COGNITIVE ACCELERATION

CONFERENCE PROGRAM

COGNITIVE ACCELERATION CONFERENCE 2018 – PROGRAM

Thursday 11 October 2018

Time	Program		
09:00 – 09:15	**Welcome and Overview** *Rainforest Room*		
09:15 – 09:40	**Cognitive Acceleration in Australia in 2018** Tim Smith, Director, Cognitive Architecture *Rainforest Room*		
09:40 – 10:40	**Keynote Address – How Artificial Intelligence Will Impact Education** Dr. Natalie Rens, AI Specialist, Office of the QLD Chief Entrepreneur and Founder of Spaceport AI. *Rainforest Room*		
10:40 – 11:00	*Morning Tea*		
11:00 – 11:45	**Workshop 1.1** *Rainforest Room* What is Thinking Science? – Daryl Bathe	**Workshop 1.2** *Aqua Room* What is Thinking Maths? – Tim Smith	**Workshop 1.3** *Ocean Room* Cognitive Acceleration Ninja skills – Neil Gordon
11:50 – 12:35	**Workshop 2.1** *Rainforest Room* Metacognition – Aisling Mulvihill	**Workshop 2.2** *Aqua Room* Cognitive Acceleration: Conflict, Construction, Cognition - Tim Smith	**Workshop 2.3** *Ocean Room* A Thinking Science Lesson – Daryl Bathe
12:40 – 13:40	*Lunch*		
13:40 – 14:40	**Keynote Address - Reculer pour mieux sauter (Go back in order to jump higher)** Professor Trevor G. Bond, James Cook University *Rainforest Room*		
14:45 – 15:30	**Workshop 3.1** *Rainforest Room* Success and failure: The Yin and Yang of deep learning – Stephanie Macmahon	**Workshop 3.2** *Aqua Room* Thinking Science at Hillbrook Anglican School – Damian Larkin & Matthew Flinders	**Workshop 3.3** *Ocean Room* Action Research in your school – Tim Smith
15:30 – 16:00	Afternoon Tea and Close for the Day		

Friday 12 October 2018

Time	Detail		
09:00 – 09:30	**Day 2 overview and Interview with Stile / Beyond STEM** *Leighton's Theatrette*		
09:30 – 10:30	**Keynote Address – Inspiring STEM futures: combining biology and engineering towards a synthetic biology revolution** ***Why every student will soon be begging to study STEM*** Associate Professor Joanne Macdonald, University of the Sunshine Coast *Leighton's Theatrette*		
10:30 – 10:50	**Morning Tea**		
10:50 – 11:35	**Workshop 4.1** *Leighton's Theatrette* Writing journal articles – Susan Presto	**Workshop 4.2** *Aqua Room* Synthetic biology: flipping science by teaching engineering instead – Joanne Macdonald	**Workshop 4.3** *Ocean Room* Coaching for Cognitive Acceleration – Tim Smith, Daryl Bathe, Neil Gordon
11:40 – 12:25	**Workshop 5.1** *Leighton's Theatrette* A Thinking Maths Lesson – Neil Gordon	**Workshop 5.2** *Aqua Room* Neuomyths in Education – Tim Smith	**Workshop 5.3** *Ocean Room* Bridging the gap between real-world science and the classroom – Jaclyn Rooney & Dave Canavan
12:25 – 13:15	*Lunch*		
13:15 – 14:15	**Plenary Address - Learning Environments and Social Synchrony in the Classroom** Stephanie Macmahon, The University of Queensland *Leighton's Theatrette*		
14:15 – 15:15	**Expert Panel Q&A** *Leighton's Theatrette*		
15:15 – 15:30	**FINAL PLENARY** *Leighton's Theatrette*		
15:30 – 16:00	**Afternoon Tea**		

KEYNOTES

HOW ARTIFICIAL INTELLIGENCE WILL IMPACT EDUCATION

Advancements in artificial intelligence (AI) are driving shifts in not only the technology we develop but the type of work we do. As machines gain the ability to perform tasks previously dedicated to humans, the skills we require and teach our students will need to adapt. Does this mean robots will take all our jobs? No. However, it does mean that knowledge is no longer the currency of success. The ability to learn, to engage with others in social environments, and to work in partnership with machines will all be key to future workers. In this presentation, Natalie will introduce the concepts that make AI such a powerful tool. Drawing on major trends in AI, she will discuss where our future will likely take us and what skill sets will come to the forefront as human-machine collaboration becomes the norm. To conclude, Natalie will discuss ideas from technology leaders on the curriculum of the future and how we might implement it.

