

STEM Education in Early Childhood

Hobart 2019



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FROM VISION TO ACTION



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Sharing initiatives to engage in STEM in early childhood settings

ELSA

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C&K Qld

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Children as 21st century learners

- The world is and continues to constantly change
- The jobs in the future may not yet have been created or even thought of
- New knowledge is increasing exponentially
- 4C's Critical thinking, communication, creativity and collaboration



STEM

STEM (Science, Technology, Engineering and Mathematics) is

- an interdisciplinary approach
- applies science, technology, engineering, and mathematics concepts and processes to real world problems



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“For the early years, STEM has been conceptualised as the creation of learning environments in which children’s curiosity about the world can thrive via systematic, authentic investigations that utilise a range of design thinking skills and scientific knowledge and processes.”

– Early Learning STEM Australia (2017)





C&K Oakey

ELSA Pilot



- ELSA is a play-based digital learning program for children aged 4 to 5 to explore science, technology, engineering and mathematics (STEM).
- 100 preschool services participated in 2018 ELSA Pilot
- Federal government initiative developed by the University of Canberra for early childhood
- A series of educational apps on tablets, hands-on activities (on and off the apps), and educator workshops



Early Learning STEM Australia



ELSA:

- supports children to play and experiment
- builds inquiry skills to ask questions, make predictions experiment, and hypothesis
- expands children's knowledge and skills in science, mathematics, engineering and technology
- improves children's digital literacy



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Our participation - why we wanted to

AEDC 2015 Language and cognitive skills Developmentally on track (%)

Australia- 84.6 QLD- 82.3

Oakey and surrounds- 76.1

Developmentally at risk (%)

Australia- 8.9 QLD- 9.7

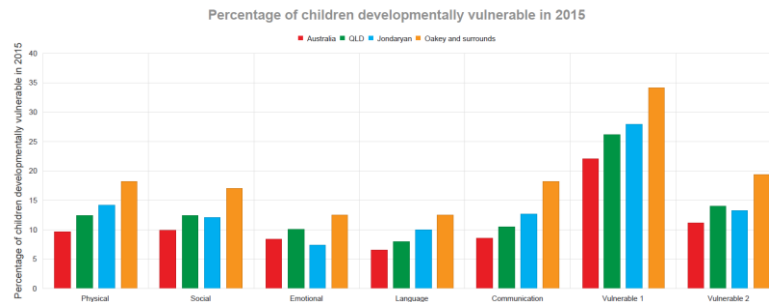
Oakey and surrounds-11.4

Developmentally vulnerable (%)

Australia- 6.5 QLD- 8

Oakey and surrounds-12.5

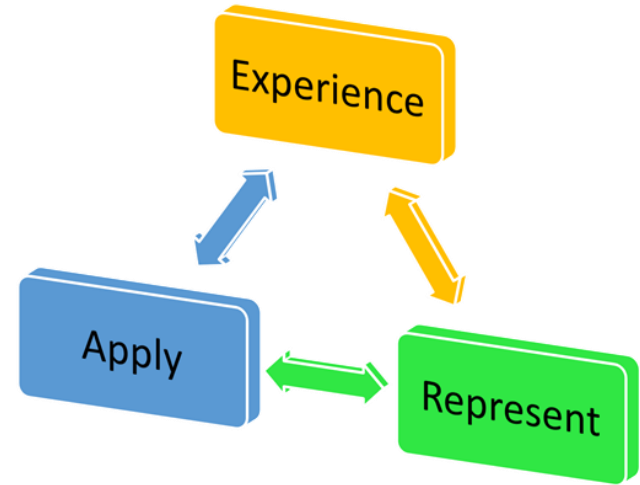
Vulnerable on two or more domains(s) (%) Oakey- 19.3

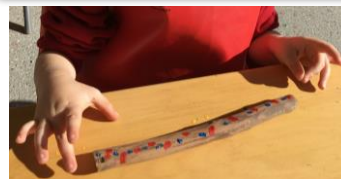
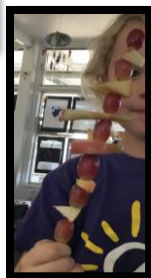
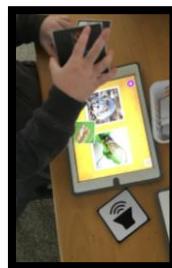


ELSA – The program



ERA Loop





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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.



