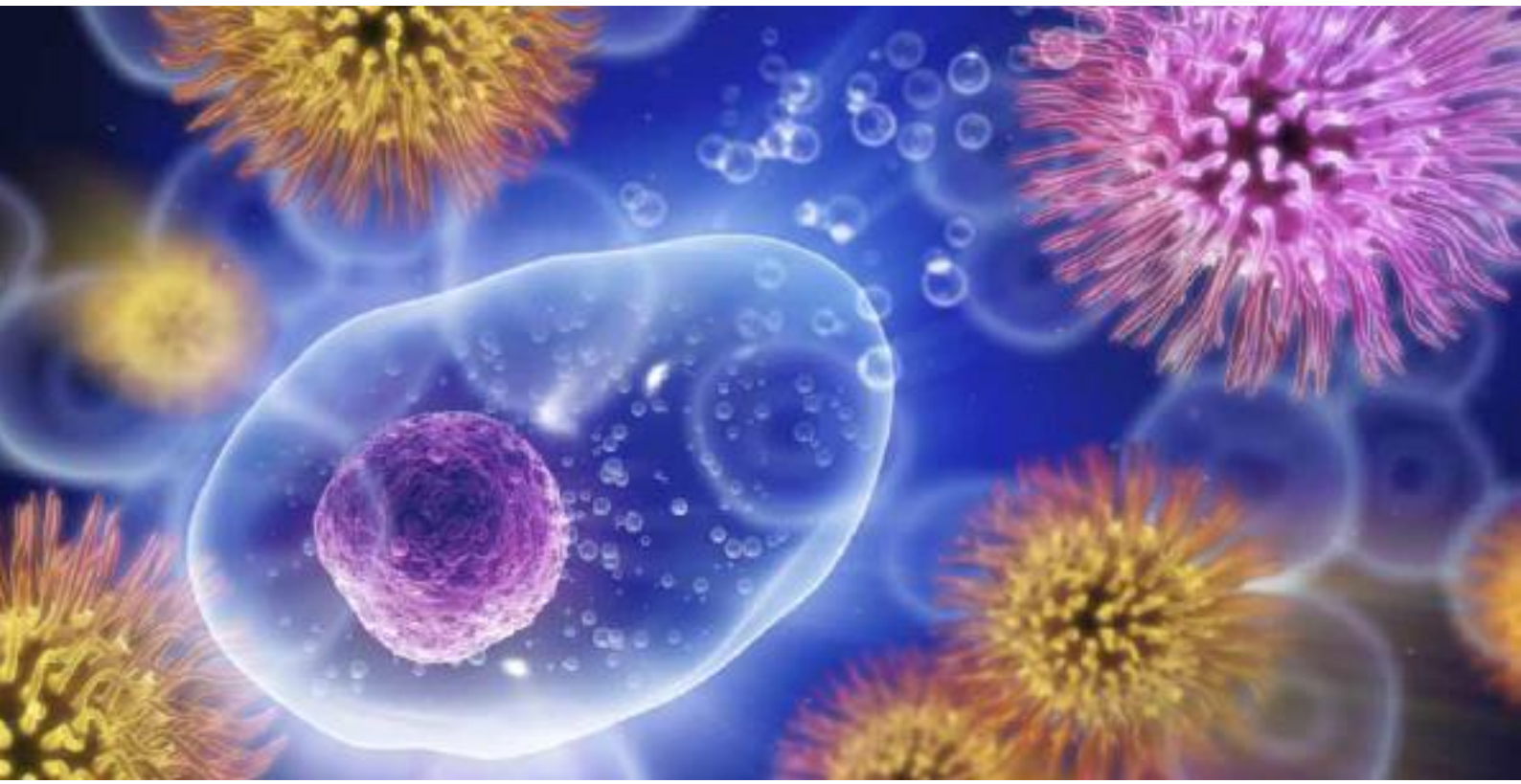


CROSSING THE BOUNDARIES

TRANSDISCIPLINARY APPROACHES IN BIOSCIENCES EDUCATION FOR THE 21ST CENTURY

Program

11-12 December 2014
Shine Dome, Canberra

VIBE net
VISION & INNOVATION IN BIOLOGY EDUCATION

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CUBE NET
Collaborative Universities Biomedical Education Network

