Aussie STEM Stars

ALAN FINKEL

Australia's Chief Scientist: 2016–2020

Story told by Kim Doherty

Teacher Notes

written by
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PUBLISHED BY
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 9–13 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.

Reasons 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 in this market. 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

Kim Doherty is an editor, storyteller, teacher, and a mum to two young children – Molly and Xavier – who she hopes will be inspired by the amazing world of science and by Alan's story. This is Kim's second book for children: the first was about Mt Everest and the amazing facts, death-defying adventures and strange myths connected to the world's highest mountain. When she's acting like a grown-up (which is not very often), Kim is an award-winning editor-in-chief who has led some of Australia's best-loved publications, from *The Australian Women's Weekly* to *Kidspot*. She is passionate about sharing Australian stories and the importance of lifelong learning. Kim is hoping to complete her most recent educational endeavour (the world's slowest Master of Laws) sometime before the end of the century.

About our STEM Star: Alan Finkel

As Australia's Chief Scientist, our country turned to **Alan Finkel** for advice on everything from the climate, to artificial intelligence, to the pandemic. But at a time when scientists have never been so important, Alan nearly didn't become one at all! Growing up in Melbourne as the son of immigrants who fled the Holocaust, Alan had to find the courage to make his own choices – even when they weren't quite what his family had in mind. Alan's story is one of being brave, loving your family and always aiming for excellence.

OUTCOMES

Australian Curriculum

KEY FOCUS AREAS

Literacy Stage 2–4

Science Stages 2–4

Health and Physical Education Stages 2–3

Personal and Social Capability

OUTCOMES

NSW Curriculum

KEY FOCUS AREAS

Literacy Stage 2–4

STEM Stages 2–4

Personal development, health and physical education Stages 2–3

BEFORE YOU BEGIN READING THIS BOOK

Front cover

- What do you know about Alan Finkel?
- What do you know about engineering?
- What do you know about the role of Chief Scientist?

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**

  Success is the ability to go from one failure to another
  with no loss of enthusiasm.
  – Winston Churchill

  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 Kim Doherty 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.

KEY PROJECTS

Key project 1: School

Throughout the book we are shown that Alan Finkel loved learning. He loved to delve deep into topics that spiked his curiosity, and he worked hard to understand more about them.

How could school and learning be more inspiring for you? For other students? For teachers?

Design a school where every child and teacher can be inspired to learn more, to venture into the unknown, and to pursue areas of interest while feeling both challenged and supported.

Think about the buildings, the lessons, the resources and what needs to be taught.

Key project 2: Space travel

Create a timeline to show how travel in space has evolved over the years. Research what objects, animals and people have travelled in space over time, and from which nations. What impacts do you think these space journeys have had on people who viewed these events and on the astronauts themselves.

Research the perspectives of people of a range of ages and countries to learn more about what significant events in space history have meant for different people.

What if humans had never travelled in space? What would life be like now and would we view the world in a different way?

Challenge questions

How is space travel like a book?

Imagine that you are an astronaut who is looking down on Earth. Write a diary entry about how you feel and/or compose a piece of music that you think would encompass how it feels.

Key project 3: Science fiction novels/stories

We learn that Alan loved reading science fiction as a child, and the book *Dune* is quoted many times throughout the book.

Explore science fiction as a genre – what makes a story a work of science fiction?

How are the plot, setting or characters different from those of other genres? Create a chart to show similarities and differences.

Study an author who has written many science-fiction stories for younger readers. What has inspired them to write like this?

Can anything in science-fiction novels be real? Find some recent works of sci-fi, discuss if anything in it could be real, and work out why or why not.

Some science-fiction novels written in the past have predicted the future. Identify some novels that did this, and the part of "the future" that they predicted.

Write your own science-fiction story. Start by creating a world that inspires you – you might draw this first so you can "see" what characters have to endure in your unknown world!

Key project 4: Climate action

We learn that Alan Finkel still plays a role in looking after the planet as a Special Adviser to the Australian Government on Low Emissions Technology.

List some ways to start making changes to ensure we lower our greenhouse-gas emissions.

Design a flow chart to show how some of these changes should be made over time, from everyday people to large companies to governments. Think about education processes and changes to products.

Look at the pros and cons of these changes from your perspective, your parent's perspective, and your Member of Parliament's perspective and Alan Finkel's perspective. What are the key differences between these perspectives and how can we come to a common goal for the greater good?

