ANU, 18 Nov 2019

Analytics for Lifelong Learning Competencies:

Aligning Pedagogy, Human-Centred Design & University Strategy

Simon Buckingham Shum
Connected Intelligence Centre • University of Technology Sydney

UTS:CIC
CONNECTED INTELLIGENCE CENTRE

@sbuckshum • Simon.BuckinghamShum.net

cic.uts.edu.au

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CONNECTED INTELLIGENCE CENTRE

Deep acknowledgements to the team whose joint work I'm sharing today…

https://cic.uts.edu.au/about/people

Simon Knight

Lecturer

Ágnes Sándor

Honorary Associate

Shibani Antonette

PhD Student (Learning Analytics)

Radhika Mogarkar

Applications Developer

Andrew Gibson

Research Fellow (Reflective Writing Analytics)

Kirsty Kitto

Senior Lecturer (Data Science)

Carlos Prieto

PhD Student (Learning Analytics)

Gabrielle Gardiner

Senior Manager

Sophie Abel

PhD Student

Roberto Maldonado Martinez

Research Fellow (Educational Data Science)

Vanessa Echeverria Barzola

PhD Student

Ming Liu

Research Fellow (Educational Data Science)

UCI Department of Informatics
Donald Bren School of Information & Computer Sciences

"Informatics concerns itself with the study of living, working and building in a digital world. Wherever technology touches people, it must be designed with ultimate care. This requires mastery of technological knowhow and a deep appreciation of the social, cultural and organizational forces at work."

https://www.informatics.uci.edu/explore/chairs-welcome


Balancing and aligning the elements
T
R
U
S
T
Learning Analytics User Experience
Learning Analytics + Learning Design
Learning Analytics Co-design
Organisational Strategy
Photo by Sean Stratton on Unsplash https://unsplash.com/photos/ObpCE_X3j6U

the machines are coming…
cognitive automation

implications for learning analytics
+ some examples

UTS learning strategy, supported by
analytics innovation + impact

San Francisco, Fall Joint Computer Conference — Dec. 9th 1968

monday afternoon

december 9

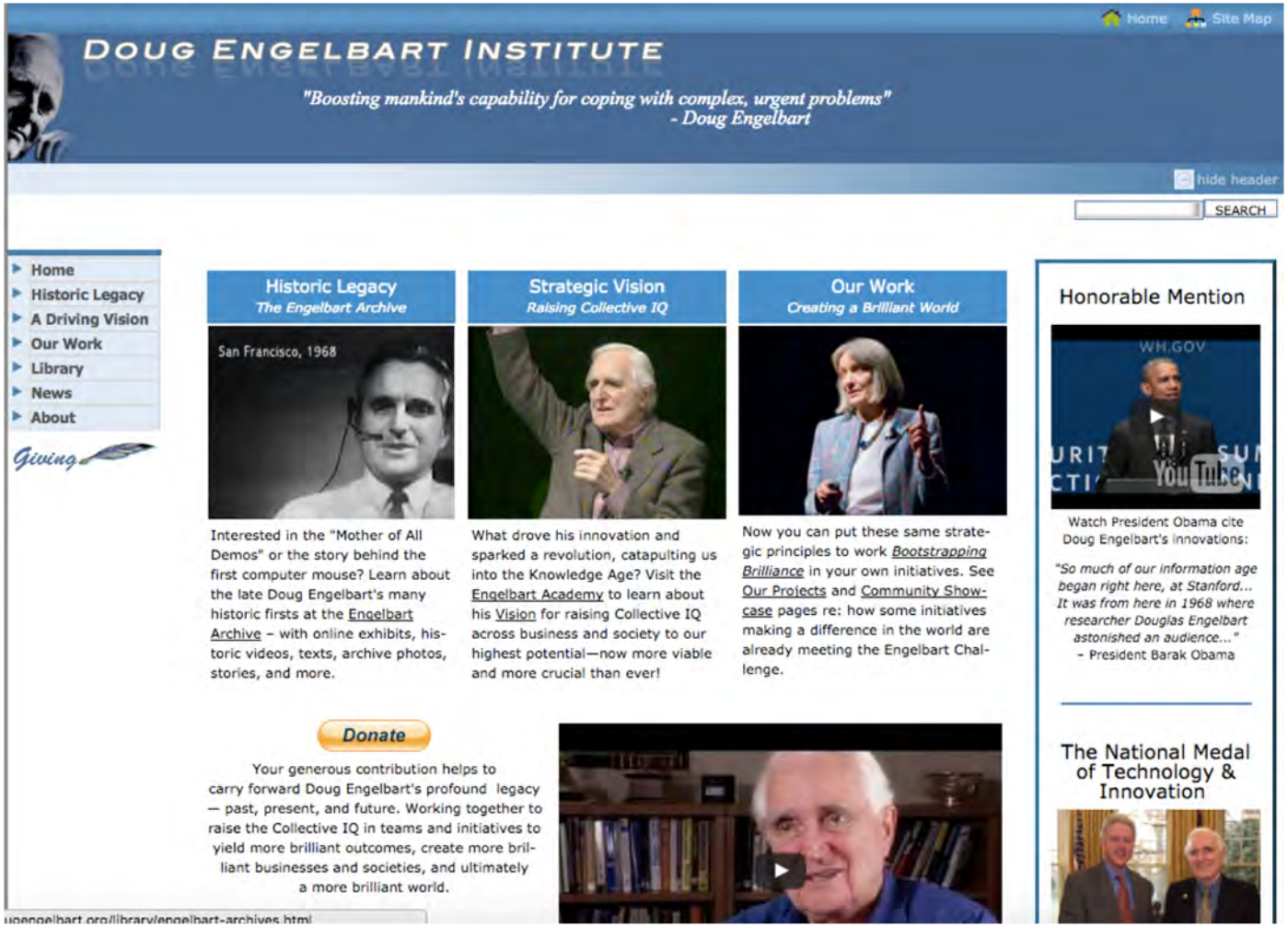
3:45 p.m. / arena

Chairman:
DR. D. C. ENGELBART
Stanford Research Institute
Menlo Park, California

a research center for augmenting human intellect

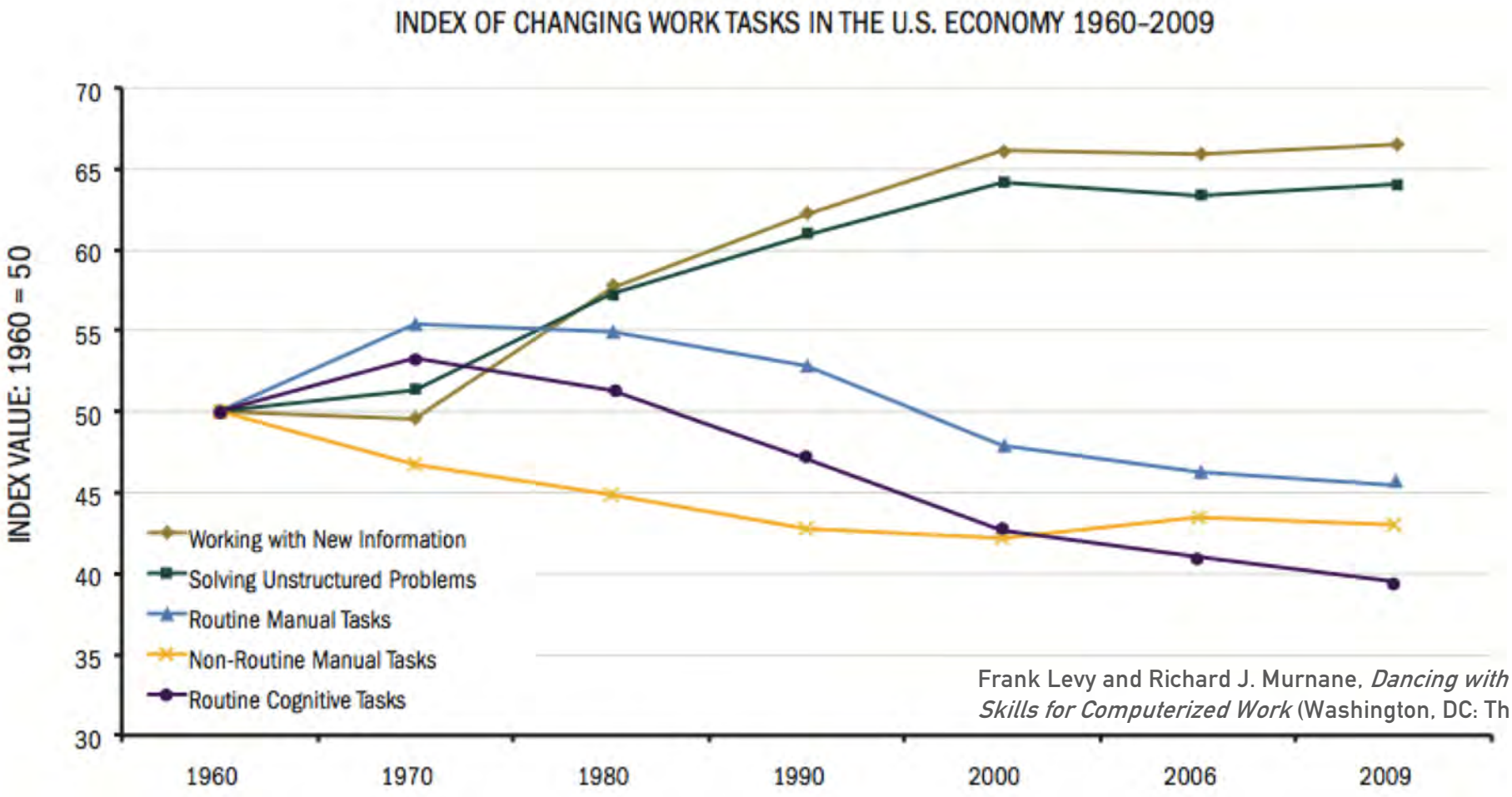
This session is entirely devoted to a presentation by Dr. Engelbart on a computer-based, interactive, multiconsole display system which is being developed at Stanford Research Institute under the sponsorship of ARPA, NASA and RADC. The system is being used as an experimental laboratory for investigating principles by which interactive computer aids can augment intellectual capability. The techniques which are being described will, themselves, be used to augment the presentation.
The session will use an on-line, closed circuit television hook-up to the SRI computing system in Menlo Park.
Following the presentation remote terminals to the system, in operation, may be viewed during the remainder of the conference in a special room set aside for that purpose.

dougengelbart.org



we need better tools to tackle “humanity’s complex, urgent problems”

US change index of work tasks 1960-2009

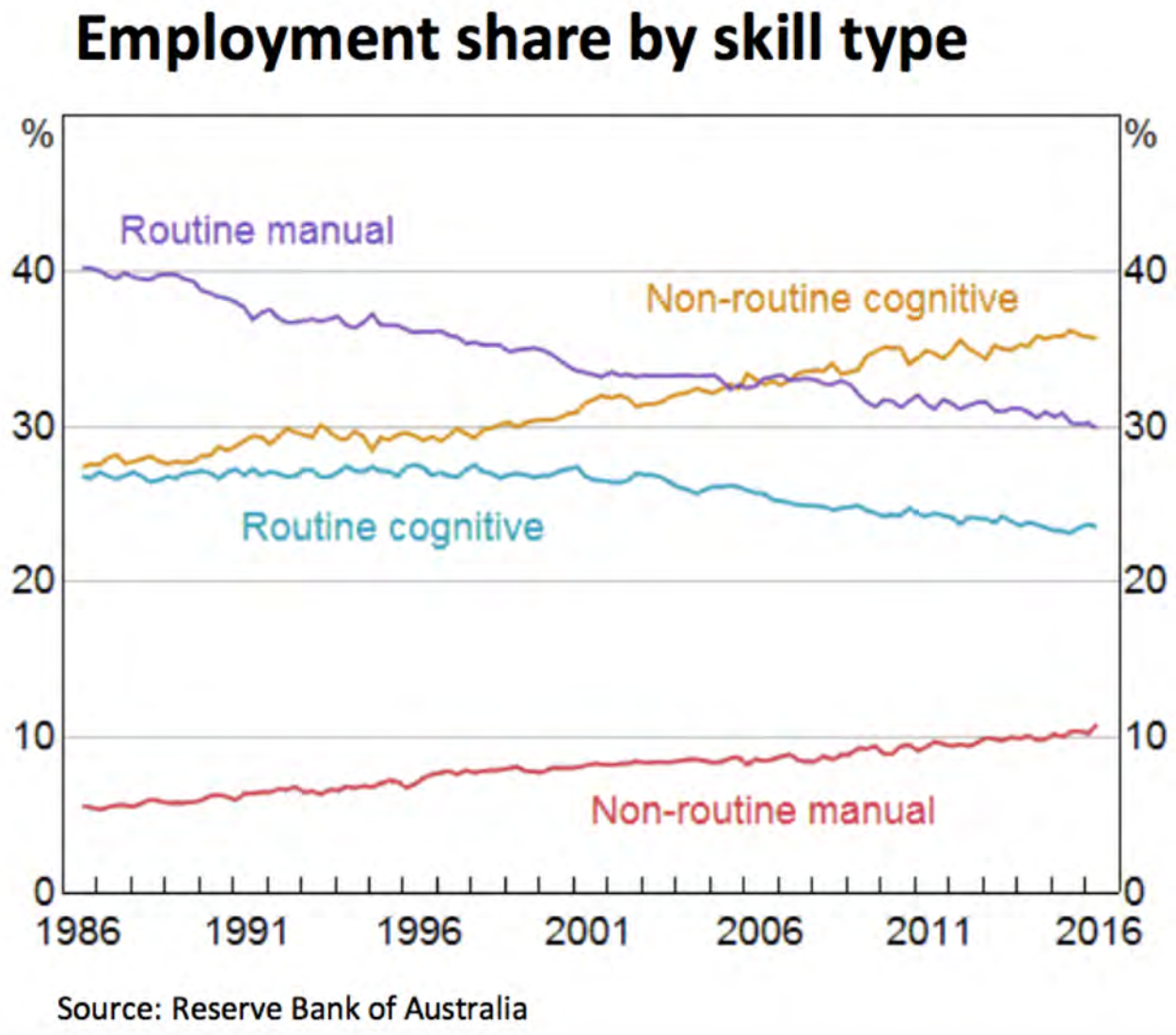


Frank Levy and Richard J. Murnane, *Dancing with Robots: Human Skills for Computerized Work* (Washington, DC: Third Way, 2013), Fig.3

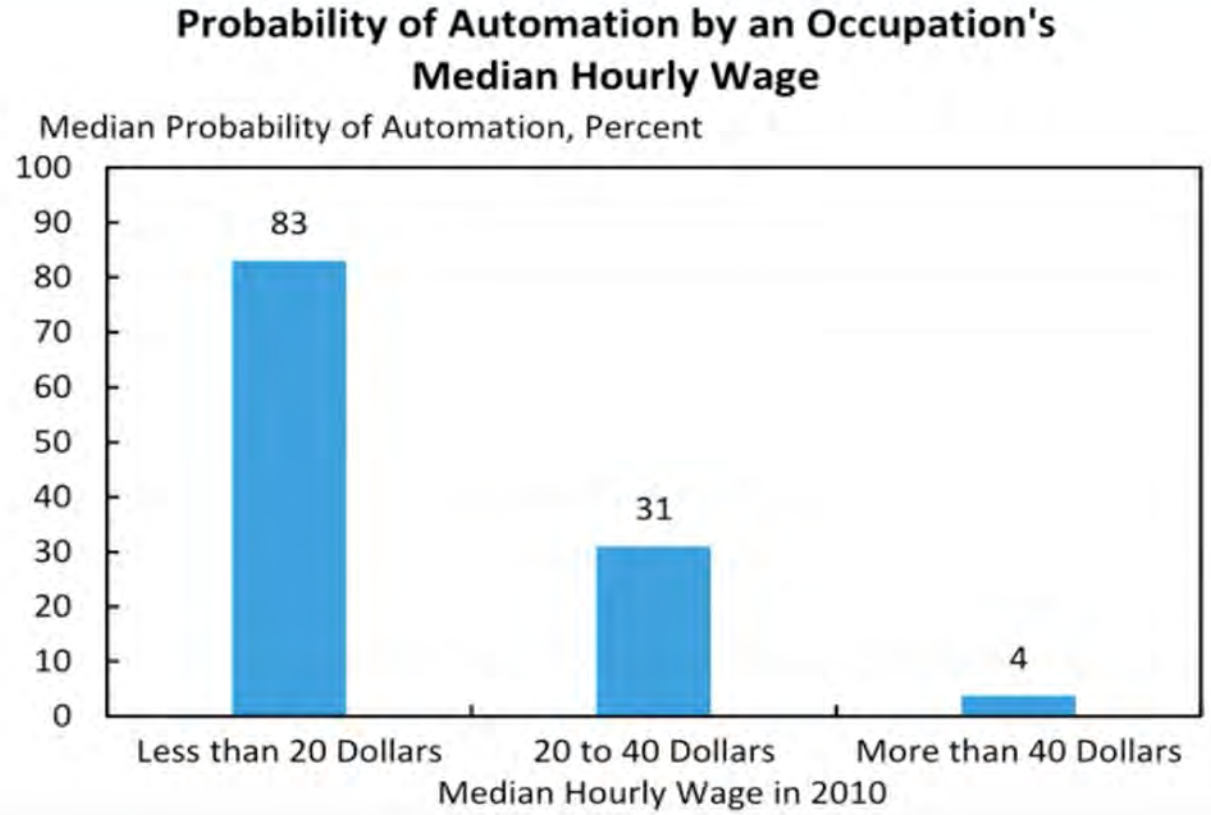
Routine manual and cognitive work is being automated

