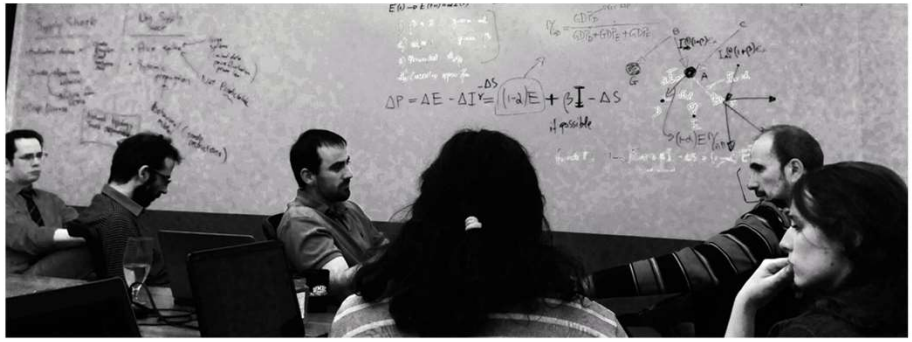
Data, analytics and learning: Interdisciplinary approaches to the generation of actionable knowledge

Dr Kate Thompson
kate.thompson@griffith.edu.au

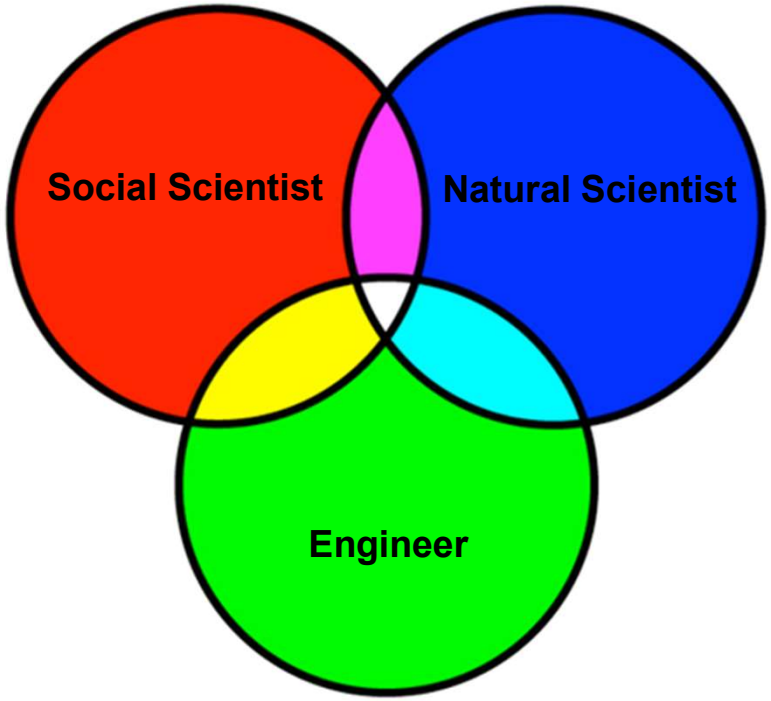
Interdisciplinary research

SESYNC

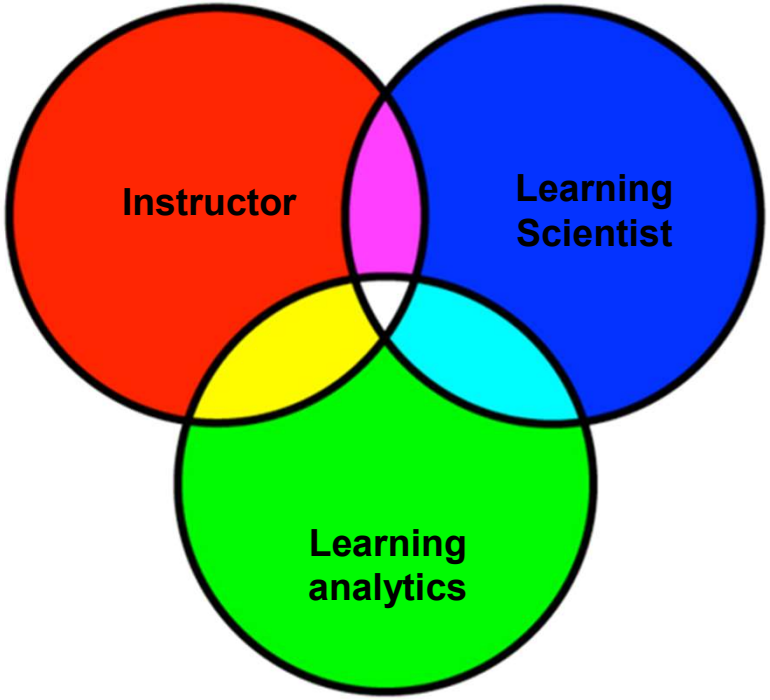


Interdisciplinary research

Different cultures:
Ways of working
Methods
Data types
Values
Motivations
Epistemologies
Uncertainty tolerance
Etc.

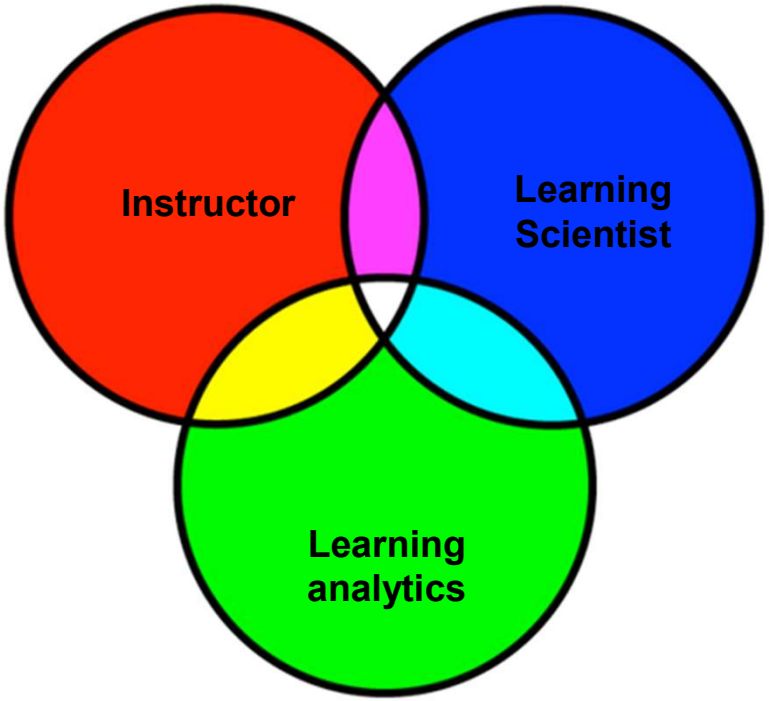


Interdisciplinary research



Interdisciplinary research

Different cultures:
Ways of working
Methods
Data types
Values
Motivations
Epistemologies
Uncertainty tolerance
Etc.



Interdisciplinary research: Teams

What processes, methods and/or tools facilitate development of this?

Interdisciplinary research: Steps