Now using all of this information, imagine you are Alan Finkel. Write a speech to be made to the Australian parliament outlining what needs to change, why it needs to change and how we should do it.

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 Alan Finkel do and say in this chapter? How did he feel?	
What real life events occurred? Find some evidence to show this, using research.	
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 your learned?

TEACHING AND LEARNING ACTIVITIES

Chapter 1

- From this first chapter, what sort of person do you think Alan is? Explore different events and descriptions of how Alan reacted to them to show you have an understanding of their influence on Alan's future.
- Why was the moon landing so important to many people around the world? Many books and movies have been written about this event – why?
- What are some descriptive words used about these astronauts in space? How has this language shaped how you feel towards the mission? Which words or sentences stand out to you?
- Find the places in Australia that helped to 'live stream' the images from the moon. Why was this such a monumental event for these places and for Australia?
- Did Neil Armstrong have to write the letter to the scientists in Australia? Explain your answer.
- Create a flowchart for the Apollo mission from lift-off to landing on the moon. Include as much detail as you can about the people involved, what happened and what was learnt.

Chapter 2

- What does wagger mean?
- Alan's Dad is a self-taught builder. What influence do you think this had on Alan growing up?
- Why do many people connect good grades with being a doctor? Can people get 'good grades' at school and become an artist? Mechanic? Teacher? Discuss how society views different professions.
- Think about the way Alan treats other people. Create a character profile of Alan that uses words to describe him, his actions, and the people and influential events in his life.
- What are some traditional Jewish foods eaten at Shabbat? Find out about the dishes mentioned in the book and research some others.
- What does this quote mean?
  And unlike many Jewish families who had bravely made Melbourne their new home, the Finkels never felt they were victims of the horrors of the Holocaust. But of course, in some ways, they were.

Chapter 3

- Find Poland on a world map, as well as the town of Bielsko. How far are these places from Melbourne? How long would it take to travel from Bielsko today? How long would it have taken in 1946?
- What happened to Alan's father during the war?
- If the underground resistance movement had not existed, would the war have ended earlier or later? Would people living under the Nazis have been better or worse off without it?
- Why do you think Alan's Dad didn't want to talk about what happened during the war? Why does this happen to people who experience traumatic events in their lives?

Chapter 4

- Do you have any posters in your room? Are your tastes similar to or different from Alan's?
- How is Alan different from children of his age? How do you think he feels about this? Find examples in the text to explore this.
- How do you think that looking at a photo of our planet helps people realise we are lucky to live here? Or perhaps that war isn't a path we should be choosing?
- What is a 'ham radio'? Find out how they are made and what they can be used for.
- Alan doesn't know his principal's first name. Do you know your principal's first name? Do you think it is more common now to know the first names of adults than it was when Alan was young? Why or why not?
- What qualities does a good leader need? Write down a list. (You might start to answer this question in this chapter, and add to as we learn more about Alan.)
- Why do you think the school laboratory assistant didn't tell on Alan and his friends after they nearly blew up the laboratory and covered it with purple powder?
- What if World War II had not happened? Would Alan's principal still be a principal at a school? Give reasons for your answer.

Chapter 5

- Schools usually expect Year 12 students to work hard and focus on their studies. However, Alan was also expected to do a lot as the School Captain. Do you think it would have had a positive or negative impact Alan, and why?
- Read this section of the chapter:
  'You know Sir John Monash was a German-Polish Jew,' said Colin, well aware of Alan's family heritage. 'He was supposed to be a brilliant engineer,' he added, almost as an afterthought.

- Do you think what Colin said had an impact on Alan? Why or why not?
- How have Alan's friends helped him throughout the story so far?
- What is an engineer? List some things that have been designed by engineers in your home, town or city.

Chapter 6

- Alan loves reading science fiction. Talk to your librarian to find out about some good science-fiction books that you could read. Complete the Key Project on Science Fiction.
- How did Paul, the main character in *Dune*, inspire Alan? Draw some similarities between Alan and Paul as you read this book.
- How do fathers influence our lives? In Alan's case this influence was positive, so list all the positive effects Alan's father had on him. Extend this idea and think: what if Alan's father was not a positive role model? How might this change who Alan was or how Alan got through the grief of losing him at a young age?
- How big is a snail's brain? Find an image of one and compare it to other creatures' brains. Does a big brain mean anything?
- Find some images of brain cells. Compare various brain cells in different animals by looking at the size and shape.
- Look up the words in the box at the bottom of p. 59 and check your definition with the one in the book's Glossary. How are these words related to objects in your life?
- Why would a professor say this to a student?
  'Certainly, Alan. You may have any equipment you need…' said the professor in a friendly voice. Alan relaxed at the good news that a solution was at hand, '…as long as you design it and build it yourself.'

