COS10025 Technology in an Indigenous Context Project unit

School of Science, Computing, and Engineering Technologies

Seminar Week 4: Indigenous STEM Knowledge

Shannon Kilmartin-Lynch

Acknowledgement of Country

We respectfully acknowledge the Wurundjeri People of the Kulin Nation, who are the Traditional Owners of the land on which Swinburne's Australian campuses are located in Melbourne's east and outer-east, and pay our respect to their Elders past, present and emerging.

We are honoured to recognise our connection to Wurundjeri Country, history, culture, and spirituality through these locations, and strive to ensure that we operate in a manner that respects and honours the Elders and Ancestors of these lands.

We also respectfully acknowledge Swinburne's Aboriginal and Torres Strait Islander staff, students, alumni, partners and visitors.

We also acknowledge and respect the Traditional Owners of lands across Australia, their Elders, Ancestors, cultures, and heritage, and recognise the continuing sovereignties of all Aboriginal and Torres Strait Islander Nations.

Indigenous STEM Knowledge

What will be covered today?

- Indigenous Knowledge of food & medicine
- Traditional plant uses
- Indigenous Land management & Contemporary land management
- Fire Farming & Rangers
- Indigenous Seasons

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Indigenous Knowledges & Western Knowledges – Food and Medicine

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Indigenous Knowledges

We must remember, that Indigenous knowledges are specific to individual mobs, Indigenous groups across Australia are diverse, and have very different cultures, languages and customs. So too, are their health knowledges – particularly those around certain plants and animals which are specific to place.

However, the constant amongst all Indigenous mobs, is the holistic nature of Indigenous health and the inclusion of the "metaphysical, holistic, oral/symbolic, relational and intergenerational" (Levac et al. 2018)

Indigenous health is much broader than western models of health – as it includes interpersonal relationships, emotions, as well as physical and spiritual.

Even Indigenous understandings of learning and intelligence are intrinsically linked to nature and land, and the duality of the lived experiences of mob, plants and animals.

Western Knowledges

Western notions of intelligence differ strongly from Indigenous understandings – they ignore spirituality and connection, instead focusing on objectivity and “scientific”* rational.

The western model is much more anthropocentric, positioning humans at the top of the hierarchy of worldly order, and not plants, animals or the land.

However, Levac et al. (2018) states:

“there are schools of Western philosophical thought that lend themselves more to Indigenous ways of knowing, such as feminist and narrative theories that privilege storytelling”

Indigenous ways of knowing and health

- Holistic health
- Traditional healing and medicine
- Caring for Country as necessary for holistic wellbeing
- Sorry business
- Men's and Women's business (gender specific Lore, custom and roles)
- Health being a communal state, rather than individual

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Traditional healing and medicine

What is traditional healing and medicine?

Traditional healing incorporates many modes, including:

Balancing spiritual and physical wellbeing

Healing songs

Bush rubs and medicines e.g. herbal remedies

Healing foods

Traditions passed down over generations

Health interventions specific to local mobs

Traditional Healing

Pre-invasion Indigenous Australians were in very good health, our traditional healing was our primary form of health care and was conducted by our traditional healers, clevermen or elders.

Today, our mobs still use traditional healers, alongside western medicine. Our traditional healers have extensive place-specific knowledge on how to treat and diagnose illness in our mobs.

Like all our knowledge, health knowledge is passed generation to generation orally. Some knowledge is sacred and secret, others wildly shared. Some of us are born healers and gifted this knowledge from our ancestors – as you will see in the film next week.

Our knowledges worked well for thousands of years protecting us from illness and disease – however, the invasion and "settlement" associated government policies, removal of land and introduced foods, lifestyles and diseases, have had devastating affects on mob.

Traditional healing is place-specific – as it relates to the weather, landscape, ailments, disease and plants and animals of a particular area.

Traditional healing methods from Victoria, may not work in the NT, because they have been accumulated over centuries of trial and error, specific to the place.

This is also important, as it speaks to the health practices of the ecosystem too – remember that Indigenous holistic health includes the health of country, and ecosystems too.

