

# Using picture books to teach STEM in preschool

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# Why children's books?

Great for

- Introducing new vocabulary (better than any other media source)
- Introducing new concepts
- Expand children's worlds
- Teaching /reinforcing print conventions
- Teaching/reinforcing rhyme, alliteration, prosody



# Why STEM in the early years?

- Children are very capable STEM learners
- Waiting till children start school to learn about STEM is too late
- Children from different SES backgrounds enter school with large differences in maths and science knowledge and these differences persist and grow

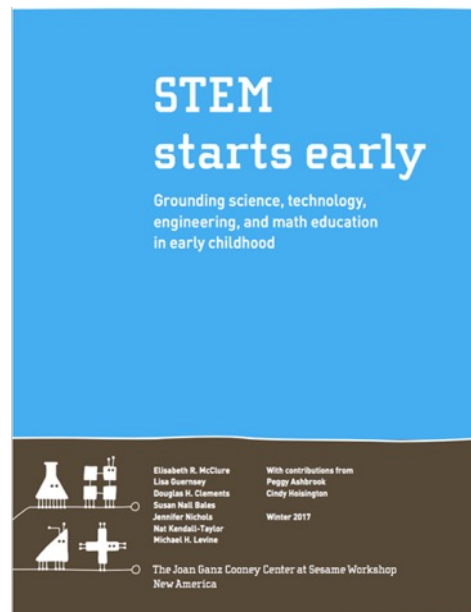
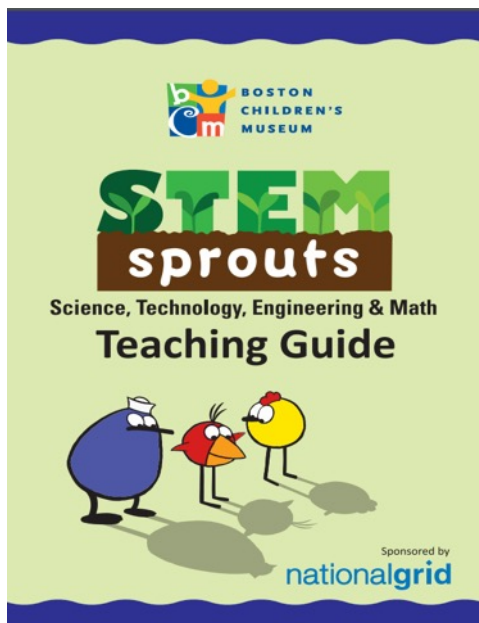


# Why STEM in the early years?

- We do STEM every day BUT we often don't make it explicit
- We need to let children know when we are doing STEM so they feel confident and capable
- Adults' beliefs about STEM affect children's beliefs about STEM
- Language matters – children must be socialised in STEM language to feel they belong and are capable



# Helpful resources and sources of information



# Looking for more information about STEM

**THE CONVERSATION**  
Academic rigour, journalistic flair

Arts + Culture Business + Economy Cities **Education** Environment + Energy FactCheck Health + Medicine Po



**Blocks are still the best present you can buy children for Christmas**

December 4, 2017 2:11pm AEDT

**THE CONVERSATION**  
Academic rigour, journalistic flair

Arts + Culture Business + Economy Cities **Education** Environment + Energy FactCheck Health + Medicine Politic




**Five things parents can do every day to help develop STEM skills from a young age**

March 12, 2018 6:04am AEDT

**THE CONVERSATION**  
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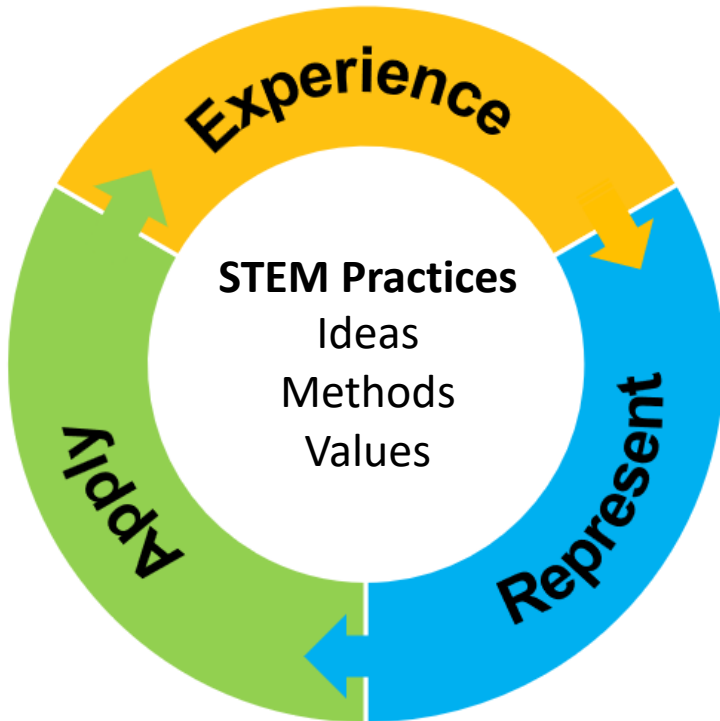
**Five easy ways to boost children's spatial skills**

Published: August 13, 2018 6:13am AEST

# Early Learning STEM Australia (ELSA)



# Experience-Represent-Apply (ERA) loop



**Experience ...** children experience a concept first with off-app activities

**Represent ...** this concept is represented on the app in game format

**Apply...** children apply the concept to their own environment





Children's picture books are a common tool for early childhood educators.

