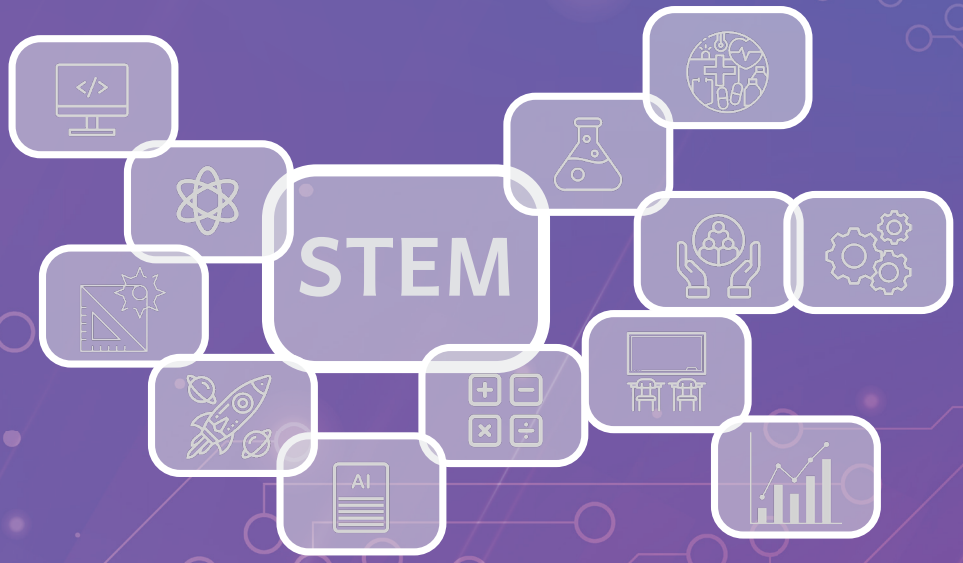
STEM Conference

1 December 2023

Flinders University

Tonsley Campus



MASA
Mathematical Association of South Australia

SASTA
South Australian Science Teachers Association

STEM Connections

Sponsored by:

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Flinders University

Conference Program

Timetable

8.00am	Registration | Tea & Coffee	Foyer
8.40am - 9.00am	Welcome & Housekeeping	Tonsley Theatre 1
9.00am - 10.00am	Keynote Presentation	Tonsley Theatre 1
10.05am - 10.35am	Morning Tea	First Floor Hub
10.40am - 11.40am	Workshop Session 1	First Floor Rooms
11.45am - 12.45pm	Workshop Session 2	First Floor Rooms
12.45pm - 1.45pm	Lunch	First Floor Hub
1.50pm - 2.50pm	Workshop Session 3	First Floor Rooms
2.55pm - 3.55pm	Workshop Session 4	First Floor Rooms
4.00pm - 5.00pm	Happy Hour	Courtyard

Registration Fees

Registration Type	Fee
SASTA, MASA, DATTA, EdTechSA Members	$145
Non Member	$225
Student Member	$50
Student Non-Member	$90
Presenters	$70

Keynote Presentation

Professor Giselle Rampersad

Professor Giselle Rampersad is the Dean (Education) in the College of Science and Engineering at Flinders University with responsibility for STEM courses in Engineering, Science, Mathematics, Computer Science and Cybersecurity. She is also a Professor in Innovation and Co-Director of the Centre for Defence Engineering Research and Training at Flinders University. She was named STEMM Educator of the Year in 2021 in the SA Science Excellence and Innovation Awards and is the Director for the multi-award-winning Diploma of Digital Technologies. Under her leadership, it received national recognition, winning the Australian Defence Industry Award for the Training and Mentorship Program of the Year in 2020, by Defence Connect. It also won the Industry Collaboration award at the SA Training Awards in 2021. The program is undertaken by employees from BAE Systems Australia, a range of defence primes, small and medium sized enterprises, STEM teachers and Wine/AgTech companies, with the program reaching 50% participation by women. She leads various major defence research projects including with Defence Science and Technology Group. She has an interdisciplinary educational background including a PhD in Innovation and Technology Management (Australia) and an MSc in Computing (Durham University, UK).