Only non-routine manual and cognitive work will be done by people

(What counts as 'non-routine' will reduce as AI improves)



The Probability of an Occupation's Automation Varies Dramatically Across the Wage Spectrum

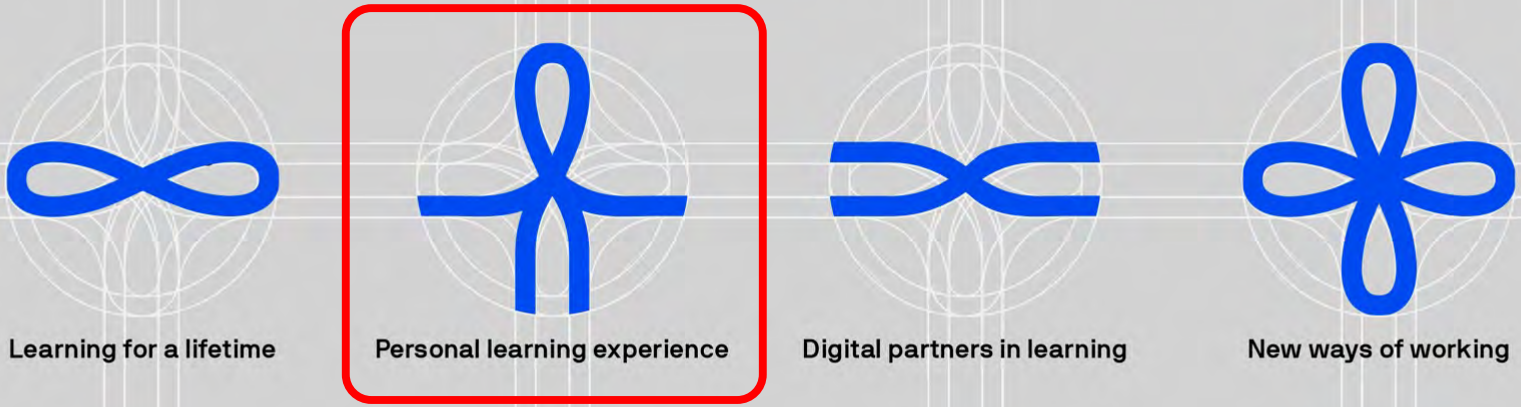


Source: Bureau of Labor Statistics, Occupational Employment Statistics; Frey and Osborne (2013); CEA calculations.

Jason Furman, Chairman of the Council of Economic Advisers
https://artificialintelligencenow.com/schedule/conference/presentation/time-different-opportunities-and-challenges-artifi

Initiatives 2019-21

strategy.uts.edu.au



Learning for a lifetime

Personal learning experience

Digital partners in learning

New ways of working

Our precinct, community and partnerships

Transforming society through connected research

A distinctive international profile and student experience

Delivering positive social change

Personal learning experience

Whether they're a first-time student or have been here before, our students will co-create their own learning experiences.

We'll create a learning experience that will be seamless, personalised and relevant. It will leverage our campus and industry connections to ensure education is enriched with leading technology.

→ data-driven feedback personalised to students

what are the implications for

learning analytics?

As analytics aggregate lower level data
& A.I. gradually automates routine cognitive work…

Humans must move to the higher ground…

- Train data scientists to combine algorithmic intelligence with creative intelligence, and ethical mindsets
- Deploy all the Educational & Data Science expertise we have to cultivate the higher order graduate qualities

As analytics aggregate lower level data
& A.I. gradually automates routine cognitive work…

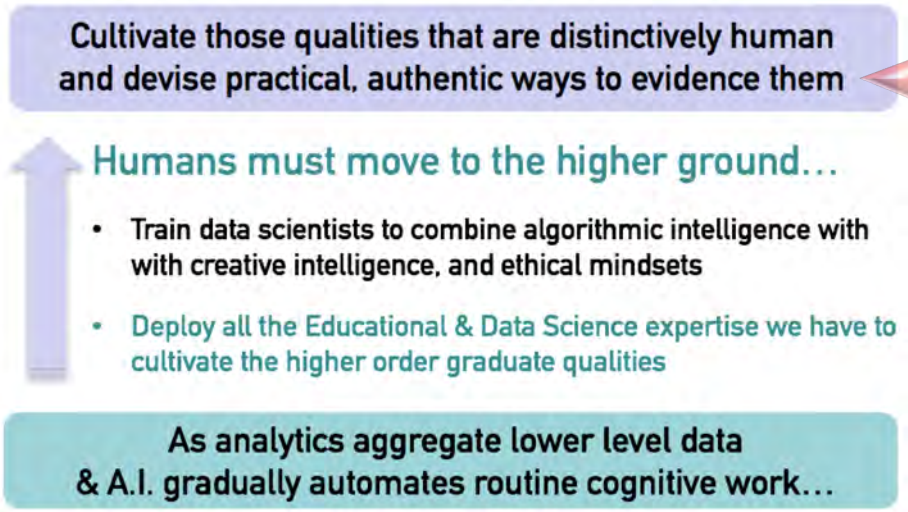
Cultivate those qualities that are distinctively human and devise practical, authentic ways to evidence them

Humans must move to the higher ground…

- Train data scientists to combine algorithmic intelligence with creative intelligence, and ethical mindsets
- Deploy all the Educational & Data Science expertise we have to cultivate the higher order graduate qualities

As analytics aggregate lower level data
& A.I. gradually automates routine cognitive work…

The endless cycle…



What we take to be "distinctively human" has always been in transition, but now at unprecedented pace

…the water keeps rising!

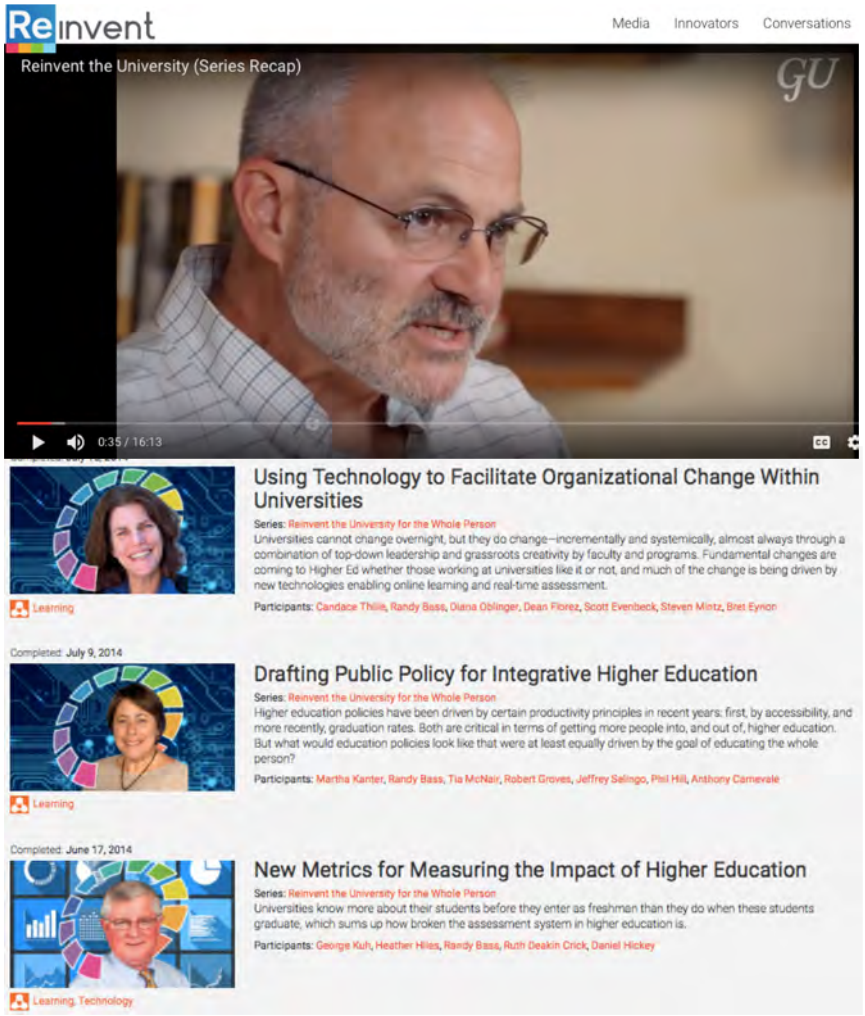
Towards analytics for a holistic higher education

Randy Bass

Georgetown University

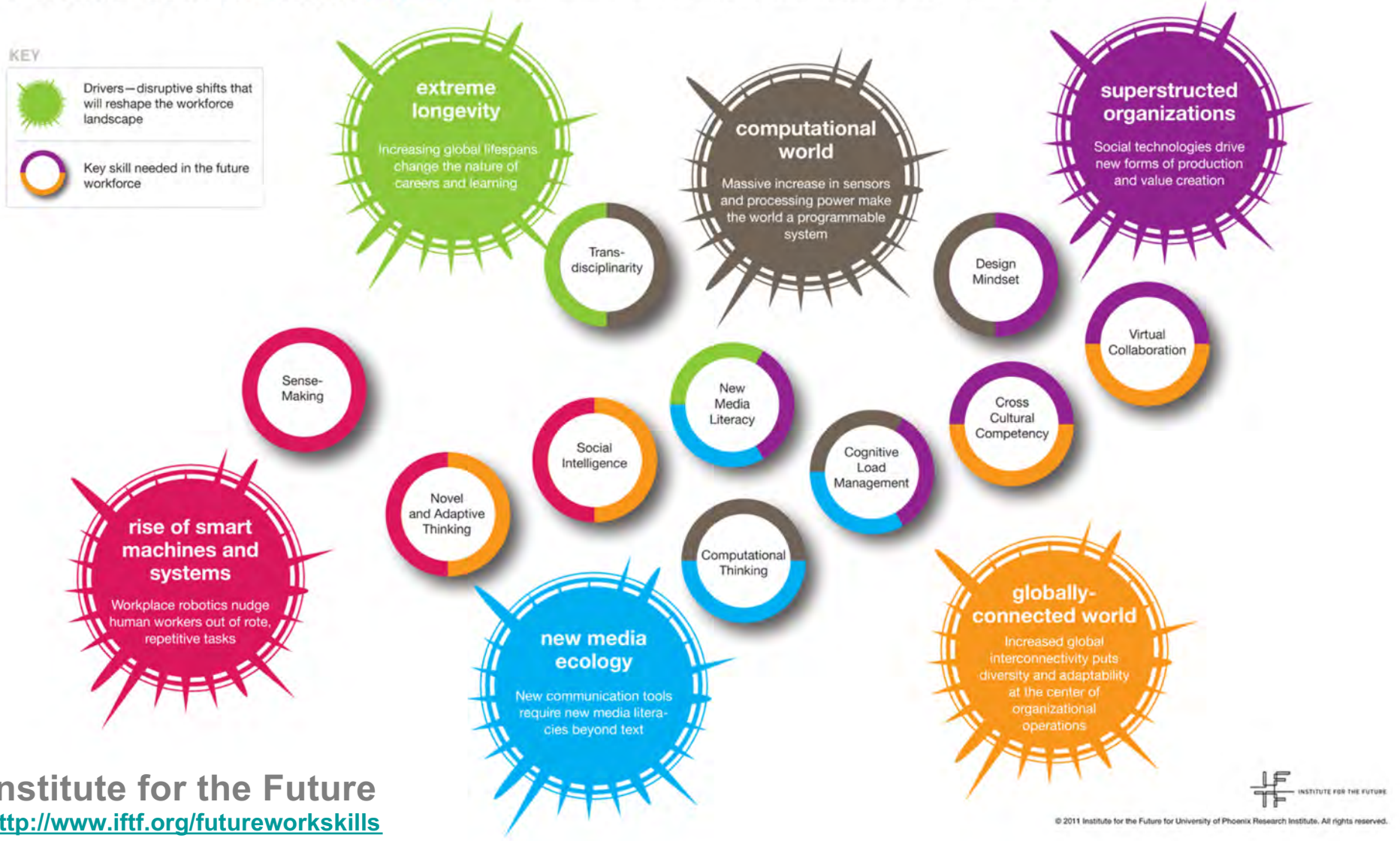
Reinvent the University for the Whole Person

http://reinvent.net/series/reinvent-the-university



Future Work Skills 2020

While all six drivers are important in shaping the landscape in which each skill emerges, the color-coding and placement here indicate which drivers have particular relevance to the development of each of the skills.



