SASTA Annual Conference

Let's Talk Science!

11-12 July 2022 Westminster School



Edrolo





Program overview

Monday 11 July	
7.30am	Registration & light breakfast
8.50am	Welcome & Awards Presentation
9.30 am	Keynote by Heather Catchpole
10.35 am	Morning Tea & Exhibition
11.10 am	Workshop Session 1
12.15 pm	Workshop Session 2
1.15 pm	Lunch & Exhibition
2.05 pm	Panel Discussion
3.25 pm	Workshop Session 3
4.30 pm	Happy Hour

Tuesday 12 July	
8.30am	Registration
9.00am	Welcome & Awards Presentation
9.30 am	Keynote by Associate Professor Debra Panizzon
10.40 am	Morning Tea & Exhibition
11.15 am	Cutting Edge Session 1
12.20 pm	Cutting Edge Session 2
1.20 pm	Lunch & Exhibition
2.10 pm	Workshop Session 4
3.15 pm	Workshop Session 5
4.15 pm	Happy Hour

9.00 am Welcome & Awards Presentation

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9.30 am Keynote 1

STEM + X: linking students with smarter careers Heather Catchpole, CEO & Co-founder, Refraction Media

Science is much more than the wow factor chemistry explosions you see in the lab. Science and STEM are intrinsic to our everyday lives and are part of careers as diverse as retail, food processing and flood control. For a decade, STEM specialist content company Refraction Media has communicated the relevance of STEM to students, parents, government and industry through CareerswithSTEM.com. This website and magazine series uses the narrative of STEM + X, where 'X' is another field, world changing goal or other area - like technology + fashion = performance



enhancing sporting gear, or more sustainable fabric. Or engineering + health = artificial intelligence that can spot early signs of cancer. In fact, wherever a student's interests, passions or goals lie, there's a STEM + X to match.

STEM is globally important to many of the biggest issues of today, from climate change, to global poverty and inequity, feeding a growing population sustainably, ensuring adequate healthcare and creating and maintaining a good quality of life.

STEM jobs are also growing rapidly and entirely new job sectors are emerging and disappearing as we increasingly shift from an industrial to a digital society. The National Skills Commission predicts that, by May 2024, employment in STEM occupations in Australia would grow by 11.7% (or 301,500 people), compared to 7.5% for non-STEM jobs. And by 2030, it's predicted Australian workers will spend 77 per cent more time using science and mathematics skills.

At the same time, STEM needs to have a diverse range of people involved to fit the evolving needs of our knowledge economy and tech workforce and ensure equity in how we apply STEM moving forwards.

In this keynote presentation, Heather will discuss how science is relevant to our most critical societal issues, and how to use interdisciplinary connections to make STEM more accessible for all students.

Heather co-founded STEM-specialist media company Refraction Media in 2013 with a view to creating a smarter future – one in which everyone has access to the skills they need to make a better planet. Heather previously worked for over a decade as an editor, science news journalist and producer at the ABC, Cosmos and CSIRO. Refraction Media have distributed over 2 million magazines to students across the USA, Australia and New Zealand through the Careers with STEM brand. In 2015 the company was awarded as Publish Australia's best small publisher and was twice shortlisted best startup in the Telstra Business Awards. She is the author of multiple children's books including Ready Set Code! Coding activities for kids, CSIRO Publishing, 2020 and It's True! Space Turns you into Spaghetti, shortlisted for the Royal Society Children's Book prize, 2008. Heather is a Board member of Science & Technology Australia, representing 80,000 scientists and technologists.

10.35 am Morning Tea & Exhibition

11.10 am Workshop Session 1

1.1 The Role of Illustration, 3D Design and AR in Scientific Understanding

Kate Tyrwhitt, St Michael's College

primary

As an Art and Design Teacher it is important to develop interdisciplinary skills that transfer to other learning areas such as Science. Divergent thinking in Art and Design helps to build better scientists. The skills learned in illustration allow students to visually model their scientific understandings. Emerging technologies such as 3D design, printing and Augmented Reality have importance in giving students skills in visualising and utilising 3 dimensional tools necessary for scientific innovation. My session would showcase student drawings, 3D designs and literacy related to scientific inquiry. I shall showcase and discuss the use of AR and VR in year 5 and 6 classes in designing Megafauna dig pits, Environmental Science projects and Space exploration devices and tools. It would be targeted for teachers of primary schools.

1.2 STEAMing Picture Books

Alexandra Fowler, Woomera Area School

primary, middle

Children who are regularly read to in their first five years are exposed to 1.4 million more words than children who aren't read to. It's inevitable that it falls to teachers to bridge these gaps and teaching Literacy is a part of every subject including STEAM. Reading books aloud to children stimulates their imagination and expands their understanding of the world and thus using picture books in STEAM can lead to fascinating creations and deep learning. This session is based on using picture books both of a scientific nature and ones that are general fiction to create STEAM based challenges, tasks and learning activities that build STEAM skills including creation, observation, problem solving, analysis and refinement. In this workshop you will explore different types of activities, learning outcomes and techniques for designing various challenges based on picture books.