ANU
THE AUSTRALIAN NATIONAL UNIVERSITY

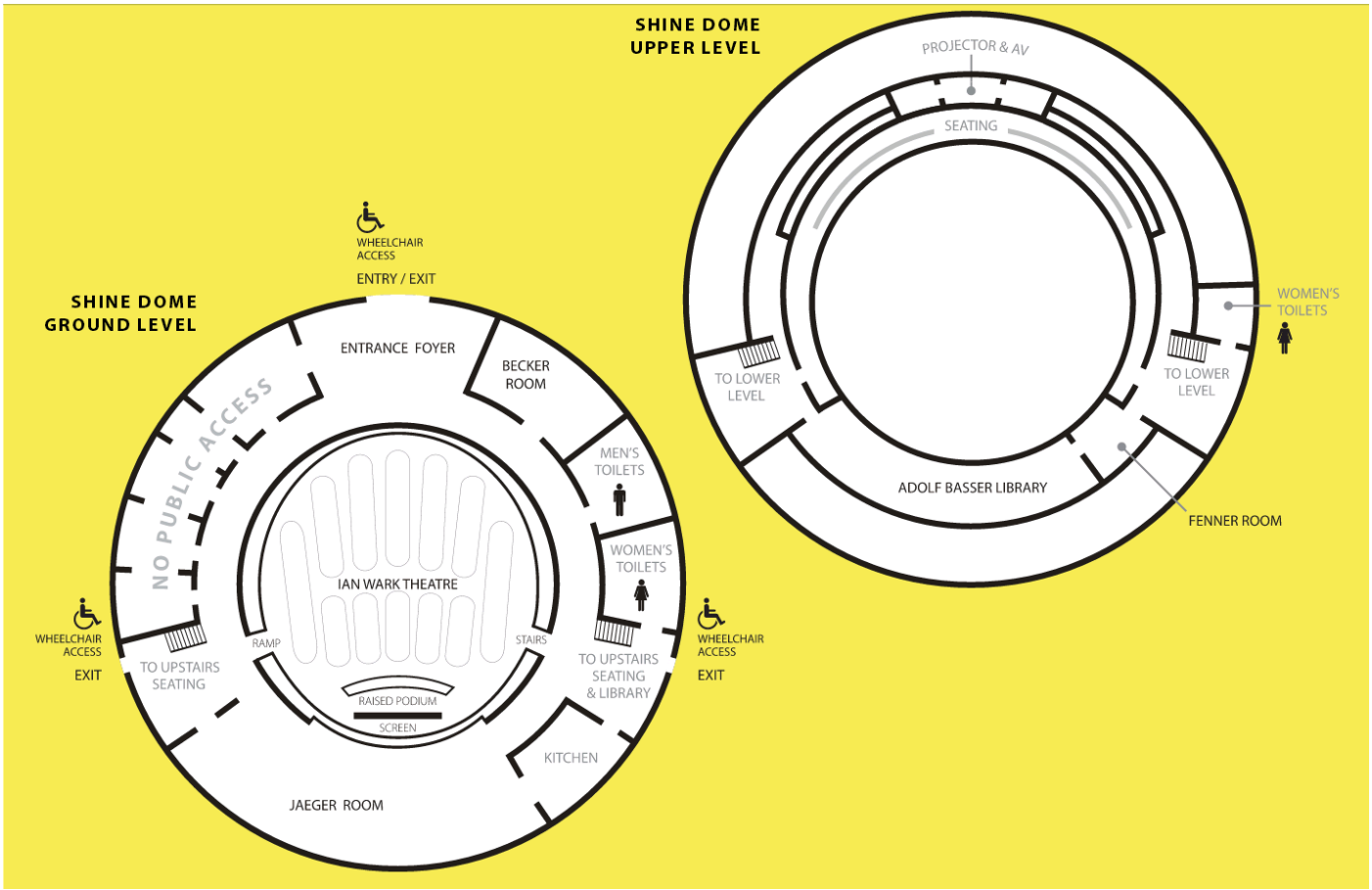
National Committee for Biomedical Sciences
A COMMITTEE OF THE AUSTRALIAN ACADEMY OF SCIENCE

MACQUARIE UNIVERSITY

THE UNIVERSITY OF SYDNEY

Housekeeping

Dietary	Meals for those with particular dietary requirements are provided and may be found on the catering table closest to the kitchen door in the Jaeger Room.
Internet access	Wireless internet access is available throughout the Shine Dome. The networks are Shine-01, Shine-02, Shine-03 and Shine-04, a password is not required.
Taxis to airport	A sign-up sheet is located at the registration desk. Please add your name to this list by the end of the lunch break each day if you require a taxi to the airport at the conclusion of the day.



About CUBEnet

The aim of CUBEnet is to create a critical mass of active tertiary biomedical academics at the national level in Australia to provide a sustainable framework for a program-wide approach to the biomedical curriculum.

In CUBEnet we work to aggregate, filter and connect ideas and information with the right people to achieve effective, transferrable and sustainable solutions around a wide range of issues in biomedical education.

Contact: cubenetmail@gmail.com

www.cubenet.org.au

About the Forum

We have reached a turning point in the 21st century with significant advances in our understanding of how people learn, technology, generational change in our student cohort, digital creativity as well as sector-wide structural reform. In order to adapt to this changing landscape we will have to draw on truly transdisciplinary collaborations and bring together the diverse expertise required to deliver meaningful and evidence based bioscience education. We must have strategies to educate our students in these challenging times as well as meeting the ever increasing urgency to have a scientifically informed and responsive public.

The annual forum for the Collaborative Universities in Biomedical Education discipline network (CUBEnet) will be co-hosted by the Vision and Innovation in Biology Education (VIBEnet) with the support of the Australian Academy of Science's National Committee for Biomedical Sciences. The forum will showcase a diverse range of local and international experts in key areas of bioscience education. Importantly, the forum is designed to provide members of CUBEnet and VIBEnet opportunities to interact with speakers, showcase on-going success and explore new collaborative opportunities.

We warmly welcome our colleagues from the biosciences and other disciplines to join us at this very exciting forum and to share your experience and take home some new ideas on how to approach the challenges that you face in your local context. We hope that you will take this opportunity to work together in new teams over the two days to adopt some transdisciplinary approaches as we create together a bioscience curriculum for the 21st century.