We asked our 100 educators in the original pilot program to bring a STEM book to share as an ice-breaker and to make personal connections.



We then asked them to think about their STEM books using a STEM Practices or STEM Habits of Mind lens to write a simple book review.

# STEM Practices

## IDEAS

Problem Posing

Finding and Validating Evidence

Questioning

Proposing

Designing and Building

Exploring and Challenging

## METHODS

Generating Ideas

Processing Information

Encoding and Decoding Information

Using Appropriate Language and Vocabulary

Using Tools to Produce Artefacts

Thinking Critically

## VALUES

Curiosity

Fairness

Imagination

Creativity

Teamwork

Persistence

# EARLY CHILDHOOD STEM HABITS OF MIND

Science, Technology, Engineering and Mathematics

CHILDREN ARE:



## Inquirers:

When they wonder why things happen and how things work.



## Engineers:

When they design, build and make things.



## Observers:

When they watch closely things in nature and the world around them.



## Pattern sniffers\*:

When they search and find patterns in words, numbers and the world.



## Describers\*:

When they describe what they do and see using precise language.



## Experimenters\*:

When they try and test things to learn how things work or what might happen.



## Encoders:

When they represent what they do and see with drawings and symbols.



## Measurers:

When they measure and count things.



## Decoders:

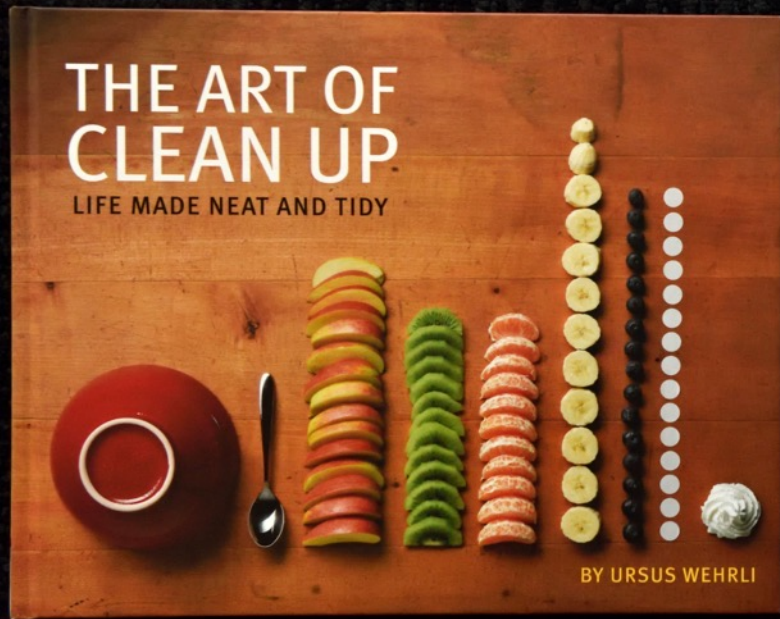
When they make meaning of representations and symbols.



## Predictors:

When they predict what might happen next.





## ELSA book review

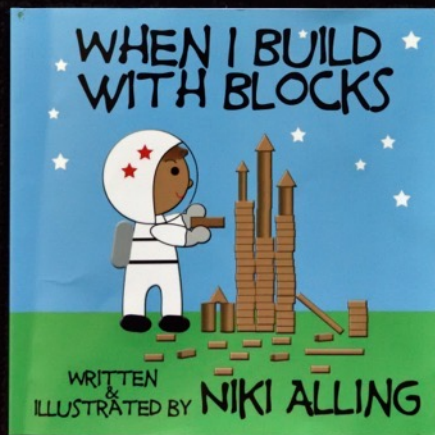
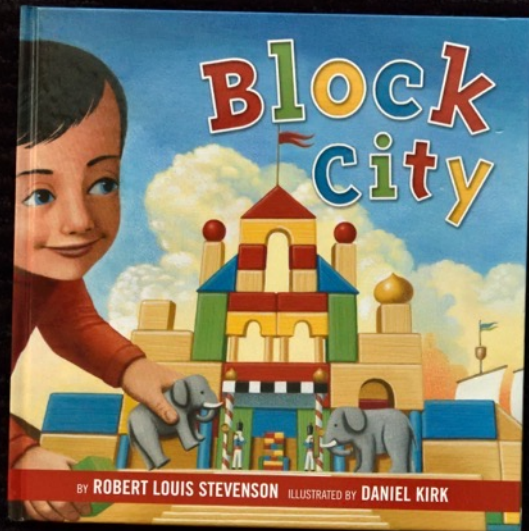
"The Art of Clean up." by Ursus Wehrli  
-Life made neat and tidy

Short description: Over the top sorting!  
A book with no words just pictures - eg. one page of a ball pit and the opposite page has this same ball pit sorted into rows of each of the coloured balls + the people outside the pit.

### Suggested activities:

- Coming up to Christmas having a Christmas tree and providing lots of baskets to sort the decorations into - by colour, by type etc the redecorate and resort etc.