1.3 Primary vs Secondary Science: The Great Divide Karina Darling, St Mark's College, Port Pirie

primary, middle

This workshop will help both Primary and Middle school teachers explore the seemingly massive gap between Primary School general science (often taught only in a classroom) and High School science (taught almost exclusively in a lab environment). What can we do to help our Year 7s meet these new challenges? Is there something we can do at Primary School to close the gap? Workshop participants will play some science vocabulary games, have a look at how Bunsen burner licenses were attained this year, look at some scaffolds for Lab Report writing and have a go at using an online lab equipment drawing tool.

1.4 Hook into properties of matter!

Denise Rule, Department for Education, South Australia

middle

This workshop will initially focus on developing your understanding of DfE Secondary Science unit construction and arrangement, delving into how science is best taught and learned. Together, we will investigate a Year 9 science unit, taking a deep dive into classroom activities that facilitate the progression of student's ability to comprehend scientific texts whilst developing awareness of scientific discoveries and societal impacts.

We will examine the learning theories (Cognitive and Social Constructivism) embedded in the unit that have been used to inform practice and explore methodologies, such as Visible Thinking Routines, as vehicles to gather evidence for assessment of learning intentions.

During this workshop, there will be discussion about application in classroom settings, consideration of extension of the activities and their relevance in building literacy in science into scientific literacy.

1.5 A Healthy Land - Measuring the environment with datalogging equipment

Stuart Lewis, Scientrific Pty Ltd

middle, senior, lab officers

The world is a beautiful and complex place. It has systems for growth and maintaining itself, from balancing gas mixtures to maintaining the soil. In this workshop we will look at several ways of measuring it.

This workshop will use Vernier datalogging equipment to explore topics such as:

- Looking at chlorophyl in plants
- Investigating plant photosynthesis
- Investigating respiration (Both plant and animal)
- Abiotic conditions
- Water analysis

1.6 From cringe-worthy silences to dialogic learning: 20 ways to get students talking science

Lara Lang, ASMS & Angeline Buckler, Aldinga Payinthi College

middle, senior

What has a very high impact on student learning? Dialogic activities!

Become the student in this workshop and experience 20 classroom activities that put the focus on talking, collaboration, feedback and metacognition for next-level science learning. From chatty hooks to verbal activation of prior knowledge; specific social and dialogic activities to motivating and active learning; cognitive and metacognitive activities through to oral assessment (with not an oral presentation in sight).

See how these strategies are used in real classrooms with real students (and not just the "high band" students, but with a complex cohort) and take away a bunch of resources and ideas for talking science in your classroom.

1.7 How does scientific literacy impact our survival?

Claire Hughes, RiAus

middle, senior

The COVID-19 pandemic highlighted the impact of scientific literacy on personal decisionmaking and action. It exposed a conflict between opinion and evidence, which could be resolved - at least in part - through quality STEM education.

For some, the pandemic offered an unprecedented opportunity to marvel at the scientific community. For others, the development and evolution of information was overwhelming, causing them to focus on potential risks.

STEM education can develop the knowledge, skills and identities needed to overcome global challenges such as COVID-19 and climate change. Scientific literacy is an urgent and important issue. Why should we care? The answer is simple: our way of life and survival are at stake.

Discover resources and strategies to support students' development and application of scientific literacy. These resources make scientific literacy relevant, but they also inspire and excite your STEM students to challenge concepts using critical thinking and analysis.

1.8 Teaching Science using Problem-based Learning

Caroline Cotton, BioBrain & Brock Herdman, Blackwood High School

senior

Problem-based learning (PBL) develops higher order thinking skills. Higher order thinking skills are seldom taught, but should be included as part of any curriculum.

PBL learning teaches students to develop thinking skills such as the ability to hypothesise, synthesize, analyse, evaluate, and generalise information rather than simply recall it. By solving real life unstructured problems, students have the opportunity to develop critical thinking skills. Come along to this session to learn how to incorporate PBL into your Science classroom.

12.15 pm Workshop Session 2

2.1 Building Scientific Literacy Through Outdoor Education Kathleen Best, Clarendon Primary School

primary

In this workshop we will look at how to build the scientific literacy of students using outdoor education in a primary setting (including junior primary). We will look at how we do this at Clarendon Primary as well as explore a range of resources that can help, like those available on the Oliphant Science Awards website. Participants will leave this workshop with resources and the confidence to put this into practice.

2.2 It's not selfish - Opportunities for you as a Science Teacher Sarah Finney, Stirling East Primary School & Sarah Todd, Coromandel Valley Primary School

primary, middle, senior

'What opportunities lie within for me?', you ask hesitantly whilst peering through heavy gilt doors teetering on their golden hinges. You hope that this threshold could lead to grand rooms of scientific educational splendour but are understandably nervous to nudge them open. The thoughts, 'What if I fail?' and 'I don't want to be selfish' plague you.

Sarah Todd and Sarah Finney, will give you a glimpse of what joys and opportunities could be waiting for you through the doors. Not only that, they will give you some of the keys to turning the locks so they fit just right.

We aim to share the dazzling dance floors and invite you to frolic in the areas of Oliphant Science Awards/Bush Blitz and blogging/STEMX/CONASTA/and State and National Awards.

We show you the dazzling joys of experience and some tactics and strategies of application writing. You will get tips and feedback on crafting the perfect submission to enhance your teaching.

Because of course.. We're not selfish.

