Aussie STEM Stars

# EMMA JOHNSTON

Marine biologist and TV presenter

Written by Dee White

## Teacher Notes

written by
Vanessa Ryan-Rendall

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WILD DINGO PRESS

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# ABOUT THE SERIES

**Aussie STEM Stars** is a fresh and unique series for children and young teens aged 10–13 years that focuses on our Australian STEM heroes. Each book is written by an award-winning children's author and follows the real-life stories of Australia's top scientists and inventors, chosen on the basis of their pioneering work. Themes explored in the series include childhood, school, family and formative experiences, what inspired them to pursue their chosen path, how they persevered in the face of challenges and what they have contributed to science in Australia.

## Reason for studying this book

Wild Dingo Press publisher Catherine Lewis is excited about their publication. "These disciplines are more important than ever as we look to our inventors and innovators to solve contemporary problems facing humanity and the planet. Our **Aussie STEM Stars** series uses narrative non-fiction as a tool for educating children – making it as fun and interesting as fiction books. Our writers are passionate about doing justice to their chosen subjects – and their lives – providing teachers, parents and librarians a wonderful series aimed at encouraging children to develop an interest in STEM at a young age."

## About the author

**Dee White** grew up near the sea, but instead of being an underwater explorer like Emma she preferred to explore the world inside her imagination and make up stories. There are three generations of scientists in her family, and her mother was one of the first women scientists with the CSIRO. Dee cares deeply about the environment and is fascinated by how things work.

She is the author of more than 25 books published in USA, UK, Canada, Israel, Australia and New Zealand. In the name of research, Dee has travelled Australia and overseas, jumped out of planes (with a parachute on), ridden a camel and been up in a hot air balloon. Dee loves writing books that empower readers and inspires them to explore the world outside their own experiences.

## About our STEM Star: Prof. Emma Johnston AO

**Emma Johnston** grew up in Williamstown, on Port Phillip Bay in Melbourne, where she spent all her spare time swimming, snorkelling and sailing with her family from a very early age. It wasn't a huge surprise when she decided to study marine biology, in particular, the effect of human activities on the health of marine systems. She is a world authority on marine ecology, researching diverse environments from Sydney Harbour, to the oceans in Antarctica, the Great Barrier Reef and Australian estuaries, advising governments and marine protection authorities on how to reduce harmful impacts.

To help the general public understand and connect with her team's work, Prof. Johnston is also a regular media commentator and was co-host of the Foxtel/BBC television series *Coast Australia*, among other projects.

In 2022, Prof. Johnston was appointed to the very prestigious role of Deputy Vice-Chancellor (Research) at the University of Sydney.

# OUTCOMES

## Australian Curriculum

**KEY FOCUS AREAS**

*Literacy Stages 3–4*

*Science Stages 3–4*

*HASS Stages 3*

# OUTCOMES

## NSW Curriculum

**KEY FOCUS AREAS**

*Literacy Stages 3–4*

*Science Stages 3–4*

*HASS Stages 3*

# BEFORE YOU BEGIN READING THIS BOOK

## Front cover

- What do you know about Emma Johnston?
- What do you know about marine biology?
- What do you know about people who are TV presenters?
- How might marine biology and TV presenting be linked?

## Back Cover

- Read the blurb. What can you gather about this book from the blurb?
- Why do we need blurbs for all types of books?

## Before you start reading

- Highlight quote on **page v**:

  *When you're facing a challenge, trust the people who say you're up for it and let their support carry you forward.*
  — Emma Johnston

  Write this quote on a poster as a class or small group. Ask students to write ideas around the quote as to what it might mean to them. Add to this poster as the book is studied.

- Outline the glossary at the back and how to use it.
- Who is the author of this book? Explore other books and pieces of writing that Dee White has written and discuss why she may have been asked to write this book.
- What is the difference between a biography and an autobiography? Explore what this book is and why it is a biography and not an autobiography. Discuss the importance of the STEM Stars series.
- What is narrative non-fiction? Could this book fit into that genre as well?

# KEY PROJECTS

## Key project 1: Microplastics

- What are microplastics and where do they come from?
- Explain the damage that microplastics cause to animals, plants, habitats and humans.
- List the possible ways that you release microplastics into waterways, then come up with some solutions to minimise your own microplastic impact on the environment.
- Design an invention using the design and engineering principles that can support one of your solutions to ensure we start cutting back on our use of plastics.
- Create a community message about what people can do to reduce microplastic waste from their household.

## Key project 2: Sea walls and other artificial environmental support

- What are sea walls and where are they located?
- Draw and label the parts of a sea wall (https://newsroom.unsw.edu.au/news/science-tech/coastal-infrastructure-urgently-needs-rethink-marine-ecologists-say).
- Find out about other human-made structures that are helping to increase animal and plant populations. Examples include habitat for the spotted handfish, artificial oyster beds and constructed hollows for birds and tree-dwelling animals.