DR. NATALIE RENS

Natalie Rens has a PhD in Neuroscience and is now the Artificial Intelligence Specialist for the Office of the Queensland Chief Entrepreneur. In her current role, she works on developing strategies to advance Queensland by improving the adoption of AI. She is also co-founder of Brisbane.AI, a meetup group that runs AI events and training programmes. She is particularly passionate about democratising emerging technology to enable better solutions to be created for the world's problems.

RECULER POUR MIEUX SAUTER
(Go back in order to jump higher)

This presentation will go back to the original research work of Michael Shayer and Philip Adey to explicate the fundamental elements of the CASE cognitive acceleration intervention. Towards a Science of Science Teaching (1981) (i) validated Piagetian theory as (ii) the basis of a national testing program to assess cognitive development in school aged children and (iii) assessing the cognitive demands of secondary science curricula in the UK. The dramatic differences between capacity and demands led to the development of Thinking Science (1989) materials and procedures that resulted

from the Cognitive Acceleration through Science Education Project (CASE II) at King's College. The argument is that it is the well-inducted teacher, rather than the theory, lessons, materials or tests, who is central to successful CASE interventions as reported in Really Raising Standards (1994). By going back to the fundamental concepts underlying the program, teachers will be able to bring about better outcomes for their students.

PROF. TREVOR G. BOND

Prof. Trevor BOND is at Adjunct Professor in the College of Arts, Society & Education at James Cook University. His research has focussed on formal operational thinking and intellectual development during adolescence since his undergraduate days. Prof Bond spent his first sabbatical with Shayer, Adey and Yates at the CASE Project in King's College, London. He worked directly with CASE project schools, and used data from one of those schools in his own doctoral research. He worked with his doctoral student, Lorna Endler to conduct successful cognitive acceleration projects in Townsville, Australia and Oregon, in the US. Prof Bond researched at the Archives Jean Piaget in Geneva, and gave the keynote address on formal operational thinking at the memorial festschrift for Piaget's closest collaborateur, Bärbel Inhelder. His more recent research has focussed on methods for measuring intellectual and achievement gains over time.

INSPIRING STEM FUTURES: COMBINING BIOLOGY AND ENGINEERING TOWARDS A SYNTHETIC BIOLOGY REVOLUTION

Why every student will soon be begging to study STEM

Imagine a world of designer genetic engineering: we've moved past simply curing diseases to tailoring our bodies according to the latest fashion whims, as well embedding the latest cyborg technologies. We can also engineer our surrounding environment to do useful things - like producing jet fuel whilst beautifying rather than destroying, thanks to self-producing and self-healing materials. But did you know this Synthetic Biology revolution is already happening? In this keynote, I will showcase fundamental advances that are set to take the world by storm. Beginning with my own research in building computers out of DNA molecules, I will moving through to genetic engineering and human cyborgs, and then delve into the future with lab assembled food, body parts and even organisms. This is the world our students are growing up into - and will be building themselves - by assembling molecular parts as easily as building Lego blocks. The opportunities are limited only by our imaginations, which puts our students in the best position to grow the transformations beyond anything we could believe for our lifetimes.

A/PROF. JOANNE MACDONALD

Assembling strands of DNA, to play tic-tac-toe against a human opponent, made Associate Professor Joanne Macdonald realise that combining Science and Engineering is limited only by our imagination.

Based at the University of the Sunshine Coast, with a joint appointment at Columbia University (USA), A/Prof Macdonald's research focuses on re-engineering molecules beyond nature. Dr. Macdonald prefers to translate research towards real-world problems and is currently building rapid biosensors to help combat deadly diseases, including Hendra and Malaria. She recently co-founded BioCifer Pty. Ltd. to produce her devices.

She is also studying spider silk as an advanced material, the artificial construction of organisms using synthetic biology, and the engineering of biomolecules to inactivate toxic chemicals, such as cocaine and nerve agents. One of her drugs has completed Phase II clinical trials for treating cocaine overdose. Featured in popular science magazines, including Scientific American and New Scientist, and Winner of the 2016 Rose-Anne Kelso award for Women, Dr. Macdonald is an avid science communicator. She teaches undergraduate Molecular Biology and Biotechnology, and particularly loves interactive workshops where she can learn more than she teaches.