CUBENET
Collaborative Universities
Biomedical Education Network

VIBEnet
VISION & INNOVATION IN BIOLOGY EDUCATION

Program

Thursday 11 December 2014

8.00	Registration and refreshments
8.30	Welcome • Professor Philip Poronnik (CUBEnet) and Professor Pauline Ross (VIBEnet)
	Morning Session
9.00	Encouraging high-achieving biomedicine students to "stop and smell the roses" • Professor David Williams
9.30	Learning from Productive Failure • A/Professor Manu Kupur
10.15	Morning tea, Jaeger Room
11.00	Play to learn to play: The potential and the pitfalls of game design for education • A/Professor Steffen P Walz
11.30	The next technology for high impact education in science • Jim Cook
12.00	Communicating science through interactive installation art • Dr Caitilin de Bérigny
12.30	• Luke Menzies
1.00	Lunch and poster session, Jaeger Room
	Afternoon session
2.00	Progress to date: A review of the role of learning analytics • A/Professor Shane Dawson
2.30	Reports from network members • Kelly Matthews • A/Professor Cenk Suphioglu • James Crane
3.00	Workshops: Making Connections
4.30	Discussion

A BBQ dinner for all participants will be held in the Jaeger Room from 6.00-8.00 pm.

Friday 12 December 2014

8.30	Registration and refreshments
9.00	Welcome • Professor Susan Howitt
Morning Session	
9.30	Professional recognition and self-efficacy in university teachers as tools to enhance teaching quality • Dr Elizabeth Beckmann
10.00	STEM skills in the workforce: 'Ivory tower to concrete jungle - Part 2' • Dr Roslyn Prinsley
10.20	Employability of bioscience graduates: Is there a need to do anything? • Dr Philip MacKinnon • Dr Lisa Schmidt
11.00	• Morning tea, Jaeger Room
11.30	The integration of teaching, learning and assessment: A design-based approach • Professor James W Pellegrino
12.15	Beyond carts and horses: What we learn with, what we learn, and how we learn • Professor Michael J Jacobson
1.00	Lunch, Jaeger Room
Afternoon session	
2.00	SURJ: Developing science students' genre writing skills through mentoring • Dr Susan Rowland
2.20	Reports from CUBEnet and VIBEnet • Dr Tracey Kuit • Dr Roseanne Quinnell • Dr Gerry Rayner • Dr Kay Colthorpe
3.00	Workshops: Making Connections

Farewell drinks for all participants will be held in the Jaeger Room from 4.00-5.30 pm.

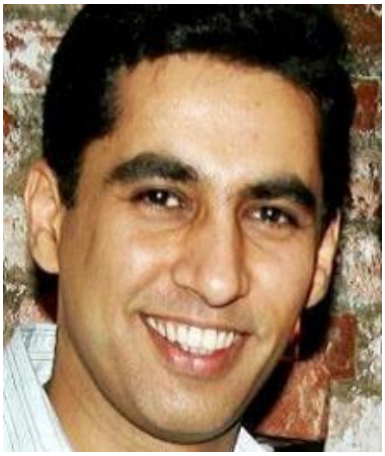
Encouraging high-achieving Biomedicine students to “stop and smell the roses”

Professor David A Williams, Associate Dean (Academic) of the Faculty of Medicine, Dentistry and Health Sciences, Program Director Bachelor of Biomedical Science, University of Melbourne

A discussion of the strategies, challenges and consequences of delivering a broad ranging, engaging, immersive undergraduate experience to students aspiring to professional graduate health pathways.

David A Williams is a Professor in Physiology, Associate Dean (Academic) of the Faculty of Medicine, Dentistry and Health Sciences, and Program Director for the Bachelor of Biomedicine at The University of Melbourne. As an active face-to-face teacher and unit coordinator since 1988 David has led many evolutions in teaching practice and philosophy in Biomedical Sciences at Melbourne. Most notably these include the opportunities provided by the Melbourne education model and progressive developments in active learning and flipped classrooms, online and eLearning and learning analytics. He is also passionate about enhancing student welfare and in understanding the high incidence of student depression and anxiety in tertiary education.

Learning from productive failure



Associate Professor Manu Kupur, Learning Sciences Laboratories, National Institute of Education, Nanyang Technological University (Singapore).

He conceptualised the notion of Productive Failure and used it to explore the hidden efficacies in the seemingly failed effort of small groups solving ill-structured problems collaboratively in an online environment. His current research extends this line of work across the modalities of classroom settings in Singapore.

Bio Dr Manu Kapur is an Associate Professor in the Curriculum, Teaching and Learning (CTL) Academic Group and a researcher at the Learning Sciences Lab (LSL) at the National Institute of Education (NIE) of Singapore. He received his doctorate in instructional technology and media from Teachers College, Columbia University in New York where he also completed a Master of Science in Applied Statistics. He also has a Master of Education from the NIE and a Bachelor of Mechanical Engineering (Honours) from the National University of Singapore. His research takes a complexity-grounded perspective to study the ontology of individual and collective cognition.

Play to learn to play: The potential and the pitfalls of game design for education

Associate Professor Steffen P Walz, Director, Games and Experimental Entertainment Laboratory (GEElabb), RMIT University and GEElab Europe (Germany).

What are the potentials –and the pitfalls- of the discipline of game design for education, and for biosciences' challenges in specific?

Assoc Prof Dr Steffen P Walz GEElab and GEElab EU Founder and Director Steffen is an Associate Professor and a Vice-Chancellor's Senior Research Fellow at RMIT University in Melbourne, Australia. He is the founder-director of RMIT's Games and Experimental Entertainment Laboratory as well as the founder-director of RMIT's GEElab Europe in Karlsruhe, Germany. Steffen is an award winning game and interaction designer, an internationally recognized scholar and book author, a business consultant and an entrepreneur with a background in computer aided architectural design, cultural anthropology, creative web direction, TV satire writing, and entertainment media production as well as attempted pop music stardom.

The next technology for high impact education in science

Jim Cook, Innovation Leader, ICT, University of Sydney

How can disruptive emerging technology help us to engage with students today, in five years and in a decade?

