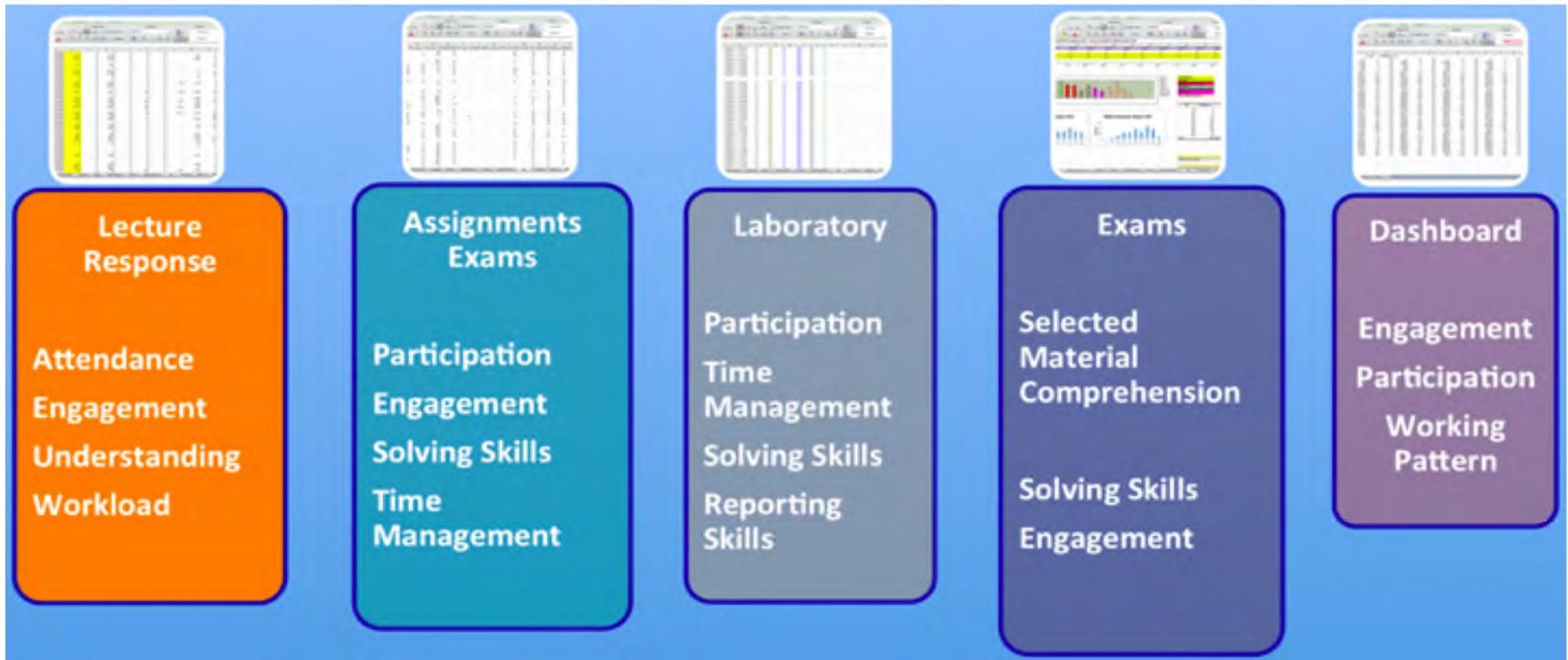
Kind regards,

xxx

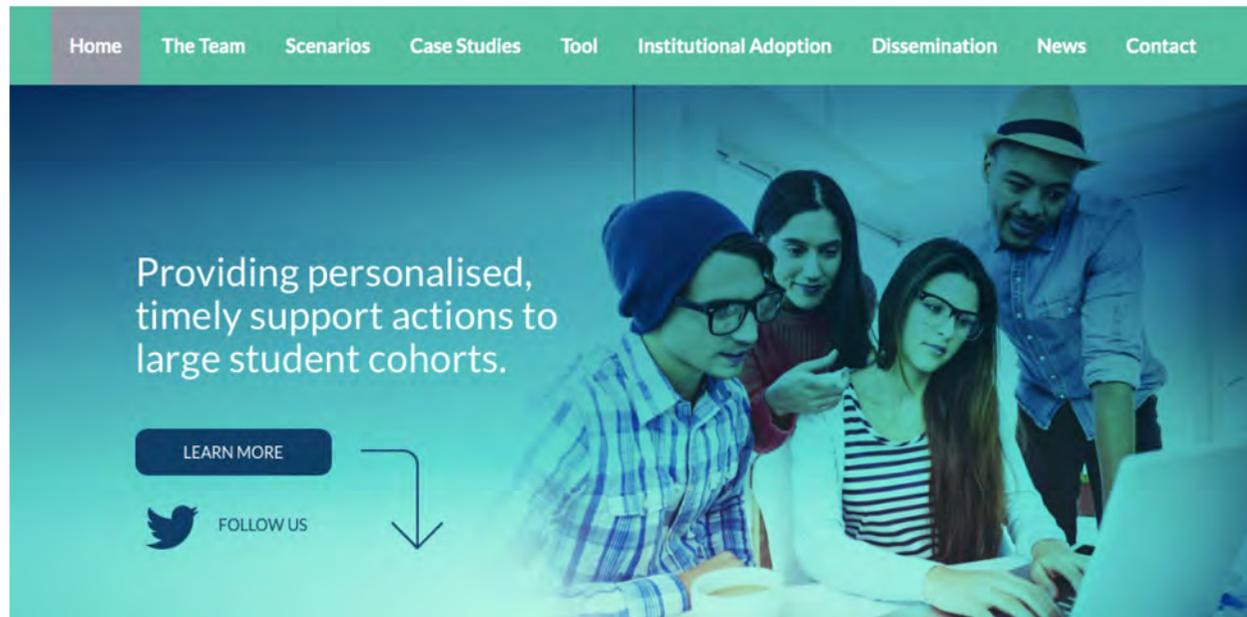
Subject Coordinator

***One of >800 unique emails, sent each week  
(Acknowledgement: Jurgen Schulte, Science)***

Data are useful only when you can identify patterns, and act on them in a timely way, at scale