Institute for the Future

http://www.iftf.org/futureworkskills

1 SENSE-MAKING

DEFINITION: *ability to determine the deeper meaning or significance of what is being expressed*

2 SOCIAL INTELLIGENCE

DEFINITION: *ability to connect to others in a deep and direct way, to sense and stimulate reactions and desired interactions*

3 NOVEL & ADAPTIVE THINKING

DEFINITION: *proficiency at thinking and coming up with solutions and responses beyond that which is rote or rule-based*

4 CROSS-CULTURAL COMPETENCY

DEFINITION: *ability to operate in different cultural settings*

5 COMPUTATIONAL THINKING

DEFINITION: *ability to translate vast amounts of data into abstract concepts and to understand data-based reasoning*

6 NEW-MEDIA LITERACY

DEFINITION: *ability to critically assess and develop content that uses new media forms, and to leverage these media for*

7 TRANSDISCIPLINARITY

DEFINITION: *literacy in and ability to understand concepts across multiple disciplines*

8 DESIGN MINDSET

DEFINITION: *ability to represent and develop tasks and work processes for desired outcomes*

9 COGNITIVE LOAD MANAGEMENT

DEFINITION: *ability to discriminate and filter information for importance, and to understand how to maximize cognitive functioning using a variety of tools and techniques*

10 VIRTUAL COLLABORATION

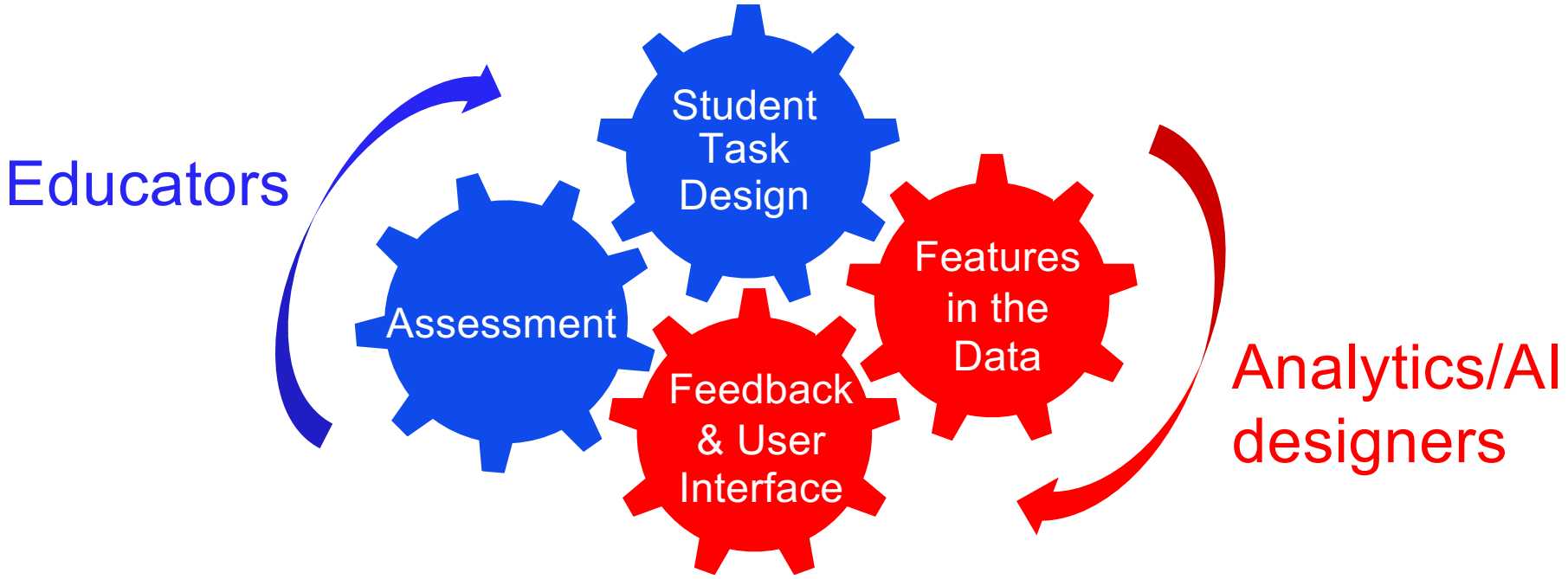
DEFINITION: *ability to work productively, drive engagement, and demonstrate presence as a member of a virtual team.*

Institute for the Future
http://www.iftf.org/futureworkskills

what are the implications for

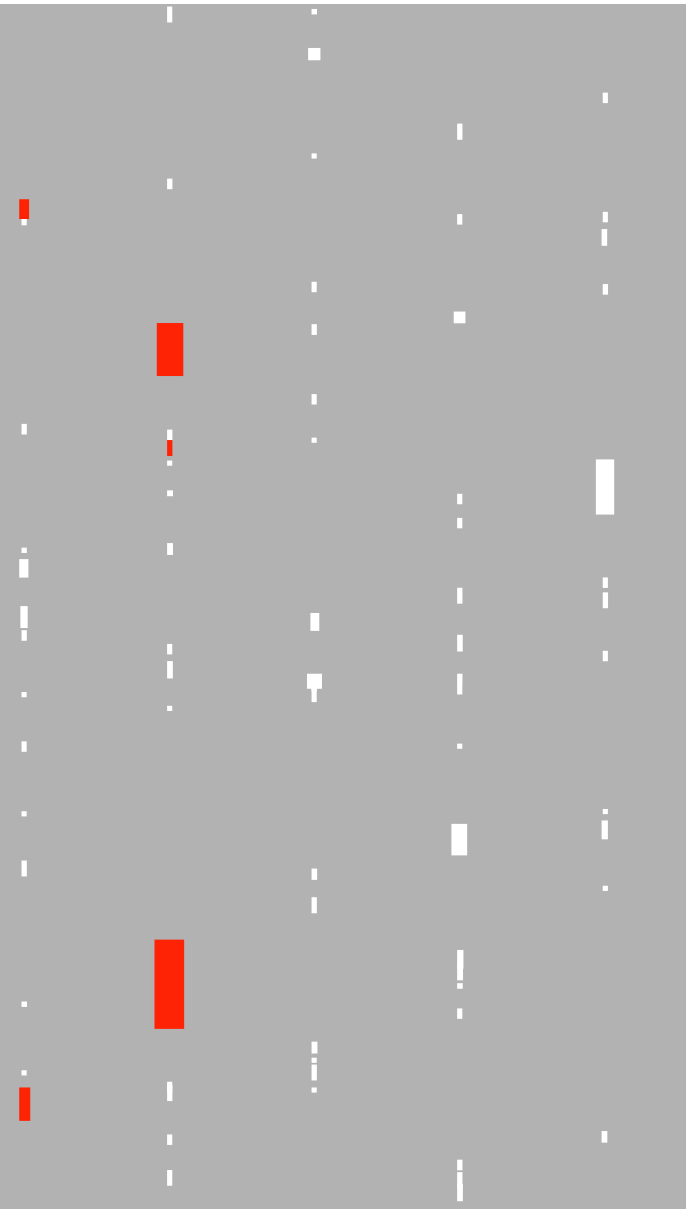
learning analytics?

Framework @UTS for educators to **co-design** Analytics/AI → **augment teaching practice**



Shibani, A., Knight, S. and Buckingham Shum, S. (2019). Contextualizable Learning Analytics Design: A Generic Model, and Writing Analytics Evaluations. *Proc. 9th International Conference on Learning Analytics & Knowledge (LAK19)*. ACM Press, NY, pp. 210-219. DOI: https://doi.org/10.1145/3303772.3303785. Eprint: https://tinyurl.com/lak19clad

Instant feedback on collocated teamwork → nursing



High performance teamwork: nursing simulations

THE ANALYTICS CHALLENGE:
Making multimodal streams meaningful

From multimodal logs to higher-order constructs:

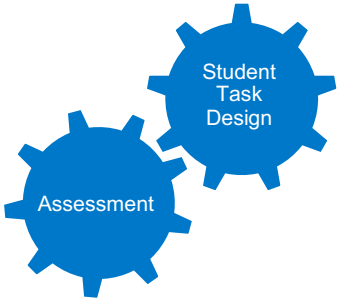
Curriculum outcomes

1 **Patient-centred care**

&

2 **Teamwork**

THE ANALYTICS CHALLENGE:
Making multimodal streams meaningful



From multimodal logs to higher-order constructs:

Curriculum outcomes

Dimensions of collaborative activity

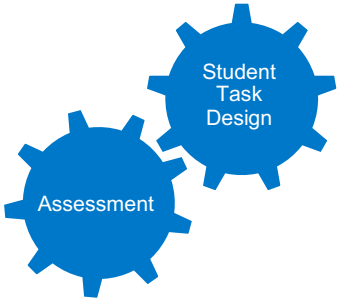
1 **Patient-centred care**

&

2 **Teamwork**

- Physical
- Epistemic
- Social
- Affective

THE ANALYTICS CHALLENGE:
Making multimodal streams meaningful



From multimodal logs to higher-order constructs:

Curriculum outcomes

Dimensions of collaborative activity

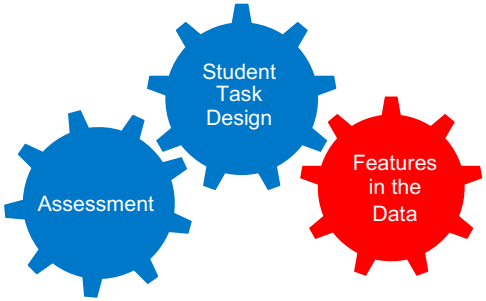
1 **Patient-centred care**

&

2 **Teamwork**

- Physical
  - Embodied strategies
  - Proximity to patient/objects
  - Intensity of physical activity
- Epistemic
  - Actions and procedures
- Social
  - Communication with patient
  - Teamwork communication
- Affective
  - Changes in emotional arousal

THE ANALYTICS CHALLENGE:
Making multimodal streams meaningful



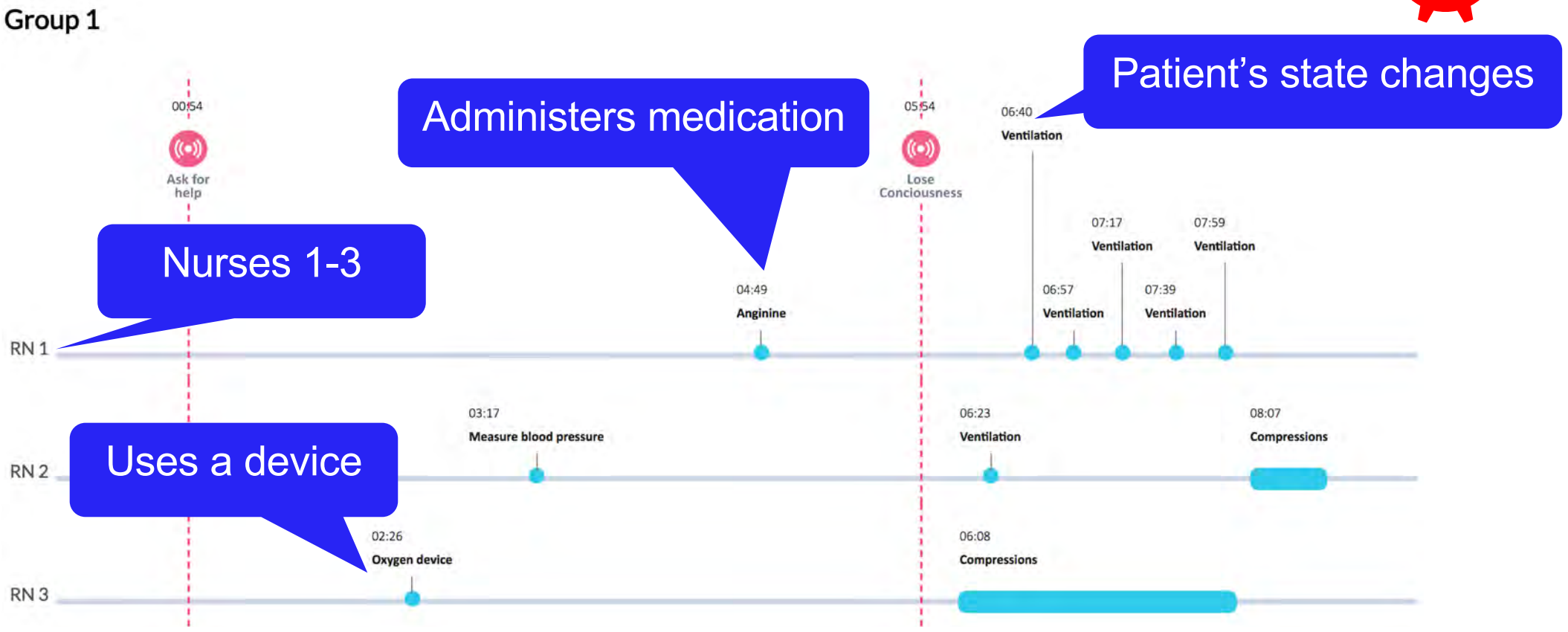
From multimodal logs to higher-order constructs:

Curriculum outcomes	Dimensions of collaborative activity	Multimodal data sources
1 Patient-centred care & 2 Teamwork	Physical	Embodied strategies
		Proximity to patient/objects
		Intensity of physical activity
	Epistemic	Actions and procedures
	Social	Communication with patient
		Teamwork communication
	Affective	Changes in emotional arousal
		Presence in meaningful zones
		Distance to the patient and the trolley
		Wrist acceleration intensity
		Actions registered by the manikin
		Critical procedures
		Interactions with objects
		# and length of utterances by the patient
		# and length of utterances by nurses
		Electrodermal activity peaks

Personalised feedback on high performance teamwork

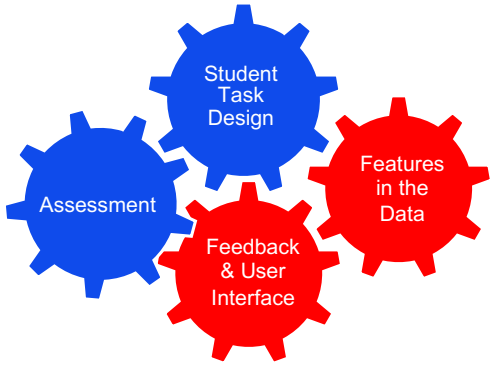
Who did what, when in a nursing simulation? Team Timeline for evidence-based debriefings

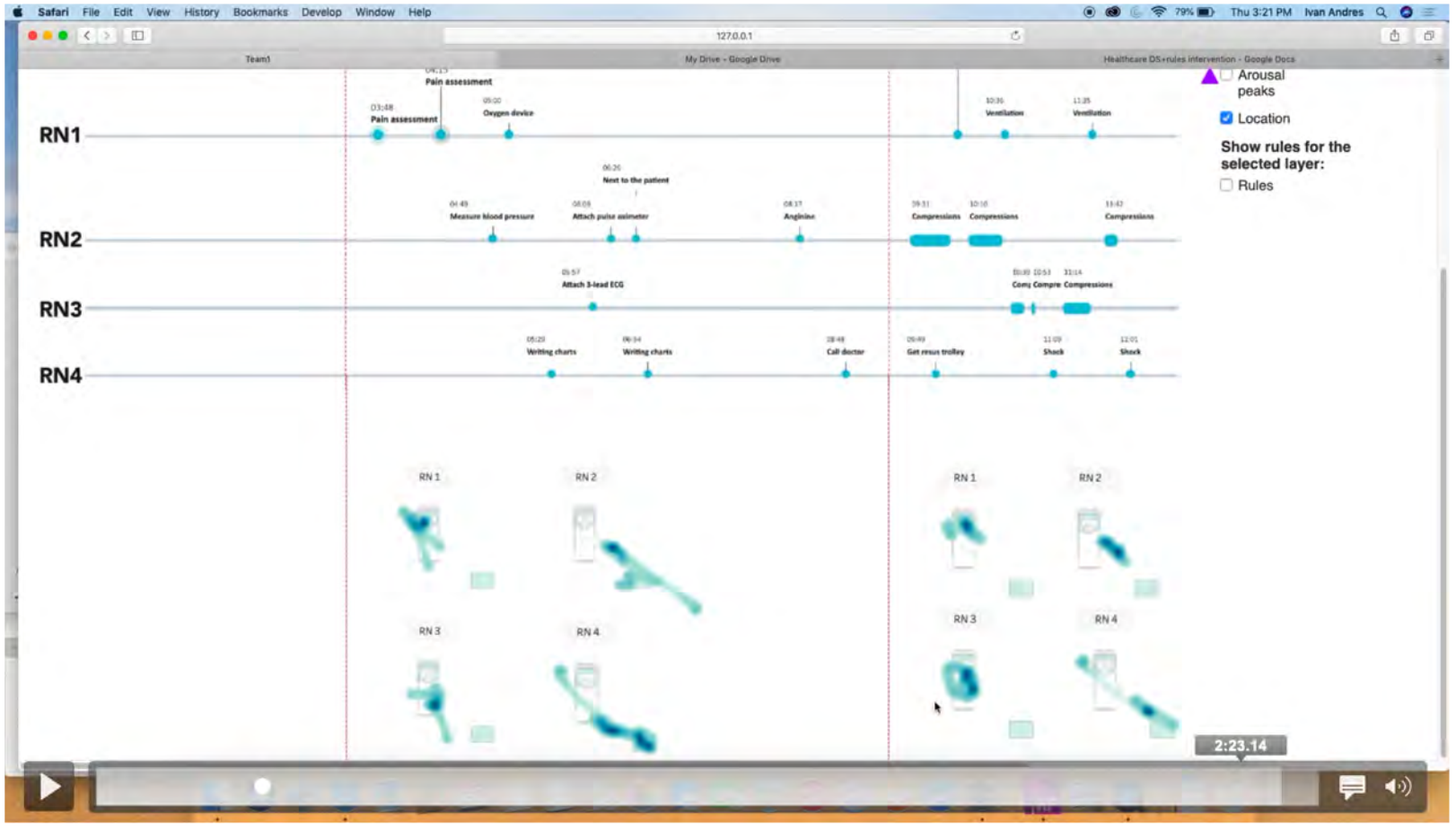
Feedback & User Interface



Echeverria, V., Martinez-Maldonado, R. and Buckingham Shum, S. (2019). Towards Collaboration Translucence: Giving Meaning to Multimodal Group Data. In *Proceedings of ACM Conference on Human Factors in Computing (CHI'19)*. ACM: NY. Paper 39, pp. 1-16. https://doi.org/10.1145/3290605.3300269 Open Access Eprint: http://bit.ly/chi19utscic

Personalised feedback on high performance teamwork





https://cic.uts.edu.au/personalised-feedback-to-nursing-teams

Student reaction to automated feedback on teamwork

"This tool helped me have quantitative data to reflect on. I can actively look back and see my exact actions, not just other perceptions of it"

"…while RN4 and RN2 were doing the fluids I was staying with the patient. It is good to step back and look at what each person was doing, one thing at the same time, I think it shows you how you worked as a team"

Echeverria, V., Martinez-Maldonado, R. and Buckingham Shum, S. (2019). Towards Collaboration Translucence: Giving Meaning to Multimodal Group Data. In *Proceedings of ACM Conference on Human Factors in Computing (CHI'19)*. ACM: NY. Paper 39, pp. 1-16. https://doi.org/10.1145/3290605.3300269 Open Access Eprint: http://bit.ly/chi19utscic

Educator reaction to automated feedback on teamwork

"I think it would be really helpful for students … if you gave them really structured reflection questions … and asked them to reflect on what they were doing — whether it was accurate or not, how they're engaging with the patient and other team members, what they were thinking and feeling at the time — it would be a really valuable tool for deep reflection."