## Key project 3: Antarctica

- Why is Antarctica a place that many scientists use to learn more about the world?
- Imagine you are a scientist and you are going to Antarctica. What would you pack? What would you study beforehand and how do you think you would do this?
- Write a series of diary entries that outline your feelings as you arrive in Antarctica, make some interesting discoveries and then leave the continent. Use the information from chapters 16 and 17 to help you with your description.

## Key project 4: The Great Barrier Reef

- Why is the Great Barrier Reef listed on UNESCO's World Heritage list? Are there any other reefs listed there?
- Research different projects that scientists are currently carrying out to help save the Great Barrier Reef. Explore these projects to see how successful they are and what impact they are making.

## Key project 5: Reflection on literature

Students can fill in this table as they read to record their ideas and feelings:

| | |
|---|---|
| Chapter | |
| In one sentence, explain what this chapter was about? | |
| What did Emma Johnston do and say in this chapter? How did she feel? | |
| What real life events occurred? Link some dates and extra details to this event. | |
| New language used | |
| How has the author made you feel? Think of the language used to create tension, happiness, wonder, anxiety. | |

## Reflect on this table after the book has been read

- How did your knowledge change throughout the book?
- How did your feelings change?
- Did how you see the characters change as you learnt more about them?
- What new vocabulary have you learned?

## Key project 6: Series study

- Read some of the other books in this series to explore the characteristics all these STEM people have in common.
- Discuss what makes them each stand out and how they contribute to a making a difference in Australia and the world.
- Discuss why you think it's important for children to read books about people like this.

# TEACHING AND LEARNING ACTIVITIES

## Chapter 1

- When you first read the title of this chapter, what did you think it meant? How did that compare once you had finished the chapter?
- Have you ever felt bored at school when you're asked to do something you already understand? What do you think teachers can do when students have mastered content and skills?
- What was the Cold War? Which countries were involved and how long did it last?
- Why was Emma's Mum forced to give up her career when Emma's younger brother Sam was born?
- Take the perspective of someone in Emma's classroom and write down how you are feeling in this moment. Using descriptive language to record your senses and thoughts as the blackness is overcoming the room.
- What do you think the blackness is? Give a scientific reason, one that Emma would like to hear.

## Chapter 2

- '*Everyone headed for the classroom door like a swarm of bees.*'
  What do you imagine here and why are the children compared to bees?
- How can air be 'choked with' something?
- Where is the Mallee? Is this area still heavily farmed?
- Find some examples of anchor plants in different areas of Australia. Draw and label some of these plants.
- Do dust storms still occur in Australia and other parts of the world? Research a recent dust storm and the reasons it took place.
- List the issues caused by humans that Emma is worried about. What can you do to help some of these problems in your life today?

## Chapter 3

- Why would the memories of the dust storm stay with Emma?
- What is a 'formidable team'? What else can be 'formidable'?
- Find the names of different kinds of sailing boats and describe what they look like. From reading the description in the story, which sailing boat do you think Emma and Ben are racing in?
- Check the pronunciation of '*Nereus*'. What names do other cultures have for 'gods of the sea'?
- Check out a video showing the start of a sailing race. Why do you think it needs to start like this? What does this add to the skills you need as a sailor?
- Why do you think the trophies for Emma and Sam were different? Do you think this still occurs? Why or why not?

## Chapter 4

- If you have a dog, why do you have one? If you don't, why not? Consider the different reasons why people want dogs or other pets, and the responsibilities that go with owning an animal. Compare this to the reason Emma didn't have a dog.
- Draw the aviary as it is described. Which words helped you to 'see' this image?
- Emma felt calm as she watched her pets. How can animals have a calming effect on people? Is there research to show this might be the case?
- Read Gisela Kaplan's book in this series and list the bird behaviours that she observed and definitely had not expected of birds.

## Chapter 5

- How would you feel if you had to leave school to live in Japan? Compare this to how Emma reacts.
- Find out where Tokyo is on a map and find its distance from where you live.
- What are clouds made of? List the different types of clouds and include illustrations or photos of each type of cloud in your answer. Do all clouds produce rain?
- How did Emma feel when she heard people speaking Japanese? How do you think you would feel?
- The man who met the Johnstons at the airport was named 'Haruto' which means 'to soar or fly'. What does your name mean? Find out if there are any English names that mean to soar or fly.
- What is a 'butterfly koi'?

- Imagine you are Emma, and you're in busy Tokyo. Write a description of what you would see as you sit in the sushi shop, looking out the window onto the busy street. You may need to find images and videos to get a sense of the atmosphere.