2.3 Implementing Virtual Reality within the Classroom Bianca Cook, AR VR EDUCATION

primary, middle

In this exciting and interactive workshop, discover how to use Virtual Reality to deliver immersive STEM experiences for students of all ages. Discover first-hand how VR dramatically strengthens knowledge retention and supports improved student outcomes, through captivating and engaging personal experiences - stimulating thought in ways not possible with traditional books, pictures, or videos. See how Virtual and Augmented Realities offer unique and unparalleled ways to engage and encourage students, by allowing them to immerse themselves in events, role play areas and interactive displays with technology that inspires and motivates. Uncover how using this technology within the classroom, students have an improved understanding of topics, experience greater concentration, a renewed enthusiasm for learning and provide a better quality of response and engagement. Session participants can enjoy an opportunity to actively experience both VR and AR using headsets and ARCubes.

2.4 Differentiation of Tasks in 7-10 Australian Curriculum Science Jason Greenslade, Westminster School

middle, senior

This session will explore how you might go about writing and structuring tasks in 7-10 to differentiate for different abilities and interests - we will cover practical and assignment based work. We will also look at how to embed Aboriginal and Torres Strait Islander priorities in some tasks and how this might be differentiated as well. Examples will be given for year levels from 7-10 in the AC and covering a range of topics and sciences.

2.5 Inquiry approaches using Data Loggers in High School Chemistry Stuart Lewis, Scientrific Pty Ltd

middle, senior, lab officers

Are you looking for ways of collecting data related to experiments in the Australian Curriculum - Chemistry (especially when experimenting at home)?

This workshop explores Chemistry using a variety of Vernier Dataloggers and probes. Multiple workstations will be used for participants to experiment with support from our presenter. Some of the topics covered will be:

- Chemistry at home
- pH and household chemicals
- Boyle's Law
- Guy-Lussac's Law
- Beer's Law
- Acid Base Titrations

Ideas for further investigations will also be explored.

2.6 Talking in SATs

Alix Verdon & Savin Sindhu, Australian Science and Mathematics School

middle, senior, tertiary

Tell your students they have a SAT coming up in a Year 12 Science course and as likely as not they start talking about the test. Skills and Applications Tasks (SATs) can be far more than tests and in the Australian Science and Mathematics School's Stage 2 Physics course we have experimented with getting students talking in SATs. We will share how we have students participate in small group conversations with peers to support them to provide written evidence of their learning even when faced with new and unfamiliar situations including complex real life problems. We will also share a SAT where students produce a multimodal product, relying on spoken language to provide evidence of their learning. Participants will also have the opportunity to talk, discussing how you might get students talking in your classroom to provide evidence of their Science Understanding.

2.7 Can geoscience save the Earth?

Richard Lilly, University of Adelaide - NExUS

middle, senior

In this workshop we will get hands-on with the rocks and minerals needed to produce clean energy technologies, and provide links to resources for teachers who are interested in building their knowledge of earth science. How much metal do we need to make a Tesla? Where does the lithium for my phone battery come from? How do we find it? This workshop will also highlight and discuss the wide range of earth science resources currently available to teachers. In collaboration with the SA-based Geoscience Pathways Project (GPP) and the CoRE learning foundation, we aim to provide training opportunities to science teachers to enable integrated learning of earth science through contextually set project-based learning. We also have geoscience outreach officers who are available to visit schools to provide specialist curriculum aligned geoscience activities.

1.15 pm Lunch & Exhibition

Panel Discussion

What's new about the Science Curriculum?

This panel discussion will be a Q&A session focussing on what's new about the Science Curriculum, what has changed and why? As well as what resources are available. The panel will include Katrina Elliott and Anthea Ponte from the Department of Education and Dr Carol Aldous a Senior Lecturer from the School of Education at Flinders University. Delegates will have the opportunity to submit questions to members of the panel via slideo.

Ms Katrina Elliott is a Curriculum Support Science and STEM Project Officer who has helped unpack the curriculum and provided best advice on teaching the scope and sequence. She worked with other state representatives across the country on the new version of the Australian Curriculum and can help explain the changes made by ACARA to the Science Curriculum.

Ms Anthea Ponte has worked as a primary science teacher across various schools in SA and was awarded the STEM Educator of the Year (in school teaching) award in 2019. Over the last couple of years Anthea has been out of the classroom designing the department's science units to support teachers. She is able to discuss the department's units and the changes to the Science Curriculum from a teacher perspective.

Dr Carol Aldous not only co-ordinates the science programs at Flinders University but has managed the Science Curriculum Focus Schools Projects and is also a project lead on the STEM Industry Engagement: Bridging the Gap project, in collaboration with the Department of Innovation and Skills.

confirmed. She is excited to share her perspective on curriculum matters with the audience

2.05 pm Workshop Session 3

3.1 Purposeful Primary Science

Anthea Ponte, Department for Education

primary

This session will highlight the purposeful strategies and structures incorporated into the Department for Education's Primary Science units of work. Using the Year 4 Chemical Science unit as a guide, participants will explore the pedagogical design, developmentally sequenced and Australian Curriculum aligned content and assessment elements within the units.

This workshop is suitable for both classroom teachers and primary science specialist teachers.