Chapter 7

- How can the workshop Alan describes be a 'wonderland' to one person but a 'nightmare' to another?
- What does this line mean?
  John knew the machines' faults and foibles…
- Draw a cycle showing how Alan is functioning at this point in his life. Explain what he does throughout his days and nights and how they flow into each other.
- The author tells us about Alan's thoughts toward Paul, the main character in the novel *Dune*:
  Learn the principle. Do the practice. Apply the skills. Repeat. *Just like Paul in* Dune.
  Think again how influential this book has been on Alan. Can you think of any books or characters that have inspired you in some way in your life?

- What is biochemistry? Explain it in your own words.
- Where is Silicon Valley and the University of California campus where Alan Finkel worked (there are 10 campuses at this university)? Find these on a map and the distance between them.
- Why do you think the author decided to highlight the content in the 'Masters of their domain' box? How does this relate to you, to the reader and to Alan Finkel as he is moving to USA?

Chapter 8

- What is an entrepreneur?
- How are diseases like Parkinson's disease and cystic fibrosis related to what Alan is studying and creating?
- Alan's stepfather told him to charge a high price if his product was good quality. Can you think of something that you or your family have bought that cost a lot of money but was good quality? Is this relationship between cost and quality always true?
- Why do you think someone like Alan wouldn't want to retire despite selling his business for $190 million?
- Does Axon Instruments still exist?
- How was Eddie the postman pivotal in Alan's career?

Chapter 9

- Where is Mt Kilimanjaro? Find out the distance of the climb, how long it takes, and the best weather to climb in.
- Check out *Cosmos* magazine: **Subscriptions Archives - Cosmos Magazine**. Is this something you would normally read? Read a few articles and write a review of this publication.
- Alan and his friend Wilson will be among the first passengers to fly into space. Imagine you are on board this with Alan and Wilson. Using the short description on page 86, describe what you think it would be like.
- What is neuroscience?
- What is an 'Officer of the Order of Australia (OA)'? Find the names of people who have been given this medal and why they were chosen. Do you think they deserved this award?
- Dr Howard Florey was a great Australian scientist who changed the world. Who are other great scientists in Australian history who have made a huge difference? You might explore the Aussie STEM Stars series for some starting inspiration!

- In ‘Parable of the light cave’ on page 91, it reads,
  It occurred to Alan then, that each of them was seeing that cave from a different point of view.
  How is it important to understand that everyone can see something from a different perspective? Why do we need to know this and how can this help us?
- Explore why we started to use oil instead of electricity in cars. Create two pros and cons tables, one as a scientist in 1915 and one for now. Through this table, work out why inventors of the past chose oil and how current scientists view this.

Chapter 10

- What is the Chief Scientist of Australia? Find out who has held this role and how long it has been a part of Australia’s government.
- Put yourself in the shoes of Alan Finkel. Write a text that outlines how Alan is feeling as he stands in front of the crowd and next to the Prime Minister.
- Find out more about the ice hotel described on page 98. Imagine you stayed there for a night – what would you do? Write a postcard home about your stay.
- What are the Northern Lights? Read the boxed text on page 99 and do some extra research to describe how they occur.
- Write a description of the Northern Lights as if you were there watching them happen. Tell someone about the different ways you might see/feel/hear and the different emotions it brings.
- What is pneumonia? Why do you need to rest once you have it?

Chapter 11

- What is the purpose of acronyms? Are acronyms the same as abbreviations? The author mentions FACS in this chapter as well as SKA and PM. Are they acronyms or abbreviations (or both?)? Are they a help or a hindrance?
- Find out more about the Australian Synchrotron and how it helps you in daily life.
- What is a Tesla?
- Whale sharks and NASA make an interesting combination. Can you think of how other aspects of science that seem completely different can help each other out?
- Explore more about synthetic biology and how it helps our daily lives.
- The Internet of Things sounds like it might a great idea, but scientists are also worried about it. Come up with a list of great things the IoT for your lifestyle, and a list of things that worry you.