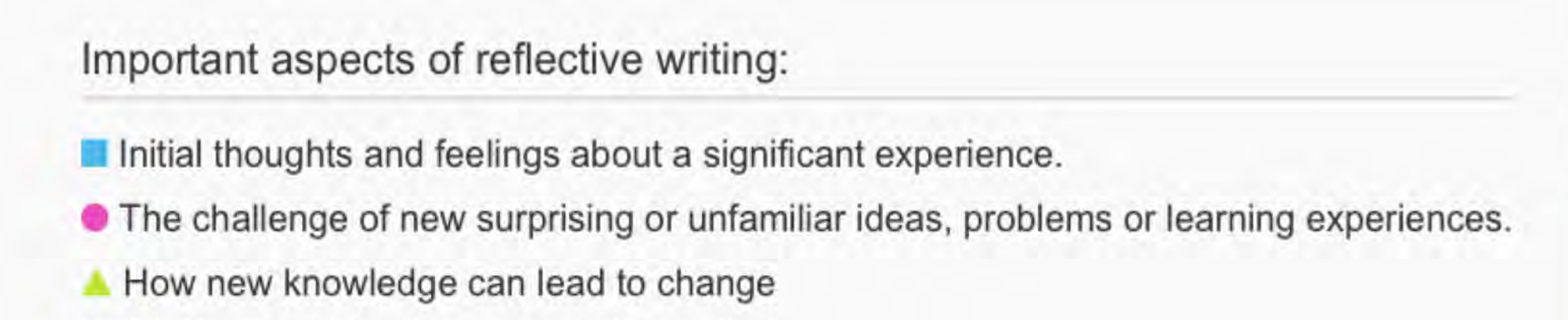
Echeverria, V. (In prep.). *Designing and Validating Automated Feed-back for Collocated Teams Using Multimodal Learning Analytics.* Doctoral Dissertation. University of Technology Sydney (UTS), AUS: Connected Intelligence Centre

Instant feedback on academic writing

→ personal, experiential, reflective

Automated feedback on reflective writing

- Reflection is critical to the integration of academic + experiential knowledge
- This is where you disclose what you're uncertain about, and how you've changed, in the first person
- Scholarship clarifies the hallmarks of deeper reflective writing:



Gibson, A., Aitken, A., Sándor, Á., Buckingham Shum, S., Tsingos-Lucas, C. and Knight, S. (2017). Reflective Writing Analytics for Actionable Feedback. *Proc. LAK17: 7th Int. Conf. on Learning Analytics & Knowledge,* March 13-17, 2017, Vancouver. (ACM Press). https://doi.org/10.1145/3027385.3027436 Best Paper Award

Educator: AcaWriter supports professional reflection by Pharmacy students following work placements

Dr Cherie Lucas
Lecturer
UTS School of Pharmacy

https://cic.uts.edu.au/immediate-personalised-feedback-on-reflective-writing

Writing Context – Postgrad. Pharmacist reflection

Assessment Rubric

Reflective Rubric [1]

Reflective Statement Assessment Rubric	Categories of reflection		
	Non-Reflector (0 Marks)	Reflector (0.5 Marks)	Critical Reflector (1 Mark)
Stage 1: Returning to experience	Statement does not provide a clear description of the learning event itself	Statement provides a description of the learning event	Statement provides description of the learning event chronologically and clear of any judgments
Stage 2: Attending to feelings	Statement provides little or no evidence of personal feelings, thoughts	Statement conveys some personal feelings and thoughts of the learning event but does not relate to personal learning	Statement conveys personal feelings, thoughts (positive and or negative) of the learning event and relates to future personal learning
Stage 3: Association: relates new knowledge with previous knowledge	Statement does not provide any links between new knowledge and previous knowledge	Statement provides evidence that prior knowledge may be consistent with new knowledge gained through this task	Statement clearly relates new knowledge learned with previous knowledge and sees how accommodating new knowledge will assist with future clinical pharmacy practice
Stage 4: Integration	Statement shows no evidence of integration of prior knowledge, feelings or attitudes with new knowledge, feelings or attitudes, thus not arriving at new perspectives	Statement provides some evidence of integration prior knowledge, feelings or attitudes with new knowledge, feelings or attitudes and arriving at a new perspective	Statement clearly provides evidence of integration of prior knowledge, feelings or attitudes with new knowledge, feelings or attitudes, thus arriving at new perspectives.
Stage 5: Validation: ("Internal consistency") self-assessing our beliefs, approaches, assumptions	Statement shows no evidence of self-reflection and self-assessing of previously held beliefs, ass tions, roaches and does not relate experience	Statement demonstrates self-reflection, self-assessment of previously held beliefs, assumptions, approaches, and occasionally relates it to previous experience and	Statements clearly conveys self-reflection and self-assessment of previously held beliefs, assumptions, approaches, consistently relating it to previous
Stage 6: Appropriation: internalising the knowledge gained in the learning event	Stateme ation of know		

Assessment

Features in the Data

Feedback & User Interface

Key to the automated annotations on writing

Important aspects of reflective writing:

- Initial thoughts and feelings about a significant experience.
- The challenge of new surprising or unfamiliar ideas, problems or learning experiences.
- How new knowledge can lead to change

Bold: Deeper reflection, personally applied.

Plain: Expressions indicating belief, learning, or knowledge.

Dotted: Expressions indicating self critique.

Dashed: Words associated with strong feelings.

AcaWriter feedback tuned for Pharmacy reflection

It is hard to believe that I started placement almost three months ago. It has definitely been full of challenging experiences which have shaped my understanding of the role of a pharmacist. During my time at Pharmacy I was able to observe different sides of pharmacy including pharmacist-patient interactions, retail, administration and the clinical aspects. To be honest my first thoughts going into placement were negative. I dreaded the idea of having to interact with patients as well as engaging with employees of the pharmacy. I felt that my lack of experience would cause an inconvenience and I would leave a negative impression in front of the pharmacist and other employees. However, I came to realise that my preceptor is an exceptional teacher and as the weeks progressed I begun to look up to him as a mentor. Despite my lack of experience my preceptor ensured I observed different counselling situations and even encouraged me to engage directly with patients from the early days of placement. By allowing me to engage with patients I have been able to build on important communication skills. **My preceptor would also observe my weaknesses and bring them to my attention so that each week we would work on overcoming my weaknesses and turning them into strengths.**

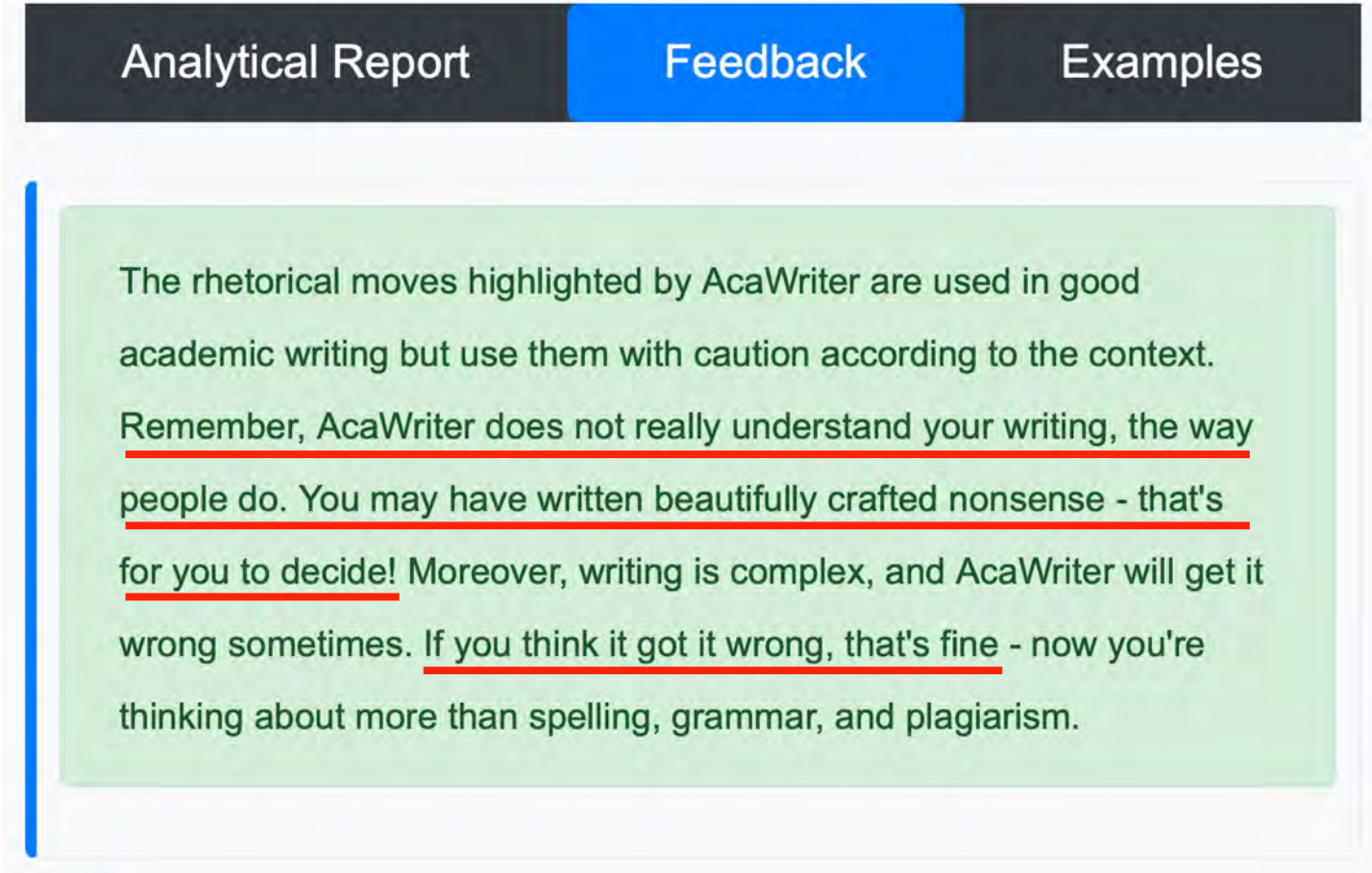
AcaWriter feedback tuned for Pharmacy reflection

It appears that you've acknowledged your first thoughts, feelings and/or reactions to an incident, or learning task, within the first paragraph.

Well done, it appears that you've reflected on how you would change/prepare for the future. Is there anything further to say about these new insights that have led to change.

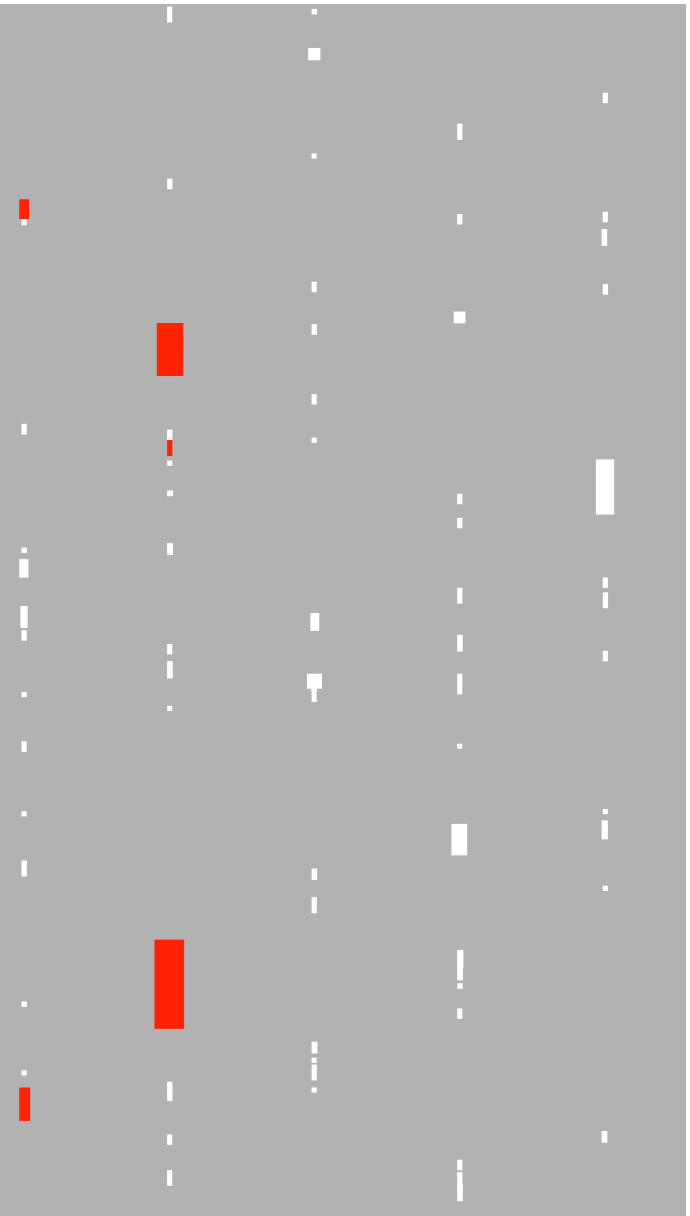
While it appears that you've reported on how you would change/prepare for the future, you don't seem to have reported first on what you found challenging. Perhaps you've reflected only on the positive aspects in your report?.

Maintaining learner agency in response to AI



Instant feedback on academic writing

→ persuasive, argumentative



A hallmark of academic writing is that it works with ideas.

Such writing typically displays specific “rhetorical moves” — a clear signal to the reader what the sentence’s purpose is in the persuasive narrative, e.g.

Contrast

“However, a recognized challenge is…”
“Despite repeated efforts…”
“Although it was predicted that…”

Signalling to readers that we're "working with ideas"

Archetypal rhetorical moves made in academic writing

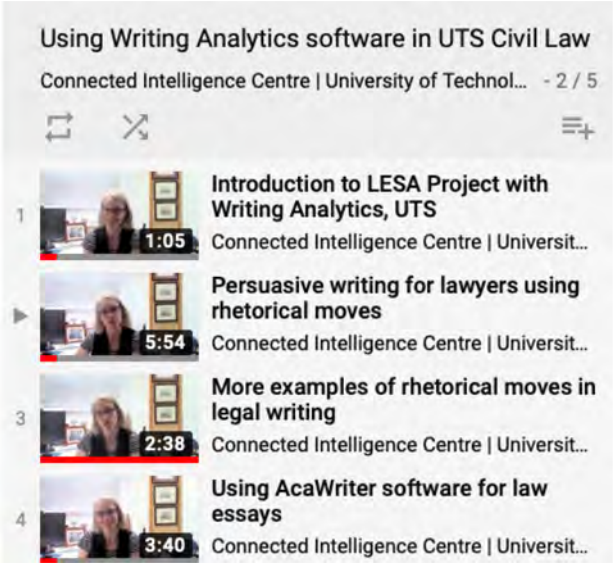
Move	Examples
Background	While data was previously studied in educational research, analytics now enables more… Recent studies indicate that the effects of the drug could be permanent.
Summary	This paper will examine the question of how we develop scalable learning analytics applications
Contrast	However, a recognized challenge in the field of learning analytics is the uncertainty around LA's pedagogical relevance
Question	Little research exists on how automated feedback impacts student writing.

