Centre for Change and Complexity in Learning

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Learning Analytics:
Informing Student Progress and Course Quality

Professor Shane Dawson

Overview:

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- LA 101
  - 2 Sigma problem
  - Feedback
- Current trends
  - LA dashboards
- Emergent LA work
  - Integrated systems
  - Learning design

Learning Analytics:

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…is the *collection*, *collation*, *analysis* and *reporting* of data about learners and their contexts, for the purposes of **understanding** and **optimizing** learning

SOLAR
SOCIETY for LEARNING ANALYTICS RESEARCH

C3L

LA Drivers:

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Pursuit of personalised and adaptive learning

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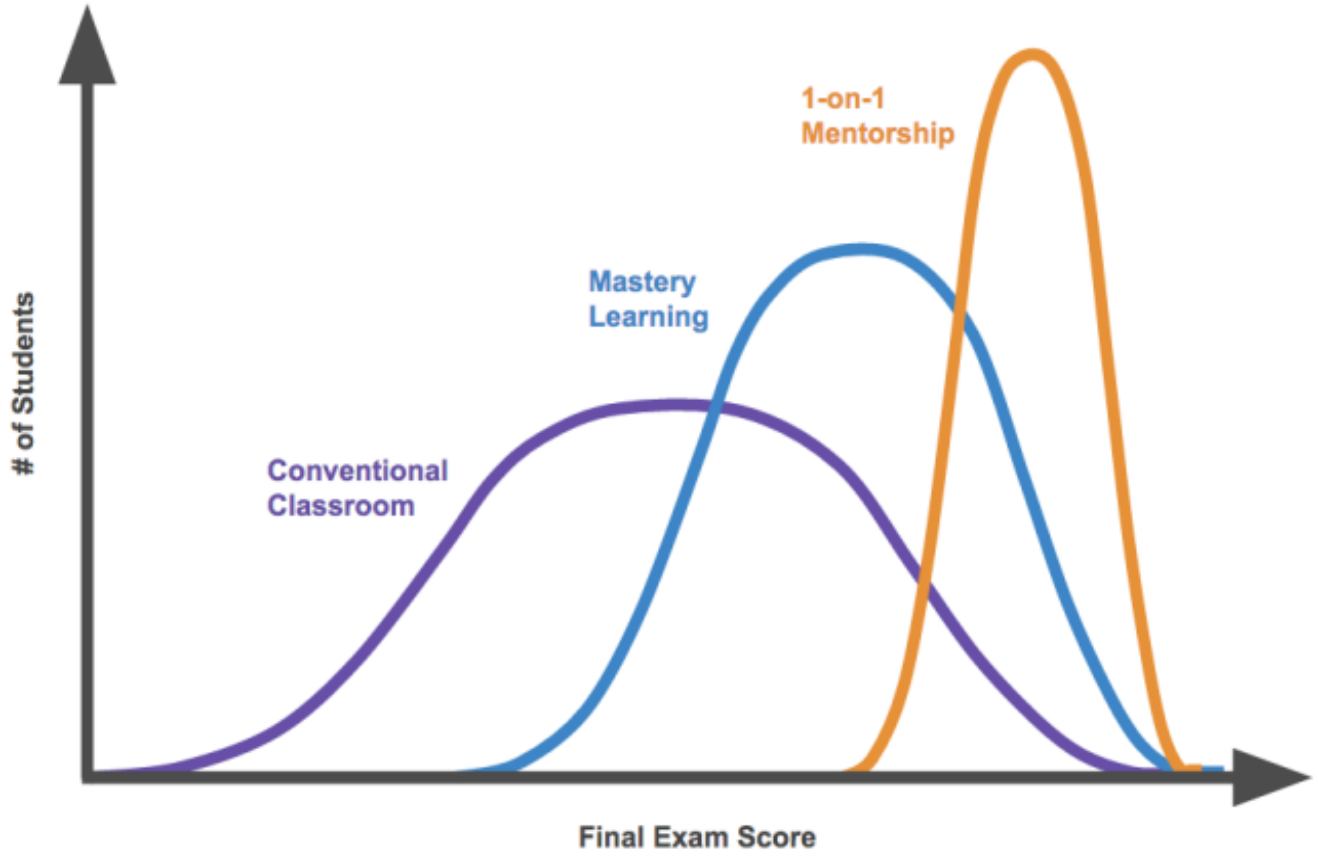
2 sigma problem

- Conventional
- Mastery
- Tutoring



Bloom, B. S. (1984). The 2 sigma problem: The search for methods of group instruction as effective as one-to-one tutoring. *Educational researcher*, *13*(6), 4-16.

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Why are human tutors so effective?

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Feedback

Guided scaffolding / affect response

Vanlehn, K. (2011). The relative effectiveness of human tutoring, Intelligent Tutoring systems and Other Tutoring Systems. *Educational Psychologist*, 46(4), 197-221

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Learning analytics generates increased feedback opportunities

- LA dashboards
- Predictive models/Recommender systems
- Feedback tools

LA Dashboards:

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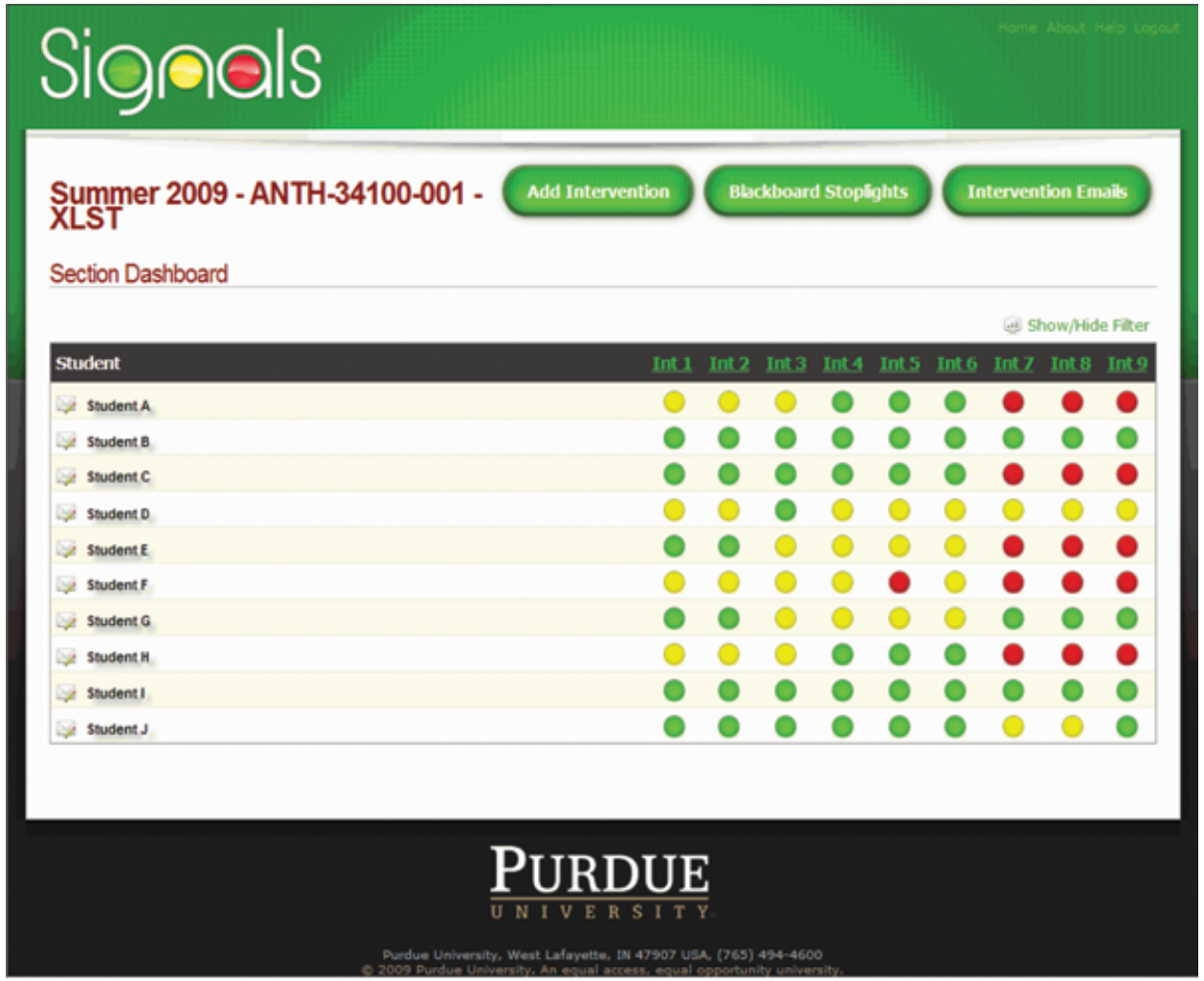