1. identification of an appropriate question;
2. development of a shared vocabulary;
3. the co-creation of boundary negotiating objects;
4. the use of tools for visualizing and combining data; and
5. a new, more connected understanding of the question.

Pennington et al. (2015)

Interdisciplinary research: Challenges

1. High diversity
2. Deep knowledge integration
3. Large size
4. Goal misalignment
5. Permeable boundaries
6. Geographic dispersion
7. Task interdependence

National Academy of Sciences (2015) Enhancing the Effectiveness of Team Science

Interdisciplinary research: Challenges

Collaboration:

- Geographic spread
- lack of centralized funding for bringing team members together
- team members' experience working together

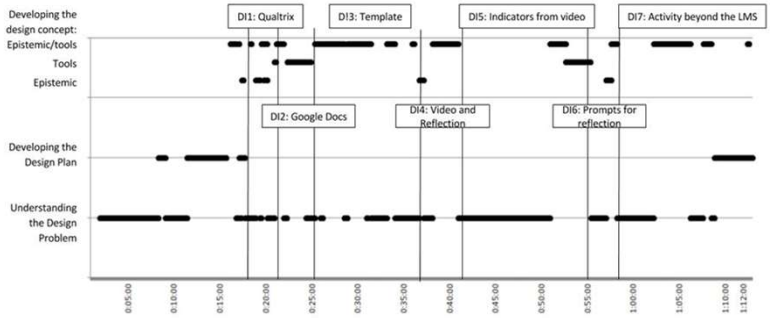
Epistemology:

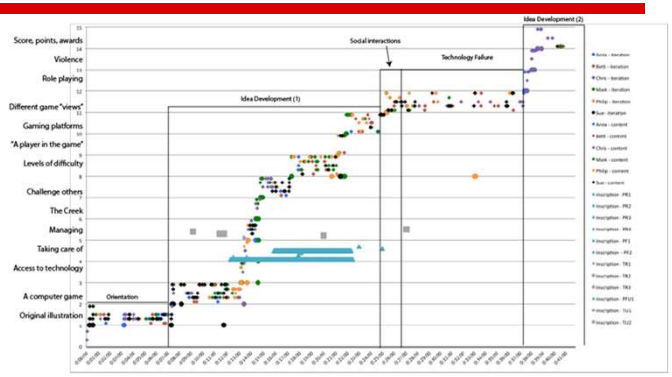
- Identification, alignment and differentiation of underlying beliefs
- how would we make a shared model of learner activity that fairly accounted for the individual perspectives?

Tools:

- identification of appropriate tools we would need to communicate, share data, visualize analyses and create and share models.

Multimodal data for learning





Interdisciplinary approaches: Learning by design

Kate Thompson (School of Education and Professional Studies, Griffith University, Australia); **Lucila Carvalho** (Institute of Education, Massey University, New Zealand); **Anindito Aditomo** (Faculty of Psychology, The University of Surabaya, Indonesia); **Yannis Dimitriadis** (School of Telecommunications Engineering, University of Valladolid, Spain); **Gregory Dyke** (Advanced Studies on Language Complexity – ASLAN, Universite de Lyon, France); **Michael A. Evans** (Department of Curriculum, Instruction, and Counselor Education, North Carolina State University, USA); **Peter Goodyear** (School of Education and Social Work, University of Sydney, Australia); **Lixiao Huang** (North Carolina State University, USA); **Maryam Khosronejad** (School of Education and Social Work , University of Sydney, Australia); **Roberto Martinez-Maldonado** (University of Technology, Sydney, Australia); **Peter Reimann** (School of Education and Social Work, University of Sydney, Australia); **Dewa Wardak** (School of Education and Social Work, University of Sydney, Australia)

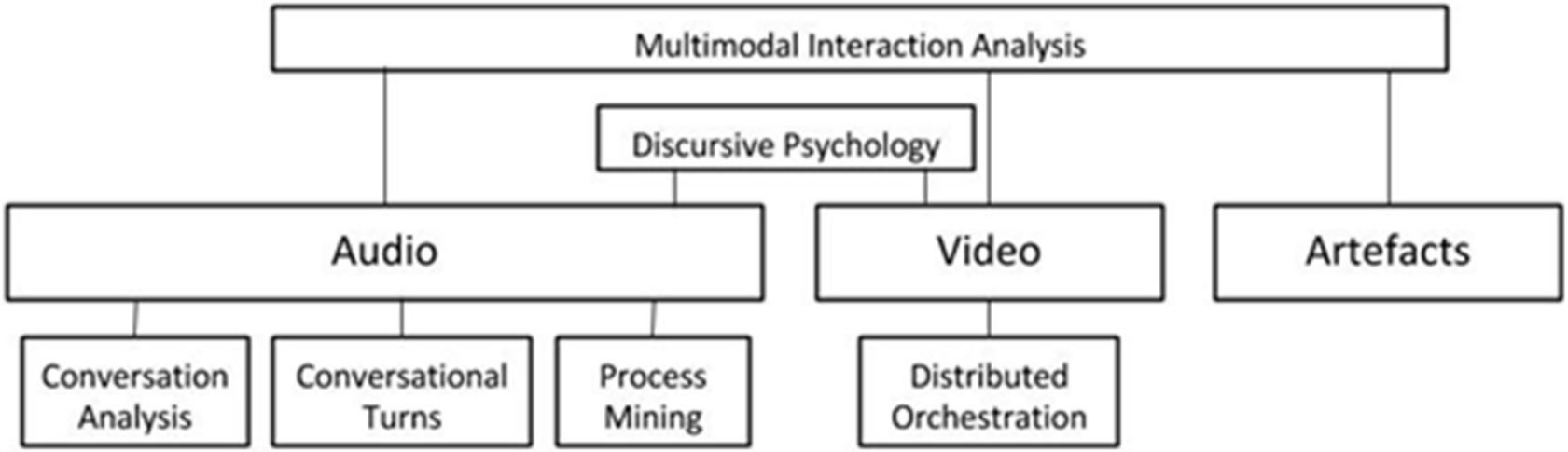
Interdisciplinary approaches: Learning by design