Jim Cook is an Innovation Leader at the University of Sydney, working closely across the University community to provide significant and positive research and teaching outcomes. With a working background which includes seventeen years in the information technology industry and eight years in the education sector, Jim has developed deep expertise in how technology can engage and link learners, educators and communities. For the past 2 years Jim has worked with a team of technologists, academics and students at the University to encourage the implementation of technology into the classroom and the laboratory.

In his current role as a thought leader in the University's ICT division, Jim's primary objective is to enable a more connected University and contribute to the way that education and research are underpinned by technology in Australia.

Communicating science through interactive installation art

Dr Caitlin de Bérigny, Lecturer and Artist, Design Lab, University of Sydney

The interactive installation artworks discussed were created through collaboration between scientists and creative practitioners, to communicate science to a non-expert audience.

Dr Caitilin de Bérigny is artist, Lecturer and researcher in the Design Lab, at the University of Sydney, Australia. She has studied, lived and worked internationally in Paris and Marseille in France, and in Seattle in the USA. Her research engages technology to engage interaction design in urban space. de Bérigny has exhibited her work internationally in France at the ENSBA in Paris and Marseille; in the USA at the Commencement Gallery; in Canada at McGill; in Australia at the National Gallery; Canberra Contemporary Art Space; M16; in Brazil at the Climate Change Impacts and Responses; in Leeds at CRTL Bodies; and in Berlin at the Wekstad.

Luke Menzies, PhD Researcher, Australian National Centre for the Public Awareness of Science, Australian National University

Luke Menzies is a PhD researcher currently looking into improving the communication of complex environmental problems at the Australian National Centre for the Public Awareness of Science at ANU. Particularly interested in interdisciplinary and participatory approaches to communicate the severity and complexity of climate change.

Progress to date: A review of the role of learning analytics

Associate Professor Shane Dawson, Director Learning and Teaching, University of South Australia

Drawing on the findings from a national study investigating the role of learning analytics, this presentation outlines how analytics are beginning to re-shape higher education learning and teaching practice.

Shane Dawson is Associate Professor, and Director (Acting) of the Learning and Teaching Unit at the University of South Australia. Shane's research focuses on the use of social network analysis and learner ICT interaction data to inform and benchmark teaching and learning quality. Shane's research has demonstrated the use of learner interaction and network data to provide lead indicators of student self-regulated learning, sense of community, academic success and course satisfaction. He is a founding executive member of the Society for Learning Analytics Research, and past conference chair of the Learning Analytics and Knowledge conference and the international Learning Analytics Summer Institute. Shane is a co-developer of SNAPP an open source social network visualization tool designed for teaching staff to better understand, identify and evaluate student learning, engagement, academic performance and creative capacity.

Reports from network members:

Kelly Matthews, University of Queensland

Associate Professor Cenk Suphioglu, Deakin University

Update on Qualitative Skills and Progress on Math Bench

James Crane, Charles Sturt University

Bioscience and Art

Professional recognition and self-efficacy in university teachers as tools to enhance teaching quality

Dr Elizabeth (Beth) Beckmann, National Teaching Fellow, Australian National University

Beth convenes the ANU Academic Professional Development program, including *Foundations of University Teaching and Learning* and *Principles of Tutoring and Demonstrating*. As Chair of the ANU Educational Fellowship Scheme Committee, she also plays a key role in the University's engagement with the Higher Education Academy.

In 2014, Beth was awarded a National Teaching Fellowship by the Australian Government Office for Learning and Teaching, to look at the role of professional recognition of university teachers in enhancing teacher self-efficacy and teaching quality.

For designing and delivering the ANU *Foundations of University Teaching and Learning* professional development course, Beth received an *Australian Awards for University Teaching Citation for an Outstanding Contribution to Student Learning* in 2013, following an *ANU Vice-Chancellor's Award for a Program that Enhances Learning* in 2010.

As educational designer in the plant science teaching team led by Dr Adrienne Nicotra, Beth received a 2011 *Australian Learning and Teaching Council Citation for an Outstanding Contribution to Student Learning* and an *ANU Vice-Chancellor's Citation for an Outstanding Contribution to Student Learning* in 2009.

STEM skills in the workforce: 'Ivory tower to concrete jungle- Part 2.'

Dr Roslyn Prinsley, National Adviser, Maths and Science Education and Industry, Office of the Chief Scientist

Why we should educate science students to better meet the needs of a range of employers, how are we doing it, and how should we do it?

Dr Roslyn Prinsley was appointed in February 2013 as the National Adviser for Science and Mathematics Education and Industry in the Office of the Chief Scientist.

Previously, Roslyn was a Principal Strategic Consultant with Sinclair Knight Merz, held a number of senior positions at the Rural Industries Research and Development Corporation, and worked for the Commonwealth Science Adviser in the United Kingdom.

Roslyn holds a PhD in photosynthesis, and a Masters in Intellectual Property Law, has published over 70 books and reports and is a member of the Plant Breeder's Rights Advisory Committee to the Minister of Industry.

Employability of bioscience graduate: Is there a need to do anything?

Dr Philip Mackinnon, Project Co-Leader, Australia Council for Educational Research, University of Melbourne

Dr Lisa Schmidt, Senior Lecturer in Higher Education, Flinders University

Many students doing biomedical science have a clear career aspiration, but what happens if they don't achieve it?