# OnTask: nationally funded, open source platform



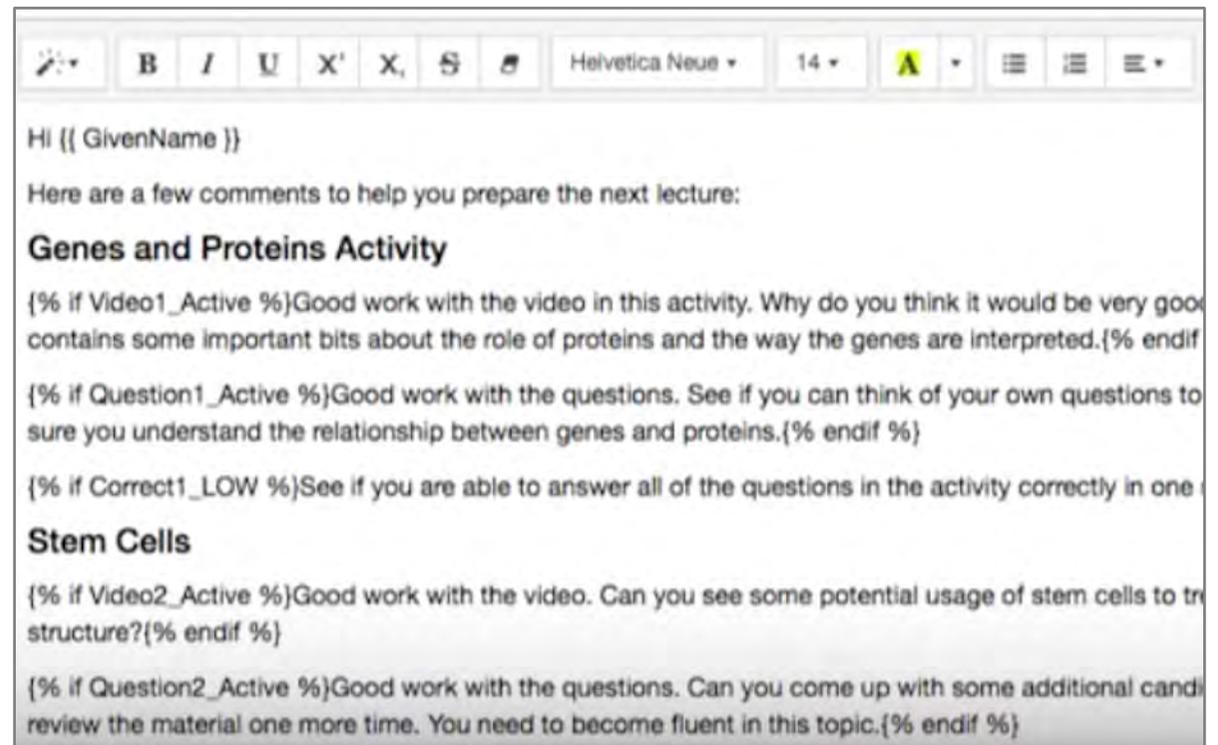
<https://www.ontasklearning.org>

# Compose your email, with different paragraphs tuned to the needs of different student groups

A visual editor helps you define which students will receive which kinds of encouraging/challenging feedback, e.g.

Students who passed all the questions first time vs. those who struggled

Students who log in very late to cram the resources prior to a practical, vs. those who plan well

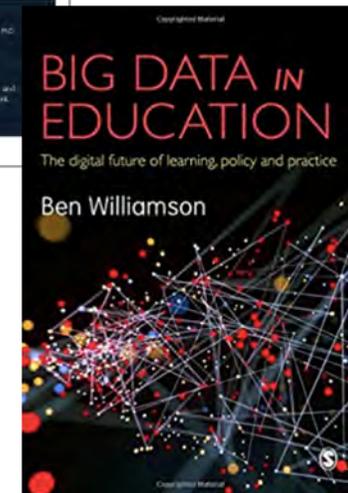
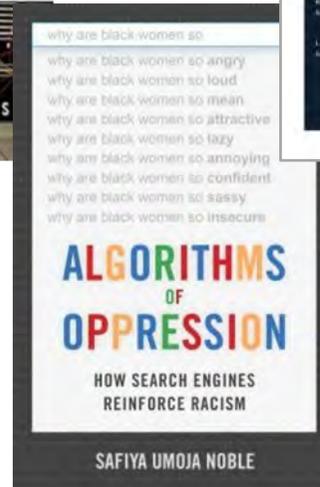
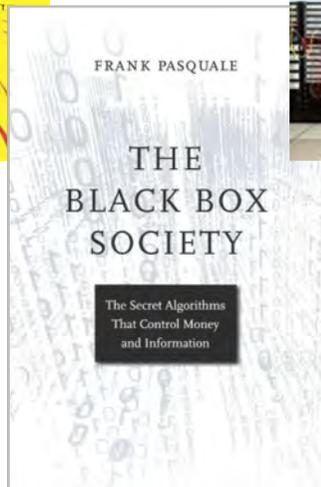
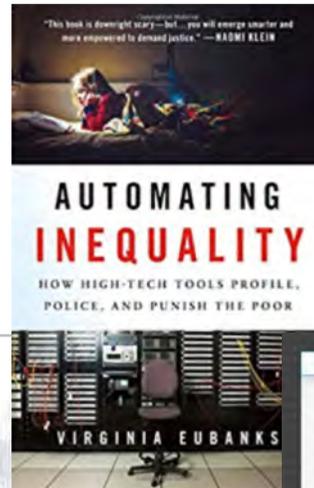
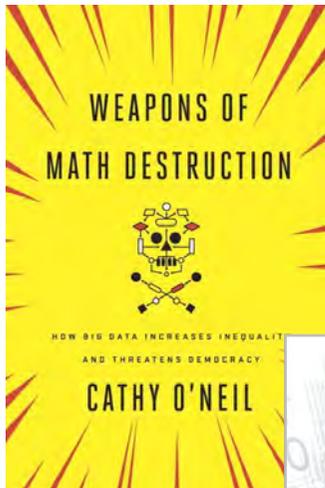


Example impact of personalised messaging such as this: Madeline Huberth, Patricia Chen, Jared Tritz, and Timothy A. McKay (2015). Computer-Tailored Student Support in Introductory Physics. *PloS ONE* 10, no. 9 (Sep 9, 2015). <https://doi.org/10.1371/journal.pone.0137001>

# trust

Schools and universities are outsourcing their 'core business' — e.g. *resource selection, feedback and grading* — to algorithms

# Growing public literacy around the business and politics of data / algorithms / AI is to be welcomed



# Why you should care about the analytics/AI black boxes in your school

Dear <Head of Maths>

Annie is now doing her geometry homework using WizzoMaths. She's seeing different questions to her friends – how do you know the system is giving students the right questions?

Dear <Parent>

The following five research publications in educational data science provide the statistical analyses showing that we can all trust this technology...

