

Learning Analytics as an Intelligent Personal Assistant for Lifelong Learners

Kirsty Kitto

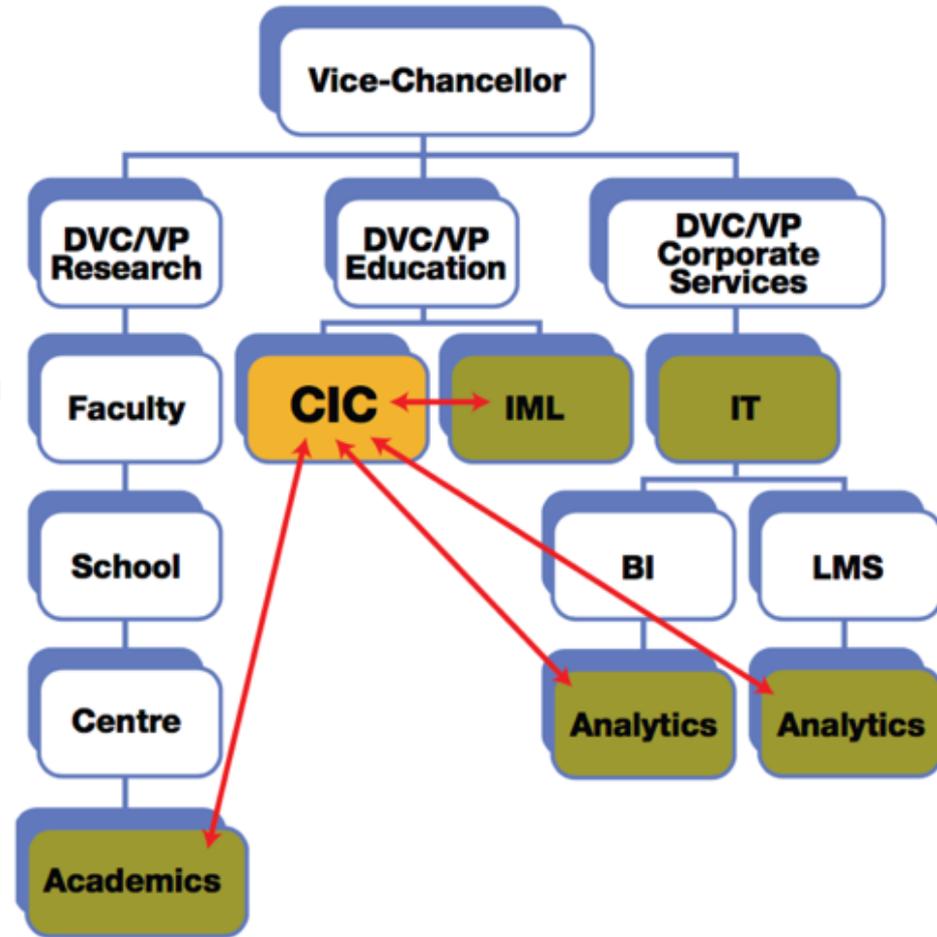
Connected Intelligence Centre

@KirstyKitto • kirsty.kitto@uts.edu.au

what is UTS:CIC?

University of Technology Sydney -
Connected Intelligence Centre

- UTS innovation lab specialising in Learning Analytics
- provides in house data science consultancy
- academics teach data science and perform research
- trains PhD students in Learning Analytics



what is learning analytics? (LA)

Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs

SoLAR definition



View Progress Export Course Content + Module

Home

Modules

Announcements

Assignments

- Get started
- Welcome to 36103 - Statistical Thinking for Data Science!

traditionally EdTech has focused upon providing analytics within the confines of specific systems built by vendors...
(e.g. LMSs, eBooks, SIS)

Search

Settings

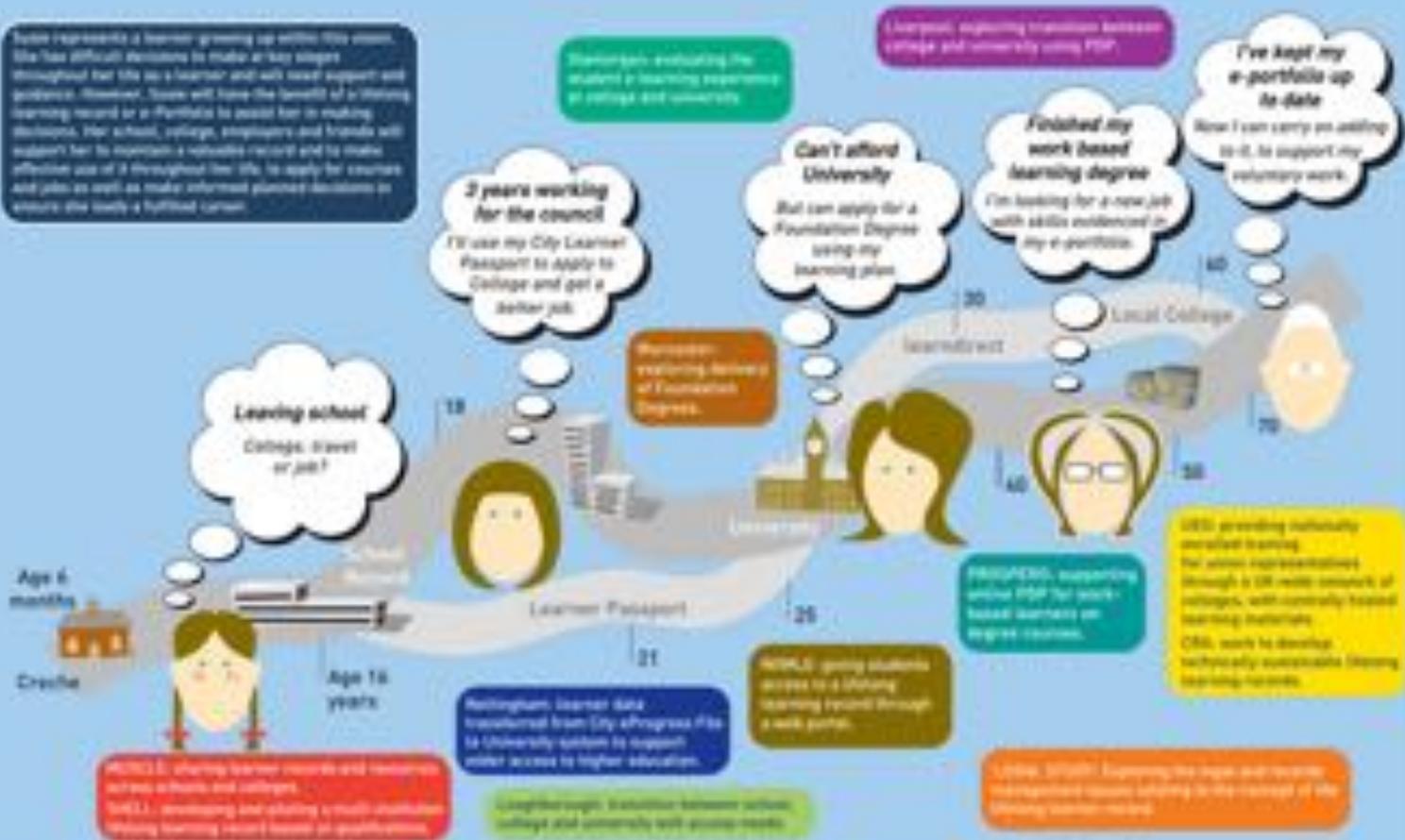
- Don't plagiarise!
- Resources, texts, and good online courses
- Module 0: Preparing for statistical thinking
- Am I ready for statistical thinking?



but learning happens everywhere!