Philip Mackinnon (BSc (Hons), PhD, Grad Cert. Mmgt.)is the Co-director of the OLT Commissioned project "Enacting strategies for graduate employability" led by Curtin University. At ACER Philip shares his time between Science test development, Higher Order Cognitive Skills projects, and the Higher Education Unit. He has consulted and led assessment development programs for higher education and participated in the development of quality assessment instruments at higher education level including the GAMSAT and the UMAT medical entry examinations. Philip also leads a core Masters subject in the School of Engineering at the University of Melbourne. Prior to joining ACER, Philip led the establishment of the industry-focused biotechnology degree program at Monash University. Philip is an Advisor to the CUBEnet Assessment Group.

Lisa Schmidt has degrees in theoretical physics, applied mathematics and biological sciences. Her PhD was in cancer research and while in Medical Biotechnology she worked on a number of industry-linked research projects and coordinated the degree program at Flinders University. Since her move to academic development, Lisa has focused on assessment, curriculum and internationalisation, especially in the sciences. She is the joint project leader on the OLT-funded 'Better Judgement' project that aims to improve assessors' management of factors affecting their judgement. She is also a member of the OLT Strategic Priority Project on 'How universities can best support students to develop generic skills: enacting strategies for graduate employability'.

The integration of teaching, learning and assessment: A design-based approach

Professor James W Pellegrino, Liberal Arts and Sciences Distinguished Professor of Cognitive Psychology and Distinguished Professor of Education, University of Illinois (Chicago)

This presentation will focus on how theory and research on disciplinary learning can serve as the core for an integrated approach to the design and enactment of teaching, learning and assessment in bioscience education.

James W. Pellegrino is Liberal Arts and Sciences Distinguished Professor and Distinguished Professor of Education at the University of Illinois at Chicago. He also serves as Co-director of UIC's interdisciplinary *Learning Sciences Research Institute*. His research and development interests focus on children's and adult's thinking and learning and the implications of cognitive research and theory for assessment and instructional practice and is funded by the National Science Foundation and the Institute of Education Sciences. He has published over 300 books, chapters and articles in the areas of cognition, instruction and assessment. He has served as the head of several U.S. National Academy of Sciences study committees, including the Committee on *Learning Research and Educational Practice*, the Committee on the *Foundations of Assessment,* the Committee on *Defining Deeper Learning and 21st Century Skills,* and the Committee on *Developing Assessments of Science Proficiency in K-12*. He is a lifetime member of the U.S. National Academy of Education.

Beyond carts and horses: What we learn with, what we learn, and how we learn

Professor Michael J Jacobson, Faculty of Education and Social Work, University of Sydney; Co-director, Centre for Research on Computer-supported Learning and Cognition; Deputy Director, Institute for Innovation in Science and Mathematics Education

In this talk I argue that recent research in the learning and cognitive sciences into how we learn couple with changes in representational infrastructures enabled by computational modelling and visualization technologies have the potential to dramatically enhance the learning of challenging conceptual knowledge and skills in the biosciences and the sciences more broadly.

Michael J. Jacobson, Ph.D., is a Professor and Chair of Education in the Faculty of Education and Social Work at the University of Sydney. He also is the Co-director of the *Centre for Research on Computer-supported Learning and Cognition* (CoCo) and an Honorary Associate in the School of Medicine. Michael's research has focused on the design of learning technologies to foster deep conceptual understanding, conceptual change, and knowledge transfer in challenging conceptual domains. Most recently, his work has explored learning with immersive virtual worlds and agent-based modelling and visualization tools, as well as cognitive and learning issues related to understanding new scientific perspectives emerging from the study of complex systems.

SURJ: Developing science students' genre writing skills through mentoring

Dr Susan Rowland, University of Queensland

SURJ@UQ is the Science Undergraduate Research Journal written by and for UQ students. In this talk I will describe what the SURJ team has learned about how to run an undergraduate journal and how to support students in their quest to produce an article of publication quality. I will also argue for the inclusion of more formal training in genre writing, argument, and logic in science curricula.

Susan Rowland is a Teaching Focused Biochemist and Chair of Teaching and Learning in the School of Chemistry and Molecular Biosciences at the University of Queensland. She is the Editor in Chief of the Science Undergraduate Research Journal at UQ (SURJ@UQ) and leads several projects including Free Energy Radio and ALURE, a national Leadership for Excellence program that helps universities introduce authentic, large-scale undergraduate research experiences for science students. She is the winner the UQ Award for Teaching Excellence (2013) and the Australian Society for Biochemistry and Molecular Biology Beckman Coulter Teaching Award (2014).

Reports from CUBEnet and VIBEnet:

Dr Tracey Kuit, Univeristy of Wollongong

Using digital technologies to prepare students in biosciences

Dr Roseanne Quinnell, University of Sydney

Campus flora: An app to support botanical literacy

Dr Gerry Rayner, Monash University and **Dr Kay Colthorpe,** University of Queensland

Assessing inquiry in real time in the laboratory

Poster session | Thursday lunch break, Jaeger Room

Mathematical Background and Performance of First Year Science Students in Chemistry and Biochemistry

We examined the background of students enrolled in first year Chemistry (Semesters 1 and 2, 2014) and Biochemistry (Semester 2, 2014) courses and investigated the relationship between their performance, and their prior studies and confidence in mathematics and chemistry. We based our analysis on the student results in assessment items across all three courses. Students were asked to respond to a survey at the commencement of the semester and were invited to participate in the 'MathsSkills' project. The survey was designed to determine the level of student prior achievement in mathematics, student individual confidence in their mathematical skills, and student perception of the importance of mathematical skills to their studies in chemistry and biology. The study cohort comprised 71 students who responded to the survey and were from a number of different degree programs. Of these students, 46 were enrolled in Semester 2 Biochemistry. A second survey was conducted towards the end of semester 2 in which students were asked to report on their perceived need for the Maths Support program. From this study it was noted that the most important factor influencing academic progression of students in Chemistry and Biochemistry was the strength of their mathematical background. The performance of students with intermediate and advanced Mathematics backgrounds was much better than those with only basic mathematics across all three courses. Interestingly, whilst student confidence in mathematics was generally not high, the respondents to the second survey (directed at the whole cohort) indicated that they did not feel the need for extra support in mathematics.