LEARNING ENVIRONMENTS AND SOCIAL SYNCHRONY IN THE CLASSROOM

The future will demand of our students the capacity to not only think deeply for themselves, but to be able to share these processes with others as they work collaboratively in groups. Effective groups are shown to be highly connected at conscious and unconscious psychological and biological levels: 'tuning in' to the actions, thoughts and feelings of others in the group, sharing their emotional, behavioural, cognitive, and physiological states. This shared sense of connection is known as social synchrony, and is correlated with both engagement and achievement. Engagement is defined as the sense of connection to the learning experience and those within it. However, the social dimension of engagement is frequently overlooked as an important conduit to developing thinking and learning. Student disengagement, particularly in the middle years of schooling, remains a challenge and teachers of all levels of experience are seeking practical solutions. Currently, attempts to address disengagement in the classroom generally centre on individual student responsibility, frequently attaining temporary or less than satisfactory results. Consequently, there have been calls for a new, social approach to understanding and managing this common pedagogical challenge. This presentation will outline research that utilised a science of learning lens to better understand the nature of connected learning environments, and how effective teachers engineer them. The findings have been translated into a practical matrix for teachers, which has demonstrated potential for supporting school and higher education teachers of all levels of experience to promote social synchrony in their classrooms.

STEPHANIE MACMAHON

Stephanie is an early-career researcher, academic and project officer at The University of Queensland and with the Science of Learning Research Centre. She recently submitted her PhD, which explored how effective teachers engineer connected classroom environments. Her studies lead to the development of a Social Synchrony Matrix, a document that can assist teachers to better understand and plan for student cognitive, social, emotional and behavioural engagement in the classroom. Prior to commencing her PhD, Stephanie spent 20 years as a P-12 Arts educator and school leader. Since 2014, she has been a Project Officer with the SLRC Translation Team, developing and delivering teacher PD, student workshops, and other research engagement activities. She is also a Case Manager for a number of diverse projects implementing the SLRC Higher Education Learning Framework across the University of Queensland. She was involved in the development of UQ's first Masters in Education course on The Science of Learning, and has coordinated undergraduate and post-graduate courses in education at UQ since 2014.

WORKSHOPS

1.1 WHAT IS THIKING SCIENCE
Daryl Bathe, Ryan Catholic College

Thinking Science is a 30 lesson Cognitive Acceleration Program (also known as CASE) for years 7 and 8. In this session we will explore the underlying theory and pedagogical approaches that make Thinking Science unique. This session is appropriate for those who have not taught Thinking Science before.

1.2 WHAT IS THIKING MATHS
Tim Smith, Cognitive Architecture

Thinking Maths is a 30 lesson Cognitive Acceleration Program (also known as CAME) for years 7 and 8. In this session we will explore the underlying theory and pedagogical approaches that make Thinking Maths unique. This session is appropriate for those who have not taught Thinking Maths before.

1.3 COGNITIVE ACCELERATION NINJA SKILLS
Neil Gordon, Chancellor State College

Understanding how the pillars of Cognitive Acceleration fit into a thinking lesson is a key learning objective for practitioners. In this session we will explore, through practical examples, how questioning and cognitive challenge inspire meaningful thinking. Appropriate for more advanced CA teachers.

2.1 METACOGNITION
Aisling Mulvihill, The University of Queensland

Metacognition is the conscious awareness, monitoring, and control of one's own cognition. As the knowledge or mental activity that serves to regulate thinking (Schneider & Lockl, 2008), metacognition supports top-down regulatory control (Haperin and Schultz, 2006) that is critical for self-regulated learning. Metacognition is widely acknowledged for its significance in learning and academic performance, yet often remains the 'hidden curriculum' in educational contexts (Kistner et al., 2010; Pintrich, 2002) The workshop will present current theory and research on metacognition, consider the application of a metacognitive instructional framework within a metacognitive training of attention for young adolescents, and workshop the application of metacognitive instruction in educational contexts.

2.2 CONFLICT, CONSTRUCTION, COGNITION
Tim Smith, Cognitive Architecture

Of the five pillars, Cognitive Conflict, Social Construction and Metacognition are often hailed as the holy grail of CA. But why? In this practical session, we will examine some examples of each pillar and ask if they can be applied to other lessons, be they senior science lessons or other subjects.