Susie's journey

and learning occurs over a lifetime!

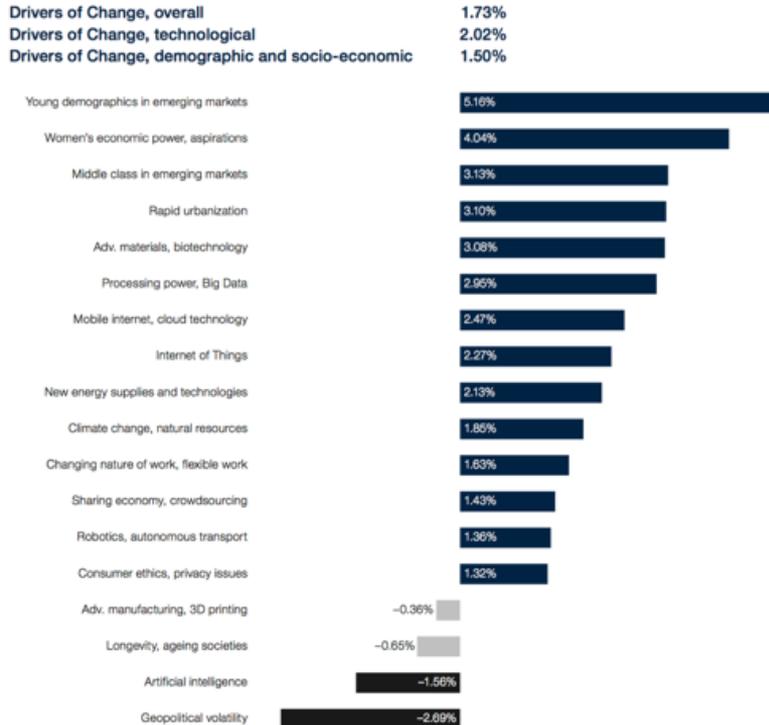


so how can we
help our learners
to succeed?



especially in the light of the fourth industrial revolution!

Figure 4: Employment effect of drivers of change, all job types
Compound growth rate, 2015-2020, %⁷



Global Challenge Insight Report

The Future of Jobs

Employment, Skills and
Workforce Strategy for the
Fourth Industrial Revolution

January 2016



but first!
what *type* of learning
are we talking about?

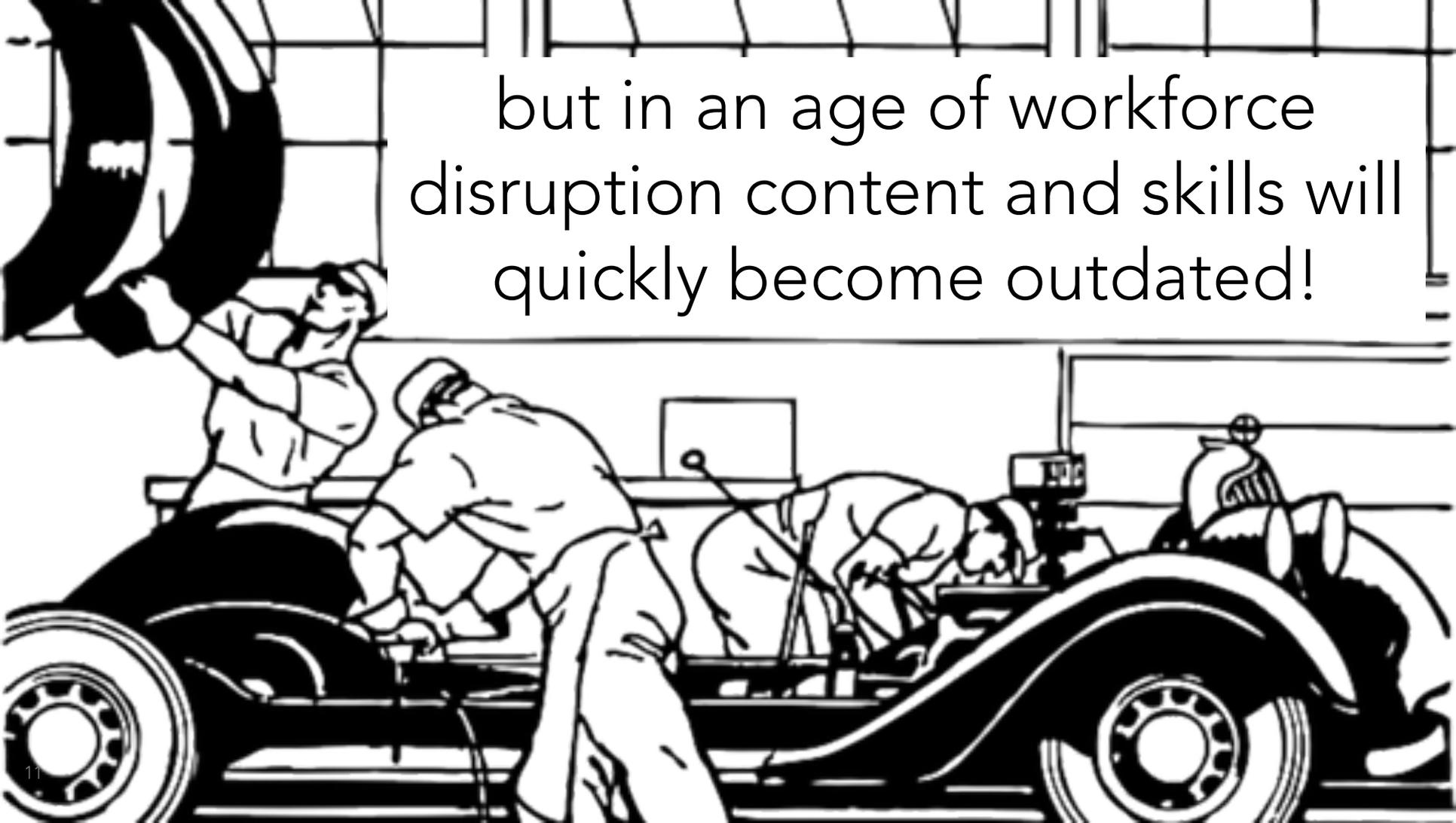
are students acquiring:
content and skills?
or
learning to learn?