Innovation through Collaboration

This presentation will cover the following areas:

- Innovating our State and opportunities for transforming the future
- The important role of STEM
- The convergence of industry and technology
- Industry connections with STEM learning in schools
- Social justice as a consideration in STEM pathways and industry
- Emerging technologies and their connection to how STEM is taught
- Connections for students between classroom learning in STEM and future work and learning opportunities
- Developing school–industry STEM initiatives
- Ongoing partnerships between science, technology, engineering and mathematics (STEM) professionals and teachers in schools

STEM Works Tonsley Tour - 1.00pm

Delivered in partnership with STEM Fast Track, STEM Works @ Tonsley provide immersive experiences and living lessons with real-work relevance for students to discover the importance of STEM for future careers.

How students and teachers can benefit from STEM Works at Tonsley:

- Change the way students see their futures and learn what they are working towards
- Explore the impressive line-up of high-tech businesses at Tonsley Innovation District
- Go behind the scenes and explore in greater depth a high-tech business
- Learn how industry, research and government work together
- Supports learning outcomes across all STEM fields as well as other subjects.

Workshop Sessions 1 & 2

10.40am - 11.40am

Session	Title	Presenter/s	Learning Area(s)
1.01	**Engineering a Monster? Authentic, hands-on STEM learning with industry connections.**	*Kyran Zippel & Nikki Asikas, Australian Science and Mathematics School*	Mathematics (Years 10-11), Science (Years 10-11)
1.02	**How close are we to "The Math(s) Fix?"**	*David Dempsey, CSIRO STEM Professionals in Schools participant and Independent STEM Consultant*	Science (Years 6-11), Mathematics (Years 6-11), Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)
1.03	**ChatGPT for teachers**	*Paul Gavini & & James Dundon, Modbury High School*	Science (Years 6-11)
1.04	**Wildlife Centre - Numeracy, Science and Technology**	*Ana Marques Britto & Danielle Martin, Playford International College*	Science (Years 6-11), Mathematics (Years 6-11)
1.05	**Project X - A Laser Based Resource Guide built under partnership between Trotec Laser and Stem Fasttrack.**	*Ben Branford, Trotec Laser*	Science (Years 6-11), Mathematics (Years 6-11), Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)
1.06	**Mathematics Anxiety: Aetiology & Strategies for students**	*Dr Simon Fuller, Adelaide North Special School*	Science (Years 6-9), Mathematics (Years 6-9), Design & Technologies (Years 6-9)
1.07	**Flexible Physics Teaching and Learning Strategies for All Students**	*Stefania Pulford & Lachlan Loader, Thebarton Senior College*	Science (Years 10-11)
1.08	**Careers with Mathematics - How maths underpins a vast array of jobs in Economics and Finance**	*Susan Stone, University of South Australia*	Mathematics (Years 6-11), Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)

11.45am - 12.45pm

2.01	**STEM applications in Meteorology**	*Bonnie Haselgrove, Bureau of Meteorology*	Science (Years 6-11), Mathematics (Years 6-11), Digital Technologies (Years 6-9)
2.02	**From Flat Screen to Spatial Reasoning**	*Jarrad Strain, Cardijn College*	Science (Years 6-9), Mathematics (Years 6-11), Design & Technologies (Years 6-9), Digital Technologies (Years 6-11)
2.03	**Growing from strength to strength - Strength-based learning in your class**	*Gregory Rowbotham & Daizee Wiles, CSIRO Education and Outreach - STEM together*	Science (Years 6-11), Mathematics (Years 6-11), Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)
2.04	**10 tips for teaching in the Age of AI**	*Hayden Tronnolone, Flinders University & Dr Alix Verdon, Australian Science and Mathematics School*	Science (Years 6-11), Mathematics (Years 6-11)
2.05	**Exploring the mathematics in science, technology, (and engineering).**	*Ann Ruckert, Open Access College*	Science (Years 6-11), Mathematics (Years 6-11), Design & Technologies (Years 6-9), Digital Technologies (Years 10-11)
2.06	**STEM in FILM – Connecting and celebrating the vision of STEM with SCINEMA Junior and Oliphant Science Awards**	*Michelle McLeod, RiAus*	
2.07	**IoT: Connecting STEM Skills to Future Careers**	*Claire Hughes, The University of Adelaide*	Science (Years 6-9), Mathematics (Years 6-9), Design & Technologies (Years 6-9), Digital Technologies (Years 6-9)
2.08	**STEM in action - an actuarial perspective**	*Jules Gribble, PFS Consulting & Sharon Kennare, MASA*	Science (Years 10-11), Mathematics (Years 10-11)