Kate Thompson (School of Education and Professional Studies, **Griffith University, Australia**); Lucila Carvalho (Institute of Education, **Massey University, New Zealand**); Anindito Aditomo (Faculty of Psychology, **The University of Surabaya, Indonesia**); Yannis Dimitriadis (School of Telecommunications Engineering, **University of Valladolid, Spain**); Gregory Dyke (Advanced Studies on Language Complexity – ASLAN, **Universite de Lyon, France**); Michael A. Evans (Department of Curriculum, Instruction, and Counselor Education, **North Carolina State University, USA**); Peter Goodyear (School of Education and Social Work, **University of Sydney, Australia**); Lixiao Huang (**North Carolina State University, USA**); Maryam Khosronejad (School of Education and Social Work , **University of Sydney, Australia**); Roberto Martinez-Maldonado (**University of Technology, Sydney, Australia**); Peter Reimann (School of Education and Social Work, **University of Sydney, Australia**); Dewa Wardak (School of Education and Social Work, **University of Sydney, Australia**)

Interdisciplinary approaches: Learning by design

Kate Thompson (School of Education and Professional Studies, Griffith University, Australia); **Lucila Carvalho** (Institute of Education, Massey University, New Zealand); **Anindito Aditomo** (Faculty of Psychology, The University of Surabaya, Indonesia); **Yannis Dimitriadis** (School of Telecommunications Engineering, University of Valladolid, Spain); **Gregory Dyke** (Advanced Studies on Language Complexity – ASLAN, Universite de Lyon, France); **Michael A. Evans** (Department of Curriculum, Instruction, and Counselor Education, North Carolina State University, USA); **Peter Goodyear** (School of Education and Social Work, University of Sydney, Australia); **Lixiao Huang** (North Carolina State University, USA); **Maryam Khosronejad** (School of Education and Social Work , University of Sydney, Australia); **Roberto Martinez-Maldonado** (University of Technology, Sydney, Australia); **Peter Reimann** (School of Education and Social Work, University of Sydney, Australia); **Dewa Wardak** (School of Education and Social Work, University of Sydney, Australia)

Interdisciplinary approaches: Learning by design



Thompson, K., Carvalho, L., Aditomo, A., Dimitriadis, Y., Dyke, G., Evans, M. A., Goodyear, P., Khosronejad, M., Martinez-Maldonado, R., Reimann, P. & Wardak, D. (under review). A multimodal approach to the analysis of complex collaborative learning environments: Synthesis research in the learning sciences.

Interdisciplinary approaches: Learning by design

Audio recordings were collected, transcribed and the discourse coded for

(1) the role of ***positioning*** in collaboration and in the design process;

(2) ***knowledge sharing*** and ***knowledge integration*** practices;

(3) ***phases of design***; and

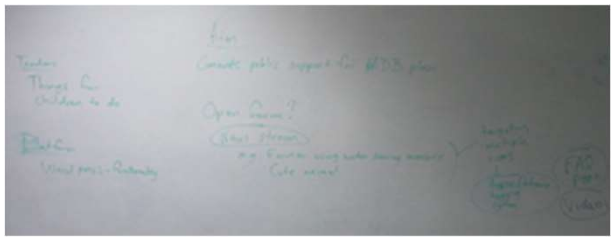
(4) ***decision-making***.

Video recordings were collected and the ***use of tools*** identified and analysed to inform the findings related to distributed orchestration.

Video and audio recordings were both analysed for ***gesture*** and ***engagement***, using a discursive psychology approach.

