

STATIC

The Newsletter of the Science Teachers Association of Tasmania.



November 2018, Volume 4



stat.

Science Teachers
Association of Tasmania Inc.



STAT on social media.

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From the Editor...



Putting the E in STEM

The current growth in STEM education offers an opportunity to engage students in inquiry-based learning, solve problems and recognise the relevance of science to society. STEM, as the acronym suggests, has four facets although it has tended to be the domain of science teachers to facilitate all four synchronously. To be genuine within the domain of STEM, each facet should be evident, although not all four need be integrated in any one activity and the balance will change accordingly.

As science teachers, science will be the one aspect underpinning what we teach. Mathematics can be integrated within STEM through any aspect of spatial reasoning, using measurement or graphing and analysing results. Technology is at our fingertips through ICT and the use of various products such as Sphero, LEGO and Beebots. This not only embraces digital technologies within the curriculum, but also design and technologies, enhancing students' practical skills in more traditional ways. According to the Vice Chancellor of UTAS, Professor Rufus Black, the one facet of STEM requiring greater emphasis and promotion in schools is engineering.

Engineering

/ɛndʒɪˈnɪəriŋ/
noun

1. the branch of science and technology concerned with the design, building, and use of engines, machines, and structures

Tasmania could be at the forefront of engineering in Australia and indeed, has produced world-class skilled practitioners. Tasmanian engineering talent has appeared in America, Europe and Asia, and is host to world-class institutions such as the Australian Maritime College. Last year, the number of vacancies in engineering jobs in the state, increased by 22% and this is a key component in the efforts to keep talented people in Tasmania. We are lucky to live in a beautiful state with rich natural areas, resources and a stunning diverse landscape. This geographical isolation has been used as an excuse for underdeveloped opportunities in the past, whereas it should be seen as an advantage. Somewhat set adrift, we are rife with uniqueness requiring an imaginative mindset to create opportunities and solve problems to tread our own path. Tasmania generates its electricity through hydro, has paper mills and boatbuilding, World Heritage and MONA, the West Coast Wilderness Railway and convict heritage. All this defines and reflects our character and depends upon engineering solutions in one way or another.



AMC: An example of Tasmanian engineering excellence.

We are on the brink of decisions requiring wise choices in order to fulfil our responsibility as current custodians of wilderness and convict heritage. To minimise the impacts of increased tourism we will need clever engineering. Issues surrounding climate change, biosecurity, water management or coastal development, require engineering solutions and STEM skills. Articles in this edition include STEM projects on fruit fly management and floodwater response highlighting an approach to teaching that engages students in these issues and develops invaluable skills.

These also develop less tangible skills students will draw upon in the future. They also need drive, ambition and imagination to carve out a future we may not yet perceive. If we facilitate these skills in students now, there is every room for optimism for a bright future.

Catching Fruit Flies: A Pressing STEM-based Local Challenge.

By John Bardenhagen

Developmental concept originating from an actual local issue using a STEM-based approach to solve a known problem.

Setting the Scene.

The Queensland fruit fly has been detected in two regions of Tasmania and control zones have been set up to monitor this alarming development. Use your knowledge of the fruit fly using the “know thy enemy” principle to design and construct a fruit fly trap that would work in the field.

Learning Goals.

Know:

- That Queensland fruit flies have been detected in Tasmania.
- Our horticultural industry is at risk.
- Exclusion/control zones have been set up.
- Traps, amongst other measures, can be effective in trapping fruit fly.

Understand:

- The fruit fly could compromise our premium high end fruit and vegetable industry.
- Fruit fly could jeopardise our fruit export potential.
- The flow on effects to the Tasmanian economy could be very harmful.
- Fruit fly can arrive in Tasmania via many different means.
- Detection and eradication strategies have been implemented.
- Traps are simple, but an understanding of “the enemy” is critical to designing an effective trap.

Do:

- From a design, make a fruit trap that theoretically could be used in the field.
- Use problem solving techniques involving prediction, trial and reflection to produce a workable solution.
- Reflect on and suggest improvements to the STEM process/es used.

Suggested Curriculum Links:

Science: Students understand the growth and survival of living things are affected by physical conditions of their environment.

Design and Technologies: Students work collaboratively to identify and sequence steps needed for a design task. They negotiate and develop plans to complete design tasks, and follow plans to complete design tasks safely, making adjustments to plans when necessary.

Design Brief: Queensland Fruit Fly Eradication from Tasmania.

Pre planning.

1. *What is the problem?*
2. *What harm could the fruit fly cause?*
3. *What is our goal?*
4. *Who are our clients?*
5. *What considerations (known facts about fruit flies) must we think of to incorporate into our design?*

Design sketches and materials.