While the learning of traditional healing may come from a traditional healer or the elders, the knowledge is understood by mob to include spiritual, ancestral and cosmological influence.

Our healing knowledge's, like all our knowledges are conveyed through story – and they often speak of the knowledges being derived from dreams, visions or from the dreaming itself.

Food & Plants as Medicine

Traditional foods, and knowledge of food properties are vital to Indigenous health.

Studies (Milburn 2004) have shown that mob can reduce and even reverse some of the negative health problems we have as a result of Western introduced foods, lifestyles and illnesses (such as hypertension, cardiovascular issues and diabetes) by returning to a traditional food diet.

Plants are very important to Indigenous healing, as they form the base of many of our bush medicines.

Plants were crushed and heated, before being applied to the skin. Or made into saps to be lathered on skin. Or smoked and inhaled. Or boiled and inhaled. Or drunk in tea. Or eaten.

We are going to explore some traditional bush medicines on the next few slides.

Green Ants: Were ground and mixed with water into a drink, which aided headaches.

Lemon Myrtle: Was made into tea to cure fevers, headaches and relieve cramps.

Tea Tree Oil: Was crushed and made into a paste to be applied to wounds. It was also used in tea, from ailments of the mouth and throat. Or used as an antiseptic.

**Fun fact – it wasn't until the 1920's that the west did experiments on the properties of tea tree oil, and "discovered" the antiseptic properties were much better than what was being used at the time, so began to include tea tree oil in medicines for treating acne, fungal infections etc.

Eucalyptus Oil: Was infused and used for fevers, chills and body pains, mouth pains. It was also used as insect replant. Today it is used widely in the West to treat everything from fungal infections, to cold and flu symptoms.

Goat's Foot: mobs in the NT and NSW, crushed and heated the plants leaves and applied them to the skin from pain relied from sting ray or stone fish stings.

Kakadu Plum: These plums are the richest source of Vitamin C in the world. NT and WA mobs would consume this fruit as part of their healthy diet. These plums have more than 100 times the amount of Vitamin C that oranges have.

Emu Bush: NT mobs would use emu bush leaves to wash our cuts and sores, and gargle it for mouth issues. The leaves could be turned into a syrup and used for everything from chest pain, diarrhea treatment, head colds, headaches and wound care. The leaves were also used to sterilise an environment, by smoking them – this was used predominantly for creating sterile birth environments. The smoking was also used to sterilise circumcision tools. Recent studies have confirmed what mob always knew, and documented the antibiotic properties of this plant.

Snake Vine: SA mob crush the vine, and creates a paste which is used to treat inflammatory ailments, such as arthritis or swelling, also used for headaches. It is also used as an antiseptic.

Kangaroo Apple: The fruit was made into a salve and applied to swollen joints. The fruit also contains a steroid, which is used in the health production of cortisone. Was also consumed as a fruit when in ripe (is poisonous when unripe)

Umbrella Bush Wattle: the wattle bark was soaked or boiled in water and used to treat everything from sore throats and coughs, to dizziness. WA mobs would also slightly burn the leaves and mix native tobacco known as Pituri, with the ash to chew in order to relive mouth and gum pain.

Gumbi Gumbi: Can be considered one of the most versatile Indigenous plant medicines.

It is found across Australia in the dryer areas and used by many mobs for traditional healing.

The fruit and seeds can be eaten for medical benefit, but the best use comes from the leaves. The leaves can be drunk in a tea, dried in a type of tablet form, or made into salves.

It was used to treat skin conditions such as eczema, used to help cold and cough symptoms, and used to increase milk production in breast feeding mothers. It was used to combat cancers, digestive illnesses and fatigue.

Recent studies have found many health benefits of Gumbi Gumbi including:

Anti-viral;
Anti-pruritic
Blood pressure regulator;
Detoxifier, and;
immune system booster.

Native Lemon Grass: The whole plant is used to treat illness, the roots, leaves and stems are made into a liquid which treats cold and flu symptoms, such as headaches, sore throat and diarrhea. It can also be applied to the skin to treat sores and rashes. Or applied to the ears in a mixture, to treat earaches. Recent studies have shown that its properties operate similarly to the way aspirin does.