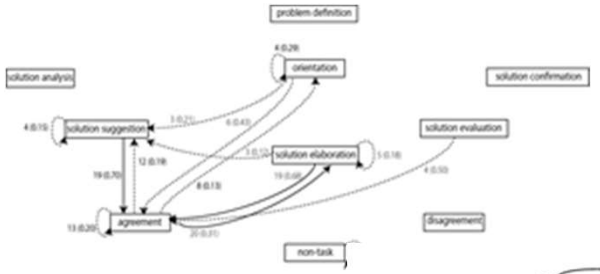
The ***design artefacts*** were also analysed using multimodal interaction analysis, in addition to ***gestures*** and ***physical location of participants*** (video) and the ***discourse*** (audio).

Interdisciplinary approaches: Learning by design

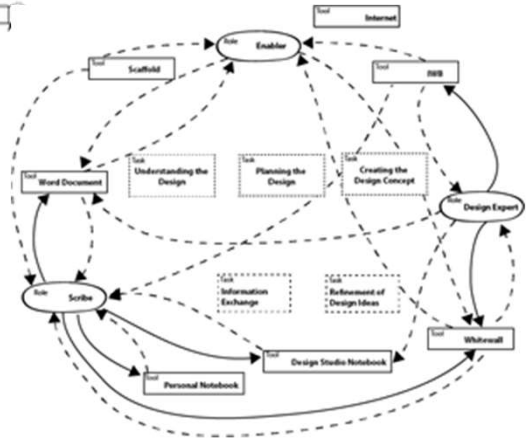


Design sketch used in MIA

Conversational Turns visualised in Tatiana



Markov transition diagram used in process analysis



Systems map - links between roles and tools used

Thompson, K., Carvalho, L., Aditomo, A., Dimitriadis, Y., Dyke, G., Evans, M. A., Goodyear, P., Khosronejad, M., Martinez-Maldonado, R., Reimann, P. & Wardak, D. (under review). A multimodal approach to the analysis of complex collaborative learning environments: Synthesis research in the learning sciences.

Interdisciplinary approaches: Classroom analytics

Kate Thompson (School of Education and Professional Studies, Griffith University); Sarah K. Howard (University of Wollongong);

Nick Kelly (Queensland University of Technology);

Harry Kanasa (Griffith University);

Jun Ma (University of Wollongong); Jack Yang (University of Wollongong);

Abelardo Pardo (University of Sydney);

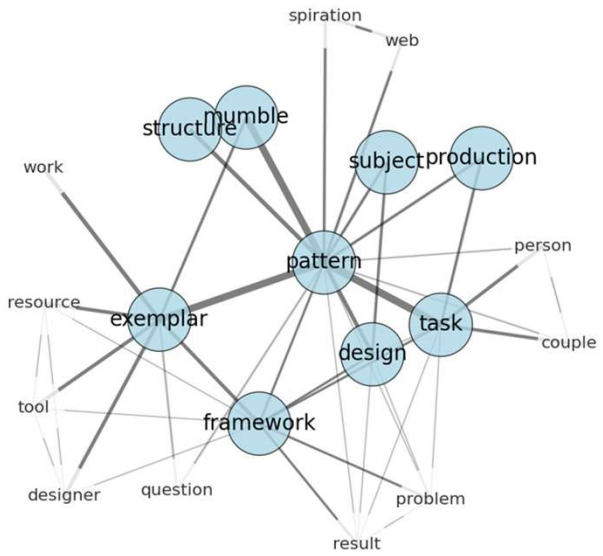
David Ashe (University of Sydney); Lucila Carvalho (Massey University); Peter Goodyear (University of Sydney); Martin Parisio (University of Sydney)

Interdisciplinary approaches: Classroom analytics

Time (minutes)	Damien (yellow)	Eileen (blue)	Gabrielle (green)	Lavina (red)
0-5	Exploring	Exploring	Exploring	
5-10	Stationary	Pacing	Pacing	Stationary
10-15	Pacing	Stationary	Pacing	Pacing
15-20	Stationary	Stationary	Stationary	Stationary
20-25	Exploring	Exploring	Exploring	Pacing
25-end	Pacing	Stationary	Stationary	Exploring

Thompson, K., Kelly, N., Ma, J., Yang, J., Howard, S. K., Carvalho, L. (under review). Temporal needs and representational affordances for multimodal learning analytics: the generation of actionable knowledge

