STEM Learning Resources

The following resources offer a range of opportunities to enhance curriculum content, plus open students' eyes to diverse sciences in action & career pathways.

These resources provide **opportunities to highlight sciences underpinning agriculture**, with applications to STEM & cross-curricula learning.



Core resource sections:

- Learning Resources
- Career Pathways
- Inquiry-Based Learning

Learning Resources

Includes:

- Sciences of Agriculture; First Nations & Indigenous Learning; Climate Change; Film/video resources.

Sciences of Agriculture

- **TIA Professional Development Workbook: Engaging Students in STEM Using Agriculture** (Version 3, 2020). TIA developed resource. Diverse practicals and outside-in approaches (data-based inquiry) for students across multiple streams of STEM. Scootle resources included, plus use of existing digital resources/platforms.

- **TIA *SMART Farms* Dashboards**
    - **Live data dashboards** from **TIA's research facilities: Forthside Farm** (vegetable research facility) & **Elliott Farm** (Dairy Research Facility) based in the North West of Tasmania.
    - **Website**: https://www.utas.edu.au/research/projects/smart-farms/_nocache
    - **Curriculum link & experiences for students:** access data in the classroom (personal inquiry, problem solving, sustainability etc.); enquire about site visits to the facility.
    - **Ag Tech link:** use of Ag Tech to monitor factors on-site, inform operations, and assist research.

Compiled for TIA's Professional Learning Workshops *Engaging Students in STEM using Agriculture (2023).*
Contact bianca.deans@utas.edu.au for further information.

- **Farming Forecaster**
    - **Publicly available, free data** for local on-farm data and weather station networks. Combines weather, soil moisture, pasture production and livestock performance information.
    - Provides forecasts of pasture forecasts for months ahead. Dashboards & farm site information (detail of the specific sites).
    - Source of free data for case study potential (e.g., science, mathematics)
    - Tasmanian farms included: enables students to select specific regions in state, or nationally.
    - Website: https://farmingforecaster.com.au/RegionSelector

- **Tasmanian Farm Innovation Hub** report – Tasmanian Agriculture Technology Guide (2023)
    - **Agriculture Technology (Ag Tech) report** collating industry interviews with Tasmanian agricultural producers, capturing over 100 types of technology.
    - Highlights the challenges of Tasmanian agriculture & solutions through technology.
    - Covers industry areas of dairy, livestock, vegetables and fruit.
    - Includes an Ag Tech glossary for key terms.

- **Biosecurity Resources**
    - **Mission Biosecurity – national website, including resources**
        - Home website: https://www.missionbiosecurity.com.au/
        - Resources: https://www.missionbiosecurity.com.au/resources
        - Range of resources on this page, including:
            - **Videos:** Best beekeeping; Fruit Biosecurity; Good Bugs, Lady bugs; Cost of Invasive Pests.
            - **Podcasts:** Fruit Fly Special; Honey Bee Special; Cutting Edge of Biological Control

    - **Biosecurity Tasmania resources (NRE)**
        - School modules (primary & secondary schools)
        - Learning About Biosecurity resources
        - Outreach & engagement opportunities

- **Primary Industries Education Foundation Australia's (PIEFA)**
    - **Education Resources:** https://www.piefa.edu.au/education-resources.html
    - **Reports** & linking Australian Curriculum 9.0 areas: Food & Fibre with Design & Technology - https://www.piefa.edu.au/reports.html

    - **PrimeZone** – Over 700 food & fibre teaching resources. Platform provides teachers with single-point access to an extensive collection of engaging resources. From interactive activities to thought-provoking videos, PrimeZone has resources enhance students' understanding of agriculture in Australia.
        - Lesson plans – search function by subject (Australian curriculum alignment)

- **PrimeZone Academy** – free courses of content
  - **Horticulture:** Wine regions of AUS (year 9)
  - **Horticulture:** Protected cropping (year 9)
  - **Horticulture, community, & wellbeing:** Green your scene (years 7&8)
  - **Crops:** Intro to oilseeds, grains and pulses (Netquest)

- **Farmer Time:** https://farmertime.com.au/ Digitally connecting primary industry with classrooms (video links, Q&As with classrooms and students, enabling direct engagement with industry).

- **Australian Good Meat** resources (Meat & Livestock Australia)
  - Classroom-ready resources aligned with Australian Curriculum 9.0 (PIEFA co-developed content). Education resources – includes a variety of supplementary materials for livestock & careers in agriculture.