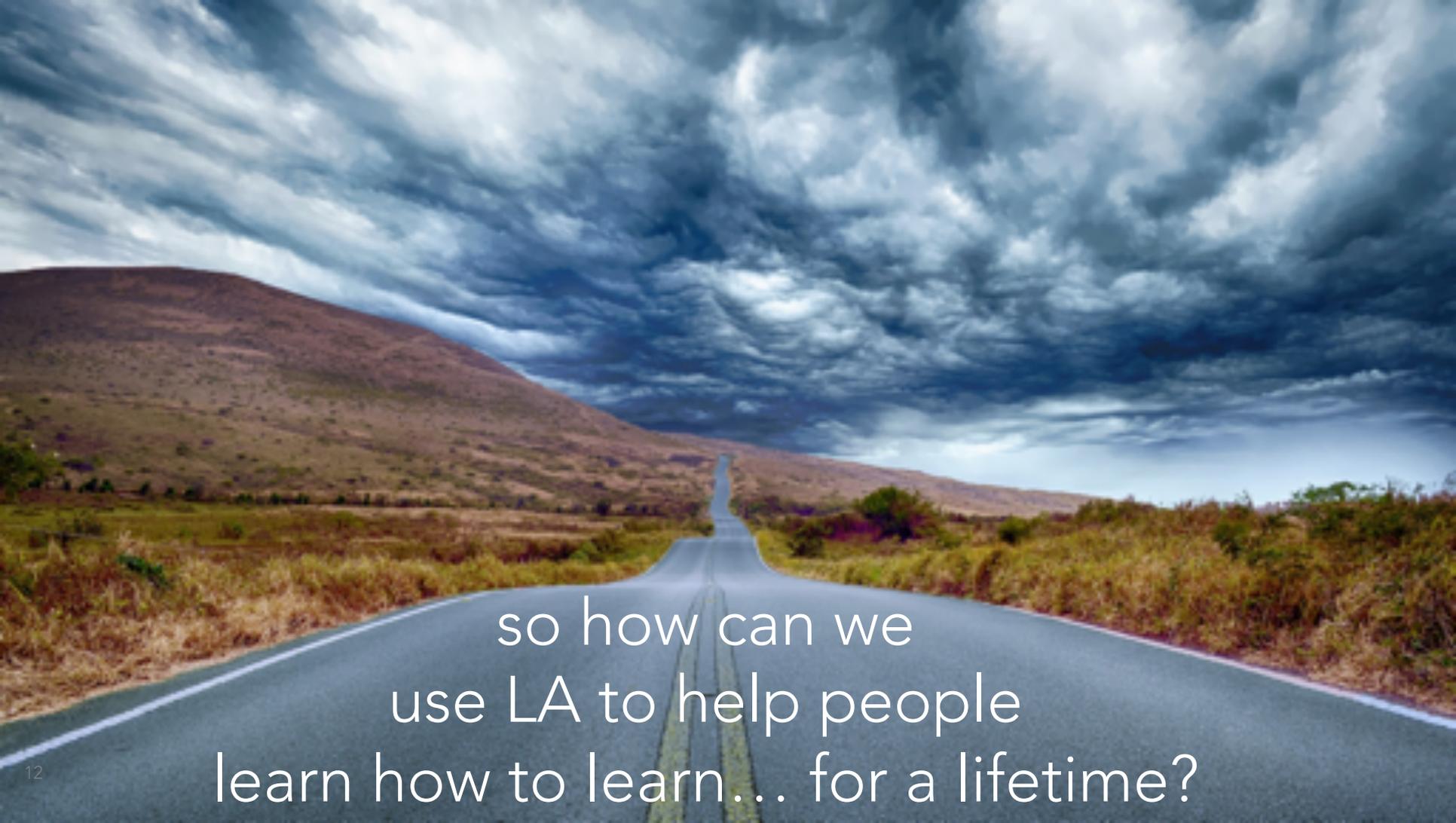


content and skills are well suited to adaptive learning and intelligent tutoring systems



but in an age of workforce
disruption content and skills will
quickly become outdated!



A long, straight asphalt road stretches from the foreground into the distance, flanked by dry, brownish-yellow grass and shrubs. In the background, a large, rounded hill or mountain rises under a vast, dramatic sky filled with heavy, dark, textured clouds. The overall mood is one of vastness and contemplation.

so how can we
use LA to help people
learn how to learn... for a lifetime?



my approach: student facing LA

CAUTION

- a “go look at it” approach tends to fail
 - students don’t apply knowledge
 - limited reflection
 - often blindly believe LA instead of questioning it and reinterpreting
 - and it can be **hard to use** (Learning Design is essential!)

example 1: learning to write

We ^{should} shold not make ^{b far} nanobots fore ^{ple reason} multipul reesuns. As you probibly know in the ^a rong ^{wrong} hands they can be ^{ea an} dangerous. So to fined out the rest you are going to have to ^{ea ans} read the rest of this ^{bon ea} exsithing artikul.

For one a nanobot could have a bug and start ^{ea ans} eeting ^{bon ea} enything cardin basted or just not work at all. ^{ea ans} Another thing is that thay may allso eat the rong ^{bon ea} substins, wich wold onle be bade in some cases. ^{ea ans} Wat is rile bad if one has a bug ^{bon ea} cold make mor with the same ^{ea ans} problem. Now I ^{ea ans} know that you are ^{bon ea} wondering wat I am tolking abot, I mean how ^{ea ans} could it make mor of its ^{bon ea} problem inles it ^{ea ans} colud rerite uthur ^{bon ea} nanobots programs. Well some ^{ea ans} sientintists are tring to figyer out how to mak ^{bon ea} it ^{ea ans} posibul for them to copy themselk. So one might be able to ^{bon ea} bekum 100.

Also thay are planing to make them abule to ^{ea ans} cile ^{bon ea} bakteryia, and there thay might eat away at the ^{ea ans} intestens insted. But don't be werryd thay mite make it so that thay will go throw the body with the rest of th ^{ea ans} food. Also thay might program them to tern of after a serTEN amout of time.

They are also planing to make ^{ea ans} smal ^{bon ea} traking ^{ea ans} divises so kids wont get lost. I just hope thay are ^{ea ans} haker safe and thay aren't over used. I don't want the ^{ea ans} ^{bon ea} government to know to much. I also don't want some ^{ea ans} ^{bon ea} sikeco ^{ea ans} thraking me.

So as you can see there are lots of problems. There is bugs, ^{ea ans} ^{bon ea} hackers, ^{ea ans} ^{bon ea} goverment ^{ea ans} overyuos, and ^{ea ans} ^{bon ea} faling into the rong hands. There is good noos I think we are stile ^{ea ans} ^{bon ea} alitaule ^{ea ans} fare from ^{ea ans} ^{bon ea} geting a lot of ^{ea ans} ^{bon ea} nanobots just yet. ^{news}

feedback – reflective writing

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

Auto feedback:

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 learn 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

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LA must be linked to the pedagogical purpose!

reflective writing

Depth	Intention					What change is likely to lead to future benefits?
	Integration		What impact on my goals/aspirations?	What other ideas could I use to change myself?	How do others address these challenges?	How can I learn from other perspectives?
	Internalisation		What do these feelings say about me?	How is this a problem that challenges me?	Why do I need to change?	How can I change?
	Interpretation	What does it mean for me?	Why do I feel this way?			
	Impression	What do I notice about my situation?				
	Thoughts	Feelings	Challenge	Self critique	Potential solution	Learning opportunity
	CONTEXT		CHALLENGE		CHANGE	
	Narrative					

Gibson, A., Aitken, A., Sándor, Á., Buckingham Shum, S., Tsingos-Lucas, C., & Knight, S. (2017, March). Reflective writing analytics for actionable feedback. In Proceedings of the Seventh International Learning Analytics & Knowledge Conference (pp. 153-162).

research writing (CARS model)

Move 1 – Establishing a research territory:

E – Emphasis of a significant or 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 authors goal, nature of the research or structure of the paper

Abel, S., Kitto, K., Knight, S., Buckingham Shum, S. (2018). Designing personalised, automated feedback to develop students' research writing skills. In Proceedings ASCILITE 2018. In Press.

feedback – reflective writing

The image shows a software interface for reflective writing feedback. On the left is a 'Key' sidebar with a list of rules. The main area is split into two panels: the left one shows a snippet of text with some words highlighted in red and green, and the right one shows the same text with a 'Feedback (Reflective)' panel overlaid. This panel contains a list of feedback points with colored icons (blue, purple, pink) and a paragraph of text where these points are applied to the original text. At the bottom, there are navigation links: 'About', 'Contact', 'Terms of Use', and 'Privacy Policy'.