Draw a labelled design to scale.

What materials and products will we be using to make our trap?

Reflection.

6. What were some key features of your trap?
7. Why would this trap work?
8. What might go wrong with the trap?
9. What would I change to make it more effective?
10. What are some of the key things I learned from this exercise?



Photograph of your invention.

Fruit Fly Trap Assessment Ratings.

rating	Teacher	Our
Does your diagram match what you made?	/10	/10
Is how the trap works well explained on your plan?	/10	/10
Will your trap, trap only the target/fruit fly?	/10	/10
Will your bait attract the fruit fly?	/10	/10
Is it likely the fruit fly will escape your trap?	/10	/10
Is the fruit fly trap designed to kill the fruit fly?	/10	/10
Does your trap show you understand your enemy? (the “science” to defeat it)	/10	/10
Our mark out of		/70
Our teacher’s mark out of		/70
Where was there a big difference? Why?		

The Final Products.



For more information about this unit and for supporting documents tailor made for primary aged students, contact john.bardenhagen@education.tas.gov.au (STAT Secretary).

Launceston Floodscapes by Kristy Tidey

Our Invermay Primary students have recently been involved in an amazing collaborative project facilitated by local artist Karen Revie, creative director of The Holographic Lounge. Floodscapes is a flood awareness project consisting of three short films that deliver key safety messages to the local community, including the dangers of flood waters, how to make a pet emergency plan, and how you can help your community stay safe. The Floodscapes project videos were created as a shareable community resource, based on the idea that people increasingly turn to social media to learn about what to do in emergencies.

In consultation with City of Launceston and SES, Floodscapes project leader Karen Revie involved students from Invermay Primary School, Launceston Big Picture School and the meenah neenah Aboriginal Cultural Education Program in creating these important community resources. Our schools are located directly in Launceston's flood zones and students have first-hand experience of the impact of floods after being evacuated during the devastating 2016 Launceston floods.

The Floodscapes video production involved students creating drawings that were then animated onto background footage from the 2016 floods. Auslan translations were filmed by student interns from Big Picture School, this inclusion helps to ensure that the films are accessible to people with hearing impairments.

The team worked with the Council's Emergency Management Coordinator, Bev Allen, who provided valuable consultation to the Floodscapes project developing the original flood safety messages with SES, visiting schools during the workshop phase and speaking to the media about the importance of the project. It was a true collaborative effort and a great project for the community by the community.

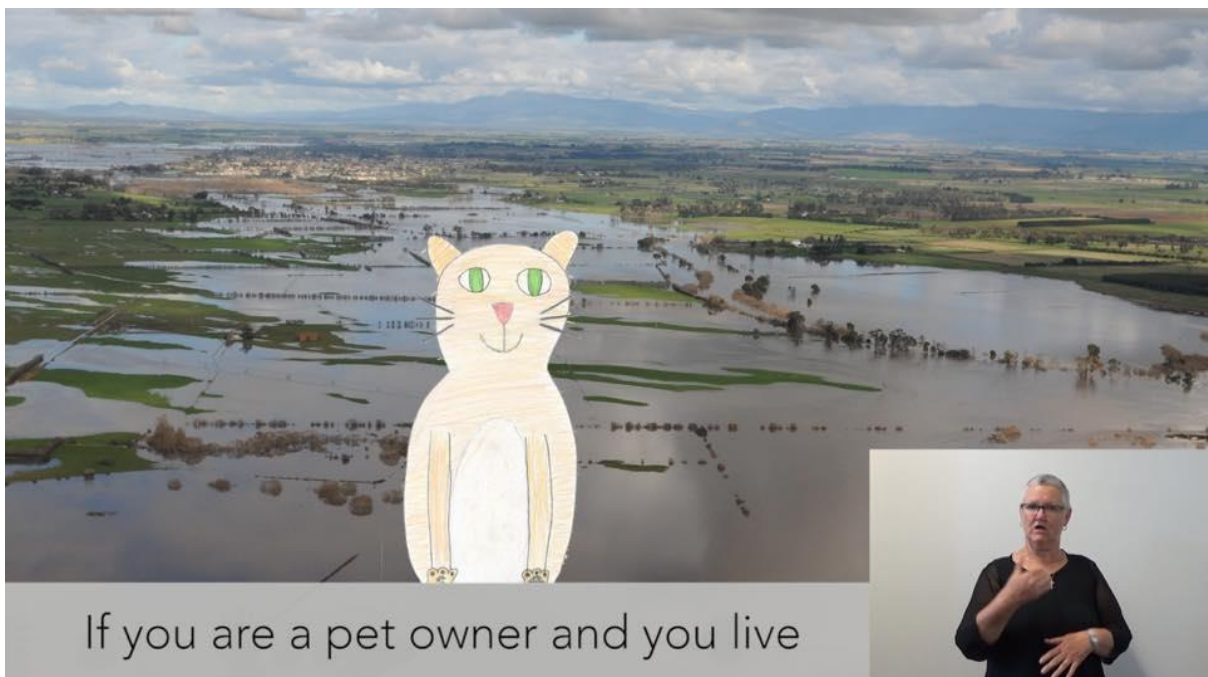
Active learning partnerships within the community provide a lasting sense of belonging and purpose for our students. It allows them to form meaningful connections with mentors, and they are empowered by the opportunity to be messengers for our city, sharing their knowledge in authentic ways.