Stem practices: Pattern sniffing  
+ Habits of Mind: Persistence, creativity



## ELSA Book Review

Title: When I build with blocks

- Block City
- Robert Louis Stevenson

Author: Niki Alling

Short description:

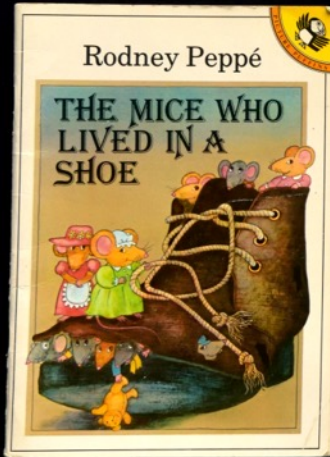
This story gives ideas of what you could build with the blocks you could find in your classroom.

Suggested Activities:

- Can they recreate some of the pictures
- Can they create some new pictures, take photos of them and create a class book of block pictures

Link to STEM Practices and STEM Habits of Mind.

- Engineers
- Designing + Building
- Persistence



## A House for Wombats

by Jane Burrell illustrated by Michael Dugan

Kate decides that wombats don't like living in the ground so she will build them a house. She has to decide on the different materials required to build a house and what other features a house would need.

Similar book The Mice Who Lived in a Shoe by Rodney Peppé

A family of mice work together to build a suitable home to protect and shelter them. They look at what a house needs and how they can work together to build the home.

Ideas to develop STEM practice

Problem Finding - what materials would you use?

Questioning - What does a house need?  
What does a wombat/mouse need in their home?

Designing and building - draw plans  
list materials  
build your house with loose part materials  
How will you build your house??

Exploring and challenging - work with different materials/techniques  
to build a model house.

Using appropriate language and vocabulary - language/vocab introduced +  
do with design + building

Generating Ideas - brainstorming types of houses/materials

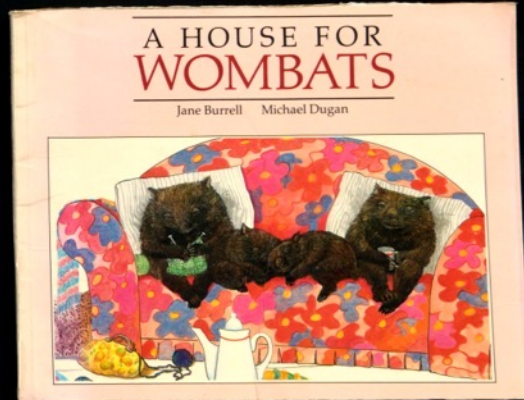
Imagination - design

(creativity? (original ideas)

CURIOSITY

persistence

TEAMWORK





Press ● Here

written by  
Hervé Tullet

This book takes the children on a journey. The book is engaging, ~~and~~ interactive and lots of fun. Each page has an instruction to follow and the follow-on to the instruction is on the next page. The children really enjoy the opportunity to discuss, question & propose what will happen.

Stem Practices:

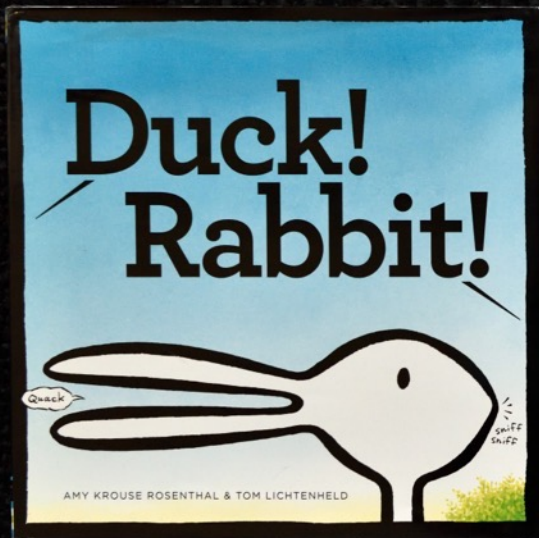
Ideas	Values
- Questioning	- Curiosity
	- Imagination

Stem Habits of Mind

Predictors - What will happen next

~~Imagination~~





## ELSA Book Review:

**Title / Author:** "Duck! Rabbit!" by Amy Krouse Rosenthal  
&  
Tom Lichtenheld.

**Short description:** A story around perspective and how an image can be portrayed in different ways.  
Opens up questions around how the image is flexible to both perspectives.

**Suggested activities:** (links to STEM Practices):

**Imagination:**

What else can you think of that can be of a similar situation e.g. Is it a ball or an orange?

How else can we modify the validations to each perspective? e.g.

Illustrate your ideas of a possible conflicting/challenging perspective

**Designing + Building**

**Habits of mind:**

- Describers (How it look like a rabbit/duck)
- Predictors - (what happens next if they don't see each other's perspective? or what happens after discovering the anteater/brochisaurus).