- **Tasmanian Agricultural Education Network (TAEN)**
  - Formed in 2015, the TAEN is an association affiliated with the National Association of Agricultural Educators (NAAE). Not only for educators, but for individuals and groups interested in promoting high-quality agricultural education.
  - **Website:** https://taen.org.au/
  - **Resources:** https://taen.org.au/resources-and-useful-links/

- **The Crawford Fund**
  - Range of curriculum-aligned secondary and senior secondary resources for educators available via their **NextGen** series of modules
  - Visit: https://www.crawfordfund.org/next-gen/#High_School_Teaching_Materials
  - These modules cover the challenges and opportunities including Climate Change & Food and Nutrition Security, Climate Smart Technologies, COVID-19 & Food and Nutrition Security, Australia – A Powerhouse of Agricultural Research, Gender Dimensions in Agriculture, Genebanks – More than Saving Seeds, and Food Loss & Waste.
  - Content, discussion guides, assessment tasks & assessment rubrics included:
  - **Development for A Better Future** series of modules:
    - Year 9-10 Educator Guide
    - Senior secondary guide (*see website to register for resource downloads*)

- **Royal Society of Agriculture NSW – Secondary teaching resources**
  - Resources home page: https://www.rasnsw.com.au/education/education-resources/secondary-schools/
  - Content areas include drones, dairy, soil quality and mapping, horticulture, livestock.

- **AgCard** – free resource modules for all stages of education (students, employees, employers). Pre-farm induction to promote best on-farm safety practices. Register for free via: https://www.agcard.com.au/
    - **Includes modules that students could complete** during: STEM inquiry-based modules/ electives (e.g., biosecurity modules), pre-work placements (e.g., farm safety).
    - **Opportunity for educators to create hybrid lessons** – discussions and investigations guided by the modules in AgCard. (e.g., Small groups or the whole class).
    - **Career advisor resource –** preparation for students to be work-ready & safety-aware.

- **VegPRO**
    - Vegetable industry education resources & short courses.
    - Funded by Hort Innovation, an Australian Government initiative.
    - Resources: https://www.vegpro.com.au/resources

- **FEAST – OzHarvest** (Food Education and Sustainability Training)
    - Curriculum-aligned program for primary and secondary schools – focuses upon food and sustainability: raising awareness of nutrition, reduce water and empower students to act locally in their communities. Program runs for 7-10 weeks as a STEM project-based learning program. Educator-led; leaders are encouraged to sign up to a teacher training day or an online training module.
    - High school program (years 7 & 8):
        - https://education.ozharvest.org/high-schools/.
        - FEAST's Australian Curriculum alignment – includes production & design content.

- **National Science Week** resources, include:
    - **Food Different By Design** (2021 educator resource). Includes lesson ideas and examples for years 7-10. Secondary school content see pg. 64 onwards.
    - Includes references to real-world case studies and global examples.
    - Example: ***"Game Changing Ideas in Food"*** (pg. 71) – covers innovation, problem-solving, technology & sustainability. Sections: Define, Discover (innovation), Dream, Design, Deliver, Debrief & Curriculum Connections.

- **Soils in Schools**
    - Developed by Soil Science Australia: Soils in Schools website resources
    - Soil science educational materials are specifically designed to align with Australian F-10 curricula.
    - The teacher guides provide engaging content & activities that can be incorporated into teaching schedules, including career pathways.
        - Teacher guides

- **Geoscience Australia**
  - **Rocks & Geography:** Website of resources
  - Includes Teacher Guides & Resources (educator notes & student activities)
  - Geological TimeWalk – geology & geography resource (major geological, climatic & biological events over time).
  - Shaping a Nation: a geology of Australia book – free PDF download of resource available (chapters follow non-linear format detailing Australia's geological evolution through a human lens).

- **Australian Academy of Sciences - Science by Doing resources**
  - Secondary science resources that are Australian Curriculum aligned
  - Resources: https://www.sciencebydoing.edu.au/resources
  - Diverse range of units, lesson plans, student workbooks, discussion guides
  - *Note: previous Curriculum pre-2023 content may show on website & be available for download.* Undergoing update in 2023 – TBA.

- **Virtual Biology Lab**
  - Virtual platform that provides students with interactive practical experiments to highlight biodiversity. Potential application for years 7-12.
  - Web platform: https://virtualbiologylab.org/
  - Downloadable graphs – application for personal/ class enquiry.
  - Option for field-study activity without physically travelling to a sample site.