Workshop Sessions 3 & 4

1.50pm - 2.50pm

Session	Title	Presenter/s	Learning Area(s)
3.01	**Exploring the role of South Australia's critical mineral resources in a carbon neutral future**	*Kelly Sharrad, Geoscience Pathways Project*	Science (Years 6-11)
3.02	**Tibial Fracture Workshop**	*Dr Francesca Bucci, Medical Devices Research Institute at Flinders University*	Science (Years 6-11), Design & Technologies (Years 6-11)
3.03	**Dreamhouse Project - interdisciplinary of Mathematics, Technology, Science and English.**	*Brian Wong, Plympton International College*	Science (Years 6-9), Mathematics (Years 6-9), Design & Technologies (Years 6-9), Digital Technologies (Years 6-9)
3.04	**Teaching the Tricky Stuff: Harnessing Mathematics Education Research to Improve Learning in Science Classrooms.**	*Ashleigh Schofield, Prince Alfred College*	Science (Years 6-11)
3.05	**Connecting Engineering with STEM Investigations - incorporating STEM in Action in your classroom**	*Michelle McLeod, RiAus*	
3.06	**Sieging Dunsinane Castle - A science, maths, English extravaganza!**	*Sam Moyle & Jo Kellaway, Australian Science and Mathematics School*	Science (Years 6-11), Mathematics (Years 6-11)
3.07	**Tips and Ideas for the Early Career Teacher of Mathematics**	*Sharon Kennare & Ana Marques Britto, MASA*	Mathematics (Years 6-11)
3.08	**STEM approaches using Data Loggers**	*Stuart Lewis, Scientrific Pty Ltd*	Science (Years 6-11)

2.55pm - 3.55pm

4.01	**Modelling Engineering: a case study of interdisciplinary science, engineering and mathematics for Years 10 and 11**	*Amanda Brook, Australian Science and Mathematics School*	Science (Years 10-11), Mathematics (Years 10-11)
4.02	**Making Virtual Reality, a Reality?!**	*Jo Kellaway & Sam Moyle, Australian Science and Mathematics School*	Science (Years 6-11), Mathematics (Years 6-11), Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)
4.03	**The Problem with Percentage**	*Sharon Kennare, MASA*	Mathematics (Years 6-9)
4.04	**Visualising the abstract in teaching Algebra in the Middle Years**	*Brian Wong, Plympton International College*	Mathematics (Years 6-9)
4.05	**Changing the world with STEM – Sharing how STEM changes our world**	*Michelle McLeod, RiAus*	
4.06	**Exploring Surveying as a real-world authentic use case for maths theories.**	*Graham Walker, Surveying SA*	Mathematics (Years 6-11)
4.07	**Could data save Humpty? A new approach to the classic egg drop**	*Stuart Lewis, Scientrific Pty Ltd*	Science (Years 6-11)
4.08	**Designing new Stage 1 Direct Investigations through A.I. influence**	*Tim Salinger, Southern Vales Christian College*	Mathematics (Years 6-11)

Workshops

Session 1 | 10.40am – 11.40am

1.01 Engineering a Monster? Authentic, hands-on STEM learning with industry connections.

Kyran Zippel & Nikki Asikas, Australian Science and Mathematics School

Join us in exploring interdisciplinary connections between maths, science, engineering and industry. This topic called "Engineering a Monster?" runs for a semester and links maths, science, english, history, engineering, technology and ethics. Check out some of the industry links and excursion opportunities that students have within this course that provides them with real life engineering contexts, authentic assessment, career pathways and inspiration for their collaborative inquiries.

Target audience: Mathematics (Years 10-11), Science (Years 10-11)

1.02 How close are we to "The Math(s) Fix?"

David Dempsey, CSIRO STEM Professionals in Schools participant and Independent STEM Consultant

In an exponential knowledge age, technical understanding is gold and incremental tweaks aren't working fast enough to address student engagement and teacher burnout and to prepare students, whether for life and / or career. "We need to run the logic of the maths process on re-imagining maths education itself." Conrad Wolfram said in his 2020 book "The Math(s) Fix". His proposals are logically thought-through, address the multiple problems with current maths instruction and have been validated in trials of new method / preparation / curriculum / materials and assessment.

A specialist in use of computers in education with deep understanding of how professionals use mathematics in the real world, what is needed for Australia to re-imagine computational learning, and so gain an edge for the future?