Descriptors^{*}:

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.



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Technology, our Journey

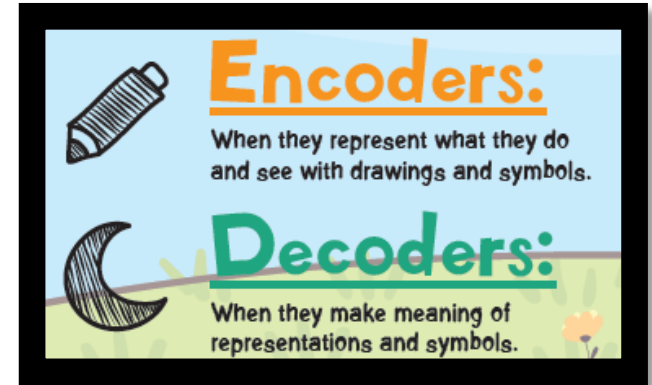
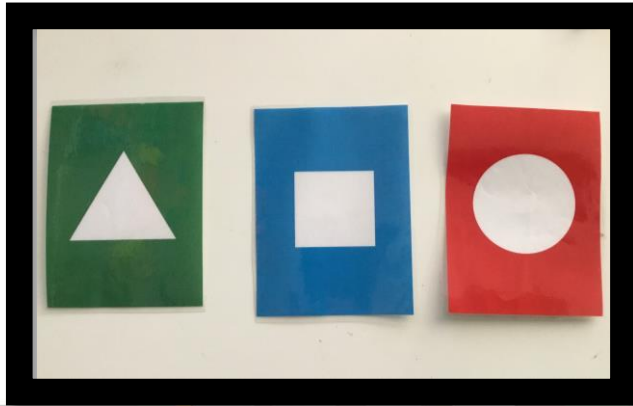
Experiences weren't limited to digital representations but also extended to acknowledging technology such as...



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Play Experience



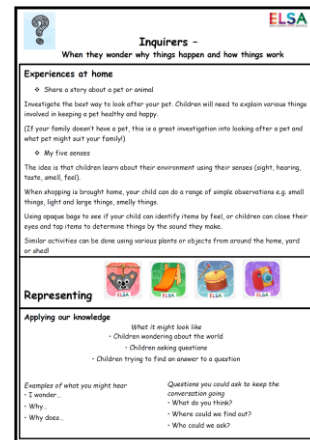
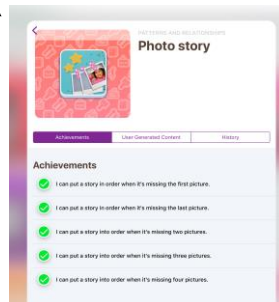
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Educating our community on STEM

- ERA loops displayed for families
- In the home projects ELSA activity folders and 'homework'
- Wider community Under 8's events
- Bonded learning progression data



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Results from ELSA Pilot

Educators:

- expanded use of STEM vocabulary and practices
- communicated STEM learning and teaching strategies
- implemented a play based philosophy
- integrated STEM practices with literacy, the arts, science, engineering, technology and mathematics concepts
- participated in ongoing learning and professional development to deliver quality STEM through PLAY!
- promoted STEM to the wider community



C&K – an organisational approach

2016 - 2017 - C&K Reimagining Excellence

2017 C&K - Think Tank

2017 C&K Community of Practice

2017 – QLD ECEC Conference – STEM Room

2018 – QLD ECEC – Exploration of loose parts

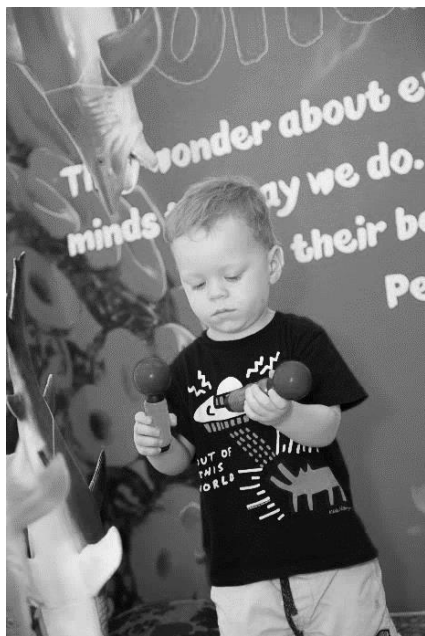
2017 - 2019 Partnerships – QUT, Qld Museum,
Ipswich Art Gallery