Associate Professor Dianne Watters, Griffith University
Contributors: Dianne Watters, Wendy Loughlin, Christopher Brown and Peter Johnston

Dianne Watters is involved in the teaching of molecular and cell biology in the School of Natural Sciences at Griffith University from first year to postgraduate levels. In 2007 she was awarded an OLT citation for outstanding contributions to student learning. The first year Biochemistry course is particularly challenging for students and one of her goals has been to improve student learning in this course. Dianne has recently teamed up with a mathematician and two chemists from the School to provide a support program for students lacking the appropriate quantitative skills. She is also a member of the MathBench team (OLT grant) which will provide online modules for students to understand important concepts in biology.

Looking Back and Feeding Forward to Build Laboratory Practical Skills

The aim of this project is to help students improve their basic microbiological laboratory skills. To improve both practical skill mastery and the assessment process, this project utilised online exemplar videos of standard techniques, video-capture of students performing these techniques and self-review. This innovative approach provides second and third year microbiology students the chance to see what they did or didn't do well, to reflect on their performance and to receive feedback to improve their learning in the laboratory. The skills tests (including streak plating, serial dilutions and spread plating) are either weighted at 5% of the final grade (second year) or a non-graded pass (third year). Exemplars of these standard microbiological techniques were prepared and provided on the Topic home page for each Topic using Flinders Learning Online (FLO, Moodle 2.x), allowing students to watch them as often as required. Students have the opportunity

to practice these skills multiple times during the semester as part of their usual practical exercises and have as many attempts as required to master the procedure. A ruggedised outdoor video camera is set up at a work station in the laboratory to record at bench level, focussing on hand manipulations and avoiding head shots. Students identify themselves verbally and record their skills. The videos are later renamed for student identification. A self-assessment activity has been built into FLO to achieve the intended learning outcome of student reflection on their skills with reference to the exemplar videos, which can be fed forward to improve performance. Preliminary results suggest that this approach using a combination of exemplars and video capture can have a positive outcome in student mastery of standard microbiological skills.

Dr Debbie Charter, Flinders University

Debbie Charter completed her PhD in the field of Molecular Microbiology at the University of Adelaide in 1995 and undertook a post-doctoral fellowship at the University of Guelph (Canada) from 1995-1997. Since 2006, she has worked in an education-focussed role at Flinders University, involved in teaching 'Foundation in Microbiology', 'Advanced Microbiology', 'Molecular Biology', 'Genetics, Evolution and Biodiversity' and 'Biochemistry'. Currently, she is the practical co-ordinator in the Molecular Biology and Microbiology topics and is completing a Graduate Certificate in Higher Education.

LabBytes - Mobile on demand video resources for students in the undergraduate chemistry labs

The LabBytes are short videos, typically 50-90 seconds in length, showing a particular laboratory technique or experimental procedure. LabBytes are downloaded by students to their mobile device when and where they are needed. Most commonly, they access them using a QR code, placed in context in the printed lab manual. In 2014, first year chemistry students made around 45,000 LabByte download requests from the library of 25 videos available. They typically downloaded them on the day or evening prior to their lab session in preparation for their lab experiments. Students self-reported that they felt more confident and capable in the lab, having used the videos prior to their lab session. With upgraded WiFi in the lab, we are now exploring installing LabByte QR codes adjacent to equipment in the first, second and third year undergraduate labs, so that students can use them there.

Professor Peter Tregloan and Dr Stephen Best, University of Queensland/ University of Melbourne

Stephen Best is Director of First Year Studies in the School of Chemistry at the University of Melbourne; Stephen's research interests are in bioinorganic chemistry, spectroelectrochemistry, vibrational spectroscopy and extended X-ray absorption spectroscopy. Peter Tregloan is Principal Fellow and Associate Professor in Chemistry at The University of Melbourne and Professorial Fellow in the Institute for Teaching and Learning Innovation at the University of Queensland; he holds an honorary professorial position in the School of Medical Sciences at The University of Sydney.

Progressive assessment improves student learning and perceived course quality in undergraduate physiology

In 2010, second year Physiology (n=165) had a traditional single 3 hr end of semester exam. Monitoring of student downloads of learning material, and the students' own comments, indicated that most students resorted to "last minute cramming" before the exams. Aiming to encourage progressive learning, and to provide diagnostic feedback earlier, in 2011 (n=128) we incorporated an in-class exam at 3 weeks in addition to the final exam. Based on initial analysis and positive student comments, in 2012 (n=148) we incorporated four 1 hr in-class exams at 3 week intervals, plus a short integrative final exam. Both student learning outcomes (overall exam marks) and student satisfaction with the course (student evaluation survey) were improved by the increased frequency of examinations and associated feedback.