Target audience: Science (Years 6-11), Mathematics (Years 6-11), Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)

1.03 ChatGPT for teachers

Paul Gavini & James Dundon, Modbury High School

This workshop aims to introduce educators to the potential of ChatGPT as an educational tool. The session will cover various aspects of integrating ChatGPT into the classroom, including creating multiple and short answer questions, literacy tasks, differentiation strategies, and aligning content with the Department for Education (DfE) curriculum. Participants will also learn how to mark and provide effective feedback to students.

Target audience: Science (Years 6-11)

1.04 Wildlife Centre - Numeracy, Science and Technology

Ana Marques Britto & Danielle Martin, Playford International College

Students participate with numeracy development as they work with, and learn about animals in the Wildlife Centre. Through theme-based learning, students are engaged and motivated to apply a variety of mathematical skills to solve authentic real-world problems. They learn Science concepts and use the Technology to create solutions for real life issues.

Target audience: Science (Years 6-11), Mathematics (Years 6-11)

1.05 Project X - A Laser Based Resource Guide built under partnership between Trotec Laser and Stem Fasttrack.

Ben Branford, Trotec Laser

Join Trotec Laser and Stem Fasttrack as we discuss Stage 1 of Project X. See the Learning Area Resource Kits we have built and collaborate with us on the future development of Project X.

At its core, Project X is built on links to the Australian Curriculum Achievement Standards and General Capabilities.

Project X is a laser technique building and resource program that develops real skills sought by employers across Australia. We encourage connection to industry and support collaboration between Student and Industry. Our goal is for Students to be "Job Ready".

Project X uses the power of laser technology and its exclusive access to industry standard software, Trotec Ruby, to assist Student and Teacher engagement. We focus on building confidence with technology, reducing the fear of failure and leading with an inquiry-based mindset, while using design thinking principals.

We believe in leaning into the typical fears surrounding technology, and taking well calculated risks. We have so far experienced positive results with a strong level of Student and Teacher engagement while still encouraging creativity and problem solving skills.

In this Workshop we will also discuss the Stage 2 Pilot Program for 2024 which is open to all South Australian Schools and is not limited by access to existing laser equipment or to branding of existing laser equipment. Stage 2 invites the collaboration of innovative Educators across all curriculum areas who are eager to push boundaries.

Target audience: Science (Years 6-11), Mathematics (Years 6-11), Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)

1.06 Mathematics Anxiety: Aetiology & Strategies for students

Dr Simon Fuller, Adelaide North Special School

At the start of this workshop, we will delve into the neuro-cognitive and social-emotional causes of Mathematics Anxiety. The workshop will look at some key findings from the Learning Sciences as how to tackle this growing challenge in the classroom.

Target audience: Science (Years 6-9), Mathematics (Years 6-9), Design & Technologies (Years 6-9)

1.07 Flexible Physics Teaching and Learning Strategies for All Students

Stefania Pulford & Lachlan Loader, Thebarton Senior College

This workshop explores a variety of innovative teaching and learning strategies that can be used to engage all students in physics, including the use of multisensory scaffolding and using strategies that involve engagement with real life applications, group work and learner created knowledge.

The workshop will model these strategies and provide teachers with practical solutions to engage a diverse range of learners. We will discuss how AI can be used to provide students with individualised scaffolding and support, tailored to their learning needs and preferences, to generate personalised learning content, provide immediate feedback, and adapt the learning environment. We will also discuss how meaningful real-world contexts can make learning more relevant (providing the contacts we use), while modelling the activities we use to engage students with collaborative learning styles to develop important job-ready teamwork skills.

This workshop is ideal for physics teachers who are looking for new ways to engage their students and help them achieve their full potential.

Target audience: Science (Years 10-11)

1.08 Careers with Mathematics - How maths underpins a vast array of jobs in Economics and Finance

Susan Stone, University of South Australia

This workshop will discuss how maths is used in careers in Economics and Finance in some unexpected ways. It will present ways to make the applications of math concepts, but more importantly maths thinking, come alive in real world applications like the climate debate (in a cost/benefit analysis), immigration and inequality. It will touch on new ways to look at old questions.

Target audience: Mathematics (Years 6-11), Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)

Session 2 | 11.45am – 12.45pm

2.01 STEM applications in Meteorology

Bonnie Haselgrove, Bureau of Meteorology

Mathematics and science play a critical role in our ability to observe and predict the weather which touches the lives of all Australians every day. In this workshop we will discuss how STEM underpins the products and services provided by the Bureau of Meteorology. We will consider simple real life examples from meteorology, for both atmospheric observation and predictive services, and adjacent fields such as hydrology and climatology. Examples will be aimed at a range of year levels and strands.