3.2 Enlivening your classroom

David LeCornu and Jo Clements, Nature Education Centre

primary, middle

Learn about how the Nature Education Centre can provide resources to enliven your classroom and stimulate student learning. With this conference's focus on Let's talk Science, NEC's resources can provide an avenue to a range of science literacy outcomes.

3.3 Closing the vocabulary gap in science Katrina Elliott, Department for Education

primary, middle, senior

"The limits of my language mean the limits of my world" Wittgenstien

How far is the vocabulary gap an issue in your classroom?

What is already working in your classroom?

In this workshop we will look at a couple of Alex Quigley's 7 steps in closing the vocabulary gap.

Step 2 Teach academic vocabulary explicitly and clearly, with coherent planning throughout the science curriculum.

Step 6 Foster 'word consciousness' in our students (e.g. sharing the etymology and morphology of words)

We will look at some strategies to further enhance teaching and learning of science to address the vocabulary gap and some literacy techniques to improve students' reading and writing in science.

3.4 Gamifying Earth Science

Suzy Urbaniak, CoRE Learning Foundation

The CoRE Learning Foundation is setting out to modernise education. Our aim is to take learning outside of the textbooks and classrooms and into the real world. To help achieve this goal CoRE has been working on an exciting project we are calling Gamifying Earth Science Learning. Leveraging knowledge and experience of how students best learn in this digital age, we collaborated with the Minerals Council of Australia, BHP and Secret Lab to develop educational computer games that have been created to be used as part of the Australian Earth and Environmental Science curriculum. The goal is to provide students with authentic and purposeful learning experiences, create a greater appreciation of natural resources and the resources industry, and potentially lead students to consider a future career in the industry. This workshop will showcase CoRE's two games, Resource! Respond! Rescue! and Old as Dirt!

3.5 Key experiments: Inquiry approaches using Vernier Data Loggers in High School Science

Stuart Lewis, Scientrific Pty Ltd

middle, senior, lab officers

Are you looking for new ways of collecting data related to experiments in the Australian Curriculum?

Multiple workstations will be set up for participants to experiment with support from our presenter. The experiments will include:

- Boyle's Law and chemical reaction rates
- Spectroscopy and Beers Law
- Newtons laws of motion
- Electrical induction and electromagnetism
- Human respiration

Ideas for further investigations will also be explored.

3.6 Soil Science

Dr Bianca Warnock, Sciren Pty Ltd

middle, senior, lab officers

The chemical and physical properties of soil can be fascinating! It's not just dirt we stand on, it's sooo much more.

We're going to explore the life beneath our feet with a hands on workshop. Perfect for primary and secondary teachers as the activity will be able to be expanded on depending of year level.

This workshop is delivered by Sciren's Dr Bianca Warnock who also works with SASTA! Bianca has developed an exciting new teacher professional development program for Wine Australia (details of which can be <u>found here</u>).

Attending this presentation at the SASTA Annual Conference would greatly compliment and expand on the Soil Science and Viticulture PD held at Waite Campus May 20.

3.7 Addressing Science Inquiry Skills using real research data: A case study about air pollution for Year 7-10 students Julie Mulholland, ANSTO

middle, senior

Fine particle air pollution is a significant global problem, contributing to climate change and posing increased risks to human health, including respiratory and cardiovascular diseases, and cancer.

We will explore activities that take students step-by-step through the development and write up of a scientific investigation about air pollution. Students propose an hypothesis, process and analyse authentic scientific data, create a graph and interpret results, and communicate the process and findings of their investigation in the form of a scientific report. And through the process students will gain new knowledge and understanding about air pollution.

This is an interactive workshop where teachers will process and analyse real world data and formulate the same conclusions as the scientists!

3.8 "Miss, how do you spell science..?"

Jesse Atkinson, Australian Science & Maths School

middle, senior

If you completed high school before the end of the 21st century in South Australia, you were probably never taught functional grammar. 'Literacy is everyone's business' is an adage thrown around leadership and English faculties of many schools. It's true...but it's easier said than done if you were never shown the meta-language and strategies yourself. So, having said all this, what options do you have as a teacher of science who wants their students to write more coherently articulately, fluently, precisely? This workshop offers some solutions that have worked (to varying degrees) at the Australian Science and Mathematics School. Hopefully one of them is suitable for your site.

3.10 pm Happy Hour

Following on from your Day 1 program with Professional Networking with drinks and nibbles. And don't forget you have the chance to win prizes donated by our sponsors if you are present at Happy Hour!

Please register your attendance at this event when you register online.

9.00 am Welcome & Awards Presentation

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9.30 am Keynote 2

Learning progressions, language and building conceptual understanding – a powerful trio in science education!

Associate Professor Debra Panizzon

As teachers of science, we strive to support our students in developing scientific knowledge, the processes and ways of 'thinking scientifically' (inclusive of SHE), and scientific skills. Forty years of research in science education demonstrates that if we are to engage, interest and help our students construct a solid, longer-term understanding of science, we need to focus on building conceptual understanding. Learning progressions provide an ideal opportunity to describe the more sophisticated reasoning and conceptual sequence to support student learning



in science. They are already available in Australia for literacy and numeracy but have actually been used in the US in the teaching of science since the early 2000s. While progressions provide a mechanism for structuring conceptual understanding the important role of language (not literacy or scientific literacy) in concept construction in science is often overlooked.