## What Friends Do Best

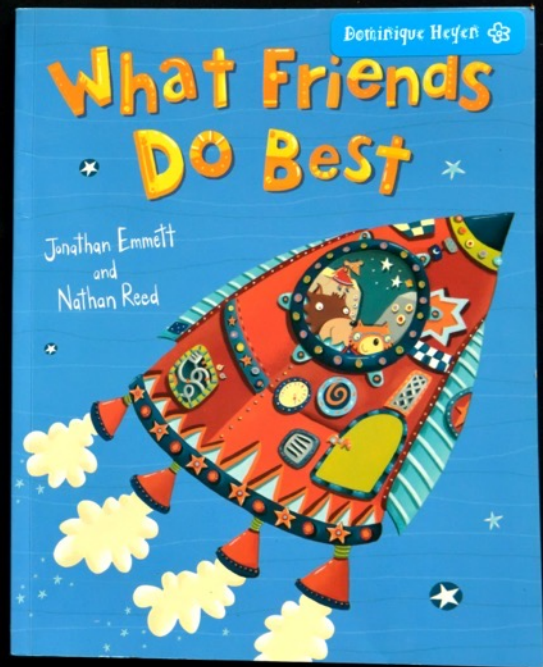
by Jonathan Emmett + Nathan Reed

Winston is a builder who makes amazing things. He decides to build something 'BIG'. Lots of bits + pieces arrive & his friends offer to help. Winston says NO he will build it himself. Ultimately he can't do it alone + his friends help him achieve his goal.

My preschool group are very Building focused and we have discussed working together, having a plan, drawing your plans, the importance of nails + screws (or small pieces in this story) to ~~the~~ help hold everything together.

Problem solving, Designing + Building,  
Imagination, Creativity, Persistence + Teamwork

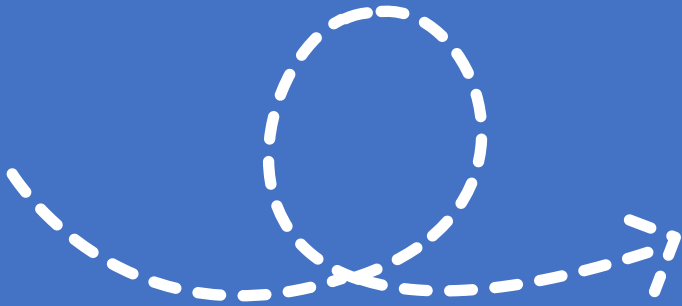
Generating Ideas - we encouraged our children to draw their ideas of what they'd like to build + consider what they need + who can help, before beginning.

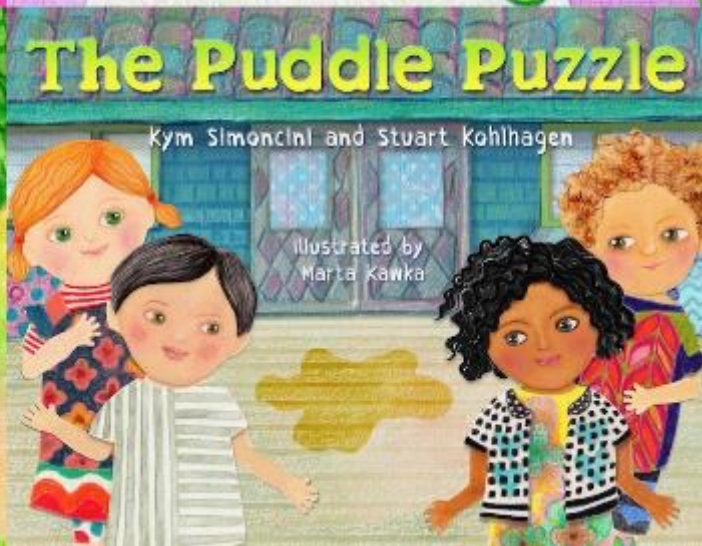
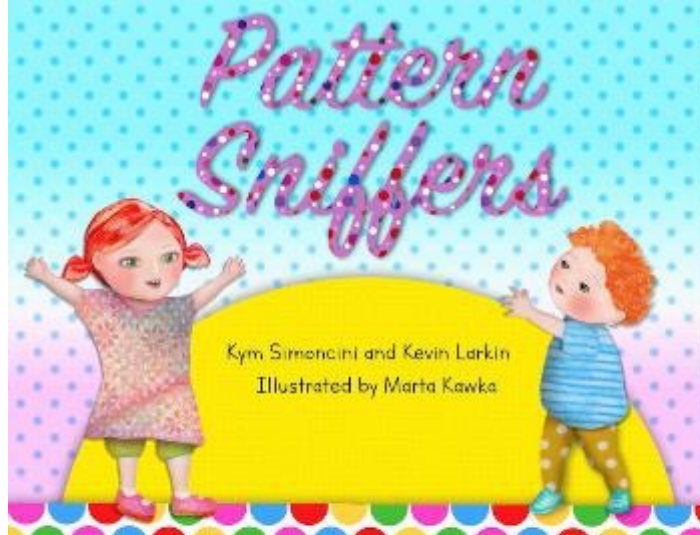


# Two outcomes

We developed four children's books to accompany the four apps

We created the Early Childhood STEM booklist





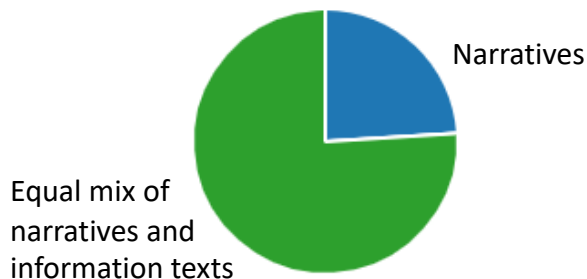
# Our study – research questions

- How and why are teachers reading to their classes?
- Are the ELSA books helpful and being used?
- Did they do follow-up activities after reading the books?