Chapter 12

- Check out the Story Time Pledge that Alan set up. Pledge to read and share your reading more – perhaps some younger children in your life would love to hear you read! If possible, organise a time to read to some younger children, or create a short video of yourself reading a book and send it to someone who would love to be read to.
- Alan thought carefully about what should happen if we continue to use robots in our lives. List some of the ideas he put to the scientific community. Do you agree with all of his ideas? Think of other rules that should be proposed for the continued use of artificial intelligence (AI).
- Alan describes climate change in a way that's very easy to understand for Elise and her classmates. Create a diagram to show what Alan has explained to share with the students at your school or in your community.
- What is the difference between artesian water, wastewater and salt water?
- Find out where Cape Grim is and any other data they collect there.
- Do you think hydrogen can be used as a fuel source instead of coal or gas in the future? Explain your thinking and use evidence to support your argument.
- What were the names of some novels Isaac Asimov wrote? What did he write about? Can you find some in your local library?

Chapter 13

- What is clean energy? How does this relate to what was discussed in chapter 12?
- Where is Antarctica and why would you go there to see the effects of climate change?
- Read over the list that was put together by Alan after the bushfires of 2019/2020 hit. Why are all of these things necessary? Did anything on that list surprise you?
- What did Alan have to look into once COVID-19 struck? How is this different or similar from what you had to do?
- Who can be a part of the RRIF? Why does need a diverse range of people to be involved?

Chapter 14

- Alan was ‘a little sad’ on the last day he worked as Chief Scientist. Why do you think he felt that way? Have you ever had to leave somewhere you’ve enjoyed being? How did you feel?
- Draw a pie graph to show how Alan decided to use his time once he finished as Chief Scientist. Now draw up a pie graph for how he used his time at another point in his life. How are they different? How do you use your time? How is this different to Alan or someone else your age?
- Has Alan Finkel been able to fly into space yet? Explore the news headlines to see if the Virgin Galactic passengers have been able to take part.
- What does the Special Advisor for Low Emissions Technology do? Why do you think this is an important role?

Afterword

- We are told that Alan Finkel thinks the two most important subjects you can study are English and Maths. Why does Alan think this? Do you agree?
- Create a list of the different ways people can use mathematics in their lives. Can we do these things without maths?

EXTENSION QUESTIONS FOR FURTHER THINKING

Paradox: Books encourage people to change the world – or do they?

Attribute listing: What are the attributes of someone who is a great Australian? Explore the Aussie STEM Stars series to find similarities between these people and other people in Australia who you also think are notable.

Analogy: How is space travel like cave diving? How is a brain cell like a map?

Examples of change: How will the world be different if we pledge to reduce carbon emissions to the levels recommended by the United Nations? What will change that will make life easier or more difficult?

ELABORATION OF OUTCOMES TO THE AUSTRALIAN CURRICULUM

Literacy

STAGE 2

Discuss texts in which characters, events and settings are portrayed in different ways, and speculate on the authors' reasons. (ACELT1594)

Draw connections between personal experiences and the worlds of texts, and share responses with others. (ACELT1596)

Discuss how language is used to describe the settings in texts, and explore how the settings shape the events and influence the mood of the narrative. (ACELT1599)

Make connections between the ways different authors may represent similar storylines, ideas and relationships. (ACELT1602)

Plan and deliver short presentations, providing some key details in logical sequence. (ACELY1677)

Use comprehension strategies to build literal and inferred meaning and begin to evaluate texts by drawing on a growing knowledge of context, text structures and language features. (ACELY1680)

Plan, rehearse and deliver presentations incorporating learned content and taking into account the particular purposes and audiences. (ACELY1689)

Use comprehension strategies to build literal and inferred meaning to expand content knowledge, integrating and linking ideas and analysing and evaluating texts. (ACELY1692)

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)

Science

STAGE 2

Living things can be grouped on the basis of observable features and can be distinguished from non-living things. (ACSSU044)

Science involves making predictions and describing patterns and relationships. (ACSHE050, ACSHE061)

With guidance, plan and conduct scientific investigations to find answers to questions, considering the safe use of appropriate materials and equipment. (ACSIS054, ACSIS065)

Living things have life cycles. (ACSSU072)

Living things depend on each other and the environment to survive. (ACSSU073)

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

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)