Sticky Hop Bush: is used by mob as an anesthetic. The leaves can be bound to the skin to treat stings. The leaves are also chewed to relieve mouth and tooth pain. The roots of the bush can be boiled and used to treat earaches.

Hop Goodenia: mob would make an infusion using both the leaves and the twigs, the infusion would be used as an anti-diabetic. Babies would also be given the infusion to help them sleep.

Prickly Paperbark: The leaves are crushed and sniffed to treat head colds and headaches. The leaves are made into an infusion to wash irritated skin. The bark is used for bandages and to bind traditional salves and leaves to the skin to treat ailments. The bark was also used for non-medical reasons, such as blankets and in roofing, and used to carry babies in.

Nettle: This stinging prickly plant was beaten against the skin to resist paralysis or rheumatism. This is highly scientific – the plant is covered in tiny hairs, which penetrate the skin and cause stinging. But these prickles, actually pierce the skin allowing air to penetrate and the bodies receptors react to the stingy and to the pain they cause, sending blood to the limbs – essentially stopping paralysis.

Indigenous Knowledges – Land Management

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Fire Farming

Indigenous communities used fire across Australia.

The burning, while reducing risk of uncontrollable fires, also created expansive grasslands, ensured good soils and reproduction of plants which encouraged kangaroos and other animals to come to the regenerated sections, where they could easily be hunted for food.

Selecting what areas to burn, when, with what method and how often, was part of place-specific Indigenous knowledges of the land.

After invasion, fire farming became less used – as the Europeans feared fire.

This meant that thick scrub and tall grasses grew in previously controlled and carefully managed areas, increasing the prevalence of bushfires.

ANU Professor Bill Gammage:

"Fire can be used for one of three outcomes:

The first, to encourage native grasses to regenerate and produce new feed;

the second to reduce scrub and fuel to prevent intense bushfires;

And, thirdly to promote biodiversity,"

When laying out burn pattens, mob considered not only kangaroos and other hunted animals, but plants, insects and reptiles. The burning patten (or laying out of country), was place and species specific, creating an incredibly complex relationship with the land and ecosystem, which is managed and sustained over multiple generations*

Plant cycles were especially important – not only for the plants that mob would consume, but the plants stages at which animals would consume them.

Fire knowledge **is place and mob specific** – what works in one area, may not work in another.

Different methods of fire were used in different times and seasons.

For example, in the NT – we conduct most burns towards the end of the “wet season” / beginning of the dry, when some of the grasses have begun to dry out, but the soil still has some moisture. This ensures the fires will be manageable and productive – and eliminates the risk of out-of-control fires in the dry season.

Across Australia, but mostly in the North, Indigenous mobs are working alongside government and council bodies, farmers and land Management companies to share vital land practice knowledges, including appropriate fire farming techniques.

Indigenous Fire Farming Research shows that:

No uncontrolled fires:

There were no uncontrollable fires. Mob understood the risk fire presented to resources, and prevented them through land management practices.

Place-specific templates:

Indigenous people knew their country, knew the species and animals of their country and how to care for them. They new what animals liked to consume what type of plants, and how to ensure these were available, through the use of fire farming.

Western Farming and the damaging affects

When Europeans arrived, they brought farming practices suited to an environment very different to Australia, that in the long-term caused erosion and salinity.

The Europeans who in a mere few hundred years profoundly altered most of the continent and, in the process, created many ecological disasters.

Widespread soil salination and erosion, deforestation, over-exploitation of water resources, rampant feral animal and exotic weed infestations, extinction of many native animal populations and species, coastal pollution and over-fishing are just some of the current problems created by the Europeans and their technologies.

Modern Australia will struggle to sustain its continuously increasing population

Damaging European farming methods

Land management practices, as hinted to above with the middens, are integral to sustainability.

Indigenous people have a comprehensive understanding of the interconnectedness of land, vegetation, animal and birdlife – this was not shared by the European newcomers.