Target audience: Science (Years 6-11), Mathematics (Years 6-11), Digital Technologies (Years 6-9)

2.02 From Flat Screen to Spatial Reasoning

Jarrad Strain, Cardijn College

Spatial reasoning is an essential skill for Mathematics and STEM education, but it is often challenging for students to develop, particularly moving from 2D surfaces into 3D spaces. As part of the new ACARA curriculum, 3D coordinate systems are now included in the curriculum. This PD will look at some learning experiences completed by students to explore 3D spatial reasoning:

- Creating and manipulating 3D shapes using physical objects and Geogebra AR
- Plotting and visualising points, lines, and planes in 3D coordinate systems
- Exploring the relationships between 2D and 3D representations of geometric objects

This workshop will include opportunities for participants to try activities on devices.

Target audience: Science (Years 6-9), Mathematics (Years 6-11), Design & Technologies (Years 6-9), Digital Technologies (Years 6-11)

2.03 Growing from strength to strength - Strength-based learning in your class

Gregory Rowbotham, CSIRO Education and Outreach - STEM together & Daizee Wiles, CSIRO

CSIRO's STEM Together program is all about building the confidence, capability and connections of Australia's next generation of future-shapers. In this interactive workshop, participants will engage in strength-based learning, with emphasis on fostering a more inclusive learning environment, supporting disadvantaged students and expanding opportunities for every class member. We will explore instantly applicable Strength-based teaching strategies and other 21st Century skills, allowing every student and educator to grow from strength to strength.

Target audience: Science (Years 6-11), Mathematics (Years 6-11), Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)

2.04 10 tips for teaching in the Age of AI

Hayden Tronnolone, Flinders University & Dr Alix Verdon, Australian Science and Mathematics School

Join us for a workshop where Flinders University and ASMS staff share their journeys in AI within education. Explore the potential of using generative AI in assessment, as well as techniques for designing AI resilient assessment. Hear about our respective learnings this year as we've developed processes and guidelines to support teachers and students in using AI, with our 10 tips for teaching in the age of AI.

Target audience: Science (Years 6-11), Mathematics (Years 6-11)

2.05 Exploring the mathematics in science, technology, (and engineering).

Ann Ruckert, Open Access College

In this workshop, the core mathematical skills, concepts, and understandings necessary to ensure deep participation in STEM are described. STEM activities will be shared for participants to engage with. These are suitable to be incorporated into Science and Technology lessons for various year levels, from Primary to Upper Secondary.

Target audience: Science (Years 6-11), Mathematics (Years 6-11), Design & Technologies (Years 6-9), Digital Technologies (Years 10-11)

2.06 STEM in FILM – Connecting and celebrating the vision of STEM with SCINEMA Junior, Oliphant Science Awards and Mathematics Challenges

Michelle McLeod, RiAus

Join this session to amplify STEM and multimedia connections in your classroom, including enhancing your use of film as a teaching tool, supporting your students to create STEM multimedia content showcasing their interests and understanding, and encouraging your school community to participate in FREE STEM multimedia challenges. Delve into FREE classroom content that utilises SCINEMA International Science Film Festival entries to explain and explore STEM concepts and innovations. Discover how to inspire your students to become STEM communicators and storytellers through SCINEMA Junior, the Junior Secondary Mathematics Enrichment Program (JSMEP), South Australian Mathematics Talent Quest (SAMTQ) and the Oliphant Science Awards, supporting them to create and share multimedia content that celebrates the power of the moving image, satisfies the curious, explains the baffling and asks the impossible.

Target audience: Science (Years 6-11); Mathematics (Years 6-11), Digital Technologies (Years 6-11)

2.07 IoT: Connecting STEM Skills to Future Careers

Claire Hughes, The University of Adelaide

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Join us for an engaging workshop that delves into the world of the Internet of Things (IoT) and its profound impact on the future of STEM education and careers. In this interactive session, you will explore the fundamentals of IoT, discover how STEM skills play a pivotal role in shaping this cutting-edge field, and gain insights into the myriad of career opportunities it presents. Through group activities and discussions, you'll gain real-world insights, leaving equipped with a newfound understanding of IoT's significance, ready to inspire future STEM enthusiasts. Don't miss this opportunity to connect STEM with the IoT's exciting possibilities!