In this presentation the key steps used by researchers to construct a learning progression to assess what students 'know and can do' in the Chemical Sciences from Foundation to Year 6 are explored. To ensure a developmental progression of concepts, the Structure of the Observed Learning Outcome (SOLO) was used as a theoretical framework. Pivotal to the construction of scientific concepts in the progression was the careful consideration of both the technical and non-technical words in science.

In a world where it's increasingly difficult to identify #fakenews, communicating and telling stories with impact is key! But is it possible to use the science of communication and marketing to share science messages and tell science stories that make people want to save the planet?

Associate Professor Debra Panizzon is an adjunct at Monash University and Research Analyst for the Teachers Registration Board of South Australia. She has held key positions at the University of South Australia, was Deputy Director of the Flinders Centre for Science Education Flinders University, and Deputy Director for SiMERR National Research Centre at the University of New England in Armidale NSW. Her research interests include STEM educational policy, assessment in science and mathematics education, cognition and learning, and critical and creative thinking. Much of her work has involved collaborative research to inform policy in science and STEM education with key educational stakeholders in Australia and internationally. Debra has a substantial publication record consisting of books, book chapters and journal articles.

10.40 am Morning Tea & Exhibition

11.15 am Cutting Edge Session 1

1A You don't have to love digging to be an archaeologist Dr Ian Moffat, Flinders University

Most people imagine archaeology as being done via excavation, but there are many other ways of studying archaeological sites. This presentation will review exciting new research using geophysical techniques and geochemical analysis which are changing how we understand the human story. This includes using remote sensing techniques to map classical Greek cities and to understand the depositional history of caves that contain important records of human evolution. It will also review how isotope and trace element analysis of teeth has helped to understand the hunting capabilities and maternal behavior of early human ancestors. These case studies provide a new pathway for students to develop an interest in chemistry and physics via archaeology.

Dr lan Moffat is an Associate Professor of Archaeological Science from Flinders University. His research applies geological techniques to help understand archaeological sites. He has worked all over the world including helping to understand the breast-feeding history of early humans in Africa using tooth chemistry, mapping classical ancient Greek cities using remote sensing and working with community groups to locate unmarked graves. He holds a PhD from the Australian National University, undergraduate degrees from the University of Queensland and has previously held research appointments at the Institute for Mediterranean Studies and the University of Cambridge.

1B Learning about learning through the worm Dr Yee Lian Chew, Flinders University

Chronic pain is a debilitating condition affecting 20% of Australians. Opioids - the most common treatment for chronic pain – are highly-problematic due to addiction and reduced efficacy in the long-term. Unfortunately, limited alternatives have led to an overreliance on these drugs, thus new treatments are urgently required.

To develop new therapeutics, we need a better understanding of how pain is controlled. In chronic pain, repeated stimulation of pain cells triggers increased excitability. This phenomenon is critical for the onset of long-lasting pain, but the factors that drive this process are poorly defined. My goal is to uncover the key molecules that drive pain sensitisation and to use an experimental system involving cutting-edge microscopy to discover new methods of treating chronic pain.

My research uses the C. elegans nematode 'worm' - the only animal where connectivity of all neurons in the brain is known. Although the nematode brain is small, containing ~300 cells (vs 100 billion in our brain), its repertoire of pain-associated genes are highly similar to those in humans. My research uses this simple animal to define new paradigms on which to test effective therapeutic strategies that in future can be translated to mammals.

Dr Yee Lian Chew, 'the worm lady', uses the roundworm C. elegans to study how neurochemical signals in the nervous system work together to coordinate complex behaviours. An NHMRC Emerging Leadership Fellow, Yee Lian uses C. elegans – one millimetre long with only 300 neurons, yet 80% genetically identical to humans – to identify neurochemical signalling pathways that can be targeted for treatment of neurological conditions such as chronic pain. An early career academic, Yee Lian earned her BSc (2010) and PhD (2015) from the University of Sydney. In 2015, she moved to Cambridge UK to study worms in colder weather, at the MRC Laboratory of Molecular Biology. She returned to Australia in 2019 as a teaching-research academic at the University of Wollongong and is currently a Mary Overton Senior Research Fellow at Flinders University.

Outside the joy of experiments, Yee Lian is a budding science communicator. She has given public lectures at National Science Week, contributed to a children's outreach program at the Cambridge Science Festival, recorded a podcast, and filmed an Elevator Pitch for ABC Science. She is now part of the 2021-2022 cohort of Superstars of STEM, a program run by Science & Technology Australia to promote the profile of women STEM professionals. Currently the Chair of the EMCR Forum Executive supported by the Australian Academy of Science, Yee Lian also aims to promote equity, diversity and inclusion in academia by removing barriers to retention for minoritised groups. In 2021, she was awarded a SA Young Tall Poppy award in recognition of her science communication and research profile.