Associate Professor David Saint, University of Adelaide

Executing the QS dance: Biologists and Mathematicians working together to develop online-quantitative skills modules for undergraduate biology programs

Studies revealed that many universities are faced with entering student cohorts who are ill equipped with the quantitative skills required to cope with even the introductory biological units. Thus many institutions have undertaken some measure of curriculum reform to try to address this problem. Part of this reform is the development of teaching and learning resources aimed at developing and improving quantitative skills. One example comes from the University of Maryland (UMD) that has developed MathBench (http://mathbench.umd.edu), a series of online modules involving quantitative biology scenarios. Acknowledging the potential of MathBench modules the Australian government through its Office for Learning and Teaching (OLT) funded a project proposal from seven Australian universities in collaboration with UMD to develop and customise MathBench biology modules for undergraduate science students in Australia. As part of the above project, this submission focuses on how the interdisciplinary team of biologists and mathematicians became 'dance' partners and collaborated in producing the on-line biology scenarios. The team was insistent on genuine collaboration between mathematicians and biologists, with the view to learn more about the factors affecting their relationship and the implications in building students' quantitative skills. As such, the project developed an agreed workflow model that guided both mathematicians and biologists in implementing the project to address collaboration and engagement issues. Through social network analysis, the actual workflow of the group was objectively mapped. The result, a high level of engagement between scientists and mathematicians during the development and contextualisation of the different modules. The framework was compared with the workflow model used in the initial module development at the University of Maryland whereby there was more interaction among the biologists with minimal input from mathematician (Thompson et al., 2013).

Dr Jo-Anne Chuck, University of Western Sydney

Jo-Anne Chuck is a biologist at the University of Western Sydney. She teaches in the difficult area of biochemistry where students are faced with the integration of chemistry, biology and mathematics for the first time. This has led to her research interests in teaching and learning that focus on enhancing student engagement in addressing such multidisciplinary content integration. As part of the MathBench team (OLT grant) and the MESH project at UWS she has been not only working on producing quality teaching and learning resources for addressing some of these issues but also the social interaction of interdisciplinary staff for input assessment. Other research interests centre on graduate attribute attainment and communication in science students.

Using 'Calibration' mode in Moodle Workshop activities to scaffold peer learning and enhance the quality and consistency of tutor marking

Hosted within the learning management system, Moodle, the Workshop tool readily facilitates learning and assessment activities that incorporate peer review or peer assessment components. The functionality of this tool includes its capacity to engage a 'calibration' mode in which exemplar assignments and reference assessments are employed to help students benchmark and improve their reviewing and assessing skills. Furthermore, data collected from the marking of exemplar assignments in 'calibration' mode can also be used to moderate assignment marks across the participating cohort of students and grading tutors. This study describes a reflective essay assignment that has been carried out within a large first year biology university course. The assignment incorporates a full-cycle peer review component in which 'calibration' mode within the Workshop tool is used to scaffold peer learning and also enhance the quality and consistency of tutor-based marking.

Dr Anne Galea, University of New South Wales

Anne Galea is currently a Lecturer in the School of Biotechnology and Biomolecular Sciences within the Faculty of Science at The University of New South Wales (UNSW), Australia. Her research background focuses on DNA-damaging anti-tumour agents and the development of new chemotherapeutics with improved efficacies. Her teaching role at UNSW encompasses a range of disciplines, including biochemistry, molecular biology, and medicine. She has been strongly involved in the design and implementation of a variety of blended learning strategies facilitated via Moodle and other learning management systems. Recent projects have addressed threshold concepts in first year biology and the application of peer assessment to help students understand scientific literature using the Workshop tool in Moodle.

Designing pictures that tell a research story

Digital technology has given us many ways of visualising, communicating and sharing knowledge. While peer-reviewed publications continue to be a dominant mode for communicating outcomes among researchers, there are a wealth of digital options that can reach a much wider audience. For instance, social media tools that use concise text and images to convey key ideas and meaning across international and/or cultural boundaries. In this study, I explored the utility of graphical abstracts for the teaching and learning of science communication, and how student choice, personal reflection, and peer reviews can help undergraduate scientists in their creative design of pictures that tell a research story.

Dr Christopher Fulton, Australian National University

Chris Fulton is a Senior Lecturer in aquatic ecology. Chris completed his PhD on coral reef fish ecology at James Cook University in 2005, and after a short post-doctoral project on tropical seaweed community dynamics, he took up his current lectureship at the ANU (2007-present). His aquatic ecology research examines how individuals, species and communities are shaped by their environment, particularly in habitats where they are subject to extreme conditions of wave energy, flow and/or temperature. Chris is keenly interested in science communication, where his current focus is upon the use of digital tools to transfer knowledge and understanding of scientific research between researchers, natural resource managers, students and the wider community.

Filling the gap: Biology BioBytes

Diversity in a student cohort requires differentiation of the curriculum to meet the varied learning needs and ensure a good learning experience for all students. However, our large cohort dictates lecture-driven delivery of the curriculum and providing a differentiated curriculum in a lecture format is inherently difficult. Our students often comment that Biology is either "too easy" as they have studied Biology to year 12 level at school, or "very difficult and fast-paced" if they have no school biology background. Unlike lectures, online teaching support modules can provide an opportunity for students to revisit lecture material and apply their knowledge while working at their own pace. Our student feedback showed that students: have difficulty adjusting to lecture-based teaching in their first semester and value additional support; want opportunities to revise their knowledge and keep up with lecture content online, and in their own time. To achieve this in 2014 we produced 16 Biology BioBytes, up to 15 minute videos presented by Biology staff (who will be acknowledged on the poster), which provided students with a short "pre-lecture tutorial". For those students without a background in Biology, it provided an introduction to the terminology and the concepts to be covered in the lectures ahead. Students were recommended to view these tutorials prior to the lecture. It was assumed by the lecturer that students had accessed this material and hence to ensure engagement for those with a Biology background, new material could be introduced. The modules remained open all semester so that a student could work through them at any time. The feedback from the students both with and without a Biology background, has been overwhelmingly positive. We plan to create more BioBytes to be ready for 2015.