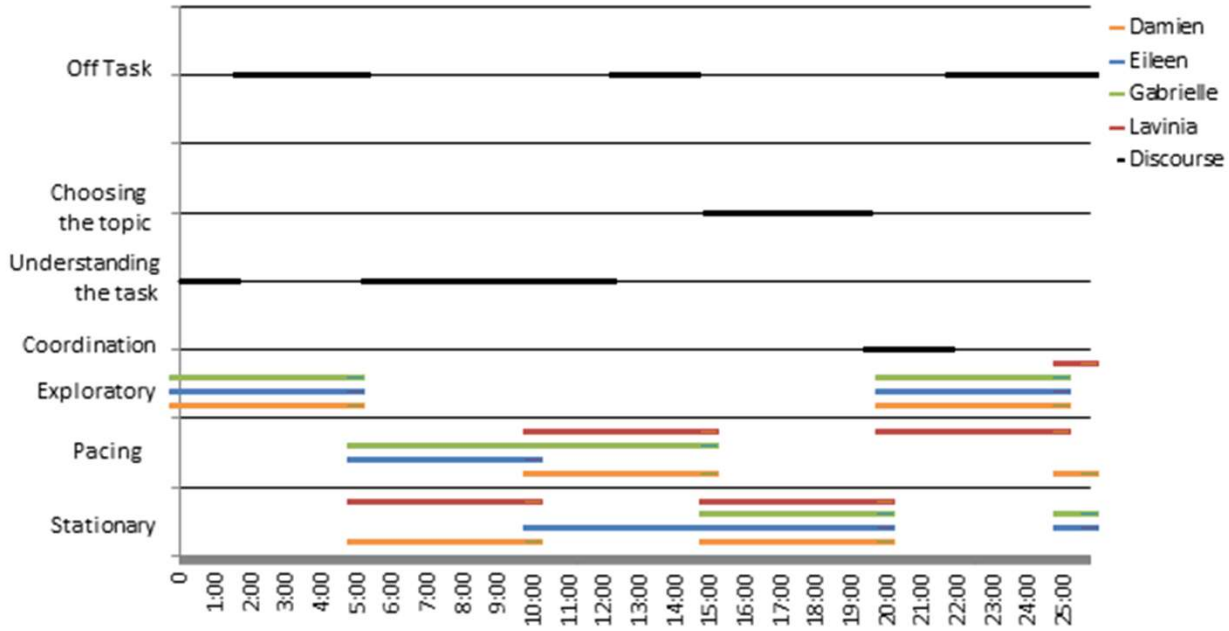
Interdisciplinary approaches: Classroom analytics



Thompson, K., Kelly, N., Ma, J., Yang, J., Howard, S. K., Carvalho, L. (under review). Temporal needs and representational affordances for multimodal learning analytics: the generation of actionable knowledge

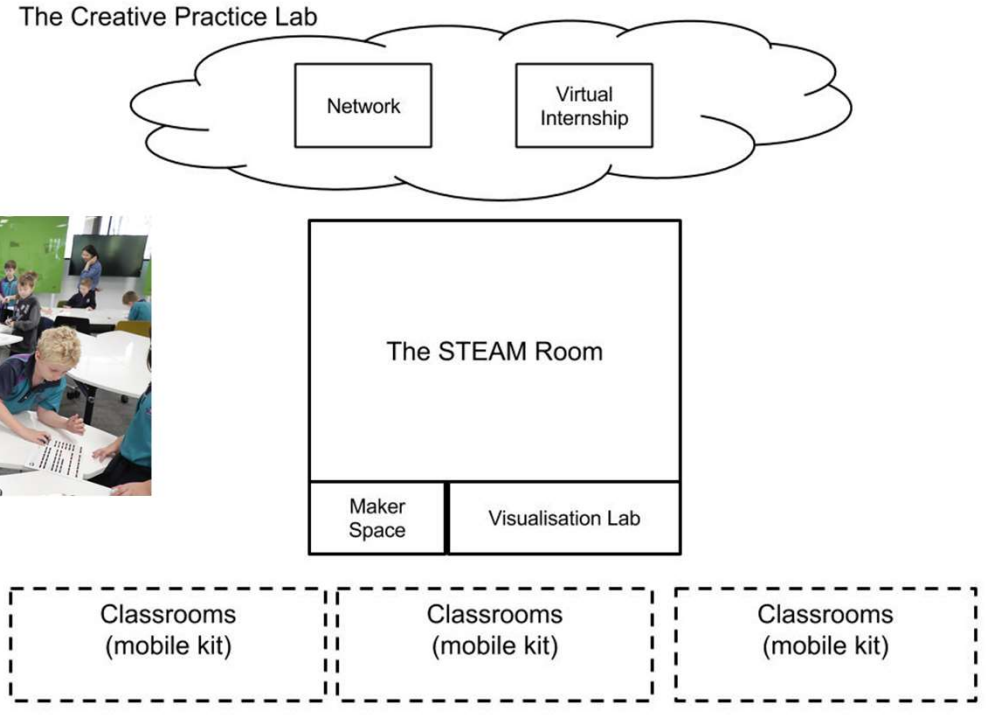
Utterances	Classification
0-24	Understanding the assessment
25-74	Off task
75-124	Understanding the assessment
125-174	Understanding the assessment
175-224	Off task
225-274	Choosing the topic
275-324	Coordination
325-374	Off task