1C Learner profiles: Supporting teachers' decision making with data and learning analytics

Dr Rebecca Marrone, University of South Australia

Significant changes in society highlight the need for more flexible and innovative ways of teaching and learning. The recent COVID-19 pandemic resulted in a significant shift towards blended and online learning in Australian schools and the adoption of a wide range of educational technologies. A by-product of such technologies is a wide range of data about students and their learning activities that can provide insight into student progress and enable the personalisation of learning. Learning analytics, a field focusing on utilising such data for understanding and improving learning and teaching processes, has recently attracted significant attention showing promise in supporting student learning across a wide range of domains. The digital data about students, their aspirations, competencies and learning progress can be effectively used to provide a holistic overview of student learning, measure their learning development and provide information necessary for timely support and intervention. This talk will focus on developing learner profiles, a particular form of learning analytics that allows teachers to measure students' learning development and provide information necessary for timely support and intervention. The particular focus will be on how learner profiles can support the development of complex skills and competencies necessary for preparing students for the future.

Dr Rebecca Marrone is a Research Fellow for the Centre for Change and Complexity in Learning (C3L) at the University of South Australia Education Futures. Her research is primarily in creativity, educational psychology and human and artificial cognition across varying educational contexts. Rebecca has an Honours degree in Psychology and a PhD in STEM from UniSA. Rebecca serves on the organising committee for the Empowering learners for the Age of AI conference and the 1st International Conference on Change and Complexity in Learning.

Br. og

12.20 pm Cutting Edge Session 2

2A A new focus on Ancient Art: Geomatic techniques to understand ancient art

Jarrad Kowlessar, Flinders University

The Alligator rivers region of Kakadu and Western Arnhem land has some of Australia's most densely painted and world renown rock art inscribed places. This region also has an incredible history of dramatic climate change, with major landscape altering events. With a history of human occupation of the area exceeding 60 thousand years and limited dating for the art of this region, archaeological interpretation of this art is a major challenge. This research developed new machine learning approaches to better understand the chronology of the art styles and geophysical techniques to reconstruct the environmental phases. These two reconstructions provide new context to interpreting how rock art site placement changed over the long history of artistic creation in this region.

Jarrad Kowlessar is an Australian archaeologist who specializes in digital archaeology and geomatic techniques. He has a background in Geographic Information systems specializing in navigation and human movement through space. He has recently focused on machine learning approaches to archaeological analysis as well as virtual reality for archaeological visualization engagement.

2B Getting 'serious' about using STEM to improve health outcomes and engagement

Dr David Hobbs, Flinders University

This presentation will discuss the process for using and developing 'serious games' – computer games that motivate and engage end users, but also deliver health outcomes for people requiring rehabilitation. It will discuss the design journey, developmental stages, clinical trial outcomes, and how a multi-disciplinary team collaborated to produce an award winning and patented serious games system to improve the lives of people with a disability.

David is curious by nature and has a passion for learning, which probably explains the fact he has two undergraduate bachelor degrees (one in Physics and the other in Biomedical Engineering) and a PhD in Rehabilitation Engineering. He has extensive experience as a Rehabilitation Engineer in the field of disability, rehabilitation engineering and assistive technologies, and is currently a Senior Lecturer and academic staff member within the College of Science and Engineering and a researcher within the Medical Device Research Institute at Flinders University.

David's professional honours to date include being awarded a Churchill Fellowship in the field of rehabilitation engineering and Universal Design; Engineers Australia's Young Professional Engineer of the Year; Engineers Australia's Top 100 Most Influential Engineers; a Fulbright Professional Scholarship in the field of paediatric rehabilitation engineering, and a Distinguished Alumni Award from Flinders University.

David's passion in life and reason for waking up is to maximise the impact and accessibility of assistive technologies to improve the lives of people with a disability. He has experience working in rehabilitation engineering research and industry institutions in Australia, England, Canada and the United States, holds a patent for his PhD work, and has twice won first prize in the College of Biomedical Engineers' Better Technology Awards for novel assistive technologies. David is an invited TEDx speaker, has delivered numerous invited and keynote presentations, and has represented Australia at two Global Research, Innovation, and Education in Assistive Technology (GREAT) Summits at the WHO in Geneva.

Outside of work, David is married to his Biomedical Engineering wife Jodie, and they live in Adelaide with their 3 children, 2 dogs, 2 fish and 1 rabbit. He loves LEGO, Star Wars, watching most sports, being with friends, going to the movies, drinking red wine, and watching and supporting any of the activities that his children engage in. He is secretly hoping that one becomes an engineer when they grow up. Or a LEGO Brick Master.

2C Introduction to Space Weather

Roland Wilson, National Security and Space Program: Bureau of Meteorology

This session will introduce participants to the basic science of space weather, different types of space weather phenomena originating from the sun, the effects these events can have on the Earth, and their impacts on a technology dependent society.

Participants will then be taken through a tabletop exercise simulating a space weather event to demonstrate the possible and broad ranging effects of a large space weather event. This exercise will demonstrate impacts on various infrastructure, including the social and economic impacts of a large space weather event.

The workshop will generate a further appreciation of space weather science across academic disciplines, the complexities of predicting events and coordinating appropriate responses, its impact and relevance to society, and inspire teachers and students to think more broadly about future space industry career options.

Roland is a proud Nari Nari man from the Hay Plains of NSW and has been living in Adelaide on Kaurna Country for the last 15 years. He has degrees in Science, Education and International Relations, and has spent the last 10 years teaching and researching in the higher education sector.

His role as the National Security and Space Program's Community Sector Lead includes driving and transforming space weather conversations and relationships within the Bureau of Meteorology, across government, government agencies, and at the community level.