Key

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- Deeper reflection, personally applied.
- How new knowledge can lead to a change

Auto feedback: Get Feedback Save Export to PDF Key

Feedback (Reflective)

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feedback – research writing

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

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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

Analytical Report

Feedback

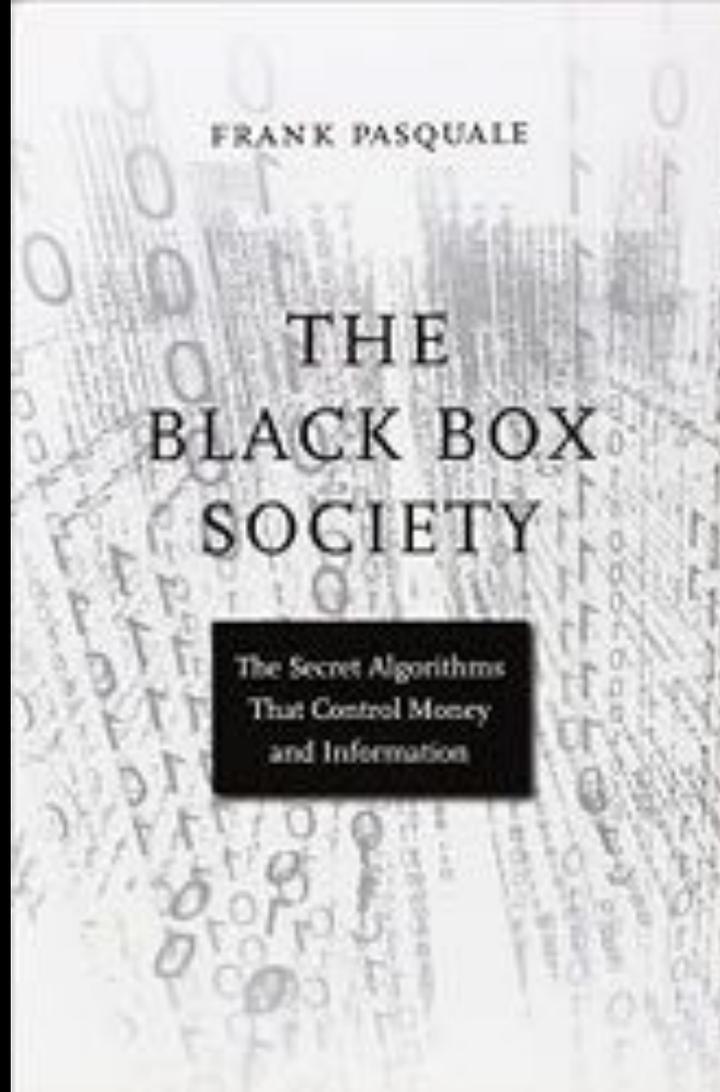
Resources

Thank you for submitting your draft to AcaWriter. Quality writing comes from revision. Research shows that writing drafts and revising your text helps improve the quality of your writing.

Remember AcaWriter is a machine – so it may not highlight all your moves correctly and could give you incorrect feedback. So, don't be afraid to disagree with the feedback, if you believe you have included all three moves in the correct order.

i It seems you have stated how your research fills the gap and/or solves the research problem [Move 3 – Occupying the niche (S or N sentences)] before you have indicated the gap and/or explained your research problem [Move 2 Establishing a niche (C or Q sentences)]. It is more effective to indicate the gap and explain the research problem before you state your solution and aim of your study. AcaWriter suggests putting Move 3 – Occupying the niche (S or N sentences) after Move 2 Establishing a niche (C or Q sentences).

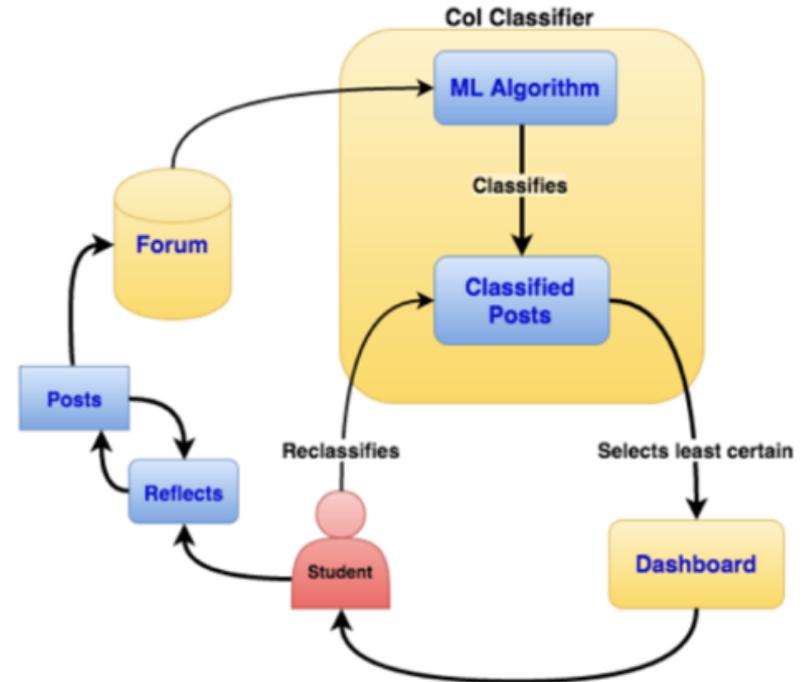
example 2:
learning to open
the black box



active learning squared (AL²)

a learning design we are starting to use:

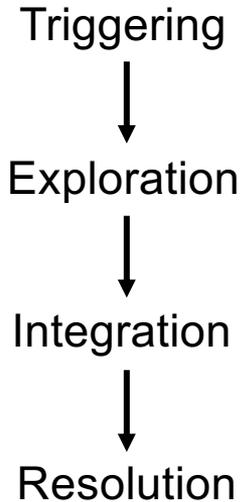
the student trains the classifier...
...while it is training the student...



Kirsty Kitto, Mandy Lupton, Kate Davis, and Zak Waters. 2017. Designing for student-facing learning analytics. *Australian Journal of Educational Technology*, 33, 5 (2017), 152–168.

cognitive presence

“extent to which the participants in any particular configuration of a community of inquiry are able to construct meaning through sustained communication.”



Garrison, Anderson, Archer (2001) Critical thinking, cognitive presence, and computer conferencing in distance education. American journal of distance education, 15(1):7–23

Stefan P. Schmid
The terror of tweeting
Sorry to bring this up again. Besides having an awesome title, this article resonates strongly with my experience trying to convince training staff and faculty to "go public". In this case it's not about "not getting it". The fear of being wrong seems to run deep.
This adds to our previous Twitter related discussions here
<https://plus.google.com/11491189423891116400/posts/yfGz8y8r2J>
and elsewhere.
+Rae Hussain +Laura Gibbs +Janet Webster +George Station

The terror of tweeting social medium or academic message?
<http://www.thegarden.com/highereducationnetwork/10/>

12 Kommentare

Laura Gibbs · 10.02.2014 · #f
Thanks for this, +Stefan P. Schmid-and-yw.L.2013 this is definitely a part of the problem. "Social media involves a loss of (direct and an) distance in trust and openness." It's also a good explanation of why there is not much social learning going on in our classes either... trust, openness, de-centering, loss of control: very much the factors that keep people from changing how they teach.
Our Center for Teaching Excellence (it used to be the "Instructional Development Program" but we've gone and become excellent of course) just launched a new website today... and is there even a glimpse of (social) any kind of conversation in digital space? anything built up down content, @thwep?

+Stacy Zemke Do you see this article? If people want control (and yes, I know the result of it - real control, or just symbolic control), then their lack of interest in Wikipedia is very understandable.