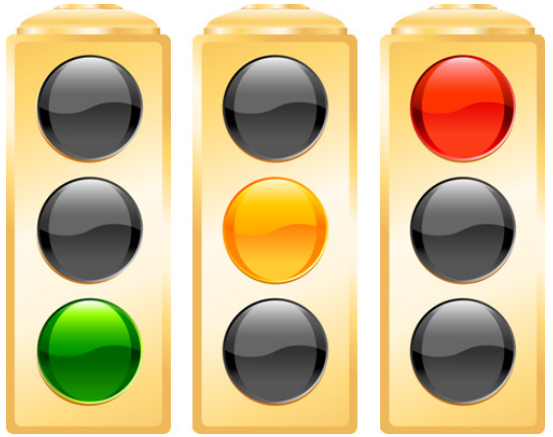

LA Dashboards:

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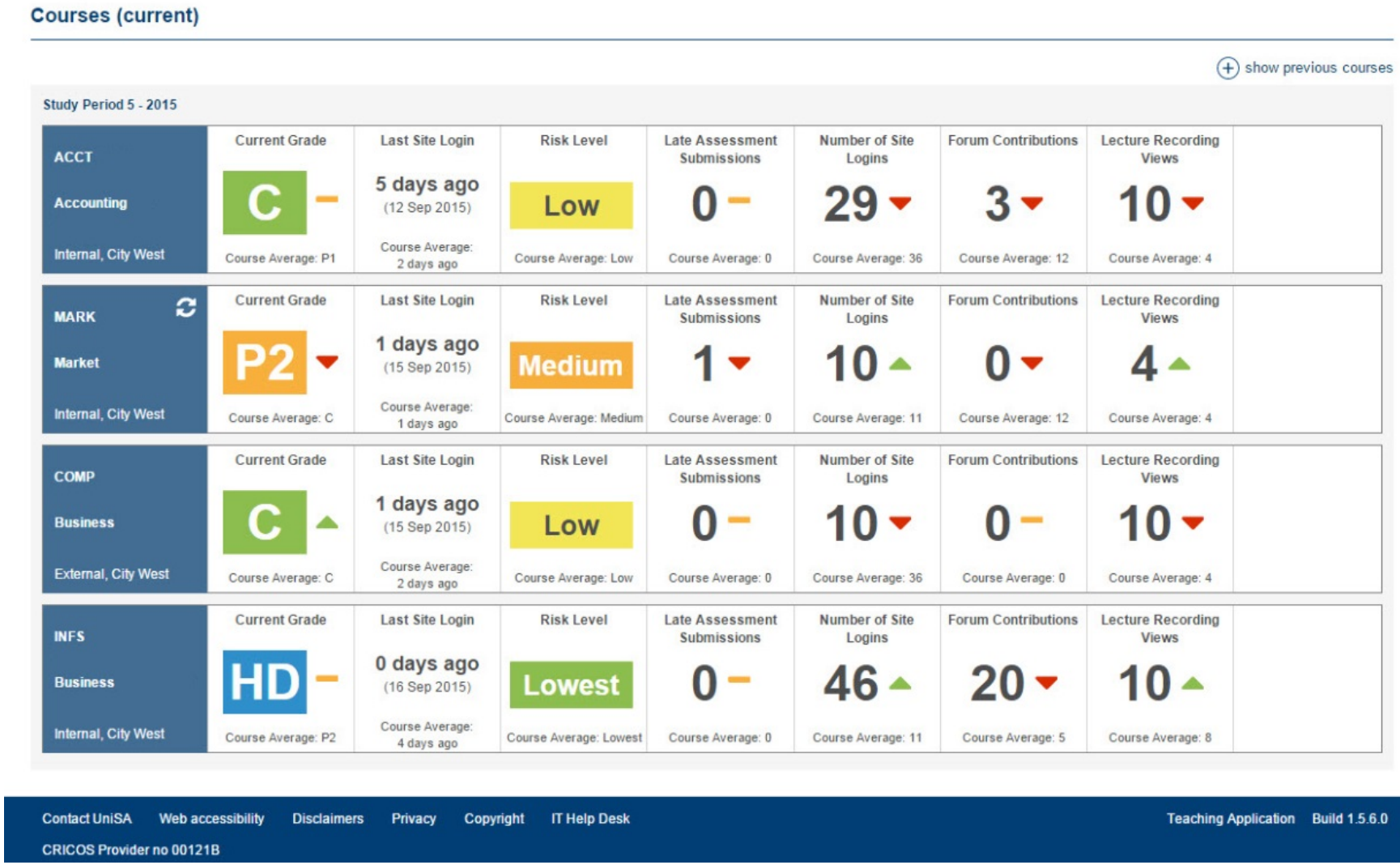

LA Dashboards:

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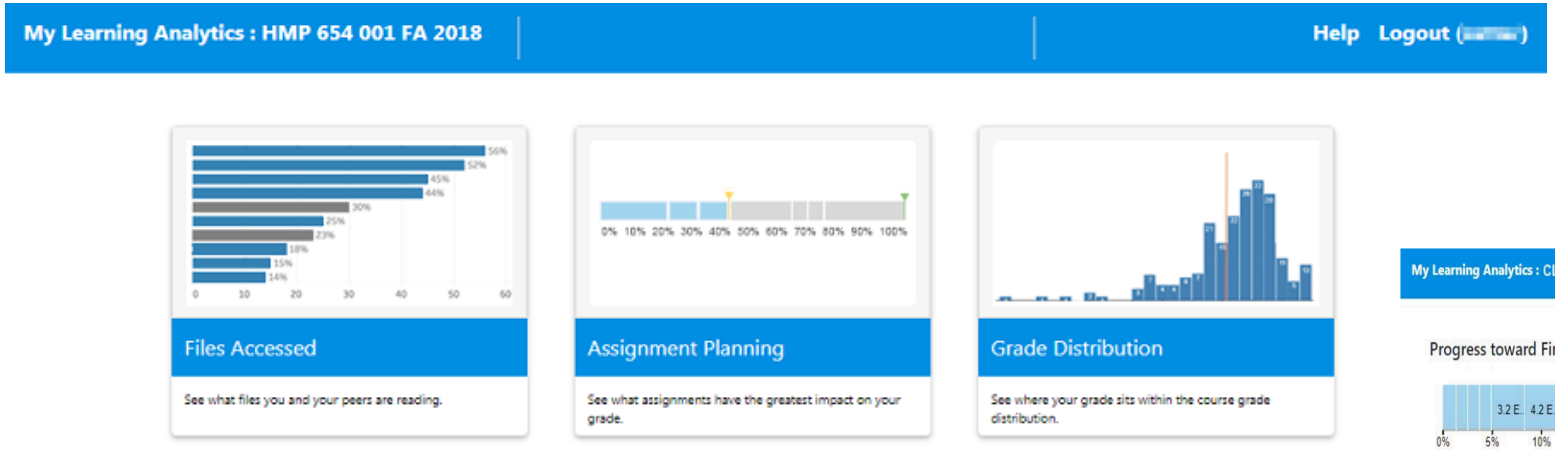