Signalling to readers that we're "working with ideas"

Archetypal rhetorical moves made in academic writing

Move	Examples
Emphasis	The key elements for this approach are... It is important to note that the policy applies to all universities.
Novelty	This new model suggests a view of learning that is an embodied and relational process
Surprise	Surprisingly, the results indicate a weak link between customer satisfaction and brand value.
Trend	With the growing quantity of data generated, there is increasing interest in analytics

Educator: explains to her students why good lawyers know how to use rhetorical moves



https://youtu.be/ruN_Vy3knB8

"[rhetorical moves] indicate to the reader the writer's *attitude* to the text. Why do we worry about that? Because as lawyers, our job is to […] argue that the way that *we* see the facts and the law favours a certain position or outcome."

Writing Context – Undergraduate Civil Law essay

Genre: critical analysis and argumentation

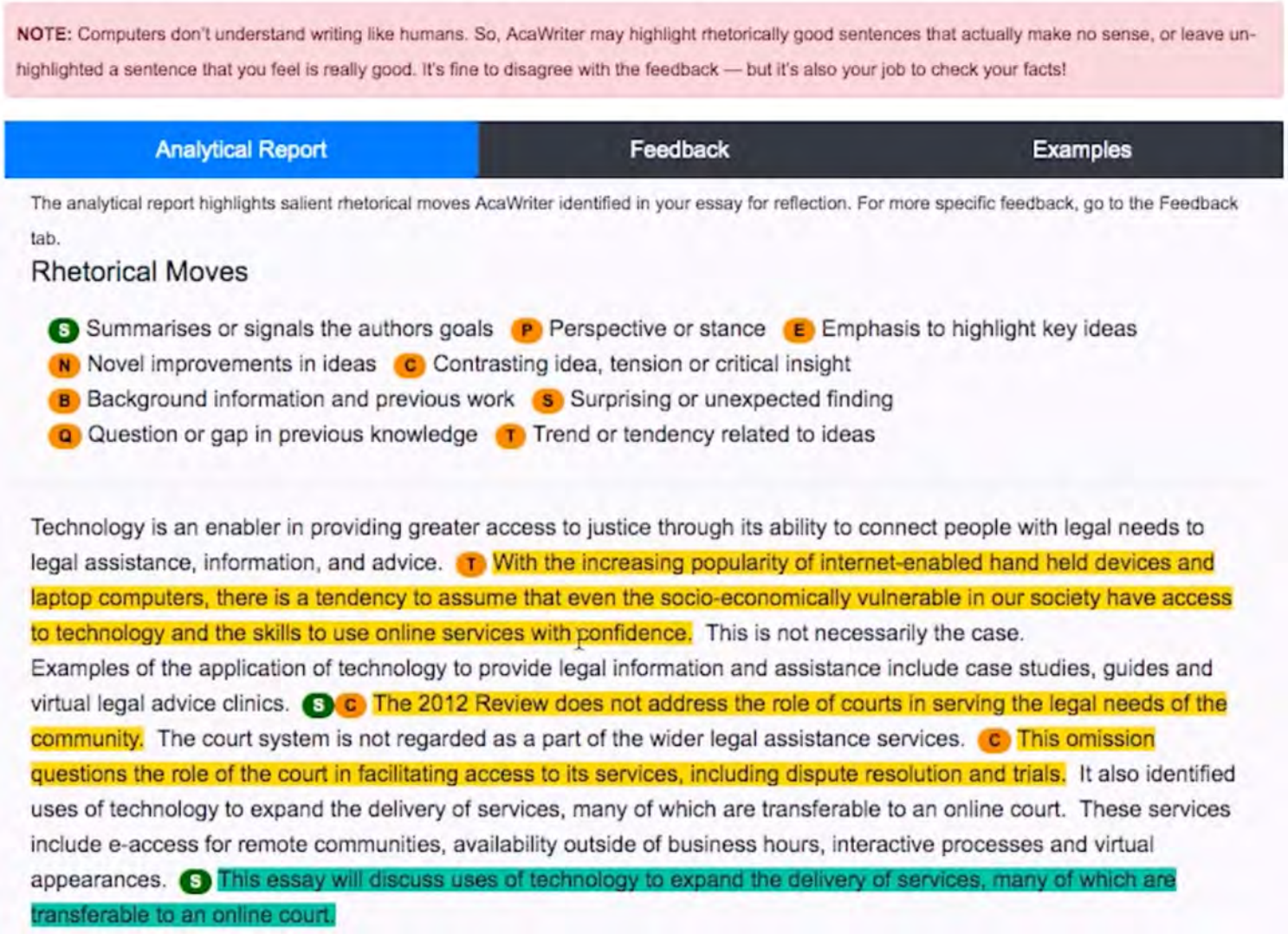
Assessment

Rubric Element	AcaWriter Tag	Example Sentence
Engagement with law and scholarly literature	B Background	The Concept of good faith **has previously been thought to be** a work-in-progress in Australia
Statement of thesis/ argument	S Summary	**This article will** trace the origins of good faith and its development in the common law.
Essay plan	S Summary	**This essay contains** three parts. The first part will talk about […]
Critical analysis, evaluation, original insight	C Contrast E Emphasis	**However**, where the obligations are found in statute and they conflict with contractual obligations, it is **important to note** that the former must prevail.
Drawing together themes and reaching logical conclusion	S Summary	**In conclusion**, the reasonable behavior required under the standard of good faith does not preclude strong bargaining techniques […]

Features in the Data

AcaWriter feedback tuned for Civil Law

Feedback & User Interface



NOTE: Computers don't understand writing like humans. So, AcaWriter may highlight rhetorically good sentences that actually make no sense, or leave un-highlighted a sentence that you feel is really good. It's fine to disagree with the feedback — but it's also your job to check your facts!

Analytical Report | Feedback | Examples

The analytical report highlights salient rhetorical moves AcaWriter identified in your essay for reflection. For more specific feedback, go to the Feedback tab.

Rhetorical Moves

S Summarises or signals the authors goals
P Perspective or stance
E Emphasis to highlight key ideas
N Novel improvements in ideas
C Contrasting idea, tension or critical insight
B Background information and previous work
S Surprising or unexpected finding
Q Question or gap in previous knowledge
T Trend or tendency related to ideas

Technology is an enabler in providing greater access to justice through its ability to connect people with legal needs to legal assistance, information, and advice. T With the increasing popularity of internet-enabled hand held devices and laptop computers, there is a tendency to assume that even the socio-economically vulnerable in our society have access to technology and the skills to use online services with confidence. This is not necessarily the case. Examples of the application of technology to provide legal information and assistance include case studies, guides and virtual legal advice clinics. S C The 2012 Review does not address the role of courts in serving the legal needs of the community. The court system is not regarded as a part of the wider legal assistance services. C This omission questions the role of the court in facilitating access to its services, including dispute resolution and trials. It also identified uses of technology to expand the delivery of services, many of which are transferable to an online court. These services include e-access for remote communities, availability outside of business hours, interactive processes and virtual appearances. S This essay will discuss uses of technology to expand the delivery of services, many of which are transferable to an online court.

AcaWriter feedback tuned for Civil Law

Analytical Report | Feedback | Examples

The rhetorical moves highlighted by AcaWriter are used in good academic writing but use them with caution according to the context. Remember, AcaWriter does not really understand your writing, the way people do. You may have written beautifully crafted nonsense - that's for you to decide! Moreover, writing is complex, and AcaWriter will get it wrong sometimes. If you think it got it wrong, that's fine - now you're thinking about more than spelling, grammar, and plagiarism.

It looks like you are missing a Summary move that highlights the purpose (thesis) statement of your essay and your essay plan. Try including linguistic cues to make this move clearer in your writing. Examples: This essay talks about.., In this essay, I analyse..., This essay consists of three parts... The first part talks about..., In conclusion,...

It looks like you are missing a Background move in your text, which highlights background information and previous literature on the topic. Try including linguistic cues to make this move clearer in your writing. Examples: The past decade has seen ...., Recent studies indicate ... ,It is generally accepted that..., the concept has previously been thought to be...

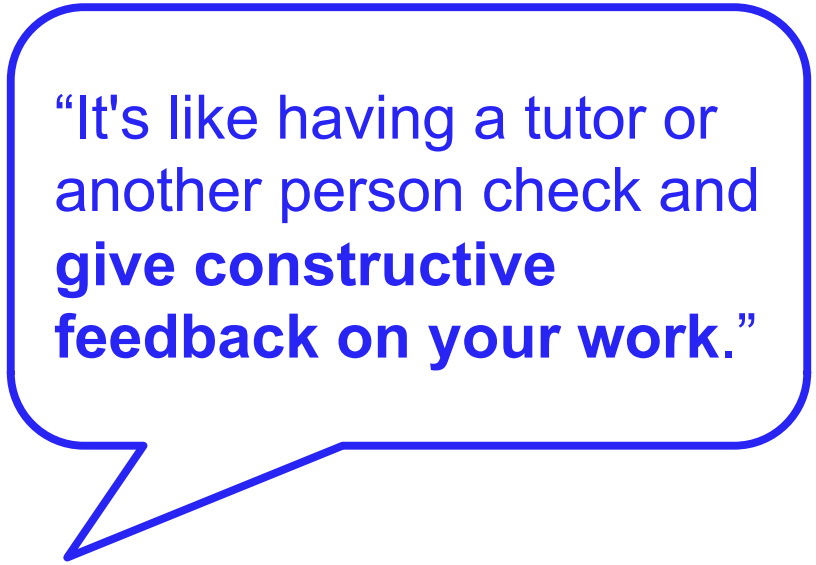
It looks like you are missing Contrast/Question move, which highlights the critical insights in your essay. Try including linguistic cues to make this move clearer in your writing. Examples: However, the issue seems to be..., the study fails to consider, little research has been done..., ...raises various questions...

What does success look like?

- The writing exercise was meaningful without AcaWriter, but with AcaWriter it was rated significantly more useful
- Students who used AcaWriter made significantly more academic rhetorical moves in their revised essays
- A significantly higher proportion of AcaWriter users improved their drafts (many students degraded them across drafts)
- Students who used AcaWriter produced higher graded submissions if they engaged deeply with AcaWriter's feedback

Shibani, A., Knight, S. and Buckingham Shum, S. (2019). Contextualizable Learning Analytics Design: A Generic Model, and Writing Analytics Evaluations. *Proc. 9th International Conference on Learning Analytics & Knowledge (LAK19)*. ACM Press, NY, pp. 210-219. DOI: https://doi.org/10.1145/3303772.3303785. Open Access Eprint: https://tinyurl.com/lak19clad
Shibani, A. (2019). *Augmenting Pedagogic Writing Practice with Contextualizable Learning Analytics.* Doctoral Dissertation, Connected Intelligence Centre, University of Technology Sydney. https://opus.lib.uts.edu.au/handle/10453/136846

What does success look like?
Students feedback on AcaWriter



Shibani, A., Knight, S. and Buckingham Shum, S. (2019). Contextualizable Learning Analytics Design: A Generic Model, and Writing Analytics Evaluations. *Proc. 9th International Conference on Learning Analytics & Knowledge (LAK19)*. ACM Press, NY, pp. 210-219. DOI: https://doi.org/10.1145/3303772.3303785. Open Access Eprint: https://tinyurl.com/lak19clad

What does success look like?
Student feedback on AcaWriter

"When you're editing your own writing, **you automatically think that your work sounds good** and that all your ideas and views have been clearly conveyed. This exercise was useful in the sense that it **indicated areas where I needed to be more explicit, which on my own I would not have noticed."**

Shibani, A., Knight, S. and Buckingham Shum, S. (2019). Contextualizable Learning Analytics Design: A Generic Model, and Writing Analytics Evaluations. *Proc. 9th International Conference on Learning Analytics & Knowledge (LAK19)*. ACM Press, NY, pp. 210-219. DOI: https://doi.org/10.1145/3303772.3303785. Open Access Eprint: https://tinyurl.com/lak19clad

What does success look like?
Student feedback on AcaWriter

"I think what is being taught is something I was already aware of. However, by being forced to actually identify **ways of arguing, along with the types of words used to do so**, it has broadened my perspective. I think I will be **more aware of the way I am writing now**."

Shibani, A., Knight, S. and Buckingham Shum, S. (2019). Contextualizable Learning Analytics Design: A Generic Model, and Writing Analytics Evaluations. *Proc. 9th International Conference on Learning Analytics & Knowledge (LAK19)*. ACM Press, NY, pp. 210-219. DOI: https://doi.org/10.1145/3303772.3303785. Open Access Eprint: https://tinyurl.com/lak19clad

What does success look like?
Educator feedback on AcaWriter

"**We can't afford to give formative feedback when we have 400 students** because it already takes us maybe about 20 hours to mark one class of these assignments — and so we can't have the tutors spend that time again giving formative feedback. So, we had to do it in a way that is time-efficient."

Shibani, A. (2019). *Augmenting Pedagogic Writing Practice with Contextualizable Learning Analytics.* Doctoral Dissertation, Connected Intelligence Centre, University of Technology Sydney. https://opus.lib.uts.edu.au/handle/10453/136846

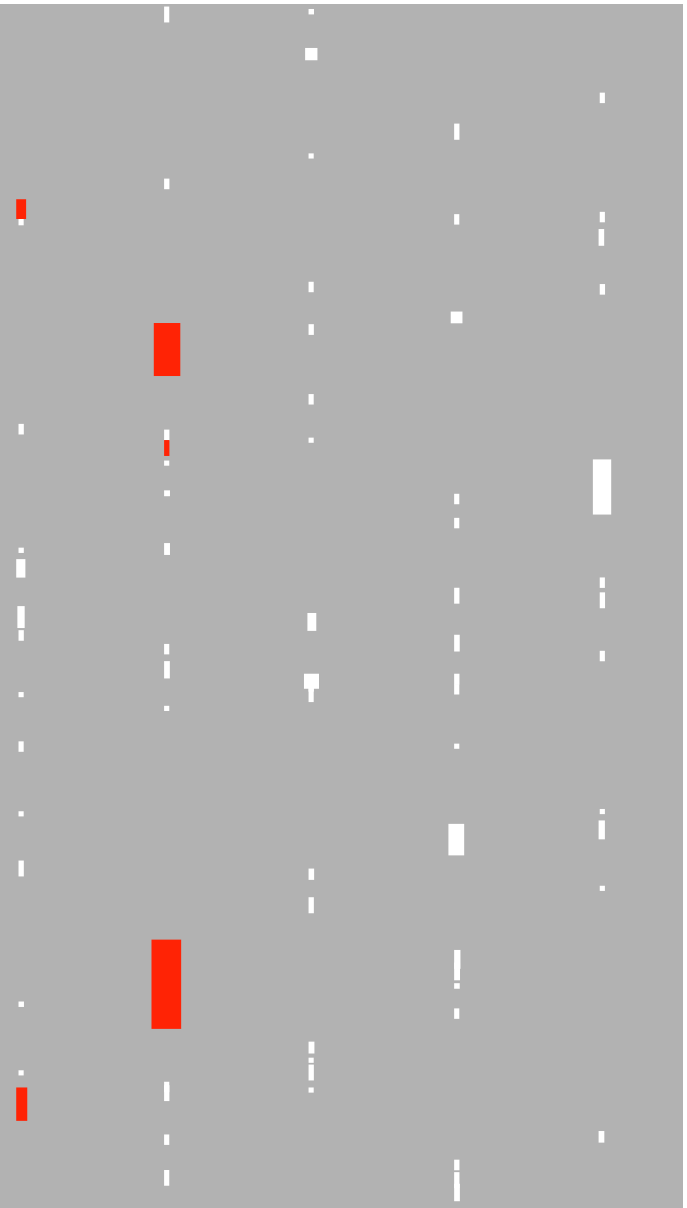
What does success look like?
Educator feedback on AcaWriter

"Overall, since we've been working with CIC around written communication over the course of the last four of five semesters, **we have seen marked improvement in students' written communication**. Overall their individual assignment pass-rate is going up... We are seeing improvements in the number of students who are either **meeting or exceeding the expectations** around written communication"

Shibani, A. (2019). *Augmenting Pedagogic Writing Practice with Contextualizable Learning Analytics.* Doctoral Dissertation, Connected Intelligence Centre, University of Technology Sydney. https://opus.lib.uts.edu.au/handle/10453/136846

UTS Student/Staff Orientation: https://LearningJourneys.uts.edu.au
Research site: https://cic.uts.edu.au/tools/clara
Platform: https://jearni.co

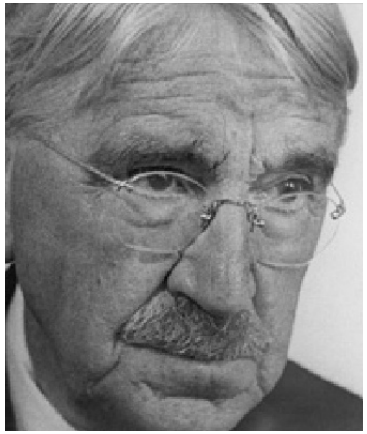
Instant feedback on learning dispositions



Knowledge, Skills & Dispositions

"Knowledge of methods alone will not suffice:
there must be the desire, the will,
to employ them.
This desire is an affair of personal disposition."