+Stefan P. Schmid by showing your staff/faculty this video
<https://plus.google.com/+StefanPSchmid/posts/11klyGz8y8r2J>

FYI, it was first posted to the +Mark Poole and had posted it on my Twitter page thread
<https://plus.google.com/117219452229374562288/posts/MzghU1P5hN>

Mark Poole · 10.02.2014 · #f
Did someone write fear and tense. Here's something to help with change. Its not finished with it yet.
<http://rgos.gsu.edu/>

George Station · 10.02.2014 · #f
I agree with the author on one point, though I don't want to over-emphasize it: Based on first-hand testimony, meaning I can (but won't) name names, I think we do still have some colleagues with the fear of looking like your own grandparent who won't spend a day on one of them meaningless computing machines. Some colleagues simply don't want to show a lack of tech-savvy in front of students. Really. To this day, Tech avoidance, sticking to e-mail and (at most) MS Office, is one way of @thwep this.

George Station · 10.02.2014 · #f
P.S. I have a bit of the shakes myself with some tech, but not other tech. Its not claiming to be an early adopter with anything but @-

<https://plus.google.com/u/0/+StefanPSchmid/posts/4wrUbFzFwpJ>

Community of Inquiry Classification

Community of Inquiry Classifications

Want to learn about your participation within your learning community?

When you start this activity, you will see one of your posts. We have used machine learning to categorise your *cognitive presence* according to the *Community of Inquiry model*.

However, our machine learning tool is still learning and it could be wrong. We would like you to:

1. Think about how your post was classified
2. Choose what category you believe your post belongs to
3. If you like, you may highlight text from your post that you used in making your decision, or add remarks to the text-box about what helped you come to your conclusion
4. You can view your history below

What is Cognitive Presence?

Cognitive presence has four phases: Triggering, Exploration, Integration, and Resolution.

Triggering Phase initiates discussion about a particular issue/topic for inquiry.

Exploration Phase posts explore the issue at hand by exchanging knowledge between members of the community.

Integration Phase interactions build upon the ideas shared and explored in the Exploration phase and begin to construct understanding or a solution about a topic or issue.

Resolution Phase are messages in a discussion that test the solutions or understanding developed in the Integration phase.

Begin

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Begin

Community of Inquiry Classification

Community of Inquiry Classifications

What is this?

Was classified as: Triggering

Here's a free definition for your buzzword bingo card

Conspectus: an approach to defining the levels at which an institution collects in a given content area. It's about the depth of collecting and there are standard indicators, which you can read about in this IFLA guide to collection development policies. Conspectus is also an approach that can be taken to collection development policy writing, where the policy sets out the target level of depth in particular areas of collecting. It's not used much in Australian libraries any more, and is a bit out of fashion internationally (though used by some research libraries still).

Sharing information/outside links

Triggering

Exploration

Integration

Resolution

Other

Preview:

Author

Posts

July 27, 2015 at 8:52 pm

#402



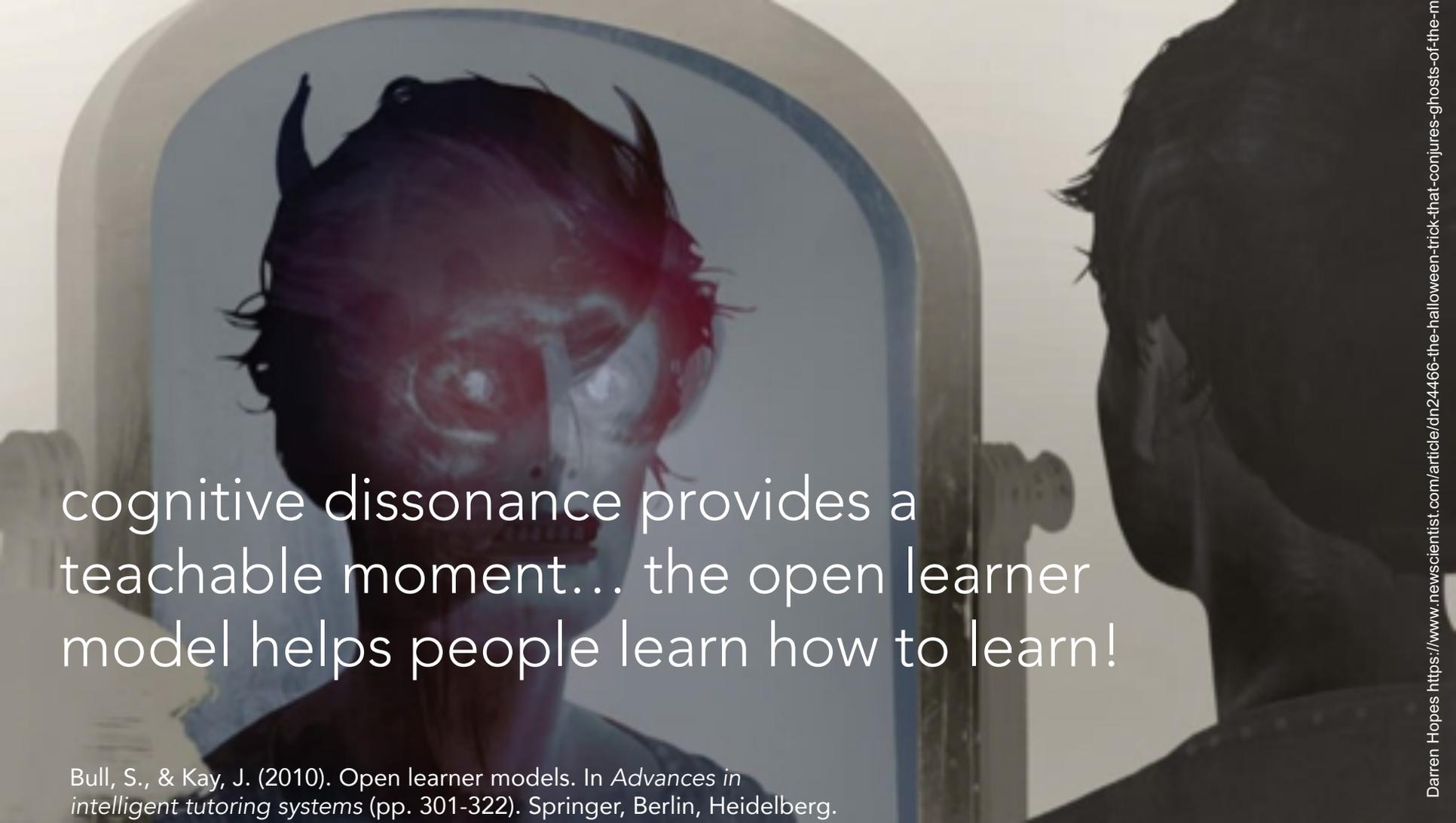
Kelli Davis

kellymuzzer

Here's a free definition for your buzzword bingo card...

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A person wearing a red devil mask with horns and horns is looking towards a silhouette of a person's head and shoulders. The scene is set against a light blue arched background.

cognitive dissonance provides a teachable moment... the open learner model helps people learn how to learn!