Associate Professor Dawn Gleeson, University of Melbourne

Dawn Gleeson is an Associate Professor in the Department of Genetics at the University of Melbourne. Dawn is also the Director of First Year Studies in Biology and oversees the 2000+ students completing Biology within the first year of the Bachelor of Science and the Bachelor of Biomedicine. Dawn delivers the Genetics lectures to these students and has had considerable involvement in developing curriculum materials, particularly on-line and interactive, to support her teaching and the teaching of Biology in general. Dawn has been the recipient of a number of awards for her teaching and outreach programs.

Key Elements of Effective Science Communication: What are they and do we teach them?

Research shows that the communication skills taught in a typical Australian BSc are (for the most part) narrow and outdated. There is a lack of diversity with the vast majority aimed at an audience of scientists of the same discipline and for the purpose of explaining experimental results despite the specifications of TLO4. This raises the questions: what specific communication skills should science students learn? And do we teach them? This poster presents a study that consulted literature and Australian experts to establish a set of 'Key Elements for Effective Science Communication' applicable to the context of undergraduate Australian science degrees. This set of core elements are specific to communication of science with non-scientific audiences; however many of the skills are also highly relevant to communication with scientists. A range of undergraduate science assessment tasks were examined for presence of these elements. Recommendations are offered as to areas in need of improvement in the instruction of communication for science students.

Ms Lucy Mercer-Mapstone, University of Queensland
Contributors: Lucy Mercer-Mapstone and Louise Kuchel

Lucy Mercer-Mapstone has degrees in Science (Ecology) and Journalism and Communication and has completed internships at CSIRO and the United Nations. Her current postgraduate research focusses on theoretical and practical approaches on how to teach undergraduate science students to communicate with non-scientific audiences in order to better equip BSc graduates with the diverse communicative skillset necessary to thrive in the modern workplace. Other research interests include the use of new media and social media in the teaching and learning environment to better engage students with science content, and how to bridge the gap between the practices of science and journalism.

Teaching the complexities of the marine park planning process to tertiary students

As we face an avalanche of change in higher education, the value of the on campus student experience is re-emerging as a focus. Learning experiences which are real-world, authentic and collaborative are those most valued by students. In the biological sciences, it can be difficult to simulate in the classroom the complex decision making process of conservation planning. A workshop was designed to give students insight into the conservation planning process that has successfully been used for marine parks in Australia and throughout the world. Central to this idea was that in order for reserves to be successful, there needs to be: "Agreement on how social, economic, cultural, management and biological interests are integrated in conservation planning…. because there will be greater acceptance of the outcome and willingness to comply with regulations" (Stewart & Possingham 2005). In this workshop students were allocated into groups representing stakeholders and asked to create a network of sanctuary zones/no-take marine reserves in an estuary along the coastline of NSW. Stakeholders ranged from commercial fishing operators to conservation biologists. To create the marine reserves, stakeholders needed to argue with each other to retain their preferred options for the reserve network. Each stakeholder group's interests often overlapped with the needs and plans of other stakeholders. The final outcome was often dependent on the ability of each group in negotiating and voicing the interests of the group. As a result of the workshop, students were able to gain a sympathetic understanding of the difficulties with the conservation planning process in a real world context where multiple stakeholders are involved.

Professor Pauline Ross, University of Western Sydney

Professor Pauline Ross is a multi-award winning academic known for infusing communication, creativity, inquiry and research into the curriculum while simultaneously building internationally recognised research in the impacts of climate change on marine organisms. Pauline Ross has held a number of academic leadership positions at Australian universities including; program co-ordinator of Teacher Education in secondary science at Macquarie University, Associate Head of School (Learning and Teaching), Assistant Associate Dean Academic (College of Health and Science) and Teaching Fellow at the University of Western Sydney (UWS). Being both a leading researcher and educator, she understands the tensions between disciplinary and educational research in the academy. Currently her National Teaching Fellowship, funded by the Office for Learning and Teaching, is to reconceptualise the academic role in the sciences and create an evaluation framework to ensure Australia has excellent academic teachers of STEM in the future.

Why learning to communicate is valuable for science students – employer perspectives

There is good reason why communication forms a large component of business degrees and many vocationally oriented science degrees (e.g., dentistry, medicine) include highly specific communication assessment tasks. Productivity and success in the workplace depends upon effective communication. Unlike vocationally-oriented degrees the BSc is poorly informed as to the specific requirements for communication in the workplaces in which graduates find themselves. This talk discusses findings from a number of small studies involving employers of UQ BSc graduates and combines them with insights from published literature to provide a snapshot of the diversity of communication tasks and roles sought by Australian science employers. Using these findings I hope to stimulate ideas for the types of communication tasks that might be applicable to teach in a BSc, to encourage attendees to reach out to employers in their own local contexts, and provide some solid lines of argument that will be useful for informing and gaining support for the teaching of communication in BSc degrees.

Dr Louise Kuchel, University of Queensland
Contributors: Louise Kuchel, Bianca Zou, Sarah Stevens

Louise Kuchel is a teaching-focused academic who researches teaching and learning of communication in the context of undergraduate science education. Louise is the coordinator of a third level science course at UQ called “Communicating in Science” as well as first year coordinator for the School of Biological Sciences, and has implemented a number of novel communication tasks within large first year and small third year science courses. Louise is interested in identifying and embedding authentic best practice for science communication into undergraduate science curricula and how best to achieve student learning of this.

CROSSING THE BOUNDARIES

TRANSDISCIPLINARY APPROACHES IN BIOSCIENCES EDUCATION FOR THE 21ST CENTURY