2.3 A THIKING SCIENCE LESSON
Daryl Bathe, Ryan Catholic College

How do Thinking Science lessons play out? A theoretical grasp of the lesson is seldom a mirror image of what takes place in the classroom. In this session we will delve into the different 'acts' in a lesson and practice some of the teaching strategies. Appropriate for those new to Thinking Science.

3.1 SUCCESS AND FAILURE: THE YIN AND YANG OF DEEP LEARNING
Stephanie Macmahon, The University of Queensland

The capacity to think creatively and critically – to problem solve, analyse, evaluate, innovate, - are skills identified as essential for success. These skills require learners to take risks; therefore inherent within them is the possibility of a negative outcome or failure. Furthermore, creative and critical thinking usually involve problems and tasks that can be challenging and difficult. But what role do risk, difficulty and failure play in success? Can the confusion and frustration that emerge from cognitive challenge actually be good for deep learning? This session will explore some of the Science of Learning research into the affective and cognitive constructs around risk-taking, challenge, difficulty and confusion, and consider how success and failure are the Yin and Yang of deep learning.

3.2 THINKING SCIENCE AT HILLBROOK ANGLICAN SCHOOL
Damian Larkin and Matthew Flinders, Hillbrook Anglican School.

Implementation strategy of the Thinking Science program varies from school to school but it is often helpful to hear what others have tried, where they have succeeded and where refinements have been made. In this session, hear how one school in Brisbane has implemented the program. Appropriate for those new to Thinking Science.

3.3 ACTION RESEARCH IN YOUR SCHOOL

Tim Smith, Cognitive Architecture

In this session we will look at how small scale action research projects can inform us about the impact of programs like Thinking Science or Thinking Maths. We will examine the applicability of various tests as measures of impact and discuss how we might structure a project so that our insights can be shared with the wider education community. This session is appropriate for all but will explain the baseline and post-intervention tests that are part of the Thinking Science program. Consider workshop 4.1 as a follow up to this workshop.

4.1 WRITING JOURNAL ARTICLES

Susan Presto, Editor: Nurture Parenting Magazine

Having your own articles published is whole new world of ways to get your voice heard on topics that are important to you. It also adds depth to your professional or academic profile. Let's get you started!

4.2 SYNTHETIC BIOLOGY: FLIPPING SCIENCE BY TEACHING ENGINEERING INSTEAD

Joanne Macdonald, University of the Sunshine Coast

Drawing from A/Prof Macdonald's experience in undergraduate molecular biology and biotechnology teaching, explore how we can inspire students to study STEM by considering science (e.g., biology) as an engineering tool rather than a series of learned facts. Which STEM subjects do the students find most boring/difficult to pay attention to? How effective would an engineering angle be to capture student interest and inspire them?

4.3 COACHING FOR COGNITIVE ACCELERATION

Tim Smith, Cognitive Architecture
Daryl Bathe, Ryan Catholic College
Neil Gordon, Chancellor State College

Professional development for Cognitive Acceleration is key to successful implementation and in this session we will explore how colleagues can be supported through peer coaching. Appropriate for all.

5.1 A THINKING MATHS LESSON

Neil Gordon, Chancellor State College

How do Thinking Maths lessons play out? A theoretical grasp of the lesson is seldom a mirror image of what takes place in the classroom. In this session we will delve into the different 'acts' in a lesson and practice some of the teaching strategies. Appropriate for those new to Thinking Maths..

5.2 NEUROMYTHS IN EDUCATION

Tim Smith, Cognitive Architecture

The growing field of the Science of Learning (SoL) aims to bring together the disciplines of education, psychology and neuroscience. Some popular teaching strategies don't have a significant evidence base behind them. In this session we will look at a number of ideas in education and establish their validity with SoL. Appropriate for all.

5.3 BRIDGING THE GAP BETWEEN REAL-WORLD SCIENCE AND THE CLASSROOM

Jaclyn Rooney, Stile Education
Dave Canavan, Stile Education

This session will examine how real-world science skills, knowledge and thinking can be successfully incorporated into the science curriculum.
With an emphasis on practical activities, this interactive session will provide a wealth of ideas to take back to your classroom, and get your students thinking like a real scientist. Appropriate for all.

SPEAKERS

DARYL BATHE

Ryan Catholic College, Townsville, QLD

Daryl is Head of Junior Science and has been running Thinking Science at Ryan since 2015.