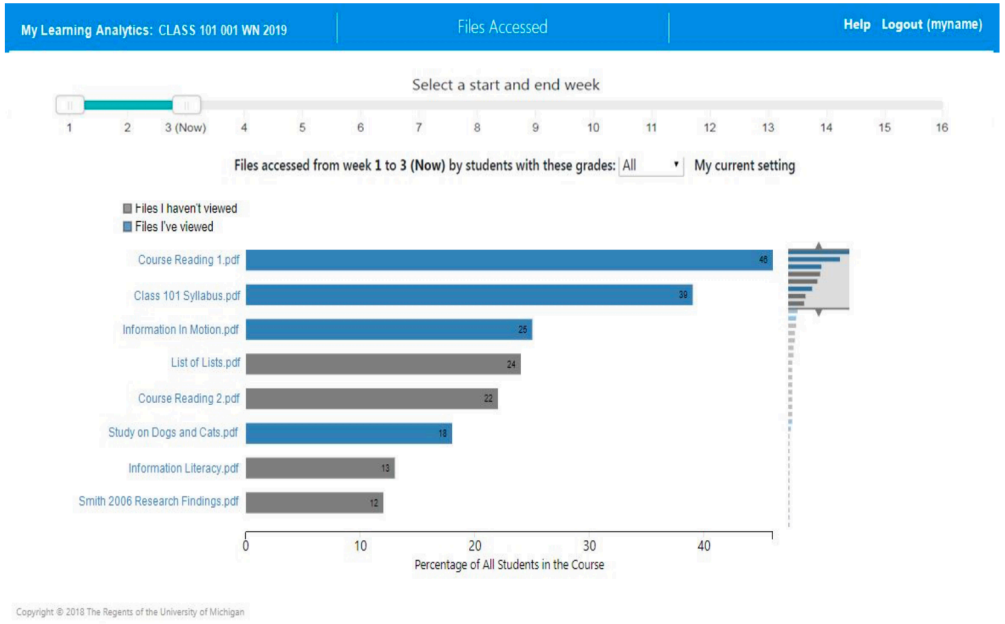

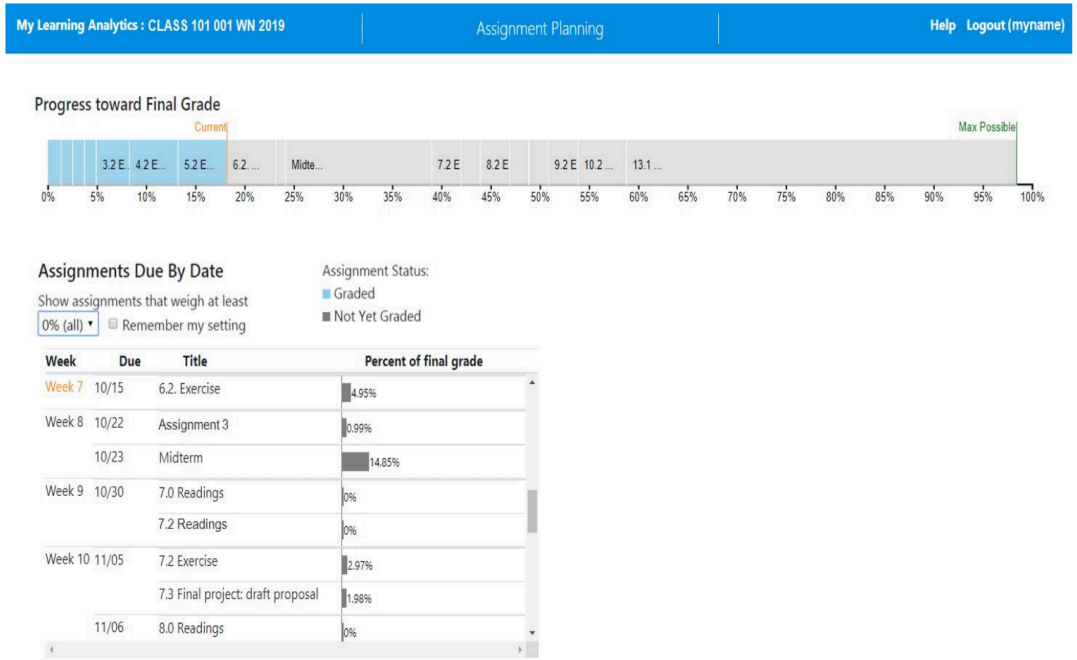

Kia, F. S., et al (2020). How patterns of students dashboard use are related to their achievement and self-regulatory engagement. In *Proceedings of the Tenth International Conference on Learning Analytics & Knowledge* (pp. 340-349).

LA Dashboards:

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- LA – Dashboards failing to support Student Self Regulated Learning (SRL)
- LA – Dashboards are at present diagnostic not developmental

W. Matcha, N. A. Uzir, D. Gašević and A. Pardo, "A Systematic Review of Empirical Studies on Learning Analytics Dashboards: A Self-Regulated Learning Perspective," in *IEEE Transactions on Learning Technologies*, vol. 13, no. 2, pp. 226-245, 1 April-June 2020, doi: 10.1109/TLT.2019.2916802

Learning Analytics :

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Pursuit of personalised and adaptive learning

Predictive models

LA Dashboard of engagement activity

Assessment and feedback

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Where to next?

LA Integrated:

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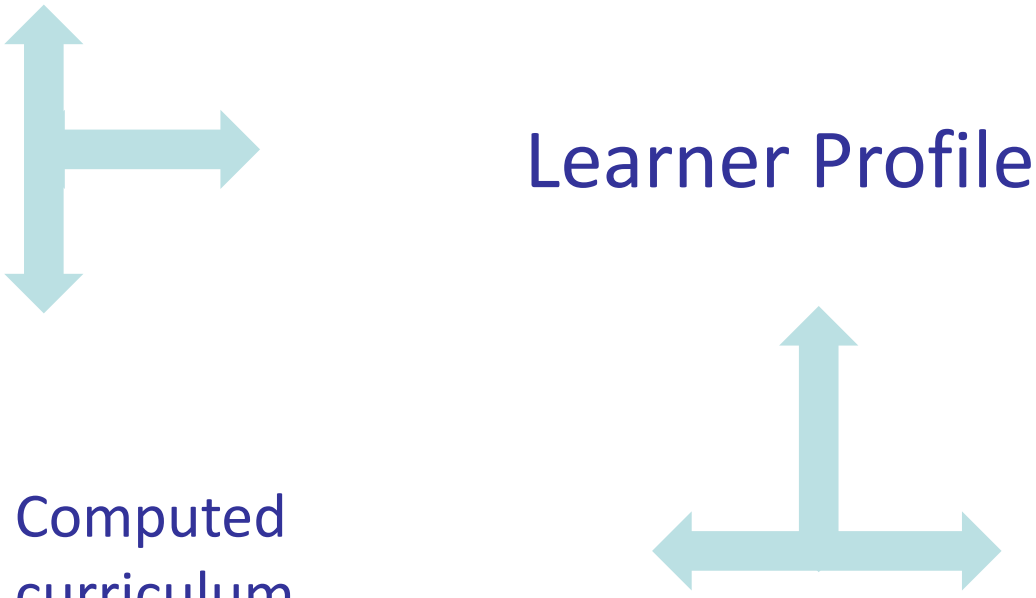
SRL – learning behaviour

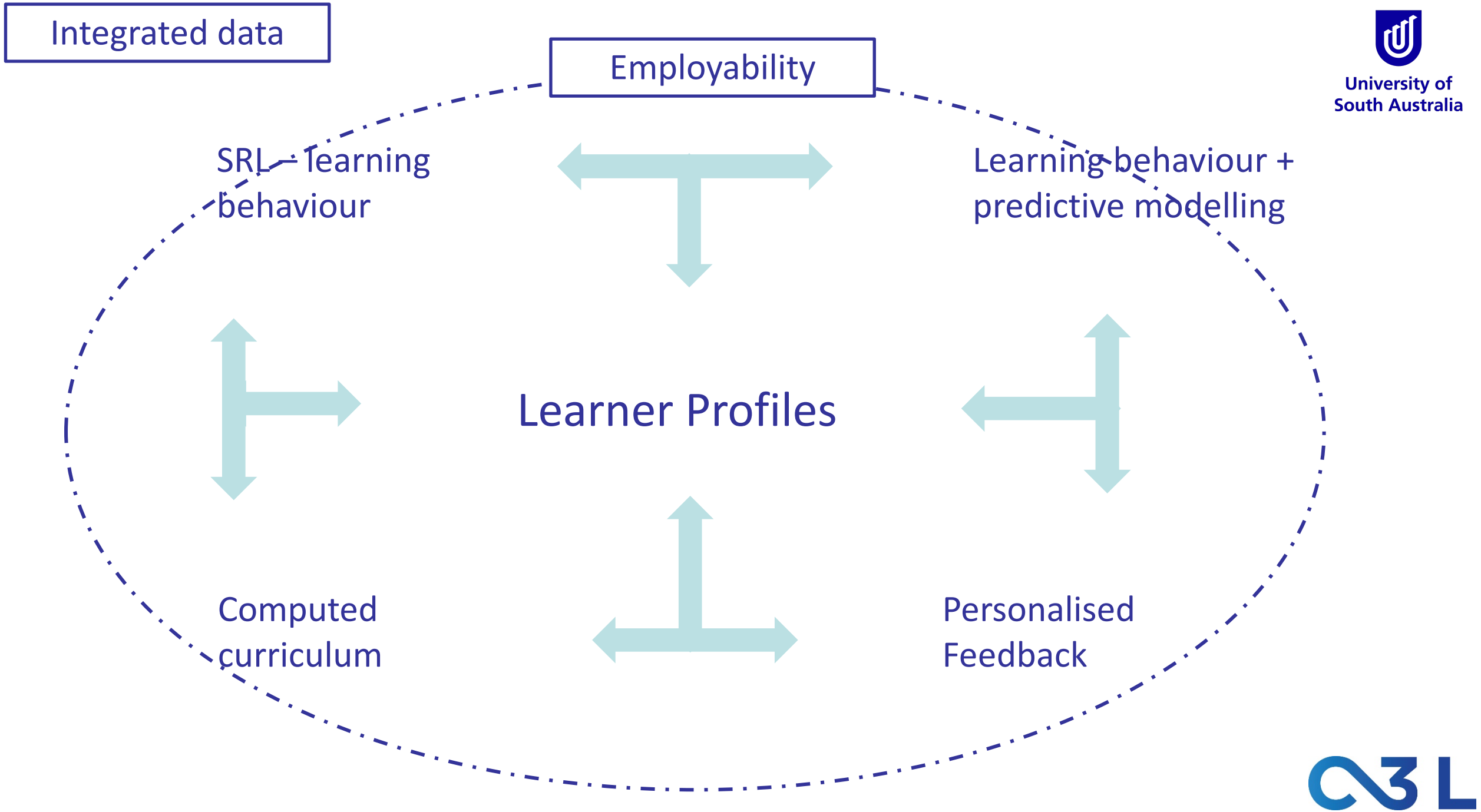
Learning behaviour + predictive modelling