John Dewey



Dewey, J. *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process*. Heath and Co, Boston, 1933

Knowledge, Skills & Dispositions

"One of the key issues emerging from these findings was the learner's orientation towards the unknown, uncertainty and ambiguity, and their tendency to either retreat from it or move into it. The former effectively precludes deep learning, and the latter is the beginning point for it."

Ruth Deakin Crick & Chris Goldspink

Deakin Crick R. and Goldspink G. (2014) Learning Dispositions, Self-theories and Student Engagement, *British Journal of Educational Studies*, 62,1,1-17. DOI: http://dx.doi.org/10.1080/00071005.2014.904038

The CLARA assessment tool

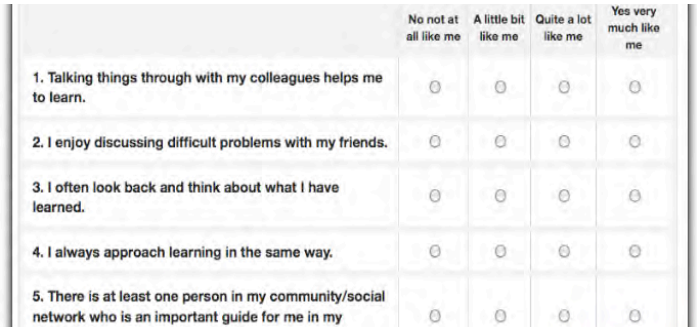
A research-validated survey instrument assessing the multi-dimensional construct of “Learning Power”

	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.	○	○	○	○
I enjoy trying out new ways of learning.	○	○	○	○
I know I can find a way of solving a problem if I have enough time to think.	○	○	○	○
Sometimes good ideas just come into my head.	○	○	○	○
Remembering what I already know often helps me to learn something new.	○	○	○	○
I have a sense of myself getting better at learning.	○	○	○	○
If I find something really hard to learn, I usually think it’s because I’m not very clever.	○	○	○	○

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

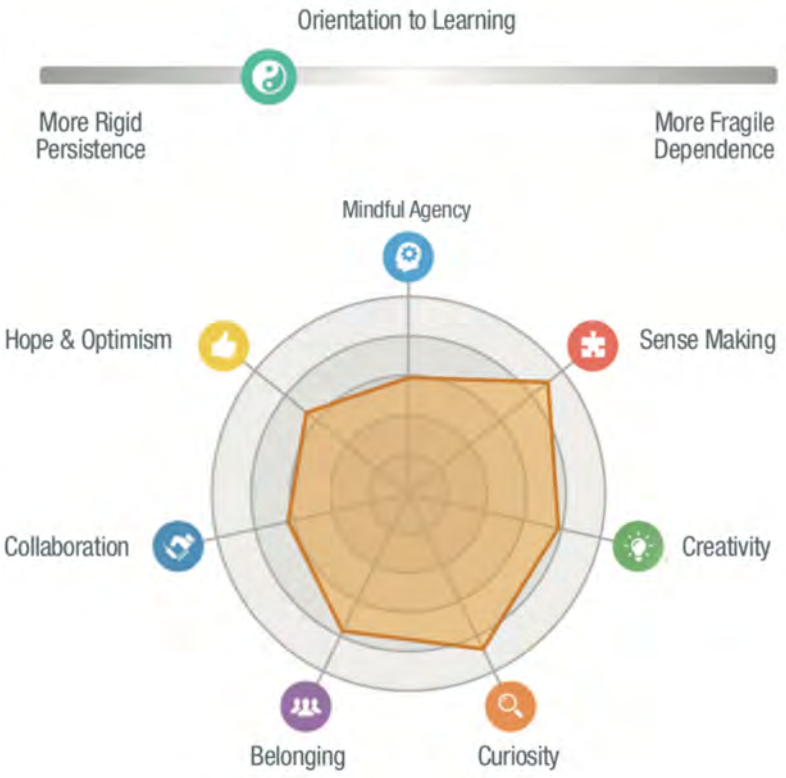
Immediate visual analytic to provoke reflection

60 item 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.	O	O	O	O
2. I enjoy discussing difficult problems with my friends.	O	O	O	O
3. I often look back and think about what I have learned.	O	O	O	O
4. I always approach learning in the same way.	O	O	O	O
5. There is at least one person in my community/social network who is an important guide for me in my	O	O	O	O

Feedback to stimulate self-directed change



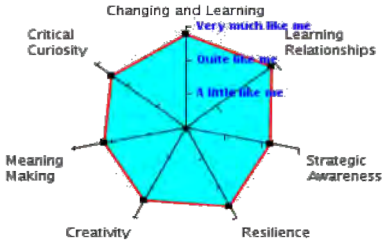
A framework for reflection and coaching

Fragile, dependent, brittle.

Closed
Passive
Fragile & dependent
Fragmented data
Lacking inter and intra-personal awareness
Isolated
Rule bound
'Done to'
A-critical

Receptive to learning and change

Resilient Agency



Hopeful
Curious
Creative
Strategic
Purposeful
Collaborative
Persistent
Aware
Sense making
Connecting data

Deakin Crick et al (2012; 2008; 2013; 2004)

Cohort analysis

- With hundreds of profiles, meaningful statistics can be performed to test for significant cohort changes / differences

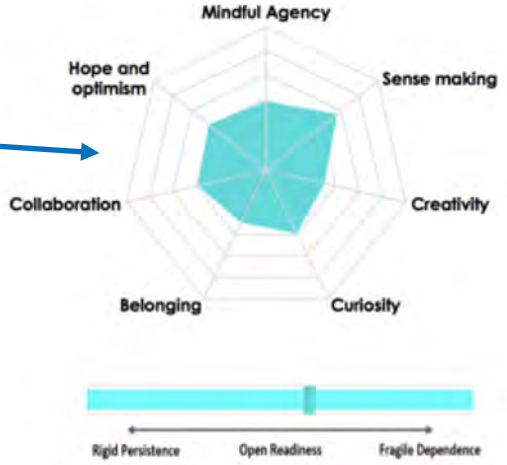
- We can derive through cluster analysis significantly different cohort profiles, inviting reflection and possibly intervention for those who might be judged at risk

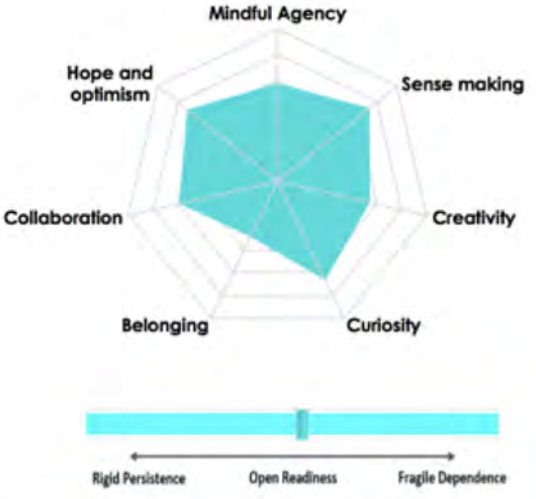
n=876

n=957

n=548

n=602

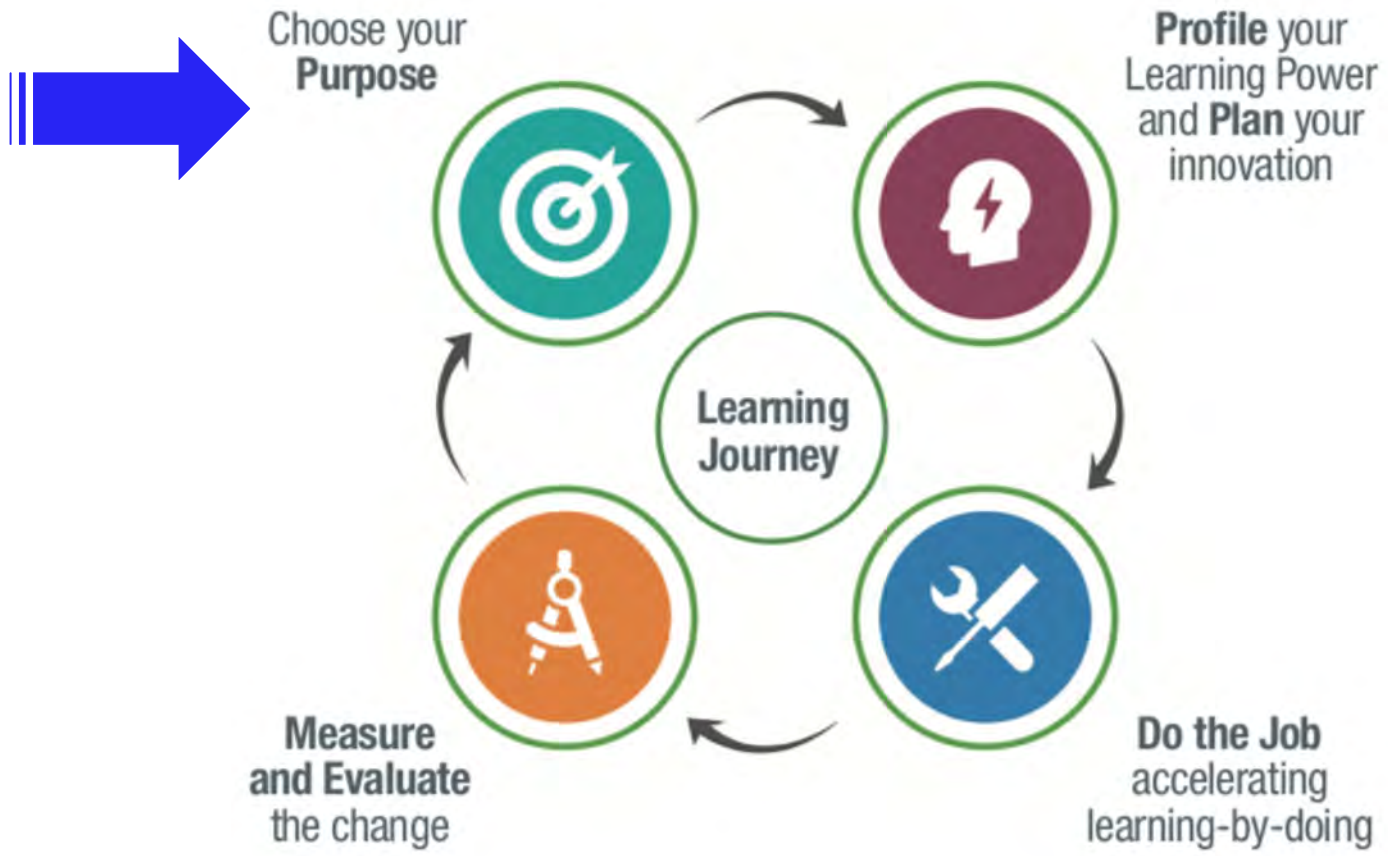




Barratt-See, G., Cheng, M., Deakin Crick, R. & Buckingham Shum, S. (2017). Assessing Resilient Agency with CLARA: Empirical Findings from Piloting a Visual Analytics Tool at UTS. *Proceedings UniSTARS 2017: University Students, Transitions, Achievement, Retention & Success.* (Adelaide, 1-4 July, 2017). https://utscic.edu.au/tools/clara

CLARA is integrated into Learning Journeys

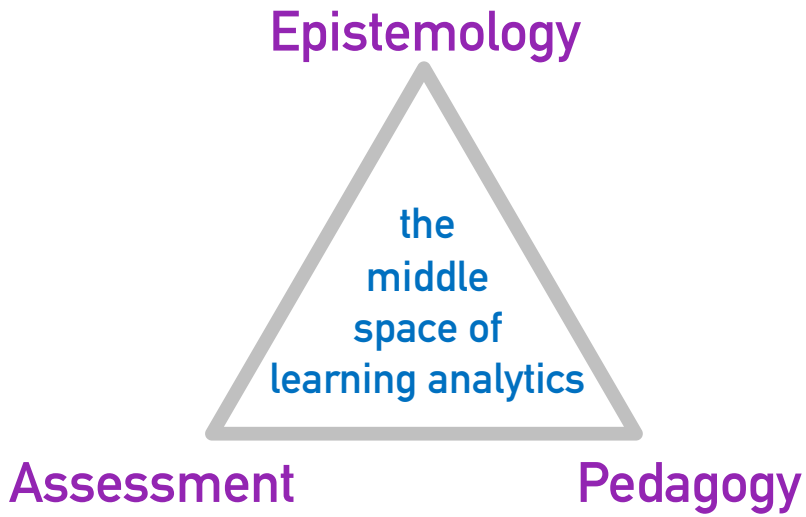
using the https://jearni.co platform



For more examples see:

Learning Analytics for 21st 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

Caution! A Learning Analytics system makes educational claims (implicitly or explicitly)



Every analytics system is making "EPA Claims"

Knight, S., Buckingham Shum, S. and Littleton, K. (2014). Epistemology, Assessment, Pedagogy: Where Learning Meets Analytics in the Middle Space. *Journal of Learning Analytics,* 1, (2), pp.23-47. http://epress.lib.uts.edu.au/journals/index.php/JLA/article/download/3538/4156

Those EPA claims are codified (in part) as

Algorithms

Algorithmic Accountability

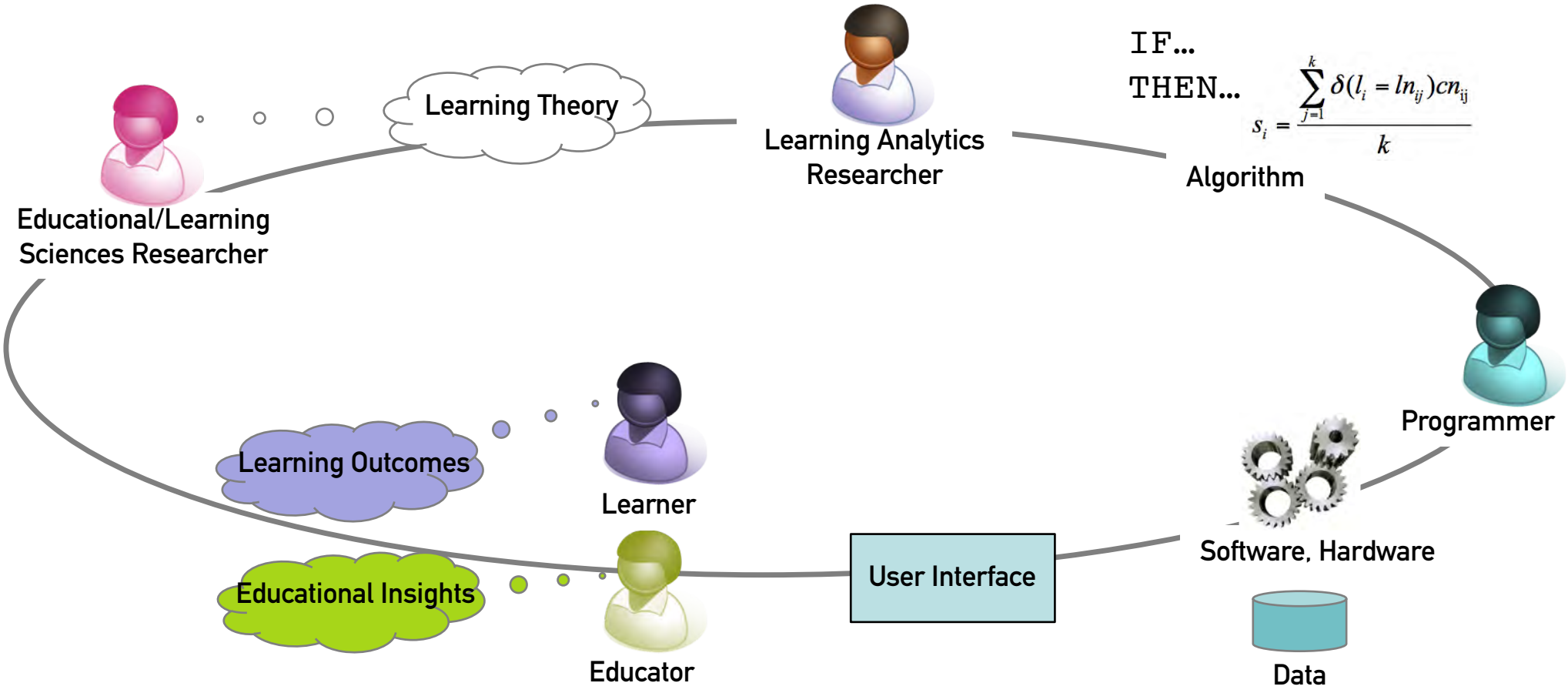
Algorithms that make us Accountable

To ourselves, or to others.