Indigenous Australians understand that due to the interconnectedness of all things, damage or destruction of country in one area has the ability to affect other areas.

Maintaining the integrity of the whole is vital to Indigenous understandings of sustainable practice and process.

Mob know just how integral and vital, each species (plant and animal) is to the ecosystem.

Mob ensured the sustainability of country for 80,000 years – Europeans destroyed it in 250 years.

The introduction of species, plants, invasive mining practices and agricultural processes, has severely damaged country.

The soil health, quality and chemistry has been altered by the removal of trees and forests, the compacting of the soil over these 250 year of cattle and sheep farming and by the sheer expanse of grain manufacturing and farming.

All of these practices are damaging to a sustainable Australia.

We only have to look to modern agricultural practices to see the effects to land, animal, plant and waterway systems.

The use of pesticides on crops, have been proved to have serious health effects on animals, insects, and as we have learnt recently – humans.

With cities expanding on every coast line in Australia, we have seen these areas stripped of native vegetation, and seen the damages to the soil and ecosystem as a result.

We have already lost many species and many more are close to being extinct.

Land clearing, deforestation, ”modern” farming and agricultural practices and the reckless introduction of animals and plants has had devastating impacts on the sustainability of Australia.

In the 250 years since invasion, Australia has lost hundreds of species.

Today 1 in 3 of our Australian mammals are at risk of extinction!

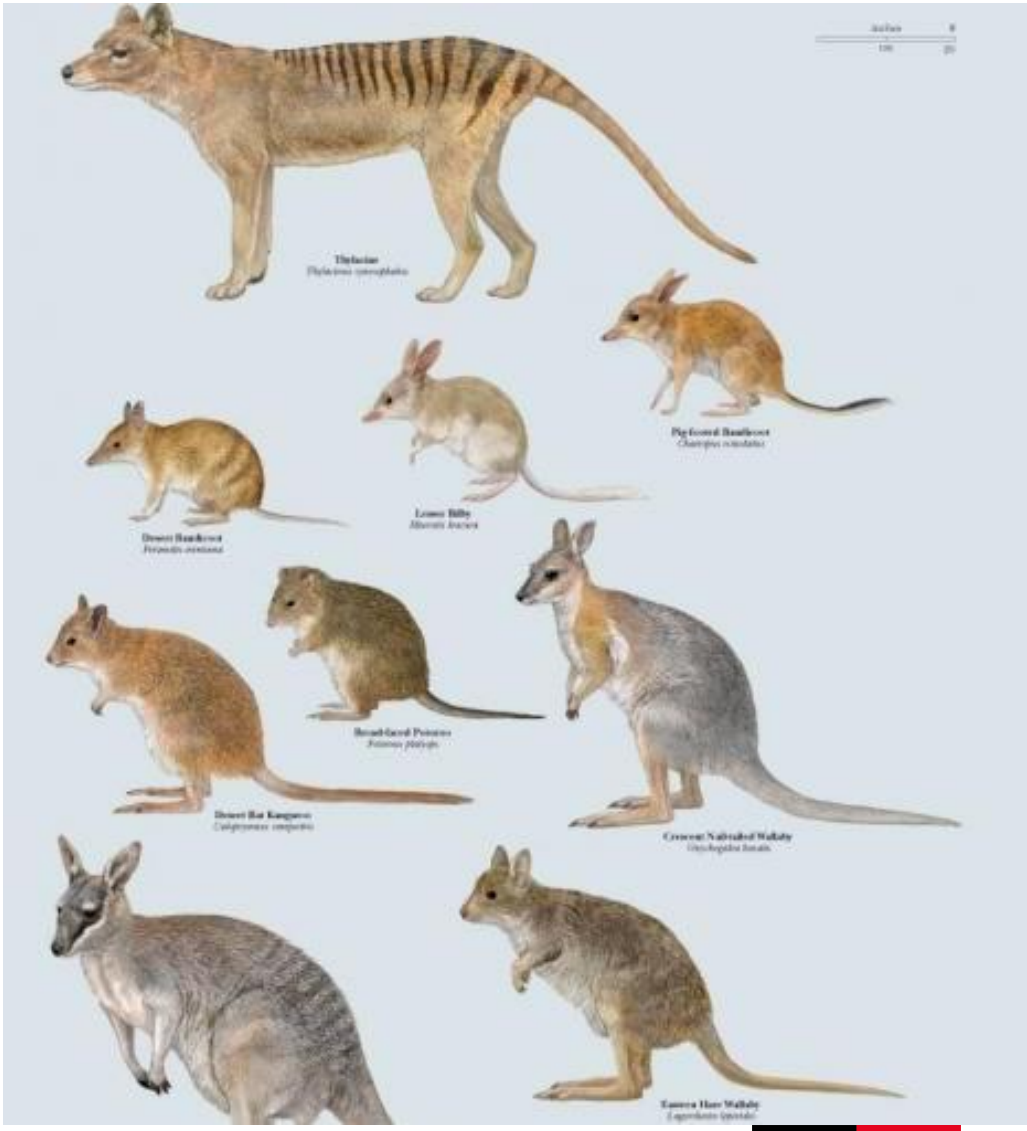
21% of our land mammal species are threatened.