Bull, S., & Kay, J. (2010). Open learner models. In *Advances in intelligent tutoring systems* (pp. 301-322). Springer, Berlin, Heidelberg.

example 3:
personalised
messaging
to students
based on
activity in
class

**PERSONALISATION
IS NOT ABOUT
FIRST/LAST NAME.
IT'S ABOUT
RELEVANT
CONTENT.**

Dan Jak



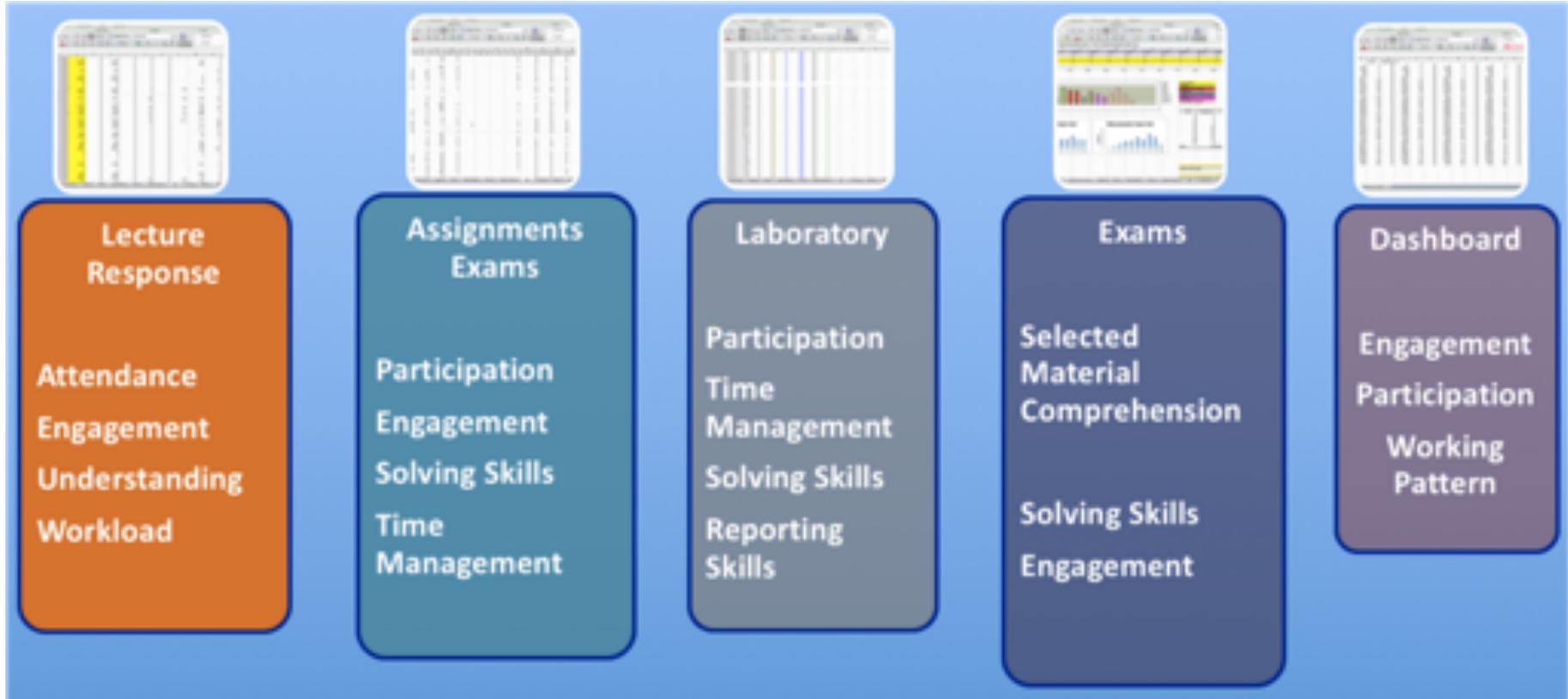
CATHERINEMONGINA



catherinemongina

weekly personalised feedback to 800+ students

(Acknowledgement: Jurgen Schulte, UTS Science)



rapid, personalised feedback at scale to students

(developed by Jurgen Schulte, UTS Science)

End of **week 3** feedback case 3

cond 1

Dear **Osiri**,

cond 2

Quite a few students had to move lab classes the past two weeks. This is just to confirm that I have you on record that you are now in lab **Group 18** and that your online lab report should be submitted at our **Group 18** pages.

cond 6

You had a good start with Physical Modelling and seem to be well on track.

cond 7

You managed to achieve 9 out of 10 marks in your WileyPLUS assignments.

Your lab reports came back with 7 out of 7 marks.

cond 8

I noticed you are a keen participant of our lecture exercises. Did you know that they can be accessed before as well as after the lecture, not just during lecture?

cond 9

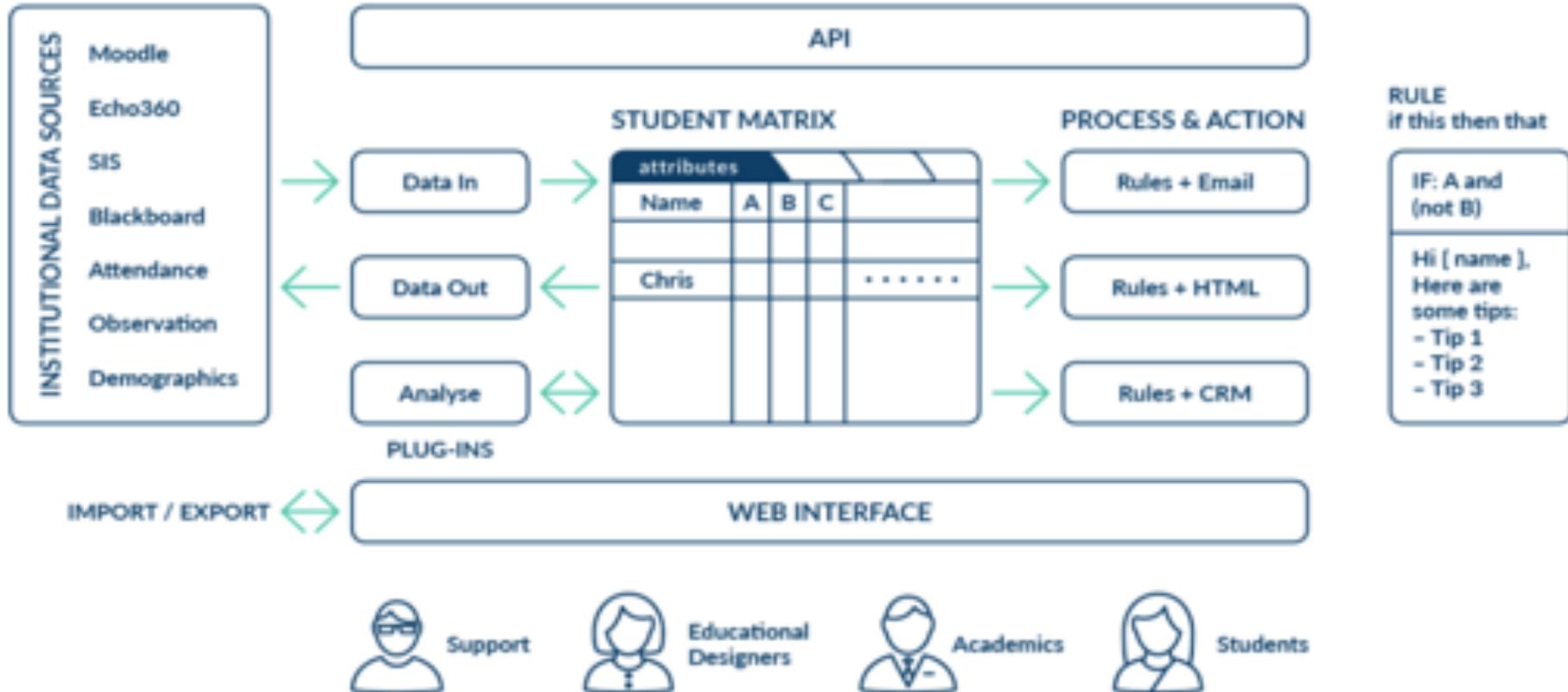
You seem to have had problems with one of the forces questions. Please have a look at HRW Chapter 3.2.2 where this case is discussed in more detail.

cond 5

Please don't forget that our **third** homework assignment has been released already. This assignment will be due 11.00 pm Friday next week.

