35 years of classroom teaching…

Three Antarctic deployments as part of education outreach teams, integrating science research and education:

- Teachers Experiencing Antarctica and the Arctic (TEA) 1998
  The Cape Roberts Project (geologic drilling)

- ANDRILL (ANtarctic DRILLing) 2006

- WISSARD (Whillans Ice Stream Subglacial Access Research Drilling) 2012-2013

Supported by grants from the National Science Foundation and various institutions/universities
Research and Education Svalbard Experience

RESEt
RESEARCH & EDUCATION SVALBARD EXPERIENCE

POLAR EDUCATORS INTERNATIONAL
Edward Bransfield charted this region in 1820, establishing the British claim to discovery of Antarctica. The following year members of a sealing expedition led by John Davis, an American, went ashore at Hughes Bay, the first known landing on the continent.

In 1896, Adrien de Gerlache de Gomery, a Belgian, led the first expedition to endure the Antarctic winter; his ship, having been frozen in pack ice, drifted with the continent for nearly two years.
MOTHER NATURE NEEDS HER DAUGHTERS.
A Scientist at Work...
The Southern Ocean
Ross Sea Marine Protected Area    October 2016

598,000 square miles (more than twice the size of Texas)

Protected by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) made up by 24 countries around the world

This area is south of New Zealand, deep in the Southern Ocean

The 1.9 million square mile Ross Sea is considered largely untouched by humans
It is one of the most productive and nutrient-rich areas with large plankton blooms and swarms of krill that feed and support incredible numbers of fish, penguins, whales, and seals.

Believed to be over 16,000 species that call the Ross Sea home.
Terns, Skuas, Krill, Whales, Sea Stars, Fish, Birds, Weddell Seals, Phytoplankton and other marine life…
We experienced various sea ice conditions, glaciers, and of course, saw lots of icebergs.
Landings on ice, rock, islands, and the continent, as well as zodiac excursions and watching from the ship...brought us closer to wildlife.
Australian Antarctic Division Education Resources

“Who’s Eating Who?”


Solve an Antarctic and Southern Ocean mystery about the sudden disappearance of huge numbers of tiny krill and learn about the food web and environmental sustainability.
Huge numbers of the tiny krill, better known as LOW LIFE, are missing, FEARED DEAD. Is someone eating more than their fair share of the tiny krill? Or is there something more SINISTER at work?

Krill are a snack enjoyed by just about everyone. All of the Antarctic animals depend on this LOW LIFE for their survival. But something has upset the balance. The atmosphere is tense. Starvation is now a very real threat. The six rival Southern Ocean gangs are watching each other closely. The FEATHERED FIENDS are blaming the SLIPPERY CHARACTERS. The SLIPPERY CHARACTERS in turn are pointing their flippers at the MISTER BIGS. The only ones with an alibi are the phytoplankton. These LOW LIFE are vegetarians! But no one is above suspicion! Even the fish and squid are inclined to think that SOME THINGS are very FISHY!

Everyone, it seems, has a motive. The black-browed albatross, a member of the notorious FLYING SQUAD, is known to swoop down on the krill, gorging on hundreds of the tiny fishy ‘snacks’. And then there’s the blue, humback, and southern right whales, the MISTER BIGS of the sea world, who cruise through the schools of krill, mouths agape, swallowing hundreds of thousands of them in a single gulp. Even the krill themselves, during moments of desperation, have been known to eat their own kind.

You are the special agent called in to investigate this dastardly crime, and it’s a tough assignment. Your mission, should you choose to accept it, will take you to the end of the Earth.

In the icy waters of the Southern Ocean there lurks a dangerous new THREAT. After living together and eating each other happily for eons there is now rising PANIC amongst the residents.

Seals are mammals, which means that they give birth to live pups and suckle their young. Milk is an important part of a young seal’s diet although they very quickly learn to hunt krill, squid, fish and other seals for themselves.

Crabeater seals (Lobodon carcinophagus) are filter Feeders and have a diet consisting almost exclusively of krill which they strain through their special shaped teeth. Killer whales and leopard seals are their main predators. A high proportion of crabeater seals are killed each year. Scientists count the number of crabeater seals in the pack ice from helicopters and from the Australian Antarctic research vessel Aurora Australis.