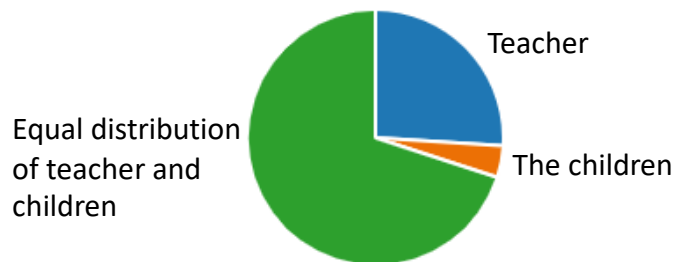
## Reading to children (50 preschool teachers, 1 male)

- 46 out of the 50 read to their children every day (other four read nearly every day)
- 46 teachers thought books were extremely important to their teaching

Types of book read



Who predominantly chooses the books?



# Reasons given for reading to children

- To develop language and literacy skills
- To introduce new topics/concepts
- For enjoyment
- To foster a love of reading
- To develop imagination



Only two teachers explicitly named STEM

# Reasons given for reading to children

*As a provocation to introduce a new topic, to help children concrete their learning, to help children to deal with situations, to send children a message, to teach children about good choices and bad choices, to develop meaning, to develop imagination and creativity, to explore ideas, to question and for enjoyment.*



# ELSA Book usage

- 48 teachers out of the 50 used the ELSA books
- 46 teachers thought books were useful
- 38 teachers reported having children engage in follow-up activities from the books



# Ways teachers used the books

- Provocations for learning
- Sharing with parents and educators to share messages
- Introduction to the apps
- Introduction of key concepts
- General book reading
- To reinforce/consolidate apps
- Stimulus for thinking and new activities