Kind regards,
Jurgen Schulte

scaling up via Australian national funding...



Providing personalised,
timely support actions to
large student cohorts.

LEARN MORE



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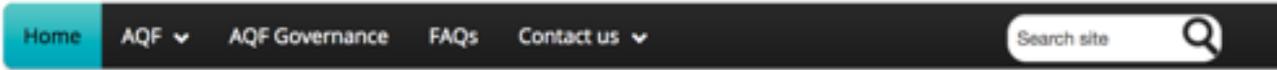
example 4: navigating workforce transition



Digital Business

**Motivate Employees
to Reskill for
the Digital Age**

qualifications frameworks are too broad



The AQF is currently undergoing a review. More information can be found on the **Department of Education and Training website**.

Australian
Qualifications
Framework



datasets exist that provide sophisticated mappings



European Commission > ESCO > Occupations



OCCUPATIONS

- data scientist
- bioinformatics scientist
- sensory scientist
- cosmologist
- hydrographic surveyor
- meteorologist

data scientist

Description

Data scientists find and interpret rich data sources, manage large amounts of data, merge data sources, ensure consistency of data-sets, and create visualisations to aid in understanding data. They build mathematical models using data, present and communicate data insights and findings to specialists and scientists in their team and if required, to a non-expert audience, and

a prototype tool

UTS: Burning Glass

Kirsty

Content Tagger/Similarity

Enter subject number(s) comma separated

Fetch Results

Occupations

Data Scientist	0.448
Data / Data Mining Analyst	0.4
Statistician	0.291
Database Architect	0.264
Data Engineer	0.261
IT Project Manager	0.260
Data Warehousing Specialist	0.248
UI / UX Designer / Developer	0.237
Financial Quantitative Analyst	0.230
Chief Information Officer / Director of Information Technology	0.223

Subject	Potential Skills
36100 Data Science for Innovation	teamwork / collaboration 0.98 random solving 0.98 decision making 0.98 data collection 0.98 data science 0.98 big data 0.98 creativity 0.88 data quality 0.87 teaching 0.77 cleaning 0.77 journalism 0.67 presentation skills 0.66 experiments 0.66 articulate 0.66 apache hadoop 0.66 organizational skills 0.43 big data analytics 0.36 python 0.36 communication skills 0.36 data mining 0.34 building effective relationships 0.28
36103 Statistical Thinking for Data Science	decision making 0.98 problem solving 0.98 statistics 0.98 data science 0.98 teamwork / collaboration 0.98 machine learning 0.77 data analysis 0.76 statistical analysis 0.76 data collection 0.66 teaching 0.75 test 0.66 cleaning 0.66 data modeling 0.66 predictive models 0.34 A/B project management 0.29 python 0.27 data visualization 0.28 communication skills 0.18 business methods 0.18 ml 0.18
36106 Data, Algorithms and Meaning	machine learning 1.00 articulate 0.99 decision making 0.98 data mining 0.96 big data 0.94 microsoft excel 0.86 data science 0.82 decision trees 0.82 predictive models 0.76 apache hadoop 0.77 presentation skills 0.66 random forests 0.65 communication skills 0.77 ml 0.65 neural networks 0.65 experiments 0.65 natural language processing 0.64 big data analytics 0.48 critical thinking 0.15 matlab 0.15 written communication 0.14
36105 Leading Data Science Initiatives	articulate 0.99 problem solving 0.99 project management 0.99 planning 0.97 data management 0.97 scrum 0.96 leadership 0.93 scheduling 0.92 data science 0.92 writing 0.91 software engineering 0.88 business case analysis 0.84 performance management 0.79 systems development 0.79 agile development 0.78 teamwork / collaboration 0.77 teaching 0.69 program management 0.68 big data 0.65 building effective relationships 0.37 business intelligence 0.36

UTS: Burning Glass

Kirsty

Content Tagger/Similarity

Enter subject number(s) comma separated

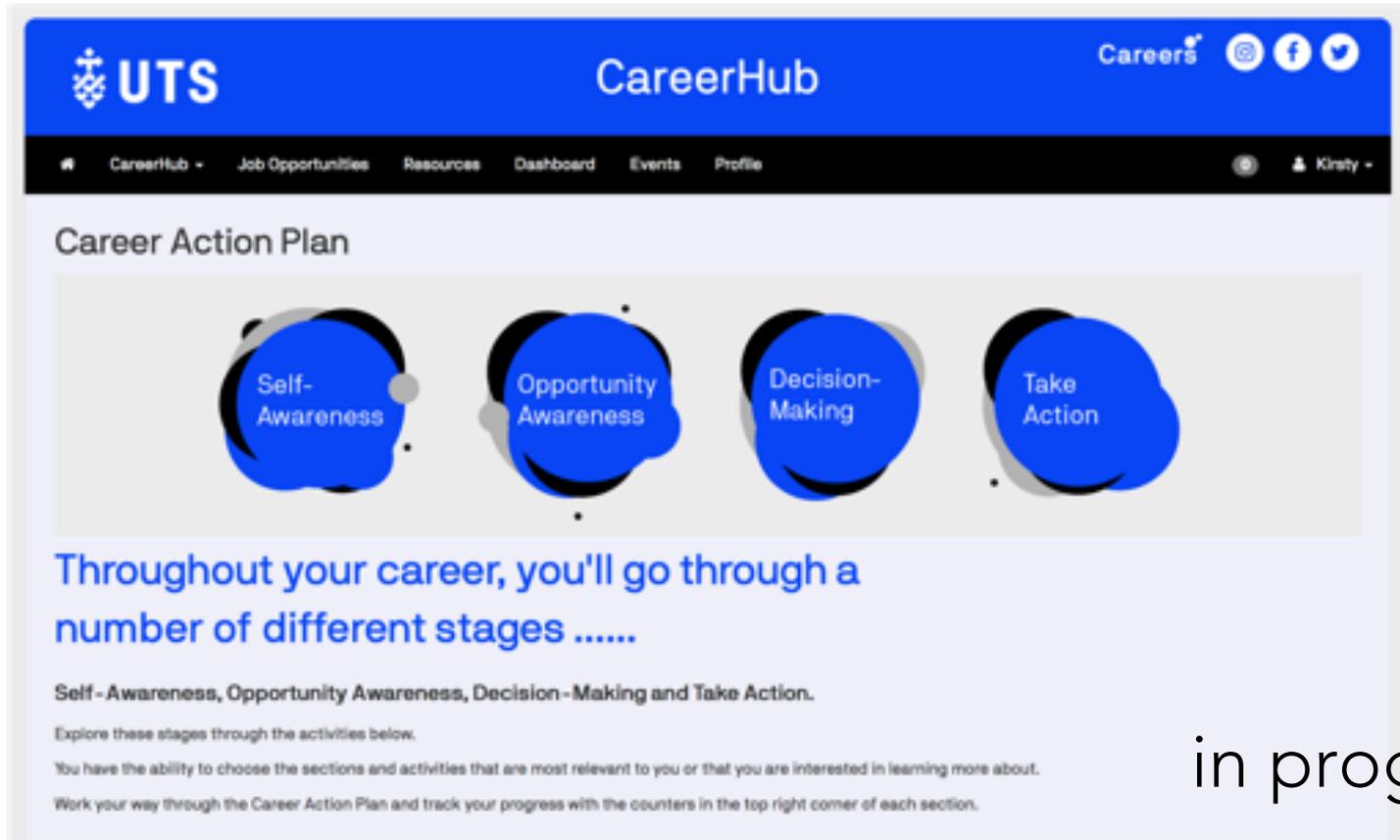
Fetch Results

Occupations

UI / UX Designer / Developer	0.448
Marketing Manager	0.407
Data / Data Mining Analyst	0.269
Data Scientist	0.264
Product Manager	0.261
Software Developer / Engineer	0.260
Market Research Analyst	0.257
Database Architect	0.256
Social Science Researcher	0.253
Natural Science Research Manager	0.239