Target audience: Science (Years 6-9), Mathematics (Years 6-9), Design & Technologies (Years 6-9), Digital Technologies (Years 6-9)

2.08 STEM in action - an actuarial perspective.

Jules Gribble, PFS Consulting & Sharon Kennare, MASA

Actuaries apply knowledge from a broad range of disciplines, including mathematics, to the challenges of solving business problems. The package of skills required for success include technical skills, professional and communication skills, and a range of skills that support innovation and problem solving.

We will give some context by summarising what actuaries do, areas they work in, and how to become an actuary. We will explore the similarities between transferable actuarial skills and the underlying skills needed in STEM applications and roles. Some specific skills that actuaries bring to the table include constructive skepticism, the capacity to make judgements in the face of incomplete information, an understanding of fairness and equity, and an understanding of materiality.

Actuaries solve problems, typically in financial contexts such as insurance, superannuation, and risk management. These problems often require projecting into the future and so inherently address uncertainty as the future is not guaranteed. As with other STEM subject areas, actuaries 'learn by doing' and so continually develop their skills and insights.

Having introduced the profession, we will collaboratively look at examples of an actuarial approach to some topics included in the senior high school mathematics and science curriculums. We will look at:

- The 'tyranny of the average' and unpacking this using an actuarial approach, and
- Risk management and approaches to risk management.

In summary, we will 'lift the lid' on the actuarial skill set in a STEM context, leaving participants with some ideas they can take back to their work.

Target audience: Science (Years 10-11), Mathematics (Years 10-11)

Session 3 | 1.50pm – 2.50pm

3.01 Exploring the role of South Australia's critical mineral resources in a carbon neutral future

Kelly Sharrad, Geoscience Pathways Project

Teachers will experience a workshop that explores the critical mineral resources found within South Australia hosted by the Tonsley Core Library. This workshop will include examining core from several critical mines in our backyard that are responsible for providing the minerals required in carbon neutral technology including wind turbines, solar, batteries and electric vehicles. Teachers will be put in the shoes of their students as they are led through the workshop activities that align with Year 8 ACARA Australian Curriculum: Science and Year 11 and 12 SACE Earth and Environmental Science.

Target audience: Science (Years 6-11)

3.02 Tibial Fracture Workshop

Dr Francesca Bucci, Biomechanics Research Associate, Medical Devices Research Institute at Flinders University

Tibial Fracture Workshop: A Hands-On Journey through STEM Applications, Bridging Math, Science, and Orthopaedics for Real-World Challenges. Embark on an immersive journey into the captivating realm where mathematics, science, engineering, and medicine converge. In our workshop, delve into a real-life application of STEM disciplines, intricately weaving engineering, and medicine into a practical and engaging approach to understanding orthopedic medicine. We'll kick things off with a quick tour of the biomechanics lab.

- Explore Knee Joint Mechanics and Tibial Fractures: Delve into the intricate workings of the knee joint, from its normal function to the impact of injuries and conditions. Gain insights into the mechanics of tibial fractures, providing real-world context for STEM applications.
- Design Interventions for Orthopedic Challenges: Put your knowledge into action by designing interventions for tibial fractures and taking on the role of a surgeon. Develop problem-solving skills through hands-on experience, applying STEM principles in a practical context.
- Inspire Your Students with Engaging STEM Activities: This workshop equips you to bring fascinating real-world examples back to your students, igniting their interest in STEM by showcasing the captivating world where mathematics, science, engineering, and medicine intersect.

Target audience: Science (Years 6-11), Design & Technologies (Years 6-11)

3.03 Dreamhouse Project - interdisciplinary of Mathematics, Technology, Science and English.

Brian Wong, Plympton International College

This workshop aims to allow the participants to:

1. View and give feedback to an example of Dream House project interdisciplinary unit across Mathematics (Measurement), Digital/Design Technology, Science (Sustainability) and English (Persuasive Writing).
2. Draft their own interdisciplinary units and obtain feedback from others. Participants are encouraged to bring in a Learning and Assessment Plan (LAP) of the subjects they wish to create interdisciplinary units from.

Target audience: Science (Years 6-9), Mathematics (Years 6-9), Design & Technologies (Years 6-9), Digital Technologies (Years 6-9)

3.04 Teaching the Tricky Stuff: Harnessing Mathematics Education Research to Improve Learning in Science Classrooms.

Ashleigh Schofield, Prince Alfred College

Many of the core concepts taught in science lessons have a counterintuitive nature and are underpinned by mathematical reasoning. Effective teaching methods, grounded in education research, can support students to understand new concepts quickly and help them retain that new knowledge. This presentation will demonstrate how worked examples and interleaving effects can be leveraged in science classrooms to improve the teaching of challenging science concepts.