- **ScienceWeb** Australia (developed by **ASTA and Education Services Australia**) - 15 units aligned with the Australian Curriculum (Science). Links to food security, sustainability, environmental effects.

- **Scootle** (managed by **Education Services Australia**) – portal for access to digital resources for teachers.

- **Science Buddies**
  - Various resources and ideas for inquiry projects & teacher resources (years 7-12 included)

Learning Resources Continued….

First Nations & Indigenous Learning Resources

- **The Orb** – Tasmanian Government resource. Provides engaging digital resources that are Australian Curriculum aligned to assist the teaching of Tasmanian Aboriginal histories and cultures.
    - **Teacher Resources:** https://www.theorb.tas.gov.au/learning-resources/.
        - **Fibre:** https://www.theorb.tas.gov.au/living-cultures/fibres
        - **Foods:** https://www.theorb.tas.gov.au/living-cultures/foods
            - Biocultural Diversity
            - Customary Law
            - Diet
        - **Fire** - https://fire.theorb.tas.gov.au/
        - **Stone tools:** primary & secondary sources resource
        - **Ochre:** various resources in module menu.
            - Touching The Earth video (4 min)

- **Aboriginal Agriculture & Aquaculture –** summary document
    - Summary of examples of aboriginal agricultural practices from books by Bruce Pascoe and Bill Grammage.
    - Included in the TIA professional development resource package. *Contact TIA for more information.*

- **Dark Emu Black Seeds: agriculture or accident?** By Bruce Pascoe
    - Information for course, with links to short, themed author videos
    - https://soillearningcenter.com/product/bruce-pascoe-dark-emu/

- **Using Dark Emu in the Geography Classroom** (2019)
    - Geography curriculum resource, with opportunity for cross-curriculum linkages (Science, STEM electives, Food & Fibre, Design & Technology, Sustainability, HASS).

- **How Aboriginal Australians Made Australia** (15 min video)
    - https://www.primezone.edu.au/resource/how-aboriginal-australians-made-australia/
    - Potential for application across years 7-10, with follow-on discussions and content depth adaptable for different cohorts. Cross-curriculum relevance.
    - Many aspects: horticultural processes, harvesting crops, geographical transfer and trading of seeds (biodiversity), diets, insects, soils and arable lands, fire in landscapes, whaling, aquaculture, and adaptation to environmental changes of seasons.

- **Indigenous Weather Knowledge (IWK) website - Bureau of Meteorology (BoM)**
    - The Indigenous Weather Knowledge (IWK) website was launched in 2002 as a partnership between the Bureau, the Aboriginal and Torres Strait Islander Commission (ATSIC) and Monash University's Centre for Indigenous Studies.
    - Website: http://www.bom.gov.au/iwk/index.shtml
    - Digital resource of **seasonal calendars** of First Nations communities across Australia.

- **Language, culture and environmental knowledge**: see http://www.bom.gov.au/iwk/culture.shtml.
  - *Introduction to climate culture*
  - *A precious heritage*
  - *Culture and beliefs*
  - *Indigenous season descriptions*

- **Australians Together** learning resources
  - A range of free lesson resources (teacher guides & student resources).
  - Website: https://australianstogether.org.au/
  - Subjects include Science & Geography. Arranged by year groups. Resources include:

Science

- Year 7 – Caring for Country: how Indigenous scientific observation and cultural practices support ecosystems
- Year 7 – Biological sciences: Indigenous classification and understanding food webs
- Year 7 – Separating mixtures (Chemistry) – applicable to year 8 (curriculum version 9.0)
- Year 8 – Fire management and sustainability practices of First Nations Peoples
- Year 9 – Protecting Australian ecosystems
- Year 10– The biological evolution of First Nations Peoples to the harsh Australian climate
- Year 10 – How Indigenous ecological practices can help reduce greenhouse gas emissions

Geography:

- Year 7 – Values of water
- Year 7 – Place and liveability
- Year 10 – Aboriginal and Torres Strait Islander Peoples' approaches to environmental management

Climate Change Resources

- **Curious Climate: Climate Curious Schools –** Tasmanian Schools Project
  - Experts answer questions from Tasmanian schools regarding climate change.
  - Explore the dozens of questions already answered by experts and look into opportunities for your school to be involved.
  - Website: https://curiousclimate.org.au/schools/
    - Explore the dozens of questions already answered by exports and look into opportunities for your school to be involved.
    - **How Curious Climate began** (1 min video) – great introduction & overview of the development of the program from Tasmanian community questions to now be an interactive schools program: https://youtu.be/qbH-2K2nUeI
    - **Project overview video** (14 min): https://youtu.be/Ivo0agffFsU

- **Open Education Resources (OER) – Climate Education.**
  - K-12 Climate Education. Resources include modules, lessons & videos.
  - https://oercommons.org/hubs/climate

- **NASA Climate Change** web resources
  - Home page: https://climate.nasa.gov/
  - Multimedia resources include videos showing effects of global warming, E.g.,: Global Warming from 1880 to 2022 (30 sec video), plus accompanying articles.