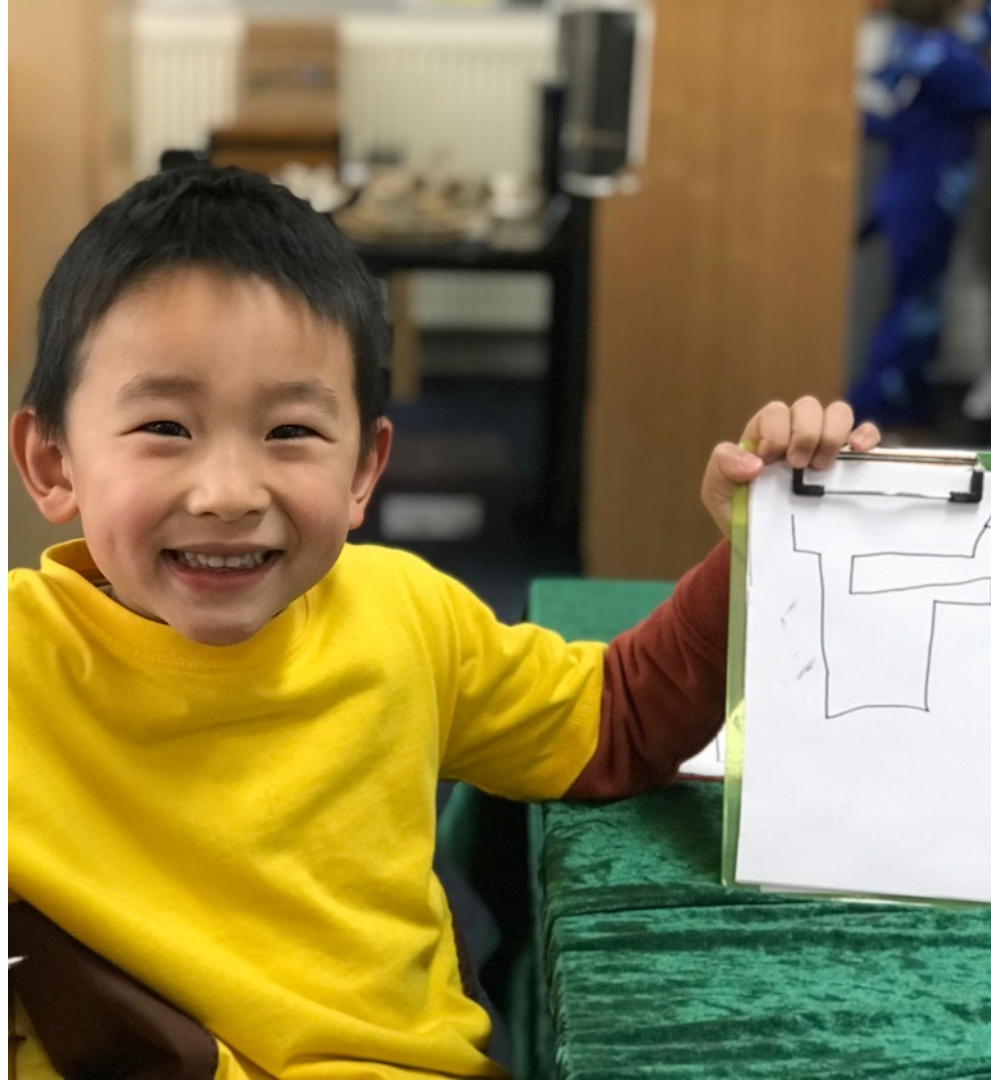
# Follow-up activities

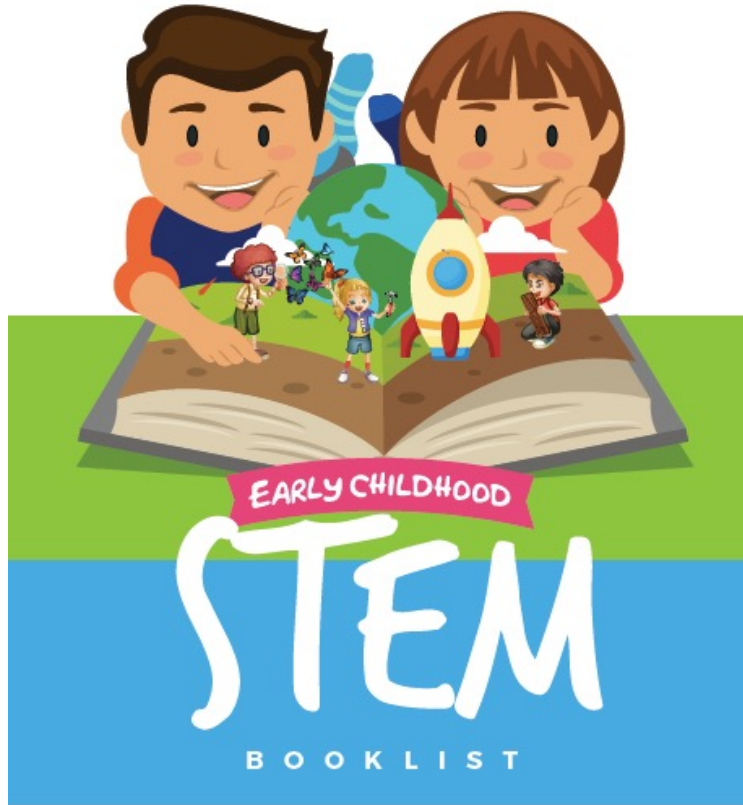
- Designing treehouses and cubby houses
- Researching structures/buildings, designs, council roles
- Creating patterns/finding patterns
- Making own Pattern Sniffers books



# Follow-up activities

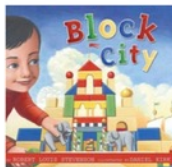
- Solving problems using scientific method
- Creating maps (treasure, zoo, home to preschool, local area)
- Creating cities using blocks based on maps





# Early Childhood STEM Booklist

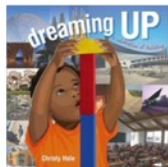
- Books focus on STEM Practices or STEM EC Habits of Mind
- Not an exhaustive list
- Downloadable at [elsaprogram.com.au/resources/](https://elsaprogram.com.au/resources/)



### BLOCK CITY

Robert Louis Stevenson Illustrated by Daniel Kirk  
Simon & Schuster ISBN: 9780689869648

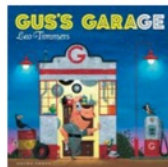
What are you able to build with your blocks? Renowned illustrator Daniel Kirk has joined his 'blocks'—in this case, bright colours, bold shapes, and retro style—with Robert Louis Stevenson's classic poem to construct a nostalgic yet exuberant celebration of fun and imagination.



### DREAMING UP

Christy Hale  
Lee & Low Books ISBN: 9781600606519

A collection of illustrations, concrete poetry, and photographs that shows how young children's constructions, created as they play, are reflected in notable works of architecture from around the world.



### GUS'S GARAGE

Leo Timms  
Gecko Press ISBN: 9781776570935

Gus's workshop is chockful of useless odds and ends. But when his friend Rico comes over with a problem (his scooter seat is way too small for a rhino), Gus finds just the thing to solve it. He creates a fabulous new vehicular contraption with an old lounge chair! One by one Gus's friends bring him their vehicles and Gus solves their troubles with ingenious solutions.



### THE BOX BOY

Mal Webster  
Windy Hollow Books ISBN: 9781921136504

A boy loves collecting things, especially cardboard boxes. He makes more and more amazing things from boxes, until his work is noticed by an art gallery director who gives him a big exhibition.



### GOING PLACES

Peter and Paul Reynolds  
Simon & Schuster ISBN: 9781442466081

It's time for this year's Going Places contest! Finally, time to build a go-cart, race it—and win. Each kid grabs an identical kit, and scrambles to build. Everyone but Maya. She sure doesn't seem to be in a hurry...and that sure doesn't look like anybody else's go-cart! But who said it had to be a go-cart? And who said there's only one way to cross the finish line?



### IGGY PECK, ARCHITECT ADA TWIST, SCIENTIST ROSIE REVERE, ENGINEER

Andrea Beaty Illustrated by David Roberts

These books all have an underlying theme: Dream Big. The fun part is each story is told from a different child in Ms. Lila Greer's classroom.