Learner Profiles

Computed curriculum

Personalised Feedback


Integrated data
Employability
SRL – learning behaviour
Learning behaviour + predictive modelling
Learner Profiles
Computed curriculum
Personalised Feedback

LA Future:

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Emerging LA:

- Establish **timely** and integrated feedback
  - Personalised and precise
  - Sensitive to user motivations and cognitive processes

LA Future: Models

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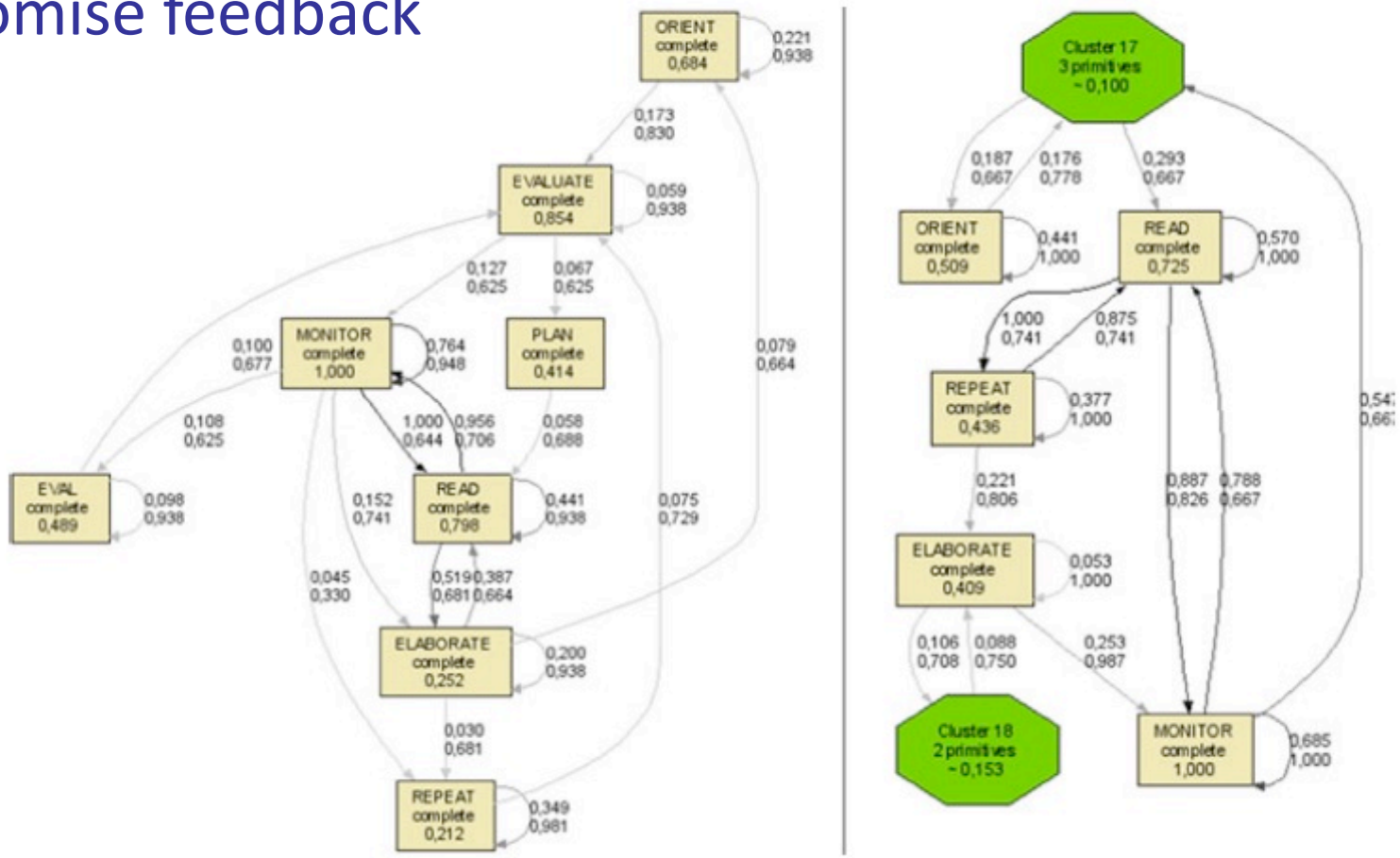
1st Yr Engineering

Cluster analyses and transitions states

- Comprehensive use (all activities)
- Strategic use (assessment activities)
- Regular use (videos and assessment)
- Disengaged

Pardo, A., et al. (2016). *Generating actionable predictive models of academic performance.* In Proceedings of the Sixth International Conference on Learning Analytics & Knowledge (pp. 474-478). ACM.

Identify learning strategies and pathways to customise feedback



Different learning pathways – high performing vs Low performing

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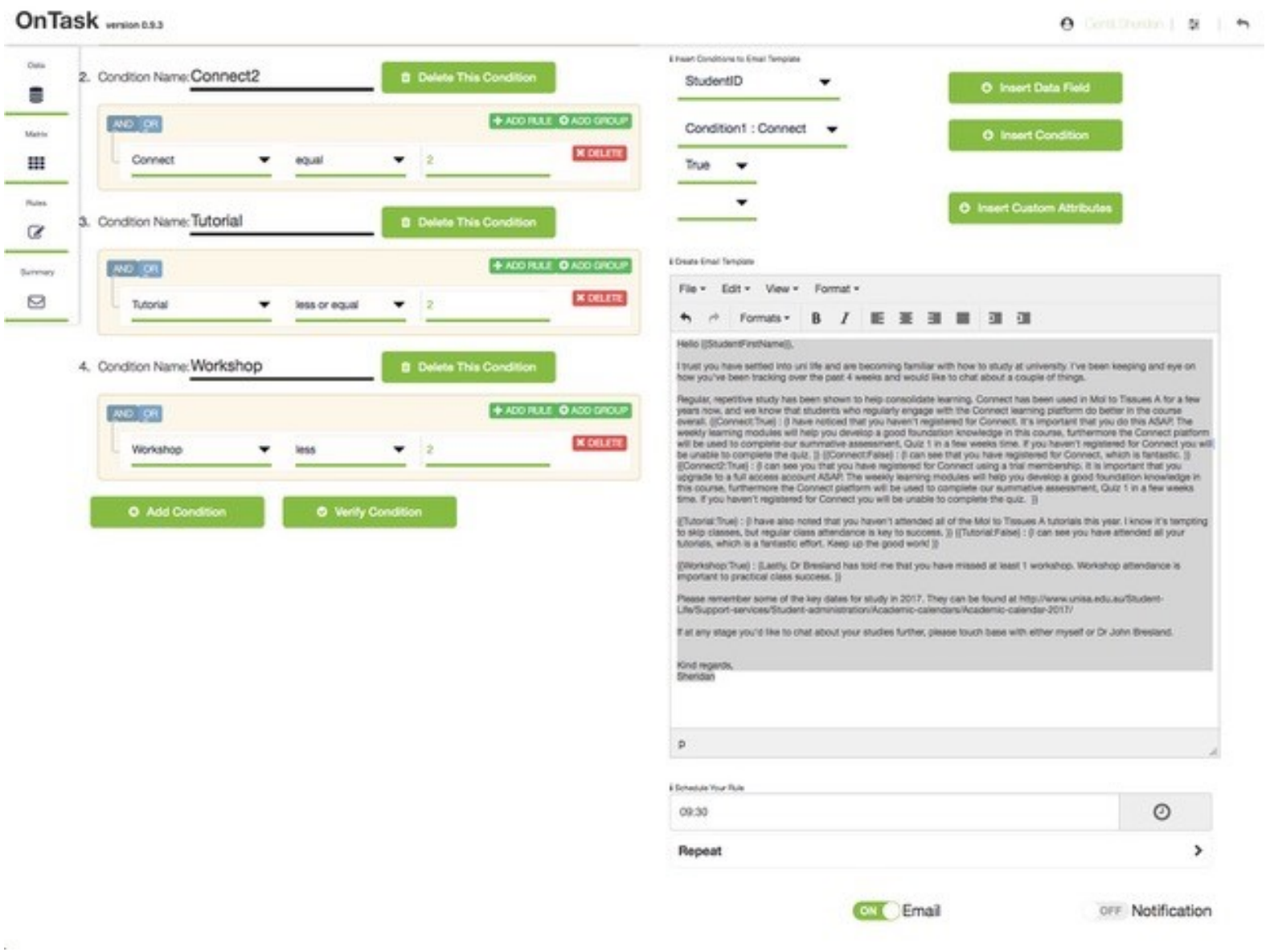
Understanding learning behaviour

Provision of timely and PERSONALISED feedback

WORKLOAD



Pardo, A., et al. (2019). Using learning analytics to scale the provision of personalised feedback. *British Journal of Educational Technology*, *50*(1), 128-138.