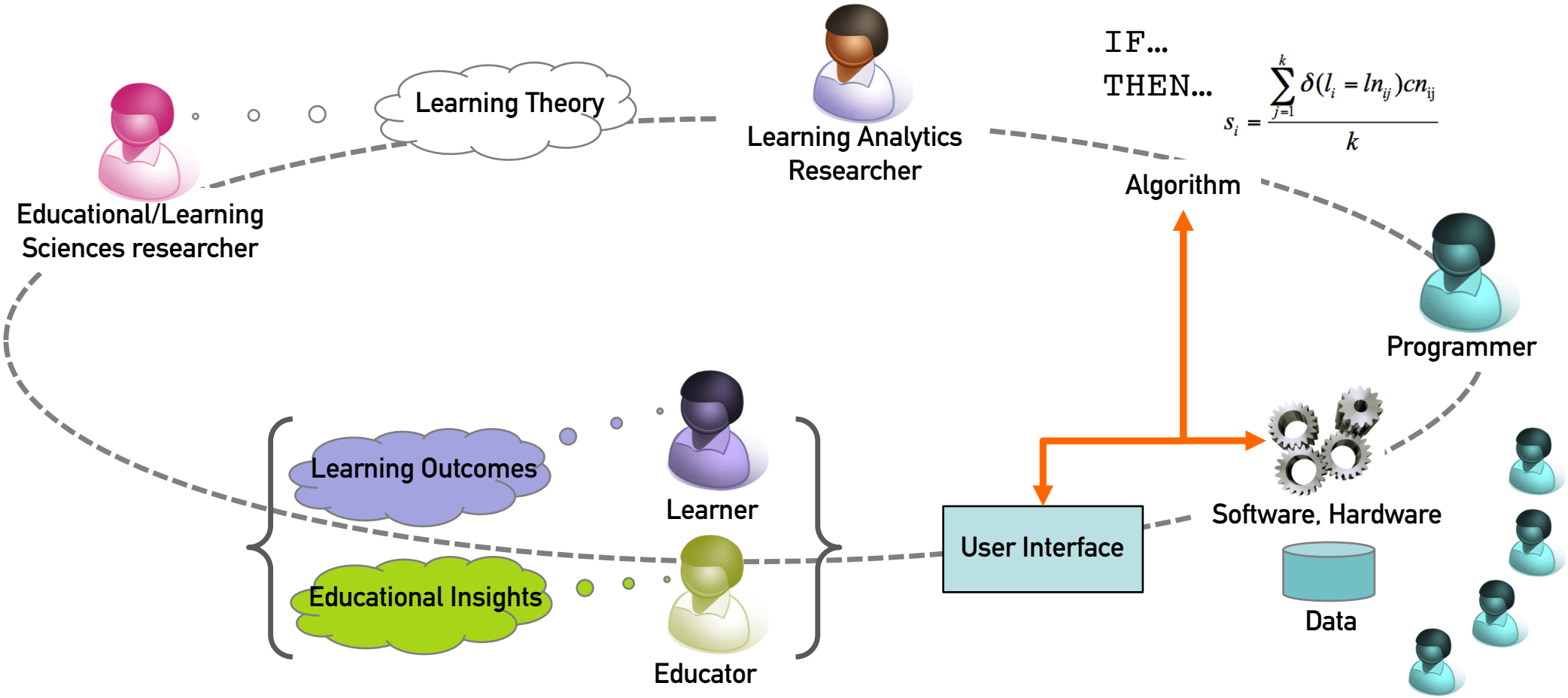
In some cases,
more objectively, efficiently and rewardingly
than a human can.

Making
Algorithms that make us Accountable
Accountable

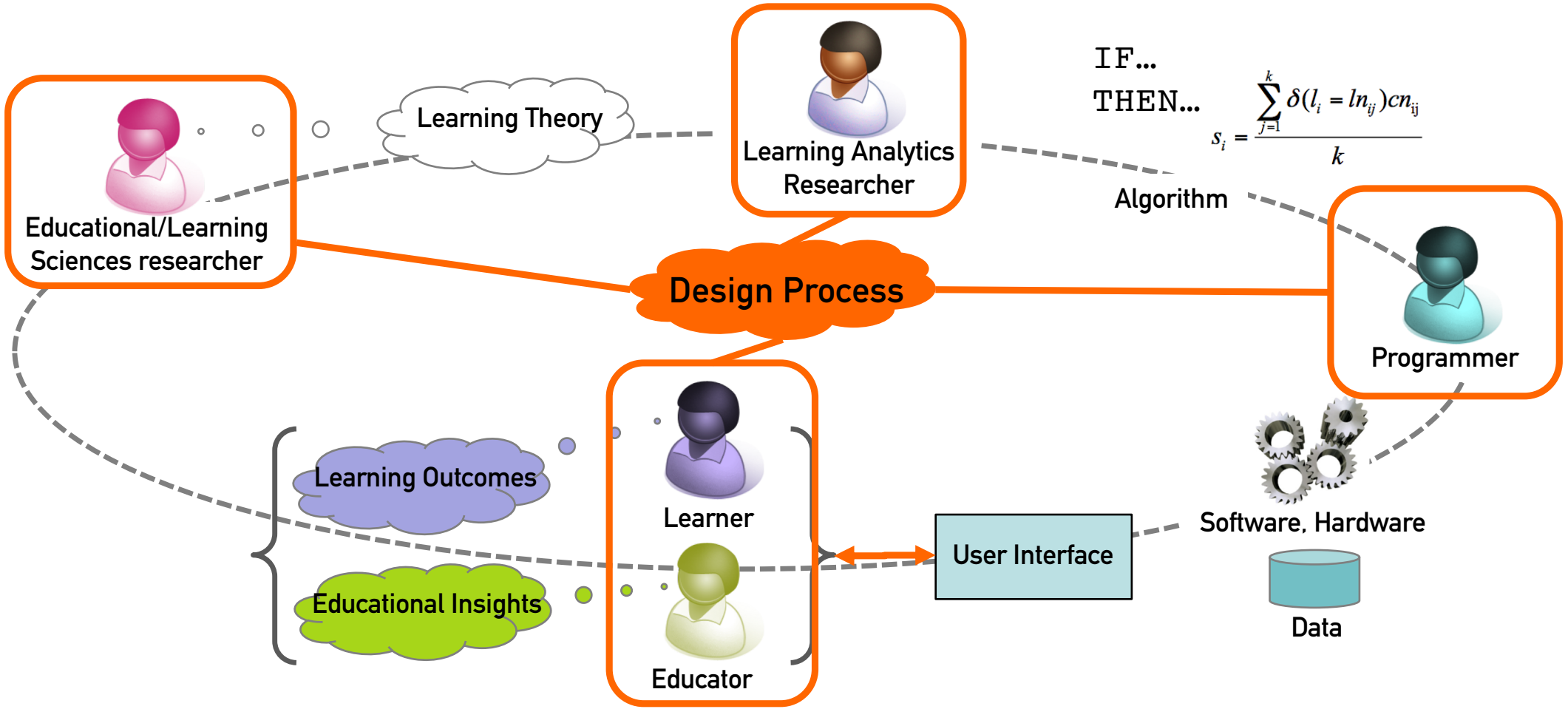
Expertises/stakeholders and key transitions in designing a Learning Analytics system



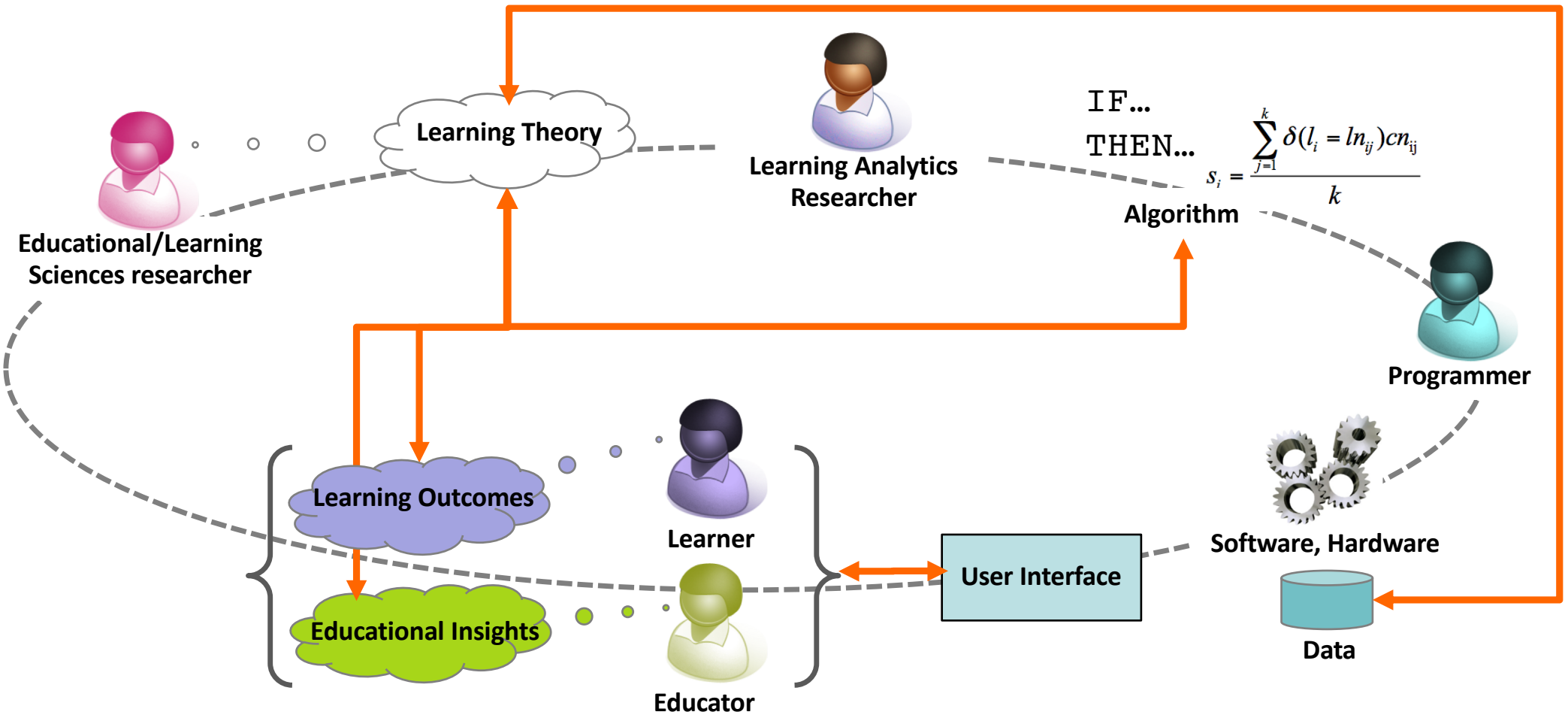
Accountability in terms of: Computer Science



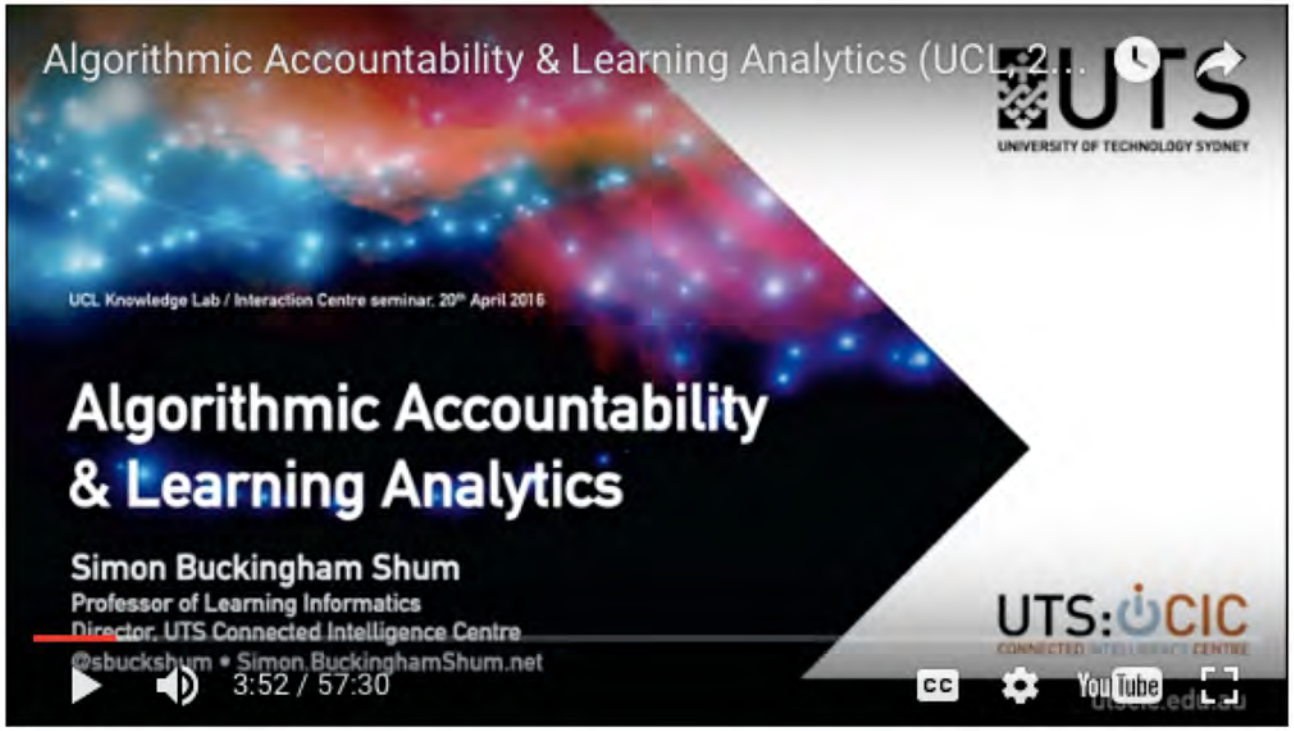
Accountability in terms of: User-Centred Design