### 11 EXPERIMENTS THAT FAILED

Jenny Offill Illustrated by Nancy Carpenter  
Schwartz & Wade Books ISBN: 9780746077696

Is it possible to eat snowballs doused in ketchup and nothing else all winter? Can a washing machine wash dishes? By reading the step-by-step instructions, kids can discover the answers to such all-important questions along with the book's curious narrator.

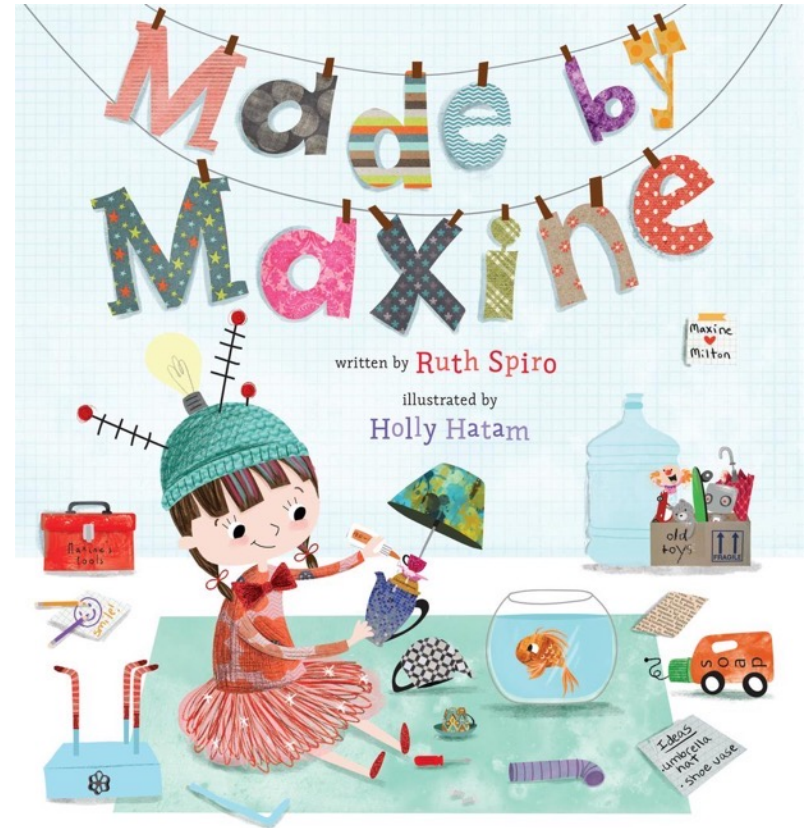
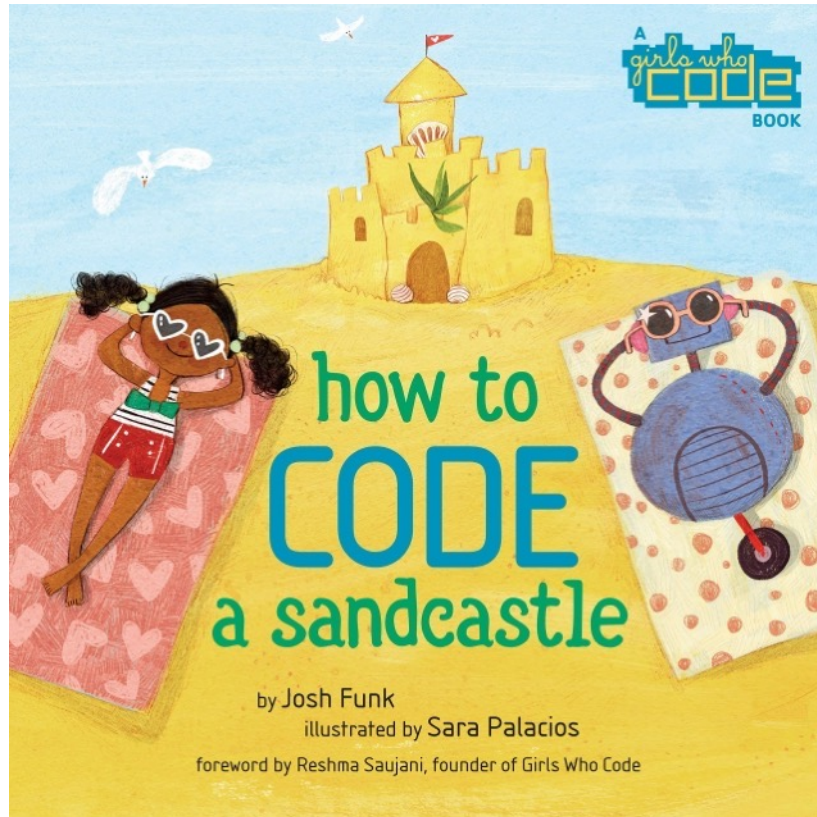