Leverage :

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- Leverage key aspects of current processes in the system
- Uptake of video as learning resources

Mind wandering:

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- Mind wandering 20-40% time during learning tasks
  - 30% when reading
  - 40% during lectures
  - 20% interactive sessions

Szpunar, K. K., Moulton, S. T., & Schacter, D. L. (2013). Mind wandering and education: from the classroom to online learning. *Frontiers in psychology*, 4.

Mind wandering:

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- Lecture recordings – 40%
- Shorter videos – 40%
- Videos with set engagement tasks – 20%
  - Note taking
  - Quizzes

Kane, M.J., Smeekens, B.A., Von Bastian, C. C., Lurquin, J.H., Carruth, N.P. and Miyake, A., (2017). A Combined Experimental and Individual-Differences Investigation into Mind Wandering During a Video Lecture. *Journal of Experimental Psychology: General*.

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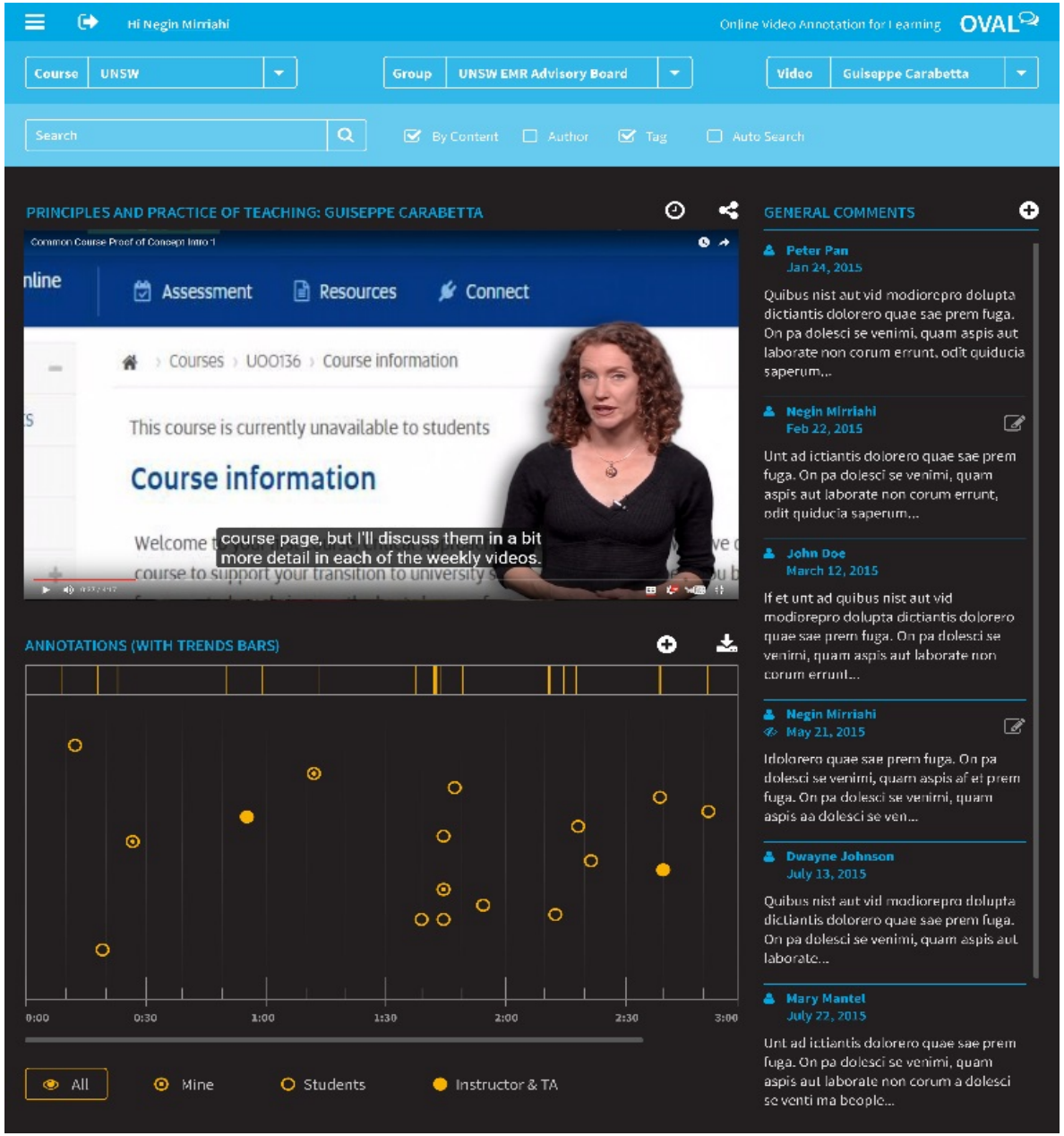
Inclusion of short quizzes – Effective yet simplistic

Development of social learning and SRL skills

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, 14(1), 4-58.



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Embedded video

General summary

Point-based annotations

Video annotations and feedback to promote:

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- Development of meta-cognitive proficiency
- Creative capacity
- Social skills
- Critical thinking

307 Secondary Schools Singapore

Koh, E., Jonathan, C., & Tan, J. P. L. (2019). Exploring conditions for enhancing critical thinking in networked learning: Findings from a secondary school learning analytics environment. *Education Sciences*, *9*(4), 287.

Gašević, D., et al. (2017). Effects of instructional conditions and experience on the adoption of a learning tool. *Computers in Human Behavior*, *67*, 207-220.

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- Engagement; models; feedback processes
- Recommendations for computed curriculum?

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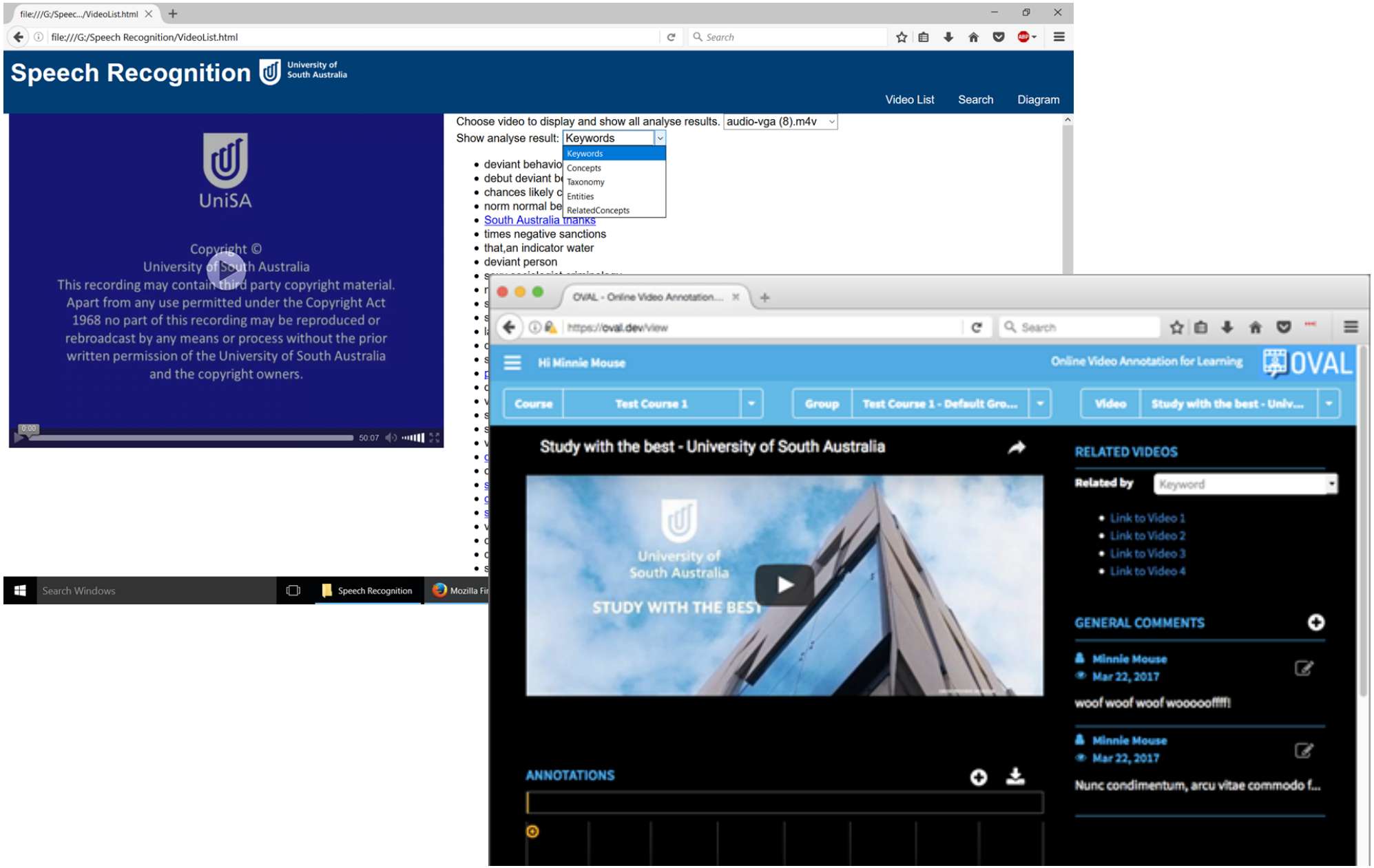