Interdisciplinary approaches: Classroom analytics



Thompson, K., Kelly, N., Ma, J., Yang, J., Howard, S. K., Carvalho, L. (under review). Temporal needs and representational affordances for multimodal learning analytics: the generation of actionable knowledge

Next steps - The Creative Practice Lab



This presentation has drawn on:

Howard, S., Thompson, K., Yang, J. & Ma, J., Pardo, A., & Kanasa, H. (2017). Capturing and Visualising: Classroom analytics for physical and digital collaborative learning processes. *The Conference for Computer Supported Collaborative Learning,* June, 2017, Philadelphia, USA. Accepted 6/2/2017.

Kelly, N., Thompson, K., Yeoman, P. (2015). Design of analytics for the automated analysis of collaborative learning discourse. *Journal of Learning Analytics, 2(2),* 14-43.

Pennington, D., Bammer, G., Danielson, A., Gosselin, D. C., Gouvea, J., Habron, G., Hawthorne, D., Parnell, R. A., Thompson, K., Vincent, S., & Wei, C. (2015) The EMBeRS project: Employing model-based reasoning in socio-environmental synthesis. *Journal of Environmental Studies and Sciences,* October, 2015.

Thompson, K., Ashe, D., Carvalho, L., Goodyear, P., Kelly, N., Parisio, M. (2013). Processing and Visualizing Data in Complex Learning Environments. *American Behavioral Scientist*, 57(10), 1401-1420.

Thompson, K., Carvalho, L., Aditomo, A., Dimitriadis, Y., Dyke, G., Evans, M. A., Khosronejad, M., Martinez-Maldonado, R., Reimann, P. & Wardak, D. (2015). The synthesis approach to analysing educational design dataset: Applications of three scaffolds to a learning by design task for postgraduate education students. *British Journal of Educational Technology, 46* (5), 1020-1027.

Thompson, K., Carvalho, L., Aditomo, A., Dimitriadis, Y., Dyke, G., Evans, M. A., Goodyear, P., Khosronejad, M., Martinez-Maldonado, R., Reimann, P. & Wardak, D. (under review). A multimodal approach to the analysis of complex collaborative learning environments: Synthesis research in the learning sciences.

Thompson, K., Carvalho, L., Aditomo, A., Dimitriadis, Y., Dyke, G., Evans, M. A., Khosronejad, M., Martinez-Maldonado, R., Reimann, P. & Wardak, D. (2015). Synthesis research in the Learning Sciences: a multimodal approach to the analysis of complex learning environments. *The Conference for Computer Supported Collaborative Learning,* Gottenburg, Sweden.

Thompson, K., Howard, S., Yang, J. & Ma, J. (2016). Mining video data: tracking learners for orchestration and design. *Australian Society for Computers in Learning in Tertiary Education,* November 28-30th, 2016, Adelaide.

Thompson, K., Kelly, N., Ma, J., Yang, J., Howard, S. K., Carvalho, L. (under review). Temporal needs and representational affordances for multimodal learning analytics: the generation of actionable knowledge

Thank you!

Any questions?