Accountability in terms of: Learning Sciences



Algorithmic accountability [deep dive]



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

These kinds of tools go far beyond current products: they require

innovation

Giving educators and students agency in shaping AI/Analytics requires

control over the code

But universities also want to see

impact

Faculty research groups are rarely incentivized or equipped to deliver robust services to thousands of students and staff

notes on UTS

organisational strategy

UTS-WIDE CONSULTATIONS & STRATEGIC ALIGNMENT

Envisioning "the Data Intensive University"

DIU UTS-wide Forum

Connected Intelligence Strategy

Privacy & Ethics Forum
Plans for a Masters Degree

Masters Degree Launches

Analytics Pilots in Faculties

CIC Staffing Grows

First Pilot Evaluation Data

Connected Intelligence Working Party

UTS-wide consultations and interviews

Director Appointed

Launch of the Centre

UTS-wide engagement

Collaboration Proposals Invited & Projects Initiated

Growing number of UTS & Industry Partnerships

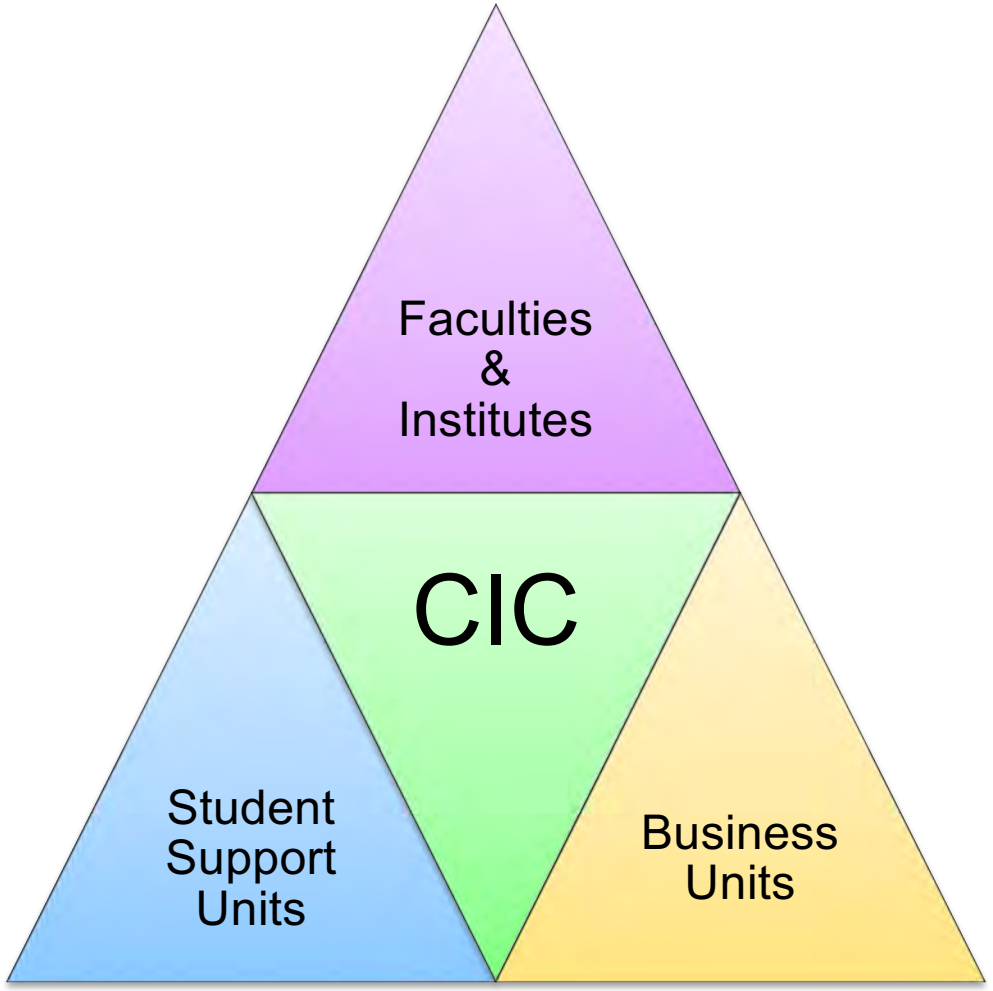
Analytical Tools Maturing

Academic Board

DEVELOP & DEPLOY ANALYTICS ACROSS UTS

2019

cic.uts.edu.au

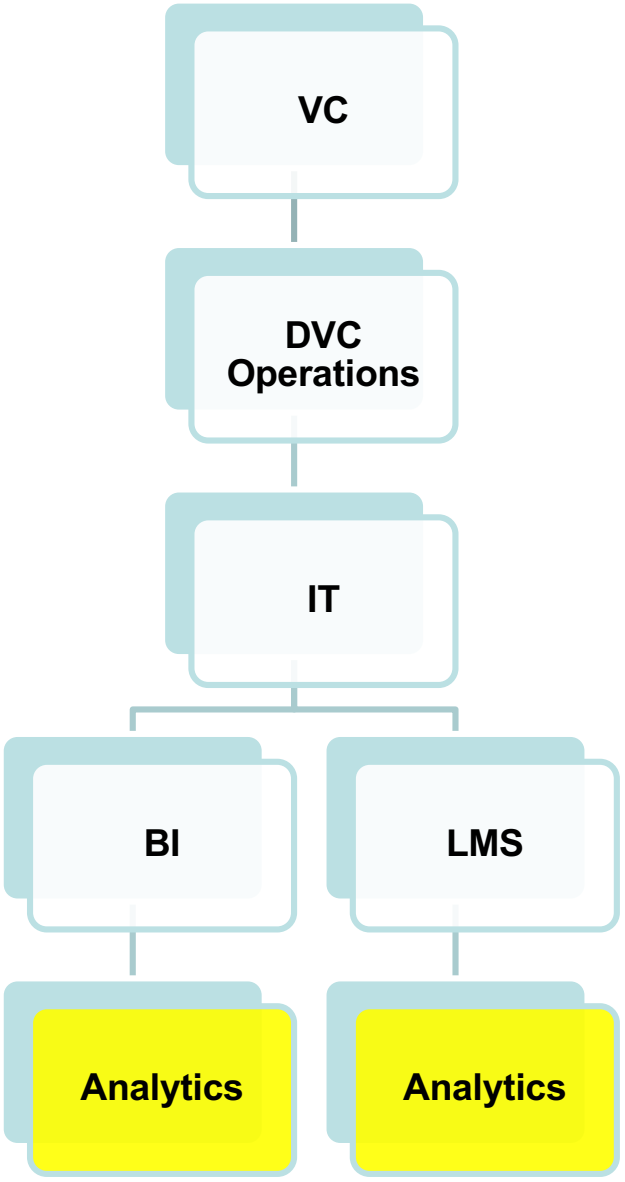


Architecting for Innovation + Impact?

Architecting for Innovation + Impact?

IT SERVICES MODEL:

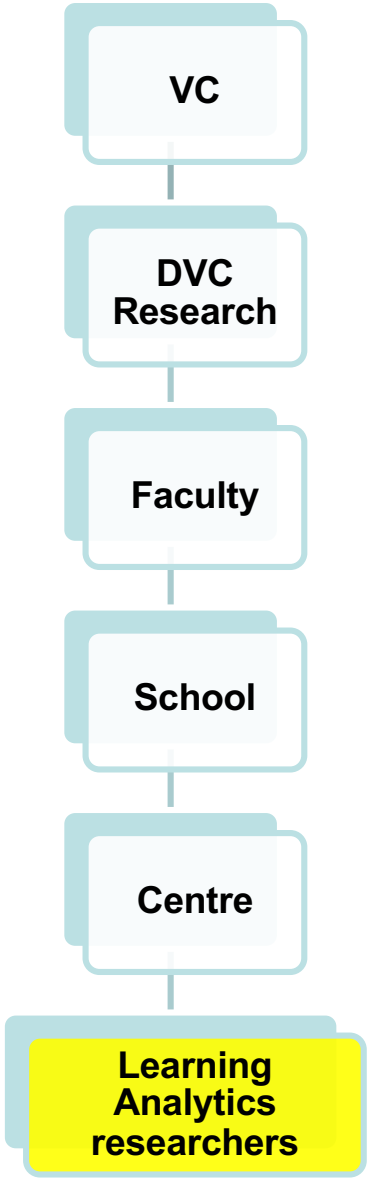
Analytics based in BI or LMS team



Architecting for Innovation + Impact?

FACULTY RESEARCH MODEL:

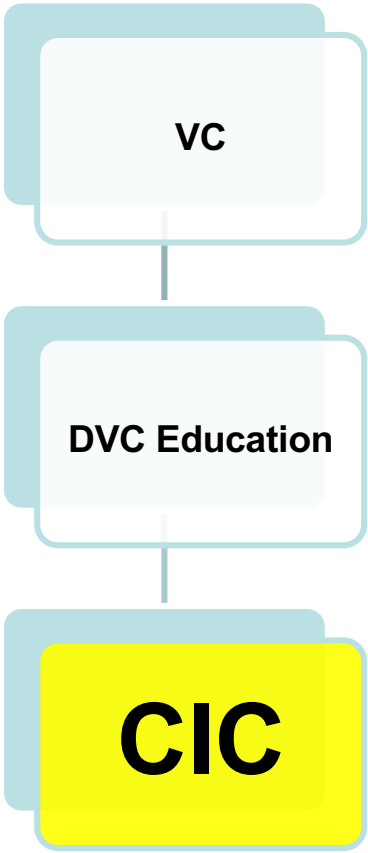
Analytics based in a centre/school



Architecting for Innovation + Impact?

HYBRID INNOVATION/SERVICES MODEL:

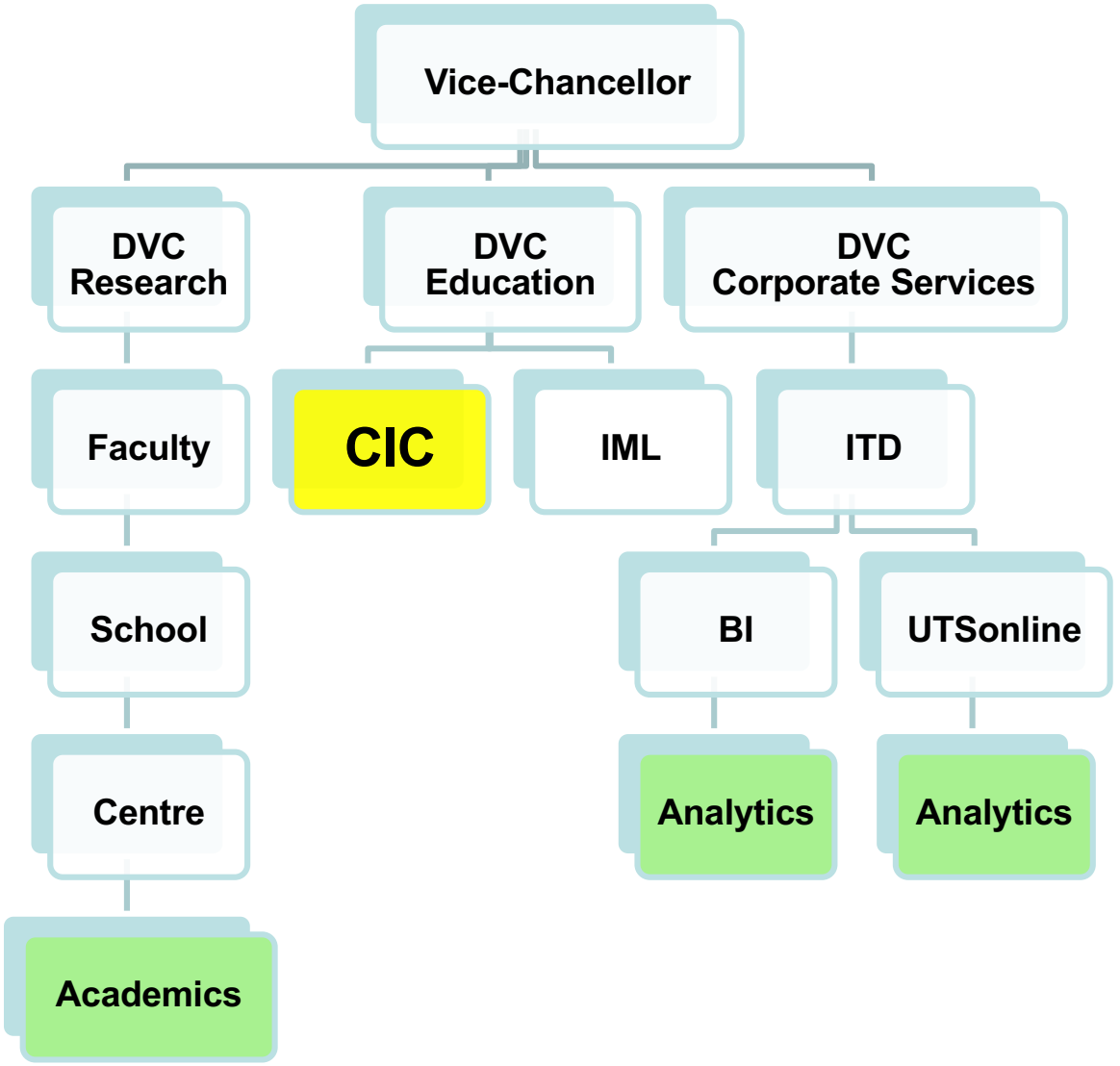
Analytics based in a non-faculty centre reporting to DVC (Education), staffed by academics + professional admin team



CONTEXT

Founded 2014, following 3 years' cross-UTS consultation and development of a **Connected Intelligence Strategy**

Now an internationally leading centre in **Learning Analytics** (i.e. Educational Data Science)



An experiment in organisational innovation… (*EDUCAUSE Review* feature article, 2018)
https://er.educause.edu/articles/2018/3/architecting-for-learning-analytics-innovating-for-sustainable-impact

Architecting for Innovation + Impact?

CIC Skillset: strong interpersonal skills

+

Education, Learning Design, Interface Design, Programming, Web Development, Text Analytics, Machine Learning, Statistics, Visualisation, Decision-Support, Sensemaking, Creativity & Risk, Participatory Design

Board Room

VC/DVCs/Deans/Directors

Common Room

Academic staff

Server Room

IT Division

ADVANTAGES THAT THIS ORG STRUCTURE BRINGS

Reporting directly to a DVC, and talking directly to other operational directors, gets stuff done

Operating within the DVC's Education & Students Office enables close coupling with student services and teaching innovation

Baseline funding provides invaluable stability for planning projects and staff

Operating outside a faculty provides agility for decision-making, and helpful neutrality

monday afternoon

december 9

3:45 p.m. / arena

Chairman:
DR. D. C. ENGELBART
Stanford Research Institute
Menlo Park, California

a research center
for augmenting human
intellect

"AI for IA"

Intelligence Augmentation:

As Analytics/AI move into higher order competencies, a key role is less to judge and act autonomously, and more to provoke productive human reflection

Cultivate those qualities that are distinctively human and devise practical, authentic ways to evidence them

Humans must move to the higher ground…

- Train data scientists to combine algorithmic intelligence with with creative intelligence, and ethical mindsets
- Deploy all the Educational & Data Science expertise we have to cultivate the higher order graduate qualities

As analytics aggregate lower level data & A.I. gradually automates routine cognitive work…

monday afternoon
december 9
3:45 p.m. / arena

Chairman:
DR. D. C. ENGELBART
Stanford Research Institute
Menlo Park, California

a research center for augmenting human intellect

What we take to be "distinctively human" has always been in transition, but now at unprecedented pace

The task of Learning Analytics may increasingly be to make persistent and visible what until now has remained ephemeral and invisible

LA+LD designs this as formative feedback to provoke reflection, insight, creativity and deeper learning


Balancing and aligning the elements
T
R
U
S
T
Learning Analytics User Experience
Learning Analytics + Learning Design
Learning Analytics Co-design
Organisational Strategy
Photo by Sean Stratton on Unsplash https://unsplash.com/photos/ObpCE_X3j6U