Our current rate of extinction is one to two per decade, current research indicates that this patten is likely to continue.

While habitat loss, unsustainable hunting and human population and engagement have placed a serious role in the decline of native animals, the biggest threat to their survival comes from introduced species, such as cane toads, foxes, feral cats and camels.

Additionally, the change to fire farming practices, and the increased probability and rate of out-of-control fires, have had substantial impacts on the survival of many of these species.

For a sustainable Australia, some people – myself included – argue that cattle, sheep, and wheat would be banished to restore the land, animals, plants and Indigenous wellbeing.



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What Middens say about land management

Who knows what Middens are?

Ancient middens are found across the coastlines and rivers beds of Australia.

They are evidence of past meals, but also – signposts for other mobs*

Overtime, and many meals in the same areas, the middens became beds of leftover shells.

There are two very important aspects of middens:

Firstly, middens are vital for maintaining the health of the soil. The calcium evident in the shells, protects the soil from salination, the shells also aerate the soil. This adds to the overall health of the soil – which in turn, effects the health of the plants, and animals who feed on the plants.

Secondly, middens act a a message to Indigenous mobs coming into the area. By seeing what shellfish species was on the top layer of the middens, the incoming mob could be sure to hunt a different shellfish, ensuring the reproductive cycles and availability of these for future harvesting.

These practices drove sustainable harvesting of marine life.

Indigenous Knowledges – Contemporary Land Management

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Contemporary Land Management

Indigenous Ranger groups conduct a wide variety of conservation activities including:

fire programs; weed and feral animal control; maintain tourism sites; look after cultural heritage sites such as waterholes; burial grounds; and, protecting threatened species such as the Greater Bilby, Purple-crowned Fairy-wren, Northern Quoll and Australian Painted Snipe.

These practices keep traditional knowledge and Indigenous cultures alive; it also ensures the conservation work is successful. Importantly, it helps the transfer of knowledge from elders to young people.

Rangers

Indigenous Australians have been managing the landscape of Australia for millennia.

Over thousands of years of continual observation, adjustment and knowledge transfer, Indigenous peoples have developed and harnessed knowledge that ensures environment sustainability alongside cultural well being.

The Indigenous ranger programs which operate across Australia (but mainly in the NT, QLD and WA) rely on this knowledge and on the connection to country that mob have, in order to protect and manage land and seas capes.

In Australia, there are over 100 separate Indigenous Ranger groups. The Indigenous rangers' programs are funded through state, federal and community led organisations. However, the Working on Country program, by the federal government is the largest. This program connects Indigenous land practice and management knowledges, with western methods, to care for country.

These programs are also vital for economic prosperity in Indigenous communities, the Working on Country program alone, employs 2500 FTE jobs.

Toward a Sustainable Future

Mob encourage wider Australians to find a deeper appreciation of the interconnectedness of all living things, and more to advocate for the conservation of country.