Target audience: Science (Years 6-11)

3.05 Connecting Engineering with STEM Investigations - incorporating STEM in Action in your classroom

Michelle McLeod, RiAus

Join this session to grow your collection of hands-on STEM activities. The Royal Institution of Australia and a range of engineering collectives are working in partnership to create a collection of curriculum connected STEM Investigations. This hands-on workshop session will demonstrate a range of learning activities showcasing current and emerging research, and highlighting connections with STEM curriculum. These activities provide hands-on student experiences; develop critical and creative thinking; engage group work and collaboration skills; and inspire deeper understanding of STEM study and career pathways. They can be adapted for use across various STEM subjects.

Participants will have the opportunity to move between a number of activity zones connected with engineering disciplines, including process manufacturing; the urban water cycle; and investigate the sustainable development of communities - on and off world. Join us to explore how you can engage your students to better understand the role they can play in constructing the communities of today and tomorrow.

Target audience: Science (Years 6-11); Mathematics (Years 6-11); Design & Technologies (Years 6-11),

3.06 Sieging Dunsinane Castle - A science, maths, English extravaganza!

Sam Moyle & Jo Kellaway, Australian Science and Mathematics School

Join us to use catapults to understand quadratic equations and energy transformations through the lens of MacBeth. Interdisciplinary learning is the cornerstone of curriculum delivery for Years 10 and 11 at ASMS. In this workshop, participants will have the opportunity to use catapults and motion capture software (Tracker) to explore modelling quadratic equations using projectiles to 'take down' MacBeth. They will use this data to identify intercepts and vertices as they relate to the varying forms of quadratic equations and analyse motion. Using this manipulative learning approach, enables differentiated strategies to assist students to understand and identify;

- Energy types and transformations.
- The relationship between the coefficients of quadratic equations and their shape and position on the Cartesian plane.
- Simplistically model the Law of Conservation of Energy to calculate potential and kinetic energy use.
- The connection between forces and motion.

This workshop aligns with curriculum connected to AC Year 10 Science, Maths and English and SACE Stage 1, Quadratic relationships (foundation understandings), Physics - Motion and forces and English - Text creation. What could be more fun than flinging marshmallows around a classroom?!

Target audience: Science (Years 6-11), Mathematics (Years 6-11)

3.07 Tips and Ideas for the Early Career Teacher of Mathematics

Sharon Kennare & Ana Marques Britto, MASA

This workshop will endeavour to give support to early career and pre-service teachers in curriculum, pedagogy and technology. Discussion will be held on writing the learning intention, successful criteria, checking for understanding, hinge questions, exit tickets, pair and share, white board, HITS, hands on activities, how to write open-ended investigations, differentiation of topics, and use of various technology platforms will occur.

Target audience: Mathematics (Years 6-11)

3.08 STEM approaches using Data Loggers

Stuart Lewis, Scientrific Pty Ltd

"STEM is science where you think with your hands" Are you looking for ways of imbedding STEM activities into the Australian Curriculum? Are you looking for a way to revive and extend your existing science equipment? This workshop will use Vernier data loggers to explore different STEM experiments. Topics will include:

- A reimagining of the classic Egg Drop experiment to include data and tie it to the Curriculum;
- Using Vernier probes with Arduino and Scratch;
- A look at how to build the Microsoft robotic hand challenge.

Target audience: Science (Years 6-11)

Session 4 | 2.55pm – 3.55pm

4.01 Modelling Engineering: a case study of interdisciplinary science, engineering and mathematics for Years 10 and 11

Amanda Brook, Australian Science and Mathematics School

Year 10 and 11 students at the Australian Science and Mathematics School have been engaged in a term-long interdisciplinary project where they take on the role of engineers and create a solution to a problem, iterating through the design cycle, using scientific inquiry skills to test and analyse, and modelling their data using mathematical techniques. See how science, engineering and mathematics have combined to create self-watering plants with coded Arduino-based pumps, new types of Shoe Glue to fix shoes, multi-stage bottle rockets with parachutes, bioslime hand sanitiser, self-cleaning doorknobs, chess programs that teach and explain strategies and so much more.