Roland's work with the Bureau comprises designing and implementing the Australian Warning System framework for Space Weather, to enable emergency management systems and the general public to be better informed about potential space weather event impacts and emergency responses to them. This work also includes designing educational materials such as simulations for training emergency management agencies.

It comprises work across the Bureau's Space Weather Capability as a part of the capabilities transformation process, to streamline communications processes and protocols enabling efficient responses to related events to relevant stakeholders.

Roland's work also includes work at the community level to increase knowledge and awareness of space weather, engaging and communicating with education stakeholders to design and implement space weather learning products via the Australian Space Discovery Centre, Australian Space Agency and Andy Thomas Foundation.

1.20 pm Lunch & Exhibition

2.10 pm Workshop Session 4

4.1 How to write a scientific summary using Claim, Evidence, Reasoning model

Jenny Woodcock, Department for Education

primary, middle

In this session we will look at how the C.E.R (claim, evidence, reasoning) model can be used to support students to write a scientific summary based on their data and observations.

4.2 Bringing Science into the Primary Classroom (Y3 - 6) Brayden Pullen & Peter Walwyn, Westminster School

primary, middle, lab officers

This session aims to offer participants the opportunity to see engaging ways of presenting Science ideas using inexpensive and readily available materials and equipment. In particular, some of the concepts related to physical sciences will be showcased.

4.3 From Curious to Clever: How a learner-friendly robotics program can motivate girls and boys in STEM

Thomas Man, Neuplex

primary, middle, senior

STEM education programs designed for schools can be too piecemeal or expensive and not sufficiently inclusive for young people from disadvantaged backgrounds or living with disabilities. As a result, schools that are not well resourced may find it hard to develop and conduct accessible, well organised STEM activities regularly. A holistic yet affordable program is both necessary and desirable to start a student's STEM journey. This presentation uses research results and actual experience to support the above argument and suggest a learner-friendly and level-appropriate robotics program that closely connects to science, mathematics, and technology focus areas within the Australian Curriculum, in a structured and engaging way.

4.4 Connect - Respect - Protect: engaging students in marine protection

James Tilly, Experiencing Marine Sanctuaries

primary, middle, senior

Experiencing Marine Sanctuaries (EMS) is an incorporated, not-for-profit, non-government organisation that provides safe and professionally supervised 'hands-on' experience of our unique and beautiful marine life.

Our session will include:

- an overview of SA's unique Marine Sanctuaries
- immersive VR experience
- teaching and learning resources to support your planning
- how EMS can support classroom and in-water activities

Please join us to explore how EMS can help you to bring your teaching and learning to life - literally - from the classroom to the coast.

4.5 Literacy in science strategies Year 7 to 10 Katrina Elliott, SA Department for Education

middle

In this workshop, we will investigate how to implement strategies for Literacy in science, Literacy of science, and Scientific literacy. We will work through some of the strategies in implementing the Australian Curriculum Science and provide you with resources based on current research to improve students' outcomes in science.

4.6 The Science of Us - Measuring humans using Data Loggers Stuart Lewis, Scientrific Pty Ltd

middle, senior, lab officers

Humans are not simple. We are a series of complex systems streamed through a conscious brain. This means that there is a lot that can be measured, from bioelectric impulses required to move muscles to an analysis of touch.

This workshop will use Vernier datalogging equipment to explore topics such as:

- EKG and heart analysis
- Muscle analysis and strength
- Wavelengths of light that fool the eye
- How to tell if a room is well ventilated
- Which feels warmer? tactile illusions
- How much dye is in foods?

4.7 Engaging Students Through Real Astronomical Data Robert Hollow, CSIRO

middle, senior

Astronomy is a discipline in which real scientific data is freely and easily accessible. This makes it an ideal area for both first hand and second hand student investigations with the potential to undertake engaging and exciting projects. We explore local and international examples of where to access and how to use data to engage and challenge students. Topics from exoplanets, pulsars and galaxy classification are explored and key databases and citizen science tools identified and examined. The possibilities for open-ended student investigations and citizen science are discussed. Upcoming projects and data challenges are highlighted.

4.8 Using the Microsoft Reading Progress Tool and tier 2 & 3 words via Quizlet

Paul Gavini, Modbury High School

primary, middle, senior

Demonstrating the Microsoft Reading tool to improve student reading literacy and subsequently the Insight tool to obtain quantitative data to monitor student and class progress.

Later part of the session will be on how to access and use Quizlet with the DfE tier 2 & 3 words.

Bo. ndy

3.15 pm Workshop Session 5

5.1 Student Agency and Information Reports - from regurgitation to creation

Miriam Doull, Mitcham Primary School

primary, middle

Are you tired of students in your Primary/Middle Science classroom presenting the same old posters and slide presentations year-in-year-out? Do you find yourself mired in a mishmash of adequate information essentially regurgitated (but carefully not plagiarised) from the internet, often designed to impress you by including overly complex diagrams and text that they are unable to explain? Do you wish your students would present you with an information report that was as engaging as something by David Attenborough, Brian Cox, or even Phil McCordic from Science Max? Do some of them wish they could too?

By setting explicit Learning Intentions and Success Criteria, drawing on Literacy strategies taught in the English classroom, and using purposeful strategies to increase student agency, a subsequent increase in student engagement can lead to an improvement in learning outcomes and quality of work.