The Floodscapes team have been interviewed multiple times by local radio and television news outlets speaking about the meaning behind this project, what they've learned and the roles people played in this collaboration. This real-world project has seen students' confidence, ownership of learning, and the desire to produce meaningful work increase exponentially. As Karen Revie aptly points out, "Young people are the future leaders of the community ... It is much more effective when you have children educating adults, so we deliberately put the power in their hands."

The project was funded by a City of Launceston community grant, and the three short films will be used for awareness campaigns, and during emergencies. The films debuted in May at the Breath of Fresh Air Film Festival held in Launceston and are now available on the City of Launceston and TasALERT websites.

The Floodscapes team were recipients of this year's Resilient Australia Schools award at a state level and will now proceed to the national awards facilitated by the Australian Institute of Disaster Resilience.

<https://stem2018.blogspot.com/2018/10/floodscapes-community-project.html>





Book Review by Jill Reade

‘Science Education for Australian Students; Teaching Science from Foundation to Year 12’.

Edited by Angela Fitzgerald and Deborah Corrigan Published by Allen and Unwin; 2018

What is it about?

The name says it all. This is a comprehensive book about Teaching Science. It talks about all aspects of Science Education in 2018. Sections include an initial focus on *Science and the Learner*; followed by *Understanding Science* which outlines connections to the Australian Curriculum Science, the Nature of Science and Science Investigations; then a section on *Pedagogy and Assessment*, including a chapter on Pedagogical Content Knowledge and finally *New Approaches in Teaching and Teacher Development*.

Who might buy this book?

Well, anyone interested in Science Education, but it would be useful to preservice teachers; early career teachers as well as experienced teachers who want to freshen their Science teaching or broaden their practice. Teacher Educators would also find it informative.

What did I like?

The case studies/vignettes taken from real teacher’s (and scientists) experiences and used to illustrate the theme of the chapter made it readable and relevant. The explanatory notes at the side of pages used to explain possibly new and important terms and ideas. The way the book was organised so that it developed important themes around Science education. This means you can dip in and out as you have time or return to an idea which you want to review or where you want to develop further understanding. It connected and used illustrations from the big ideas in Science in ways that developed the chapter’s theme. It really did attempt to use examples from most levels of schooling. It paid more than lip service to covering both primary and secondary teacher’s interests. Each chapter includes questions to challenge your thinking and comprehensive references.

What didn’t I like?

Not much really. One chapter became a little verbose but that was unusual. As both editors are Victorian there was some extra focus on the Victorian iteration of the Australian Curriculum Science, but it was clear that this approach was not used by other states.

Availability

I found it on the net from Allen and Unwin (\$59.99) and other book sellers for a bit less. STAT received a copy for review.