## Chapter 6

- Emma couldn't understand any Japanese in her new school, so she used non-verbal cues to gain some understanding. How do non-verbal cues help you throughout your day?
- What does the word 'Sensei' mean?
- Why do you think children all over the world know how to play tag?
- Use a map to find out where Ishinomaki and the Kitakami Mountains are.
- Why do you think the author chose to include the story about the sea urchin in this book? Why are these short stories important to biographies?

## Chapter 7

- Emma is back in Port Phillip Bay. Using a map, find the location of where she is snorkelling (Crystal Pools) and how people still use it today.
- Read through the paragraphs that describe what Emma is seeing as she snorkels around Crystal Pools. Write down the adjectives that help you to feel as if you are there with her.
- What is 'abalone'?

## Chapter 8

- Why do you think that, in the past, women and girls have not been encouraged to study maths and science?
- How had Emma's time in France and Japan helped her?
- How do rules help and hinder students? Consider the rules in place at your school: how do they help you? How do they hinder you? Can you offer any new suggestions for rules?
- How will Emma get to her new school?

## Chapter 9

- In what ways is University High School different from MacRobertson High School? Are they different from or similar to your school?
- In this chapter, think about what Emma has done. How has this changed your viewpoint about the type of person she is?

- If Emma hadn't met Nandi, what do you think may have happened to Emma and her schooling?
- Did you expect Emma's mother to be happy that Emma hadn't told her applying to University High School? Explain this using your knowledge about Emma's mother and about your parents.

## Chapter 10

- Emma loves not wearing a school uniform. How do you feel about school uniforms? Do you agree with Emma?
- Girls at Emma's school hardly take maths or science. Do you think that girls still feel the same way at your school? Why do you think that girls have traditionally not been encouraged to take these subjects, while boys have?
- Emma notices the lack of recycling facilities at her school. Does your school recycle or compost its waste? How can you be like Emma and take action? Use Emma as inspiration!
- What is 'work experience'? Think about what work experience you would like to do in the future and describe how you imagine it being.
- '*... she didn't want to stay for the post-mortem afterwards either.*'
  What does this sentence mean?
- Why is it important that children can make their own choices about what they want to study? How are Emma's parents playing an important role in supporting her?

## Chapter 11

- Find an image of the Baillieu Library. Write a description using all five senses, imagining you are inside.
- What has Emma taken for granted? Why do you think many people take these things for granted?
- Why don't people realise how much damage they are doing to the environment? How do you think you and others could realise the damage that you're making?
- What is 'ecological research'?
- What is a mentor? Do you have someone whom you would call a mentor? Why?
- How has Emma's drive changed throughout this chapter? What were the key influences on those changes?

## Chapter 12

- Research what copper is used for.
- Does the *Marine Science Association Bulletin* still exist? If so, find an online copy to see what current projects are being undertaken nowadays.
- What did Emma's PhD research discover? How do you think the results from her project might make changes industries?
- Why is the world of marine science 'diverse and exciting'?

## Chapter 13

- How was Emma different from her colleagues at the University of New South Wales?
- What does the word 'floundering' mean? How is it used in this chapter?
- What was the 'bubonic plague'? Research online recent research that has found the origins of this disease that killed half the population of Europe in the mid-1300s.
- What do we know about the effect climate change is having on marine life and both the north and south poles?
- Why do you think Emma calls Sydney Harbour her 'office'? Do you think there are different 'office' locations for other types of careers? List others that you can think of.

## Chapter 14

- Emma had discovered 'almost every type of ocean habitat' in Sydney Harbour. Find out the different types of ocean habitats and explain how they are different from each other.
- What are 'living sea walls'? Find out where they are located around the world.
- What are 'microplastics'?
- For the clothes you are wearing today, what are they made of? Do you think they contribute to microplastics found in the ocean?

## Chapter 15

- What does it mean that Emma 'fluctuated between excitement and trepidation'?
- What are 'marine worms'? How are they different from earthworms?
- List the training that Emma had to complete in order to go to Antarctica.
- Why would you die 'in as little as 10 minutes' if you fell into the ocean near Antarctica? Find out how the temperature of the water and air in Antarctica at different times of the year.

## Chapter 16

- What is an ‘iceberg’?
- What special clothing is Emma wearing as she arrives in Antarctica? Where was the first puffer jacket invented: how long ago and where was the first one used?
- Why are the buildings and transport brightly coloured at the station?
- Find a map of Antarctica and learn more about the research stations scattered across the continent.
- What is ‘camaraderie’ and why would this be found in a place like Antarctica? Where else can you experience camaraderie?
- What are ‘crevices’ and how would a snow pick help you stop falling down one?
- Explore where albatrosses, petrels, gulls and terns travel from before they arrive in Antarctica.