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Shane:
5 tasks due today

Upcoming

English
Mr. Dickens
S1A
Lessons P1

Maths
Do Sheet
Check Answers with teacher
Then do Extension Activity
Homework Due: 04 October 2012

Monday

Physics
Mr. Einstein S3

Tech
Mr. Jobs S23

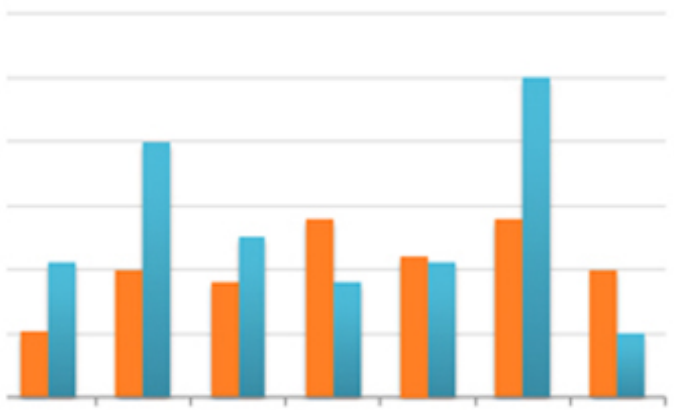
English
Mr. Dickens S1A

Geography
Mr. Polo T16

Maths
Mr. Newton T1

Study Progress

Desired grade	Credit
Motivation for study	Career
Target	2hrs/ day



Planned study

Actual study

Employability:

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Master of Teaching (MMET)

Overview | Jobs | Skill matching analysis summary | Assessment Profile

The number of courses in the program : 69

All Courses

FILTER

COURSE DETAILS

Course Level	Course Name	AQF
4.5	Arts Education M	
4.5	Arts for Secondary Teaching 1	9
4.5	Contemporary Practice in Education Research	
4.5	Critical Perspectives of Education	9
4.5	Critical Perspectives on Curriculum, Pedagogy and Assessment	9

Analysis of curriculum:

Course aims, objectives, descriptions, and assessment

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Skill matching analysis summary

The following analytics were performed based on the public available data.

Match against skills gained from Course & Assessments FILTER

MATCHED HARD SKILLS (OVERALL: 24) +

UNMATCHED HARD SKILLS (OVERALL: 8) +

MATCHED SOFT SKILLS (OVERALL: 10) −

Show 10 entries Search:

TITLE	SKILL IN COURSE FREQUENCY	SKILL IN JOB FREQUENCY
problem solving	251 (51.02%)	54225 (22.91%)
communication	219 (44.51%)	55259 (23.34%)
experience	210 (42.68%)	77351 (32.68%)
professionalism	203 (41.26%)	71837 (30.35%)
self-management	149 (30.28%)	66136 (27.94%)
teamwork	129 (26.22%)	68425 (28.91%)
leadership	92 (18.70%)	44734 (18.90%)
responsibility	26 (5.28%)	42277 (17.86%)
courtesy	25 (5.08%)	29689 (12.54%)
flexibility	9 (1.83%)	13568 (5.73%)

Mapping curriculum with job descriptions

1. Discrete “hard” skills
2. Enterprise skills

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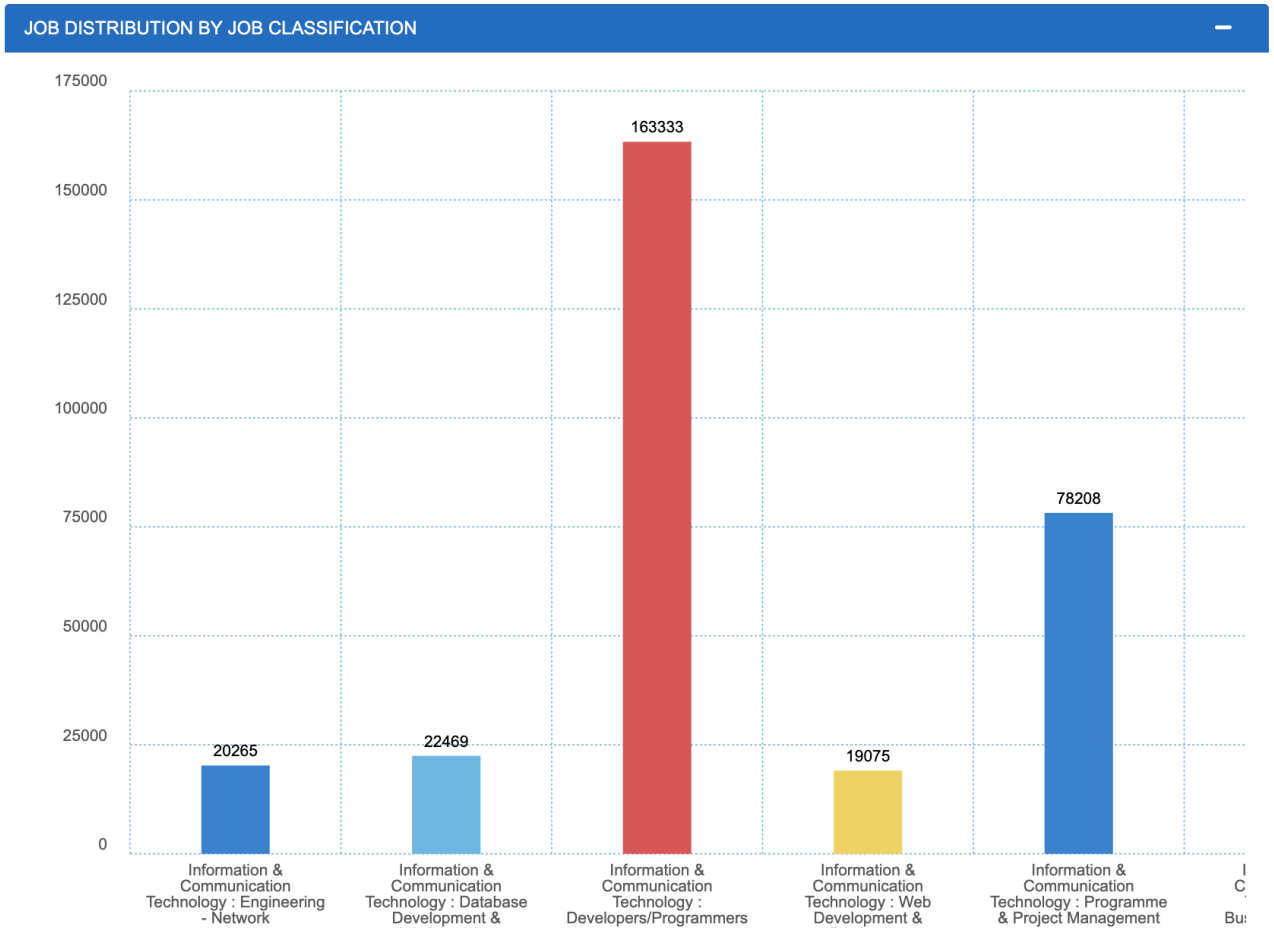

Job trends

- Time
- Locality
- Classification

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As Student

Overview | Jobs | Skill matching analysis summary | Assessment Profile

The number of courses in the program : 22

All Courses

COURSE DETAILS

Course Level	Course Name	AQF
4.5	Advanced Research Methods	
4.5	Applications for Social Media Data	7C
4.5	Applying Social Research Methods	7C
4.5	Colonial Experiment: Australian History 1788 - 1918	7B
4.5	Foundations of Law	7A

Student lens

- Progress towards career goals and skills
- Identify gaps
- Recommend alternatives

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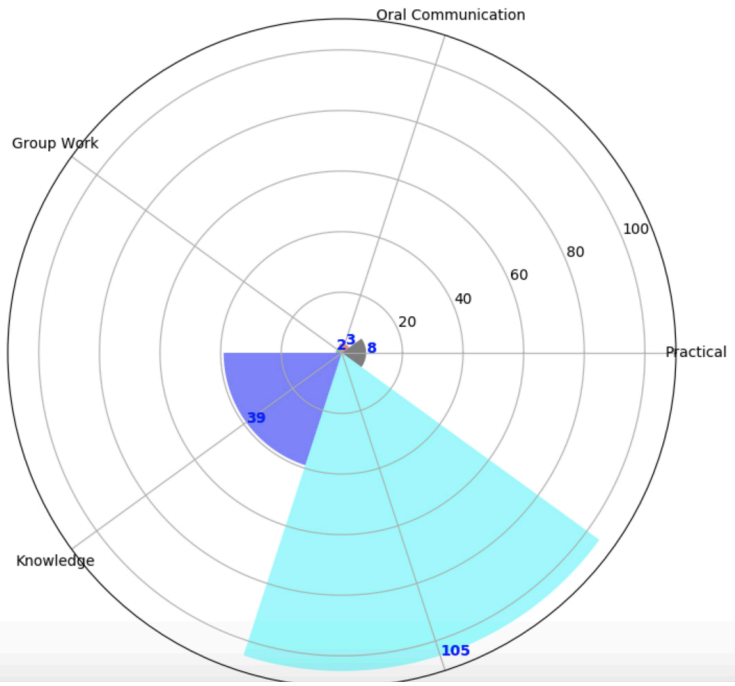
Assessment Profile