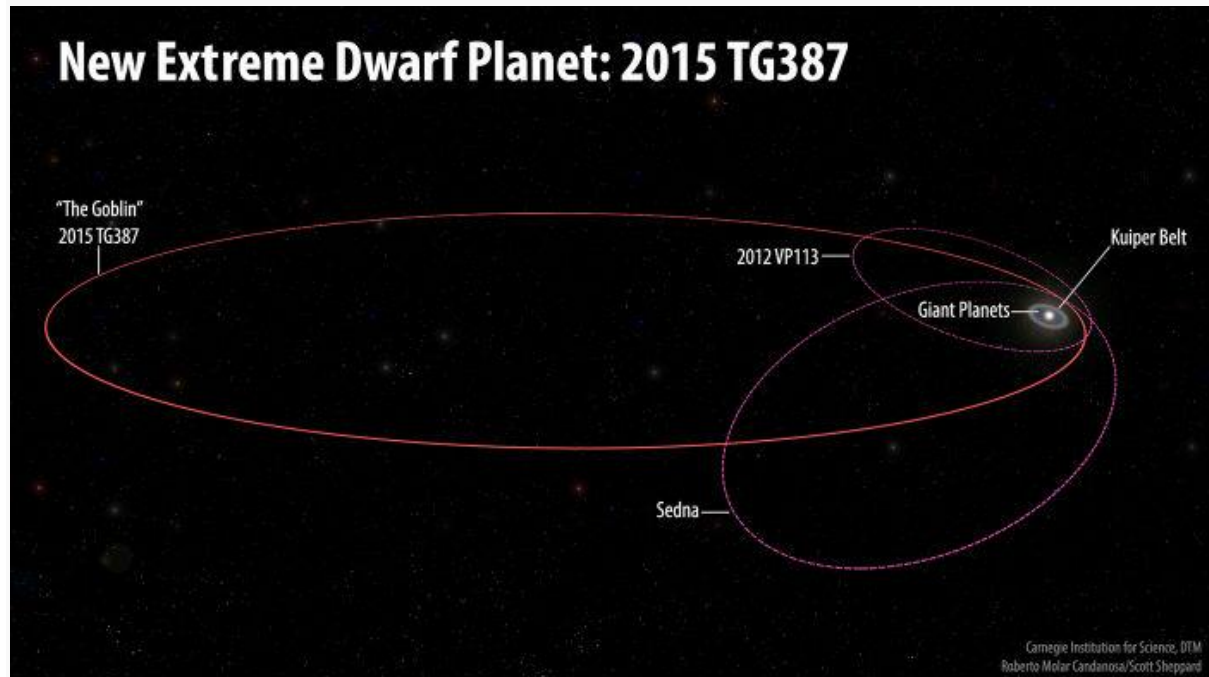
Overall I would recommend this book as an excellent addition to your library of Science education resources.

Scientific Snippets and Discoveries

Recent advances in knowledge worth sharing...

Dwarf Goblin at the Edge of the Solar System

A dwarf planet with a diameter of 300km has been observed for three years, although details have only recently been released. It orbits at a maximum of 2,300 AU, making it extraordinarily far away, at a lonely and chilly 345,000,000,000 Km. That distance takes it on an orbit lasting 40,000 years, although it swings closer in at 9,750,000,000 Km.



(Carnegie Institution for Science)

The discovery coincided with Halloween in 2015 and this inspired the name 'Goblin'. This, along with other recent observations, extend our perception of the solar system and begs the question; what else is out there awaiting our discovery?

<https://www.abc.net.au/news/2018-10-03/dwarf-planet-the-goblin-discovered-on-outskirts-of-solar-system/10331800>

The State of the Planet

Researchers from the University of Queensland (UQ) and the Wildlife Conservation Society (WCS) have reviewed the state of the world's pristine areas and have found us teetering on the edge of an environmental precipice. The land surface altered by the activities of humans stands at 77% and the figure rises to 87% in the oceans. Five countries now play host to 70% of remaining wilderness areas in inhabited continents (Australia, Brazil, USA, Canada and Russia). This has prompted calls for the protection of all remaining wilderness areas and certainly emphasises the obligation and responsibility Tasmania has in making

scientifically sound decisions on how we manage protected areas in the face of increasing population and visitor numbers.

<https://www.abc.net.au/news/science/2018-11-01/wilderness-australia-needs-protection/10447816>

Scents and Sense Ability: Smells increase available light to leaves.

Volatile organic compounds that give the sensation of the ethereal earthiness of the deep smell of a forest have been found to have an important role in plant growth. These compounds help scatter light, increasing the solar energy available for leaves and allowing greater efficiency in chloroplasts. Leaves otherwise in the shadows become exposed to this scattered light and the potential for forest growth increases. This also partly explains the soft nature of light in forests.

https://blog.doublehelix.csiro.au/why-do-forests-smell-so-good/?utm_source=Double+Helix+Extra&utm_campaign=2e4da7696a-EMAIL_CAMPAIGN_2018_03_01_COPY_01&utm_medium=email&utm_term=0_36b345597f-2e4da7696a-53724041

Artificial Intelligence in Cars and Moral Judgment

A survey of 2.3 million people worldwide has been conducted by researchers at MIT to gauge the kind of decision making prevalent in different cultures when faced with moral driving decisions. These involved scenarios whereby an imminent accident would result in the death of someone and the driver would have an influence on who would be spared. Responses fell into three broad groups, reflective of cultural backgrounds. For instance, in countries with strong government institutions, such as Finland, people crossing roads illegally were less likely to be spared than in countries with weaker institutions, such as Nigeria. Judgements based on perceived income were more influential in countries with greater economic disparity, so lower socio-economic pedestrians were less likely to be spared in Colombia than Finland. This all has ramifications for how we design automated cars and build integrated moral decision making into artificial intelligence. Whilst this should give us greater efficiency in road use and traffic flow in the future, accidents will still happen. Cultural perception is just another important facet of this and we now have greater insight as to what this looks like on our roads in different parts of the world.