This session outlines key strategies and tools that can be used to: increase student agency in the middle and upper Primary Science classroom; develop student skills in research and information synthesis; and encourage the production of creative information reports that demonstrate the depth of student understanding against Learning Intentions and Success Criteria.

5.2 How do scientists use film to speak science? Claire Hughes, RiAus

primary, middle

In 2022, we find ourselves in a time in which film is one of the most powerful and effective mediums used to share science learning. Whether it's sparking curiosity, teaching a controversial concept, or engaging a student who's a visual learner; film has a strong impact.

Not all video content is created equal. Add to that the volume of videos available, making it difficult to choose what's relevant. We know your time is precious - so we're here to help!

In this workshop, you'll learn effective practices to engage students in scientific literacy using SCINEMA films and resources, which are all mapped to the Australian National Curriculum. Using these films in classrooms will raise awareness about the impact of scientific understanding on society. They also highlight the importance of STEM careers and disciplines.

You will leave this session with a teacher toolkit (new ideas and resources) and the confidence to use these to aid the teaching of more controversial and challenging content.

Boundary and

5.3 What's Up? CSIRO's Initiatives in Space Robert Hollow, CSIRO

primary, middle, senior

CSIRO is a major leader in Australian space initiatives. Specific examples including the Space Roadmap, the CSIRO Centre for Earth Observation, NovaSAR-1, a new radar satellite and the development of CSIROSat-1. CSIRO also provides excellent space tracking and communication through facilities such as the CDSCC operated in conjunction with NASA and the ESA station at New Norcia. The CSIRO Space Future Science Platform funds a diverse range of space projects pushing science and technology in innovative ways. We explore these initiatives in detail, highlighting how they can be incorporated into the curriculum. The role of Earth Observation in addressing the UN's Sustainable Development Goals is discussed. Examples of educational resources and activities are presented.

5.4 Let's talk about the languages and terminologies in valuing and respecting Aboriginal knowledges, languages, cultures and histories in the South Australian context

Caroline Dean, Department for Education

middle, senior

The SA Department for Education has partnered with SA Aboriginal Nations to embed Aboriginal knowledges and ways of knowing into the Science Curriculum. This workshop will showcase examples and provide opportunities to discuss culturally responsive language, terminologies and contexts to support science teachers to confidently facilitate authentic teaching of deep and rich learning experiences for students. The resources for were developed in consultation with Elders and Cultural Consultants nominated by the Kaurna, Narungga and Ngarrindjeri Nations and using referenced resources and materials. Some examples include exploring the geology of stone tools, observing tides and ecosystems. Resources also investigate the motion of spear throwers as levers, making adhesives, exploring transferring energy using skin cloaks and fire starting through friction. These resources bring together the Aboriginal Cultural knowledge with the Science concepts, the pedagogy and the assessment criteria.

5.5 Inquiry approaches using Vernier Data Loggers in High School Physics

Stuart Lewis, Scientrific Pty Ltd

middle, senior, lab officers

'Physics is science where you think with your hands'

Are you looking for ways of collecting data related to experiments in the Australian Curriculum - Physics (Especially when inertia keeps you at home)?

This workshop explores Physics using Vernier Dataloggers. With multiple workstations, and support from our presenter, participants will use dataloggers to explore different physics experiments. Topics will include:

- Spectroscopy
- Newtons laws of motion
- Electrical induction and electromagnetism
- Magnetic Fields
- Measuring Motion of everyday objects
- Friction
- Physics at home

Ideas for further investigations will also be explored.

5.6 Practical tools to incorporate literacy in Science Sylvia Saad & Jack Stewart, Adelaide Botanic High School

This workshop will focus on equipping you with a variety of resources and strategies you can use in your Science classes tomorrow. We will be going through how to guide and support students to identify, understand and apply scientific literacy in a range of year level examples.

5.7 Inspiring Deconstruct & Design in Senior Chemistry Vera Dunaiski, Westminster School

Do you feel the need for speed and some creative ideas for investigation design tasks?

The aim of this workshop is to present a variety of possible problems for deconstruction. you will walk away with rsources that include design templates, task sheets and A levels exemplars

5.8 Senior Science Literacy In Action

Keith Gatford, Marden Senior College

At Marden Senior College, we only have students in Years 11 and 12. Each year, approximately 70% of students in our classes are new to the school. That means we haven't been involved in their Literacy development through middle school and we have little knowledge of their abilities. For the last few years we have struggled to find a solution to cater for such an unknown commodity.

In mid-2021, I discovered a tool called Scribo that appeared too good to be true. It is an AI-based web tool that helps students learn to write and it is customisable to different subject areas.

Having trialled Scribo in a limited number of classes in 2021, we have now rolled out Scribo across the whole school for 2022. The best part is it saves us time.

Here, you will be introduced to Scribo and shown how it is helping our students to develop their literacy in Science and other subject areas. We will discuss how it can be used, not just for senior schooling, but middle and junior schooling as well.

4.15 pm Happy Hour

Stick around for your last chance to network with colleagues and new friends you may have met at the Conference. And don't forget you have the chance to win prizes donated by our sponsors if you are present at Happy Hour!

Please register your attendance at this event when you register online.

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