Crabeater seals

Antarctic fur seals (Arctocephalus gazella) have thick, soft coats. Each square centimetre of their skin has about 40,000 hairs. This dense cover keeps them well insulated against the icy cold waters of the Southern Ocean. Lucky to be alive!

During the 1800s Antarctic fur seals were hunted to near extinction by sealers wanting their fur for ladies’ coats. Records show that British and American sealing ships took as many as 112,000 fur seal skins in just one twelve month period between 1800 and 1807. Fortunately fur seal populations have slowly recovered since the demise of the sealing industry.

The southern elephant seal (Mirounga leonina) is the largest of the seals, with males weighing over 4 tonnes. It can produce a deafening roar from its trunk-like nose to scare off rivals.

You are the special agent called in to investigate this dastardly crime, and it’s a tough assignment. Your mission, should you choose to accept it, will take you to the end of the Earth.

Antarctic fur seals

Leptonychotes weddellii live in the pack ice and are often seen in tide cracks or sleeping on the ice.

Weddell seals

A cleverly written story with beautiful graphics, that sets the stage for your investigation.
Low life: phytoplankton
Flying squad: storm petrels to albatross
Feathered friends (fiends): penguins
More feathered friends: emperors
Slippery characters: seals
Mister Bigs: whales
Also included is a food web page that shows the transfer of energy among creatures in the Southern Ocean.

This leads to an activity I’d like to share that has to do with building an Antarctic food web and taking a look at factors which can impact that food web.
Who's eating who in Antarctica?
Food Web Activity: Catchy Catch

Albatross, emperor penguin, squid, leopard seal, Weddell seal, fishing boat, killer whale, humpback whale, toothfish, krill, plankton

Ropes – Each student is assigned one animal in the food web. Once students have their designated animal, join the colored ropes according to the description below. I’ve often used name cards or picture cards to pass out to students.

**Thick green:** phytoplankton to krill (can cover a clothesline/other rope with colored duct tape or cloth bits)

**Green/white:** krill to squid, fish, emperor penguin, Weddell seal, humpback whale, albatross

**Yellow/black:** squid to fish

**White:**
1. Fish to killer whale, albatross, emperor penguin, Weddell seal and leopard seal
2. Squid to killer whale, albatross, emperor penguin, Weddell seal and leopard seal

**Orange (I used red):**
1. Emperor penguin to killer whale and leopard seal
2. Killer whale to humpback whale, albatross, leopard seal, Weddell seal
**Action:**

There are impacts on the food web and ecosystem.

Krill shakes lines as impacted by overfishing – Who can feel it? Who can’t feel it (killer whale). Now if you can feel it, shake the rope also. It now impacts all.

Show another impact on the ecosystem, such as loss of phytoplankton due to global warming. Students affected drop their line (phytoplankton) and if a student has a connecting line, they drop it also.

Talk about various links in the food web and what would happen if individual links were affected. What would happen to the ecosystem?
** you can also use ONE rope and link the various parts of the food web together

** add more cards (for example two-three of each card or other members of the ocean food web).
PEI Master Class Series

- Linking a scientist and educator to present a world-wide webinar

- Goals: reach out to researchers who are interested in improving their science communication skills and to educators who want to build their science knowledge
An Introduction To Antarctic Marine Ecosystems...

• With Jess Melbourne-Thomas from the Australian Antarctic Division

• Archived on the PEI website and you can Google the title of the Master Class on YouTube

• Each Master Class has a discussion group for approximately 2 weeks after the webinar
Flexhibit: Antarctica’s Climate Secrets

• 5 themes

• Kids become the teachers

• Funded by the NSF to increase public understanding of ANDRILL and climate science.
Hosting the Flexhibit…learning how to teach others…

Kids teaching kids….  
A great model that builds knowledge, confidence, experience….
Antarctica’s Rock Cores

How do scientists retrieve sediment cores and interpret them?
Mix Up A Model
Rock Core
Building a Drill Site Model…


Building a model of the ANDRILL drill rig; simulating the drilling process