https://www.nature.com/articles/d41586-018-07135-0?utm_source=briefing-dy&utm_medium=email&utm_campaign=briefing&utm_content=20181025

Kepler Runs out of Steam

‘The diversity of the phenomena of nature is so great, and the treasures hidden in the heavens so rich, precisely in order that the human mind shall never be lacking in fresh nourishment’. Thus said Johannes Kepler with an insight into the depths of future discoveries. The namesake space telescope was launched in 2009, experienced a near-terminal technical fault in 2013, but has now run out of fuel. The legacy is a vast uncovering of ‘the treasures hidden in the heavens’ since 2,681 planets beyond our solar system have now been confirmed by the light of stars dimming as an orbiting planet crosses in front. The final data was downloaded before the terminal moment, leaving researchers the job of confirming a further potential 2,900 planets.

https://www.nature.com/articles/d41586-018-07247-7?utm_source=briefing-dy&utm_medium=email&utm_campaign=briefing&utm_content=20181031

Spinal Cord Therapy enables Three Paralysed People to Walk Again.

Three men with severe spinal-cord injuries have received a revolutionary treatment that has enabled them to walk again, including outside. The spinal-cord received stepped electrical stimulation so that only certain groups of muscles could be activated in precise order. This was combined with physical therapy, resulting in muscle memory, such that patients could reproduce the movements without the need for the electrical stimulation. This has been the result of years of research, including the controversial use of animal testing. It has enabled us to better understand the way the nervous system and the brain responds to therapies. Spine injuries affect almost 500,000 people a year through accidents or violence and this lengthy and costly treatment would not be available to all. However, it could lead to a more effective treatment pathway for patients in the future.

https://www.nature.com/articles/d41586-018-07237-9?WT.ec_id=NATURE-20181102&utm_source=nature_etoc&utm_medium=email&utm_campaign=20181102&sap-outbound-id=1A6D77877F2B5166ED8C9DAC58A6C0375EE85D10

STATIC QUIZ

Easier:

- 1 Which Tasmanian endemic bird is flightless?
- 2 What condition can develop in marsupials if they are given bread to eat?
- 3 Which of the following cannot be placed in a recycling bin? Plastic bottles, milk cartons, toothpaste tubes or glass jars.
- 4 Kitchen foil is made using which metallic element?
- 5 What is measured using a spectrometer?
- 6 Which group of snakes shares its name with a coding language?
- 7 Which tree gives Australia its green and gold sporting colours?
- 8 What is the largest planet in the solar system?
- 9 Which two elements are found in a water molecule?
- 10 Which of the following is radioactive? Helium, Lead, Lithium or Uranium.

Harder:

- 1 Which element accounts for the majority of the mass of the Sun?
- 2 Who wrote 'The Blind Watchmaker'?
- 3 What is the smallest constellation in the night sky?
- 4 What colour is Betelgeuse?
- 5 What type of animal is a Clarence Galaxia?
- 6 Where is the largest volcano on earth?
- 7 What does 2-methyl-3-furanthiol taste like?
- 8 In which year did Charles Darwin publish 'On The Origin of Species'?
- 9 Which are the two driest Australian State capital cities?
- 10 How many species of frog are there in Tasmania?

And for those thinking completely sideways...

1. If you ate fish in March, beef in May and crabs in July, what would you eat for Christmas dinner?
2. What is the next number in the sequence? 11, 4, 6, 46, 2, 9, ?
3. Who is the odd one out? Darwin, Lindbergh, Lyell, Hutton, Goodyear.

Answers:

Easier:

- 1 Tasmanian Native-Hen
- 2 Lumpy-jaw
- 3 Toothpaste tubes
- 4 Aluminium
- 5 Colour
- 6 Python
- 7 Wattles
- 8 Jupiter
- 9 Hydrogen and Oxygen
- 10 Uranium

Harder:

- 1 Hydrogen
- 2 Richard Dawkins
- 3 Crux, the southern cross.
- 4 Orange, it is a red giant star in Orion
- 5 Fish
- 6 Hawaii
- 7 Chicken
- 8 1859
- 9 Adelaide and Hobart
- 10 11

Cryptic sideways thinking clues only!

- 1 Look to the stars!
- 2 Alphabetic periodicity
- 3 Think on a first name basis