### CHARLOTTE THE SCIENTIST IS SQUISHED

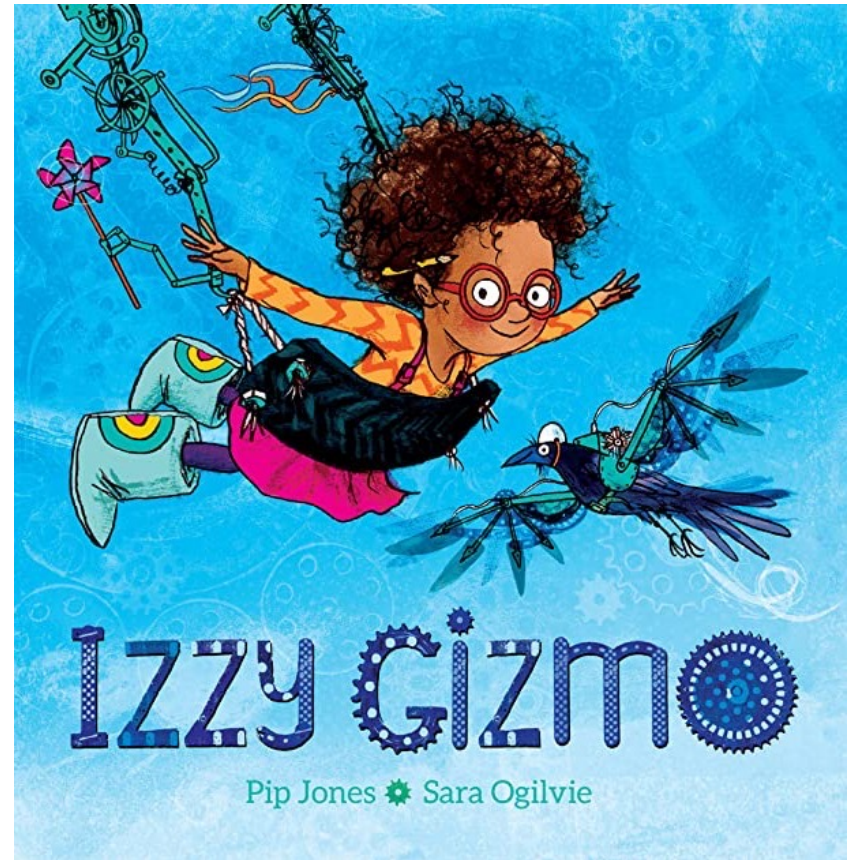
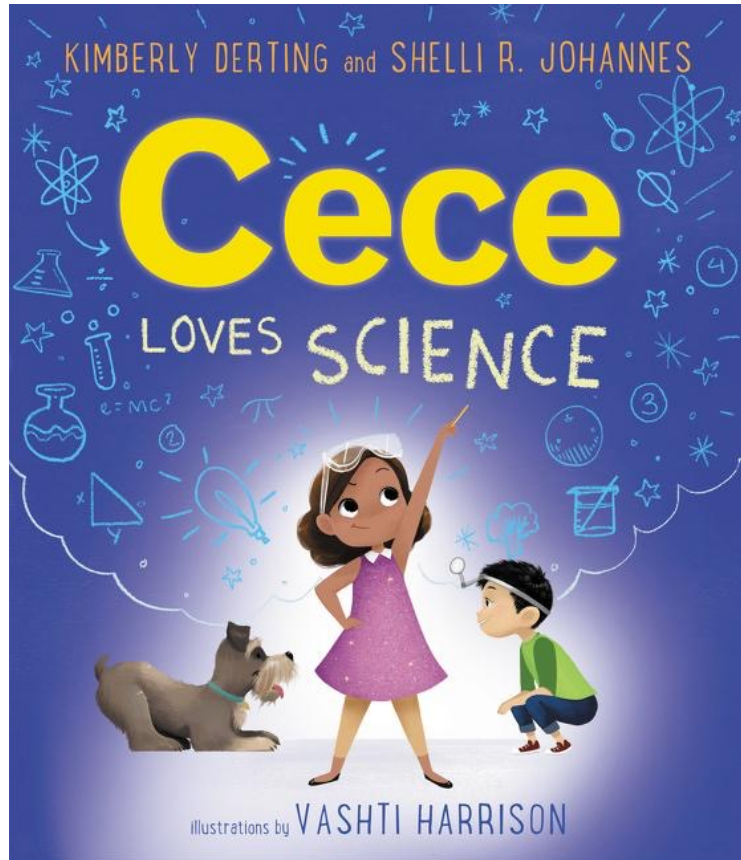
Camille Andros Illustrated by Brianna Farley  
Houghton Mifflin ISBN: 9780544785830

Charlotte is a serious scientist. She solves important problems by following the scientific method. She has all the right equipment: protective glasses, a lab coat, a clipboard, and a magnifying glass. What she doesn't have is space. She has so many brothers and sisters (she is a rabbit, after all) that she is too squished to work on her experiments!

# Notable new books



# Notable new books





# Don't have the money for lots of new books?



Google 'read alouds' for your book

<https://www.youtube.com/watch?v=89hKTOEbr-Y>

# Take home message

1. Children's books are a great way to introduce and consolidate STEM learning
2. Use STEM Practices or STEM Habits of Mind as a lens to view children's books
3. Build your STEM library through books and online read-alouds

# For more information

## Kym Simoncini:

- [kym.simoncini@qut.edu.au](mailto:kym.simoncini@qut.edu.au)
- <https://serc.edu.au/stem-resources/> (to download Early Childhood STEM Habits of Mind resources)

## ELSA Team:

- [team@elsa.edu.au](mailto:team@elsa.edu.au)
- [elsaprogram.com.au](http://elsaprogram.com.au)