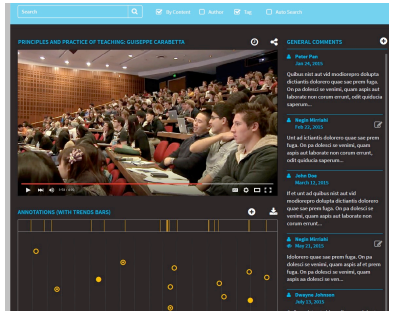
RAW COUNT DIAGRAM (ONLY SHOW CORE COURSE OR COMPLETE COURSE RESULTS)



Assessment

- Current course and program view
- External and accredited options?

SRL – learning behaviour



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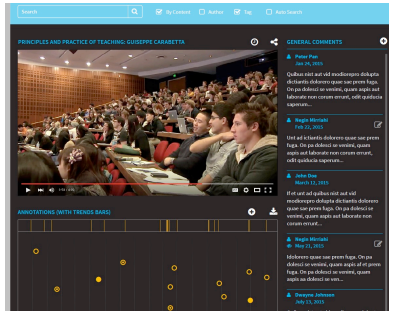
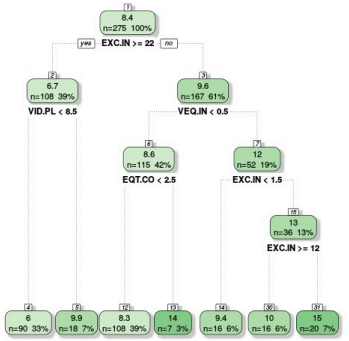
SRL – learning behaviour



Learning behaviour + predictive modelling



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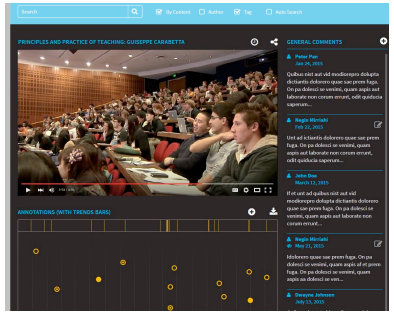
SRL – learning behaviour



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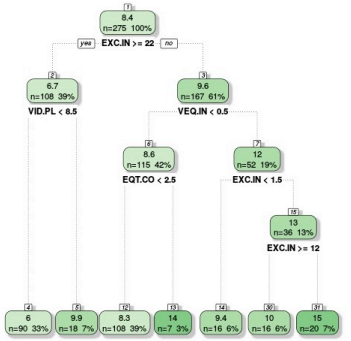
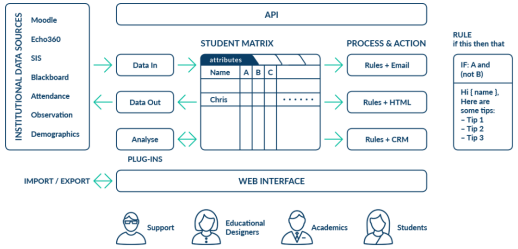


Personalised Feedback



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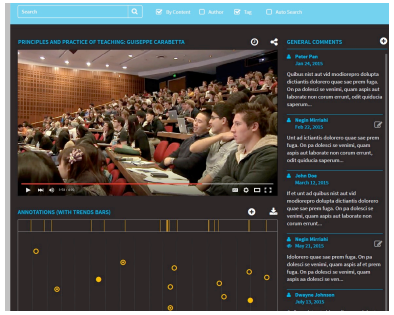

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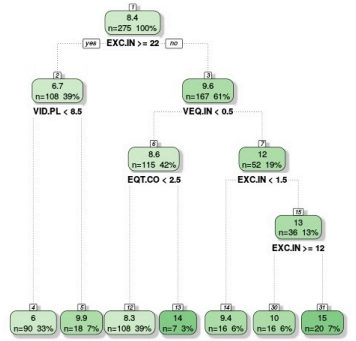
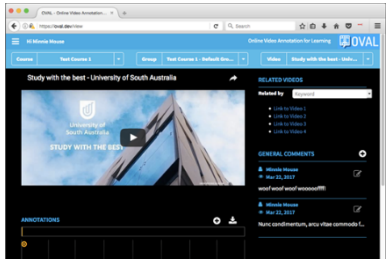


Personalised Resources



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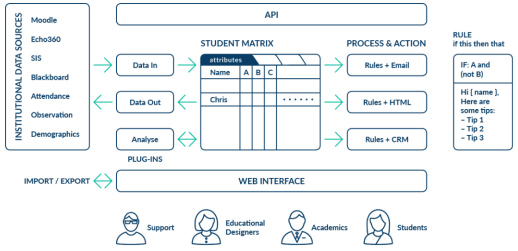

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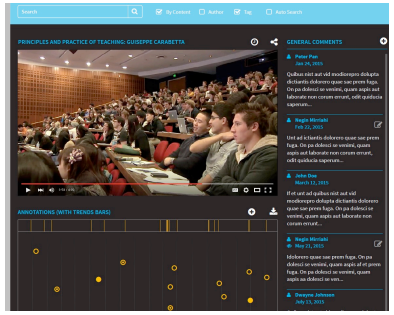
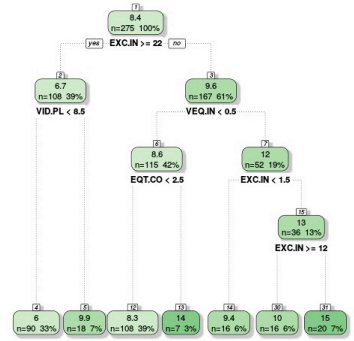
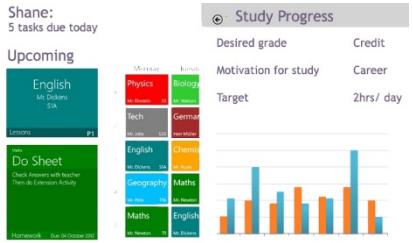
SRL – learning behaviour



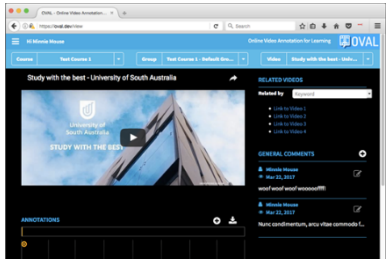
Learning behaviour + predictive modelling



Learner Profile



Personalised Resources



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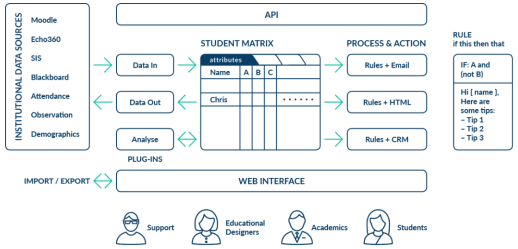

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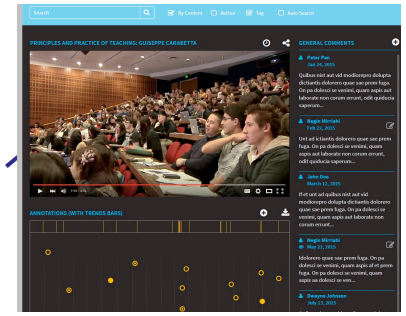
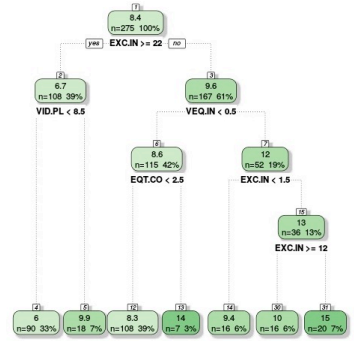
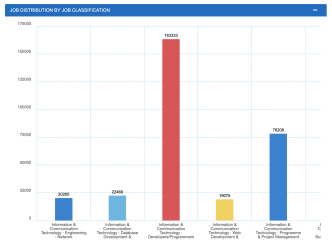
SRL – learning behaviour



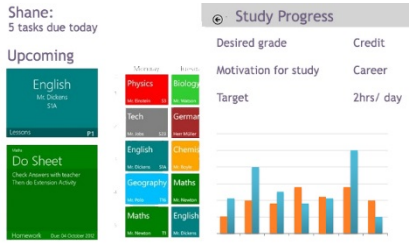
Learning behaviour + predictive modelling



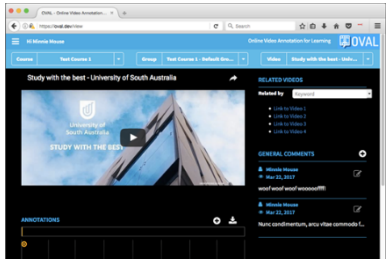
Career orientations



Learner Profile



Personalised Resources



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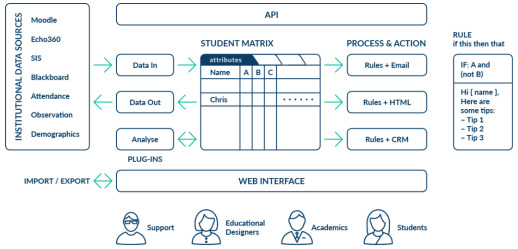

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To muddy the waters

How do we design for learning?