In recent years there has been a slight shift in recognition of Indigenous land care practices, as a result of catastrophic fires, climate changes and increased scientific understandings on CO2 emissions – Indigenous people across the world are providing solutions to these modern issues.

Slowly, there is some adoption of these practices, occurring globally, in order to repair the damage done by European industry, farming and practices.

For example, in Australia Aboriginal fire management is becoming increasingly common.

Indigenous Seasons

Indigenous seasonal knowledges are interconnected with Aboriginal and Torres Strait Islander land and sea use and management.

Our seasonal knowledges, link seasonal cycles of plants and animals, knowledge of the weather and climate, with indigenous culture and land uses.

In relying on our knowledge traditions of seasonal patterns, weather events and plant and animal reproduction cycles, we were able to secure an ongoing supply of medicines, food and other necessary resources.

To do this, we interpreted the stars, astronomy, the weather, and many other biological indicators, which allowed us to predict seasonal changes which directed us to harvest, hunt, farm (fire and otherwise), fish or move locations.

Some of these indicators were incredibly specific, and the result of prolonged and continual engagement with the environment. Such as in Queensland, where the arrival of hairy caterpillars in lines indicated that mullet would be breeding's in the freshwater and estuaries.

Indigenous seasons are place and mob specific, and incredibly accurate at predicting the expected weather conditions, as well as the availability of certain resources.

These knowledges were acquired over thousands of years of adjustment, generation sharing of knowledge and observation – many of these knowledges are shared through story, which often links back to the dreaming.

Tiwi Seasons

The three major Tiwi seasons are:

Kumunupunari – (March to August) is the dry season of fire and smoke.

Tiyari – (September to November) is the season of hot weather and high humidity.

Jamutakari – (December to February) is the wet season when pakitiringa (rain) falls consistently every day and the swamps, creeks and rivers are full. Wunijaka, the north-west wind blows and brings rain. There is much pumurali (lightning) and thunder with the rain.

Tiwi Seasons

The thirteen minor overlapping Tiwi seasons are:

Wurringawunari – Season of the knock-em-downs. This is the first part of the dry season when the first dry winds blow in from the south-east, flattening the tall grass and drying up surface water.

Kimirrakinari – Season of fire when dry grass is burnt.

Pumutingari – Season of the wind that flakes skin.

Yirriwinari and Mirniputari – Season of cold weather in the middle of the dry season, mid-June to the end of July, is signalled by the flowering of Wurritjinga (Eucalyptus confertiflora)

Kumwari – Season of fog, when temperatures are low and fog develops in the mornings.

Yartupwari – Season of the dry creek bed, when waterholes and creek beds dry up.

Milikitorinari – Season of hot feet, when the hot ground burns the soles of feet. Food gathering is concentrated in the mangroves and jungle patches instead of the dry plains and woodlands.

Pumwanyingar – Season of thunder. Humidity increases and clouds develop every afternoon but there is little rain.

Kurukurari – Season of the mangrove worm. The worms are easy to find and are sweet and filling.