## Chapter 17

- What does the chapter title make you think or feel? Describe your reaction.
- List the different checks that Emma needs to do before she goes on her ice dive.
- Why might the water look like ‘an ice slushy’?
- How might a torch be like ‘the beam of a lighthouse’? What other similes might describe a torch’s light?
- What are ‘fan worms’ and what do they look like?
- Why is marine life larger in Antarctic waters?
- What is an ‘invertebrate garden’?
- Why is Emma worried about climate change as she leaves Antarctica?

## Chapter 18

- List some facts about the Great Barrier Reef that you have learnt from this chapter.
- What is coral ‘bleaching’?
- Create a poster to teach other children why the planet is warming and how they can help slow the process, using the information in this chapter.
- What is an Order of Australia and why did Emma receive one?
- Watch the short film that Emma appears in https://www.youtube.com/watch?v=nYXFEfB2Lf8. Think of what you have learnt from this video and how you can share this knowledge with others.

## Ways we can reduce our carbon footprint and pollution

- How can you take some of these ideas and present them to students at school or to your own family? Think of creating illustrations, songs or videos to capture their attention – you can make a stand, like Emma did when she was in high school, and take action.
- How many of these actions are currently part of your life? How many more do you think you can do?

# EXTENSION QUESTIONS FOR FURTHER THINKING

**What if** girls were still not encouraged to study maths or science? How might this impact current and future research and projects?

**Paradox:** Synthetic fibres are cheap to create. Therefore, people can afford to clothe themselves, yet the materials have a great impact on the environment. What is our choice?

**List** the tools you need to be a marine biologist in various water environments. How do the different environments impact what you need?

**Analogy:** How is marine biology like treasure hunting?

**Imagine** you have discovered a way to stop plastic pollution. Think about how you can convince local businesses and people to take on your idea immediately through an interview, a TV commercial and an information sheet.

# ELABORATION OF OUTCOMES TO THE AUSTRALIAN CURRICULUM

## Literacy

**STAGE 3**

Make connections between students' own experiences and those of characters and events represented in texts drawn from different historical, social and cultural contexts (ACELT1613)

Analyse and evaluate similarities and differences in texts on similar topics, themes or plots (ACELT1614)

Identify, describe, and discuss similarities and differences between texts, including those by the same author or illustrator, and evaluate characteristics that define an author's individual style (ACELT1616)

Clarify understanding of content as it unfolds in formal and informal situations, connecting ideas to students' own experiences and present and justify a point of view (ACELY1699)

Plan, rehearse and deliver presentations for defined audiences and purposes incorporating accurate and sequenced content and multimodal elements (ACELY1700)

Navigate and read texts for specific purposes applying appropriate text processing strategies, for example predicting and confirming, monitoring meaning, skimming and scanning (ACELY1702)

Plan, rehearse and deliver presentations, selecting and sequencing appropriate content and multimodal elements for defined audiences and purposes, making appropriate choices for modality and emphasis (ACELY1710)

Analyse how text structures and language features work together to meet the purpose of a text (ACELY1711)

Use comprehension strategies to interpret and analyse information and ideas, comparing content from a variety of textual sources including media and digital texts (ACELY1713)

**STAGE 4**

Identify and explore ideas and viewpoints about events, issues and characters represented in texts drawn from different historical, social and cultural contexts (ACELT1619)

Reflect on ideas and opinions about characters, settings and events in literary texts, identifying areas of agreement and difference with others and justifying a point of view (ACELT1620)

Compare the ways that language and images are used to create character, and to influence emotions and opinions in different types of texts (ACELT1621)

Recognise and analyse the ways that characterisation, events and settings are combined in narratives, and discuss the purposes and appeal of different approaches (ACELT1622)

Recognise, explain and analyse the ways literary texts draw on readers' knowledge of other texts and enable new understanding and appreciation of aesthetic qualities (ACELT1629)

## Science

**STAGE 3**

Living things have structural features and adaptations that help them to survive in their environment (ACSSU043)

Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE083, ACSHE100)

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSIS086, ACSIS103)

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions (ACSHE098)

**STAGE 4**

Classification helps organise the diverse group of organisms (ACSSU111)

Scientific knowledge has changed peoples' understanding of the world and is refined as new evidence becomes available (ACSHE119, ACSHE134)

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE121, ACSHE136)

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124, ACSIS139)

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS125, ACSIS140)

Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures (ACSHE223, ACSHE226)

## HASS

**STAGE 3**

The environmental and human influences on the location and characteristics of a place and the management of spaces within them (ACHASSK113)

The contribution of individuals and groups to the development of Australian society since Federation (ACHASSK137)