Subject	Potential Skills
81539 Impossibilities to Possibilities	teamwork / collaboration 0.97 creativity 0.98 teaching 0.98 building effective relationships 0.98 communication skills 0.88 experiments 0.86 meeting deadlines 0.76 microsoft office 0.67 problem solving 0.65 creative problem solving 0.65 detail oriented 0.65 microsoft excel 0.65 writing 0.65 project management 0.65 organizational skills 0.65 critical thinking 0.65 customer service 0.65 planning 0.65 microsoft powerpoint 0.65 multi-tasking 0.65 budgeting 0.65
81540 Technology, Methods and Creative Practice	creativity 0.99 decision making 0.99 articulate 0.98 teaching 0.98 data analysis 0.88 teamwork / collaboration 0.98 communication skills 0.74 writing 0.74 issue proposition 0.74 presentation skills 0.74 problem solving 0.74 presentation skills 0.69 cleaning 0.67 organizational skills 0.66 detail oriented 0.66 creative problem solving 0.66 building effective relationships 0.66 microsoft excel 0.66 microsoft powerpoint 0.66 qualitative research 0.64 project management 0.64
81538 Frame Innovation	articulate 1.00 decision making 1.00 troubleshooting technical issues 1.00 data analysis 1.00 technical assistance 1.00 value proposition 1.00 academic achievement 1.00 data warehousing 1.00 teaching 1.00 instructional design 1.00 whole creative suite 1.00 data visualization 1.00 creativity 1.00 creative problem solving 1.00 product design 1.00 content development 1.00 student learning outcomes 1.00 communication disorders 1.00 grant writing 1.00 fundraising 1.00 persuasion 1.00
94663 Navigating Entrepreneurial Ecosystems and Initiating Change	articulate 0.99 creativity 0.98 teamwork / collaboration 0.97 data analysis 0.87 teaching 0.86 communication skills 0.83 troubleshooting technical issues 0.83 writing 0.82 detail oriented 0.81 project management 0.81 microsoft office 0.81 customer service 0.81 organizational skills 0.81 written communication 0.81 verbal / oral communication 0.81 multi-tasking 0.81

so can we use this to help people identify new opportunities when they are **returning** to university?



The screenshot shows the UTS CareerHub website. The header is blue with the UTS logo on the left, 'CareerHub' in the center, and 'Careers' with social media icons on the right. Below the header is a navigation bar with links for CareerHub, Job Opportunities, Resources, Dashboard, Events, and Profile. The main content area is titled 'Career Action Plan' and features four blue circular icons representing the stages: Self-Awareness, Opportunity Awareness, Decision-Making, and Take Action. Below the icons, there is a blue heading: 'Throughout your career, you'll go through a number of different stages'. Underneath, it lists the stages: 'Self-Awareness, Opportunity Awareness, Decision-Making and Take Action.' and provides instructions on how to explore these stages through activities and track progress with counters.

UTS CareerHub Careers

CareerHub - Job Opportunities Resources Dashboard Events Profile

Kirsty -

Career Action Plan

Self-Awareness Opportunity Awareness Decision-Making Take Action

Throughout your career, you'll go through a number of different stages

Self-Awareness, Opportunity Awareness, Decision-Making and Take Action.

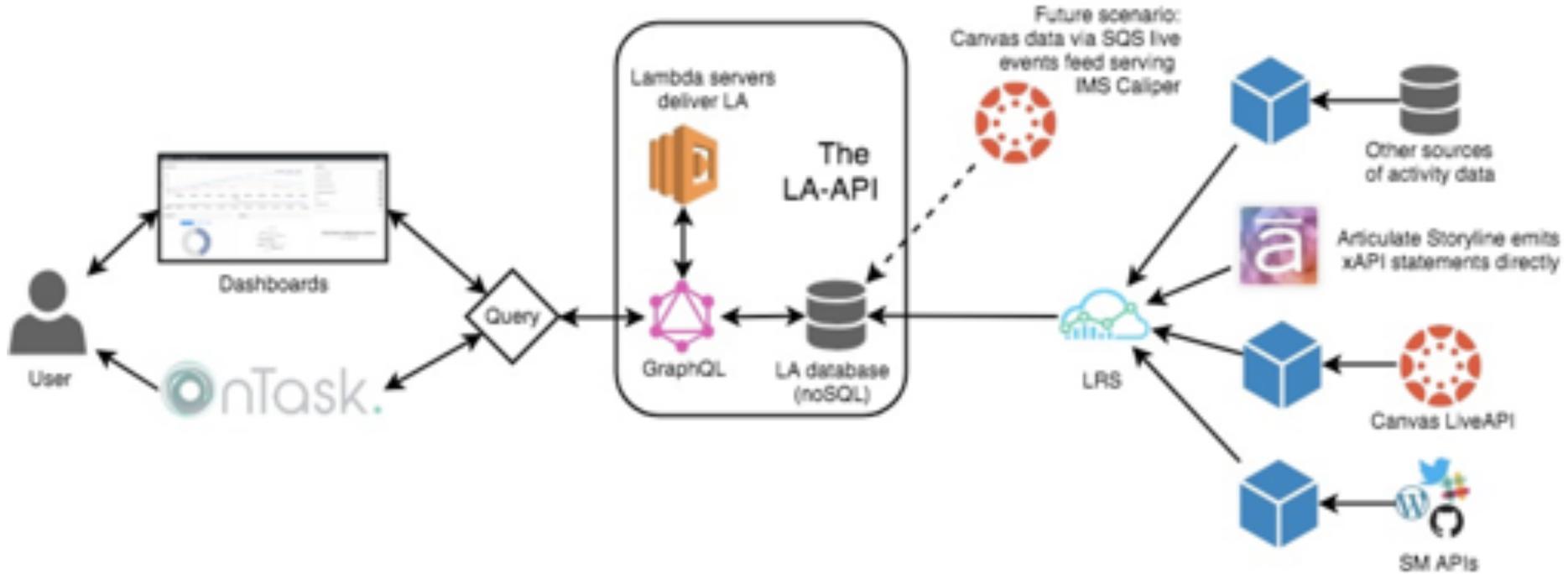
Explore these stages through the activities below.

You have the ability to choose the sections and activities that are most relevant to you or that you are interested in learning more about.

Work your way through the Career Action Plan and track your progress with the counters in the top right corner of each section.

in progress!

but that requires an ecosystem of tools!



data interoperability and portability are essential in a lifetime of learning!



learning to
learn is a long
and winding
road



one that is fraught
with peril if we are
too naive!

in summary

what I have learned... and often wish that EdTech would too:

- learning happens everywhere – so we need to *enable* that
- learning happens over a lifetime – so over many systems!
- we must establish the *type* of learning we are hoping to enable
- we must focus on solving actual problems!
- data interoperability and portability are essential!
- technology alone is never enough

Questions?