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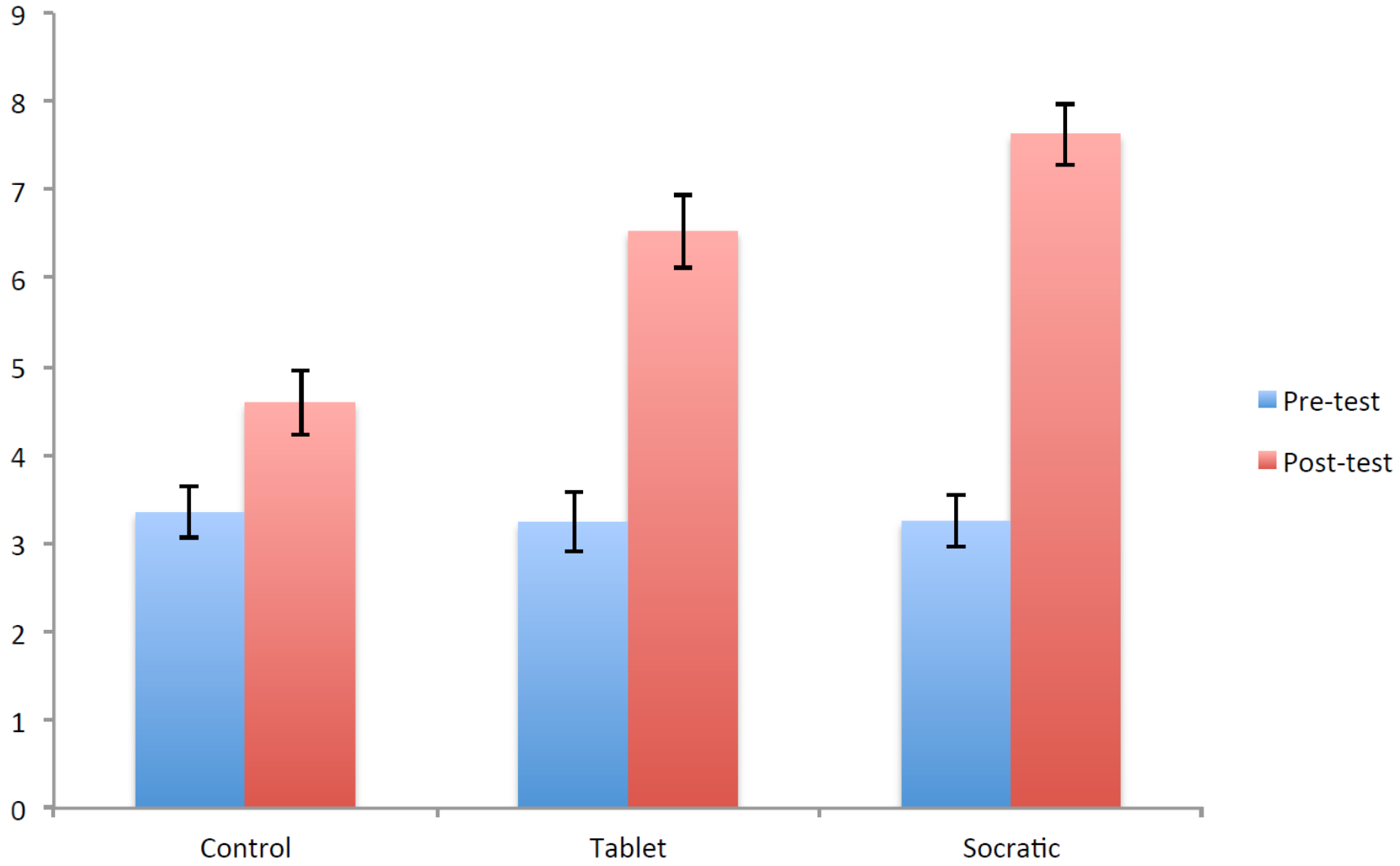

Thanks to and in collaboration with Dr. Jason Lodge Centre for Studies in Higher Education, University of Melbourne

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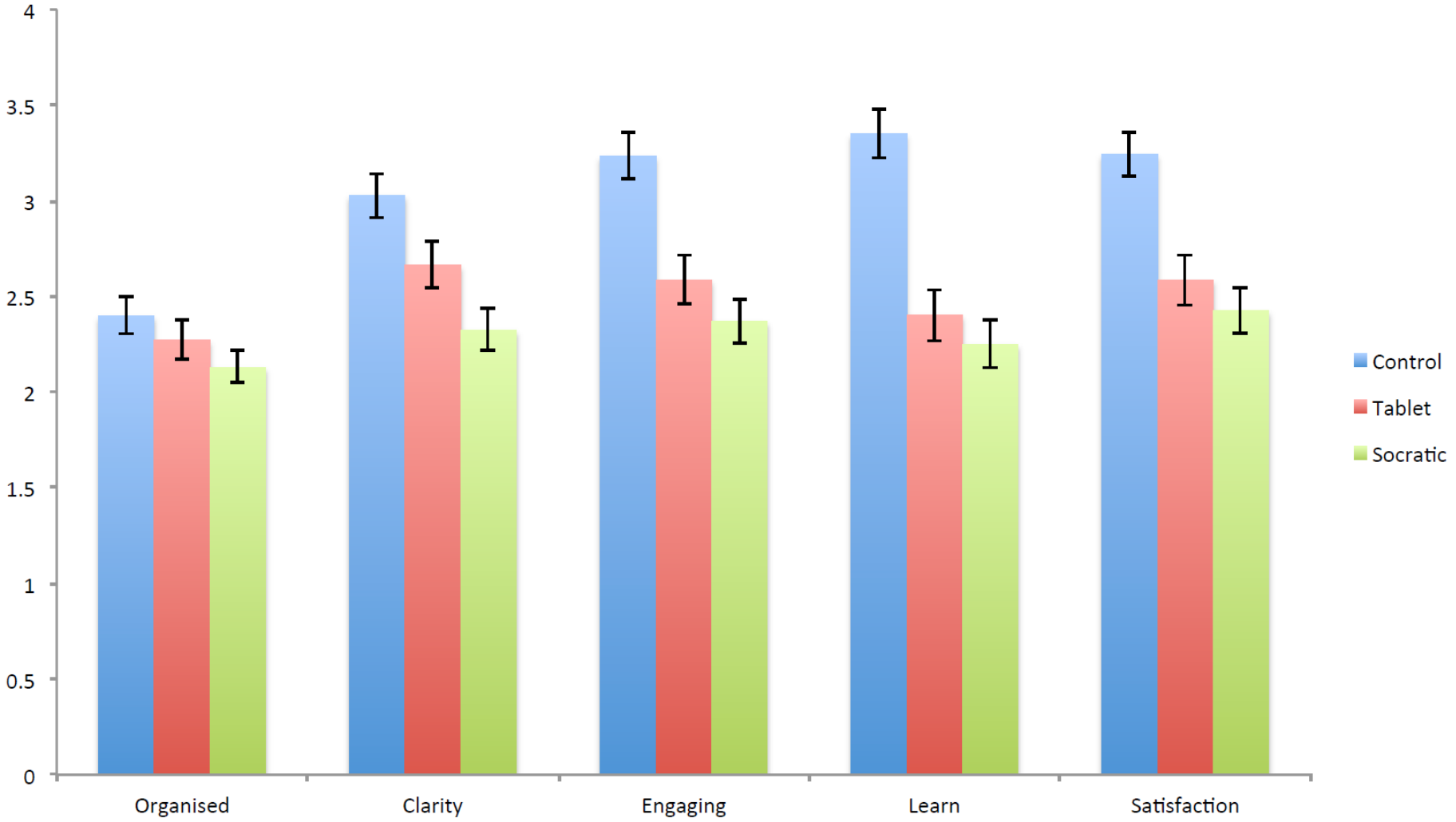

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What data are you using to assess progress and quality?

Course evaluations and student satisfaction?

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Thank you…

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