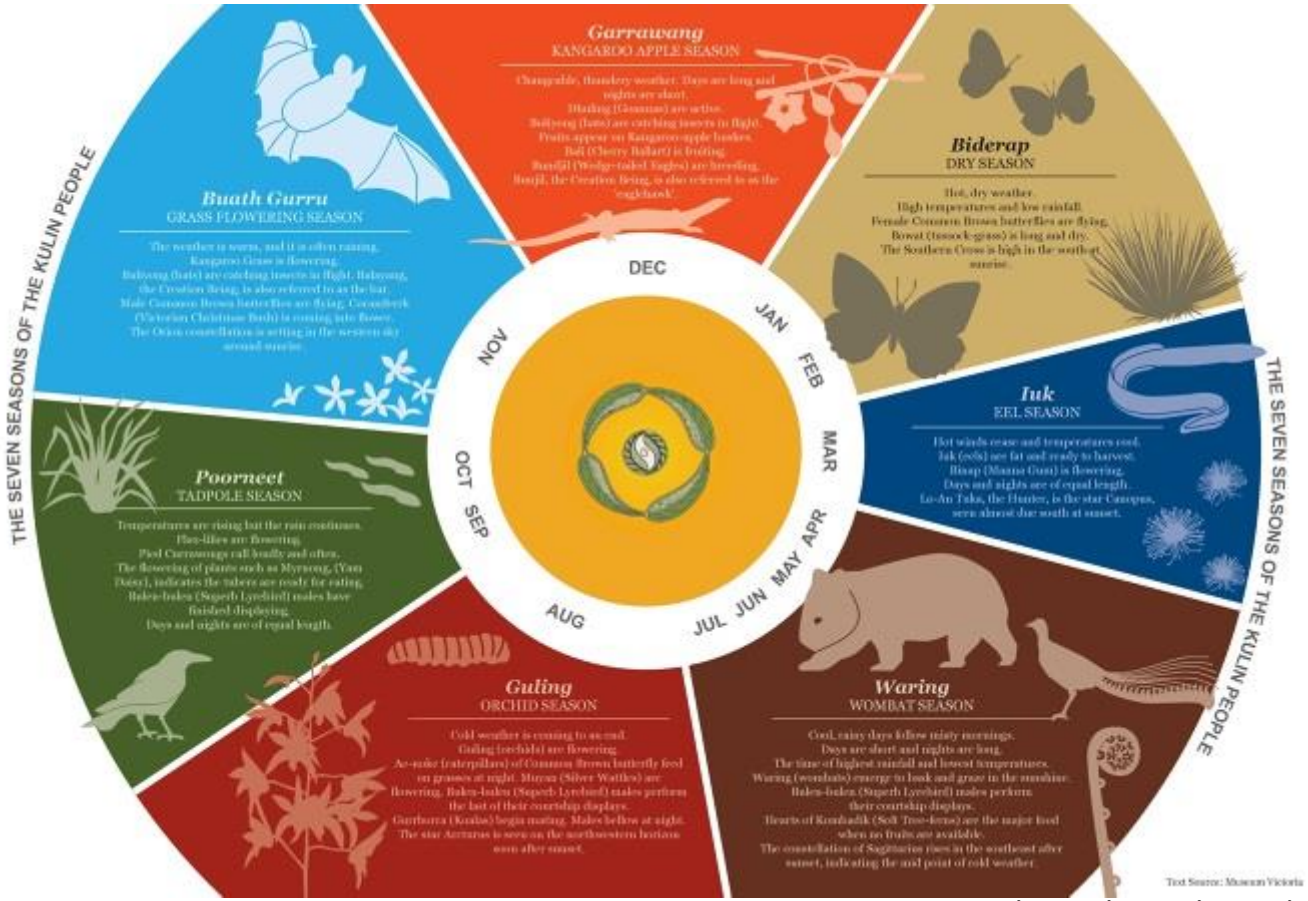
Mumpikari – Season of muddy possum tracks. When the first rains fall the possums return to their trees from foraging on the ground at night and leave tell-tale muddy footprints on the trunk of the tree. This makes possum hunting easier.

Tawutawungari – Season of the clap sticks. Kurlama (special yam) ceremonies are held now.

Wurrijingari – Season of the flowers.

Marrakatari – Season when tall grass flowers, and Wurringawunari - Season of the knock-em-downs, are both short and indicate the end of the wet season.

Victorian Mob Seasons



Text Source: Museum Victoria

Victorian Mob Seasons

- *Biderap,* Dry Season (Jan-Feb)
- Iuk, Eel Season (March)
- *Waring*, Wombat Season (April-July)
- *Guling*, Orchid Season (Aug)
- *Poorneet*, Tadpole Season (Sept-Oct)
- *Buarth Gurru*, Grass Flowering Season (Nov)
- *Garrawang,* Kangaroo-Apple Season (Dec)

Week 5

What will be covered in week 5:

- Astronomy from the Indigenous context
- Use of nanofibers from spinifex and other resin trees
- Traditional use of Kakadu plum and how it is being utilised today
- Water Sciences

20th March 2023