Target audience: Science (Years 10-11), Mathematics (Years 10-11)

4.02 Making Virtual Reality, a Reality?!

Jo Kellaway & Sam Moyle, Australian Science and Mathematics School

How can you authentically and simply utilise VR/AR/XR to enhance student learning?

Often this emerging digital technology is viewed as a gimmick. At ASMS we have been exploring how to embed a range of reality softwares into learning design, to authentically connect to curriculum and enhance learning experiences. From content consumption through to content creation, join us to discover and experience a range of VR/AR technologies, such as CoSpaces, Google Earth, Merge Cube, JigSpace, YouTube VR and Minecraft, and participate in a discussion regarding the costs, pitfalls, device options, adaptive strategies and authentic curriculum blending.

Target audience: Science (Years 6-11), Mathematics (Years 6-11), Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)

4.03 The Problem with Percentage

Sharon Kennare, MASA

Looking at an investigation on Percentage involving sheep. This investigation covers the content descriptor AC9M6N09 using mathematical modelling to solve a practical problem using percentages for Farmer Kate. Technology will be incorporated in this investigation. Discussion on how the students are to present their investigation as well as justifying the choices made. Ideas will be presented on how to differentiate and make the investigation open ended.

Target audience: Mathematics (Years 6-9)

4.04 Visualising the abstract in teaching Algebra in the Middle Years

Brian Wong, Plympton International College

This workshop aims to allow the participants to:

1. Utilise the Bar model to help visualize abstract concepts in solving algebraic word problems.
2. Utilise digital manipulative(s) to help visualising concepts in solving algebraic equations

Target audience: Mathematics (Years 6-9)

4.05 Changing the world with STEM – Sharing how STEM changes our world

Michelle McLeod, RiAus

Interested in connecting your classroom and learning activities with current and emerging STEM research? Looking to utilise resources and activities that incorporate STEM in Action examples from across the STEM fields? Come along to learn about the FREE Australian Curriculum connected resources available through The Royal Institution of Australia's (RiAus) STEM Education Platform. Utilising content from COSMOS Magazine, and a range of partnerships including the Australian Antarctic Division, the Minderoo Flourishing Oceans project and other Australian institutions, our resources provide learning activities connected with science as a human endeavour examples, cross-curricular priorities and subject content topics, whilst also incorporating hands-on activities and conceptualising links between research and curriculum. Join this session to explore available resources and activities, suggest new ideas, explore research examples, and network with colleagues.

Target audience: Science (Years 6-11); Mathematics (Years 6-11); Design & Technologies (Years 6-11), Digital Technologies (Years 6-11)

4.06 Exploring Surveying as a real-world authentic use case for maths theories

Graham Walker, Surveying SA

Surveying relies heavily on mathematics and as such can be used as a practical and authentic example of where mathematical theories are useful in the real-world. Taking trigonometry as an example, the surveyors Total Station is a pure trigonometry machine, and is relied on heavily by surveyors to go about their day-to-day duties. This interactive workshop will look to work with the teachers present to explore different authentic examples, exercises, practicals, and use cases where surveying can help add context to the maths curriculum being taught, with the ultimate aim being improvement of student engagement.

Target audience: Mathematics (Years 6-11)

4.07 Could data save Humpty? A new approach to the classic egg drop

Stuart Lewis, Scientrific Pty Ltd

The key element of STEM is form and functional design in a problem solving context. If you are looking for ways to engage your students in real world problem solving that incorporates design and testing regimes in an integrated cross-curricular approach, then this workshop is for you. The workshop challenges participants to design and test a device to prevent the fracturing of an egg when dropped. This will involve a functional engineering design, principles of science supported by data (Mathematics) to provide a solution (Technology). Don't worry about the mess! We will clean it up if your design doesn't "work".

Target audience: Science (Years 6-11)

4.08 Designing new Stage 1 Direct Investigations through A.I. influence

Tim Salinger, Southern Vales Christian College

This workshop aims to give additional insight of new ideas that are possible through artificial intelligence. I'll be describing in detail how a new Stage 1 Direct Investigation came to life through different design stages: identifying the problem, brainstorming 'Hooks', utilising A.I., connecting key ideas in curriculum, and writing a new task sheet. Participants will be experiencing first hand my new Direct Investigation, as well as being part of the iterative process to improve the task, and its richness.

Target audience: Mathematics (Years 6-11)

Program correct as of 30 November 2023 but may be subject to change without notice.

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