Dear <Head of English>

Freddie is now getting instant grades from WizzoWriter on his written responses about King Lear – that's spooky – how do you know the system is giving the right feedback?

Dear <Principal>

Where is the data from these platforms being stored, who is the data sold to, how long is it stored, and can I have a copy of my child's data please?



# Algorithmic accountability in learning?

Algorithmic Accountability & Learning Analytics (UCL, 2016)

UCL Knowledge Lab / Interaction Centre seminar, 20<sup>th</sup> April 2016

## Algorithmic Accountability & Learning Analytics

**Simon Buckingham Shum**  
Professor of Learning Informatics  
Director, UTS Connected Intelligence Centre  
@sbuckshum • Simon.BuckinghamShum.net

3:52 / 57:30

UTS UNIVERSITY OF TECHNOLOGY SYDNEY

UTS: CIC CONNECTED INTELLIGENCE CENTRE

cc YouTube

<http://simon.buckinghamshum.net/2016/03/algorithmic-accountability-for-learning-analytics>

**to go deeper...**

## LEARNING ANALYTICS IN SCHOOLS



60+ school leaders + ed-tech startups in Sydney this March at LAK18  
<http://lak18.solaresearch.org>

Video, slides, briefings: <https://latte-analytics.sydney.edu.au/school>

# AI in Education (esp. Schools)



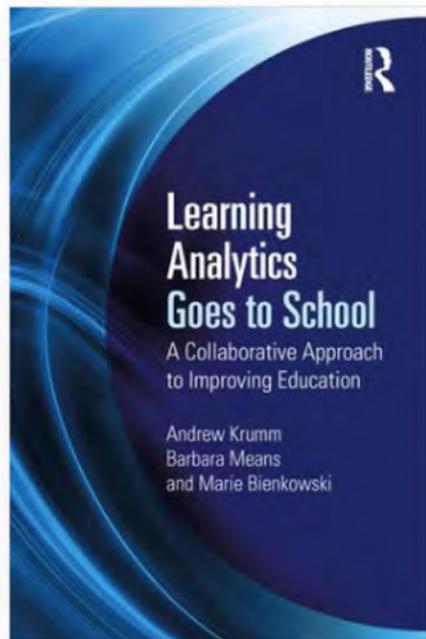
Great introduction for educators to what AI is (and is not)

Clarity on what makes human intelligence distinctive (for now...)

Examples of how AI can be used to augment teaching practice, not automate it

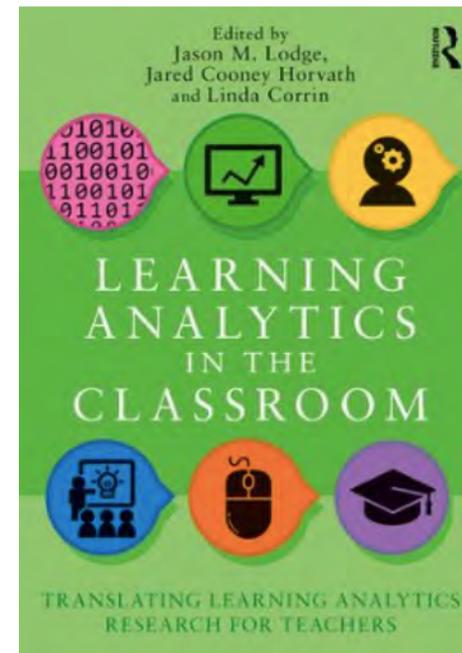
# Learning Analytics in Schools

Analytics experts and educators co-designing school improvements and the data to serve as evidence



<https://www.routledge.com/Learning-Analytics-Goes-to-School-A-Collaborative-Approach-to-Improving/Krumm-Means-Bienkowski/n/book/9781138121836>

Translating the implications of learning analytics advances for teachers



<https://www.routledge.com/Learning-Analytics-in-the-Classroom-Translating-Learning-Analytics-Research/Lodge-Horvath-Corrin/n/book/9780815362128>

**Design analytics that close the feedback loop**  
this is the revolutionary shift • learner and teacher agency + agility

**Tech alone will fail**  
embed new tools in meaningful learning activities, aligned with assessment

**Build your capacity to design analytics**  
shape data to meet your needs • learn how to critique analytics

**Understand what Data, Analytics and AI can + can't do**  
what used to be 'distinctively human' is changing  
but human intelligence remains vital – for both staff and students