Additional STEM film/video resources:

- **Scinema International Science Film Festival**
  - Science films and documentaries streamed free online each August. Royal Australian Institute funded in Australia. Register online to receive updates & view variety of science films from diverse STEM fields via: https://scinema.org.au/
  - Inspire students to explore science communication and expose them to passionate scientists and citizen science projects occurring globally.
  - Your school could register to host a science film festival event or open this out to the wider region of schools & community.

- **SciToons (Brown University, US)**
  - **Science cartoons program learning resources.** Various topics presented in engaging and digestible ways. Suitable across STEM subjects for years 7-12.
  - **Brown University Repository** (collection of their videos): https://repository.library.brown.edu/studio/collections/bdr:9d2cf9ga/
  - YouTube channel: https://www.youtube.com/@SciToons

Career Pathways

- **Career Harvest:** main careers portal of PIEFA - https://www.careerharvest.com.au/
  - **Careers lists:** https://www.careerharvest.com.au/careers - lists career options across diverse skill sets
  - **Career videos**: https://www.careerharvest.com.au/career-videos
  - Relevant career resource for educators, careers counsellors, students, parents, industry

- **AgATTRACT** initiative from Federal Government ($25.2 million over 4 years, commenced ~2021). Several resources and platforms were developed from these, including the below programs:

  - **AgCareerStart Project:** https://agcareerstart.com.au/

- Gap year opportunity for agricultural farm placement

- **My Future:** https://myfuture.edu.au/
  - Provided by National Career Information Service (managed by Education Services Australia)
  - Industry insights webinar (panel discussion - PIEFA & 3 industry guests feature): https://publish.viostream.com/play/bxixurbdtk6518

- **Australian Government produced industry videos** – showcasing business owners in their agricultural business settings.
  - Examples of real-world business and operations
  - https://www.agriculture.gov.au/agriculture-land/farm-food-drought/agricultural-workforce/planning

- **Agriculture-Specific Career Videos – various:**
  - **Soil Science Australia** – careers in soil science resource
  - NSW government video - **Careers in Agriculture for Your Future**– 20 min video, showing the diversity of roles in agriculture (includes veterinary science), with interviews of young members of the industry https://www.youtube.com/watch?v=yiD_P4RHzg8
  - Queensland Farmers video: **Your Career in Agriculture –** 10 min video, various perspectives of different roles in agriculture. https://www.youtube.com/watch?v=dxvfLy6Z8zg&list=RDLVyiD_P4RHzg8&index=2

Continue to Inquiry-Based Learning….

Inquiry-Based Learning

Science inquiry examples:

- Class projects
- Individual or small group inquiry & projects
- Case studies
- School collaborations between industry, researchers & science communicators
- Peer-based science communication *(see separate TIA resource for examples)*

Science Investigations & Awards

Local and national science investigation awards & opportunities include:

- **Tasmanian Science Talent Search (TSTS)**
  - STAT coordinated Science investigation program. Themed entries.
  - See STAT website for details: https://stat.org.au/, under TSTS section.

- **UTAS Science and Engineering Investigation Awards**
  - State-wide in Tasmania. Open to years 5-12.
  - Registrations close in term 3.

- **Additional opportunities:** Students that enter the UTAS Science and Engineering Awards may also enter their projects to the TSTS Research Investigation section. Students that submit their TSTS work meeting a certain standard will be invited to submit their entry to the National BHP Foundation Science and Engineering Awards. See Science Teachers Association of Tasmania (STAT) for more information. National camp and presentation opportunities.

- **BHP Foundation Science and Engineering Awards** – details of the awards, past winners and finalists, and inspiration for projects.

- **Eureka Prizes** (Australian Museum) - School Prizes.
  - Including Sleek Geeks Science Eureka Prize) - video entry of science communication of a specific theme. Open to primary & secondary school students. Entries open term 4, close end of term 1.