DAVE CANAVAN

Stile Education

Community Leader, QLD

MATTHEW FLINDERS

Hillbrook Anglican School, Enoggera, QLD

NEIL GORDON

Chancellor State College, Sippy Downs, QLD

Neil is co-ordinator of CASE on the Coast and also a Peter Doherty award winning science teacher. Neil has worked extensively with Cognitive Acceleration programs both in Australia and the UK.

DAMIAN LARKIN

Hillbrook Anglican School, Enoggera, QLD

Damian is a practising maths and science teacher with 26 years experience in a number of Catholic and independent schools around Queensland. He has coordinated a range of subjects but most time has been spent coordinating junior science, including three years leading maths and science integration in the middle years of schooling.

Damian began learning about and delivering Thinking Science lessons under the guidance of Cognitive Architecture's director, Tim Smith, before bringing the program to Hillbrook Anglican School.

Along with science education, Damian is keenly interested in sustainability, completing a Master of Environmental Education through Griffith University. He is the current chair of the Sustainability Committee at Hillbrook, working with a team of people to minimise the school's ecological footprint.

AISLING MULVIHILL

The University of Queensland

Aisling Mulvihill is a practicing speech pathologist, clinical educator and researcher at the University of Queensland. Her research activities span the topic of self-regulation from early childhood to adolescence. Since graduating from Trinity College Dublin in 2006, Aisling has worked as a paediatric Speech Pathologist in both Ireland and Australia across sectors of public health, education, and private practice. Aisling has specialised practice in supporting children with learning and social-emotional challenges relating to Autism Spectrum Disorder (ASD), Attention Deficit/Hyperactivity Disorder (AD/HD) and Developmental Language Disorder (DLD). In 2013, Aisling co-authored the Ant Patrol Children's Stories, a series of six educational children's stories that aim to support children's social and emotional learning. The series has been well-received by educators, allied health professionals and parents. Aisling's PhD research investigates the development of self-talk as a self-regulatory tool in children with and without developmental vulnerability. Aisling is also involved in a large-scale interdisciplinary science of learning research project investigating the effect of metacognitive training on attention control in young adolescents.

SUSAN PRESTO

Editor Nurture Parenting Magazine

Susan Presto is the Editor of Nurture Parenting Magazine, researcher at Griffith University, freelance feature article writer, and creator of authentic online video content. Her focus as editor is on providing thought-provoking, evidence-based information for the physical, emotional, intellectual and spiritual elements of child-rearing and education from a natural parenting perspective. Her teaching background has been in innovating and implementing whole school Wellbeing practises based on research into Jungian theory and Kallick and Costa's Habits of Mind. This has meant working with top level sporting teams, school

administrations, teachers, and students to enhance team dynamic, decision making and dealing with stress and led to presentations at international and national conferences on: team building, resilience, classroom management, mindfulness. Other conference presentations and academic publications have dealt with her research at Griffith University and the topic of writing, fiction and non-fiction, and the influence of Poethics- taking responsibility of the unknowability.

JACLYN ROONEY
Stile Education
Head of Content,
Melbourne, VIC

TIM SMITH
Cognitive Architecture,
QLD

Tim taught in the UK before moving to Australia in 2008. He has held positions of leadership in schools and has advised on policy and curriculum reform in science education.
Immediately prior to moving to Australia, Tim worked as the Director of Specialist Science Status at Nonsuch High School for Girls where he collaborated with the National Science Learning Centre to develop regional centres of excellence in teacher professional development. In 2005, Tim was awarded an Einstein Year Bursary for his work on 'Girls into Physics'.
A physics graduate from Swansea University, Tim also holds postgraduate qualifications from Cambridge University and the Institute of Education in London. He has presented at conferences in the UK, Australia and the USA and is currently researching the impact of Thinking Science on general intelligence.
Tim has taught in the state, Catholic and independent sector in both coeducational and single-sex (both boys' and girls') schools.
A Yachtmaster Instructor, Tim is married to Laura, an Emergency Physician, and they have five-year-old twin daughters. Tim is director of Cognitive Architecture, an education consultancy committed to learning more about evidence-based practice in education.

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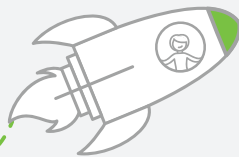Cognitive Architecture
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