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Young children viewed as thinkers and theorists



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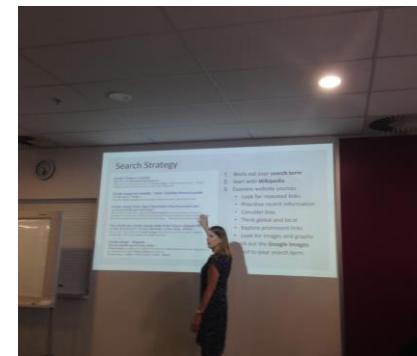
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C&K Community of Practice

- Educators from across Qld from diverse centres and diverse experience
- Critical friends from QUT and Ipswich Art Gallery
- Professional learning opportunities
- Projects
- Sharing projects and feedback from their centre
- Interviews with educators and visits to their centres

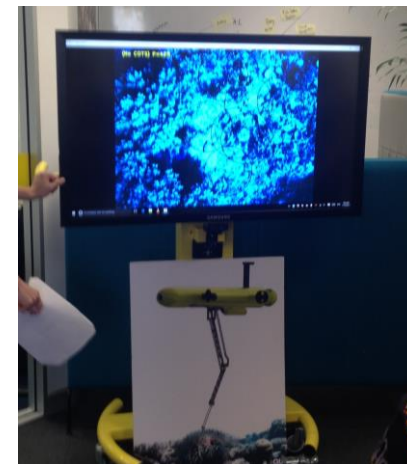


Professional learning



Early Years STEM: Inquiry Pedagogies

Mia Christensen
QUT School of Early Childhood and Inclusive Education



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C&K Community of Practice

Discussions and provocations

- What is learning? What is STEM?
- Reflecting on environments
- Considering questioning and thinking strategies
- Using STEM language and thinking
- Discussing technology without screens
- Searching for information initiated by children's curiosities



Educators sharing their work and insights

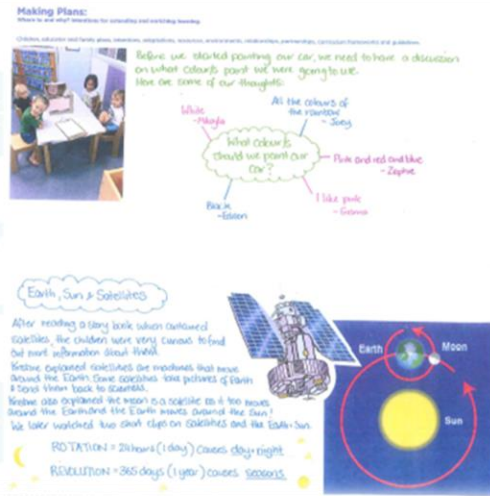


STEM stands for science, technology, engineering, and mathematics. STEM is important because it permeates every part of our lives. Science is everywhere in the world around us. Technology is continuously expanding into every aspect of our lives. Engineering is the basic designs of roads and bridges, but also tackles the challenges of changing global weather and environmentally-friendly changes to our home. Mathematics is in every occupation, every activity we do in our lives. By exposing students to STEM and giving them opportunities to explore STEM-related concepts, they will develop a passion for it. A curriculum that is STEM-based has real-life situations to help the student learn. Programs like Engineering For Kids integrates multiple classes to provide opportunities to see how concepts relate to real life. STEM activities provide hands-on and minds-on lessons for the student. Making math and science both fun and interesting helps the student to do much more than just learn.

http://engineeringforkids.com/article/02-02-2016_importanceofstem



New words we learnt today:
Stable foundation



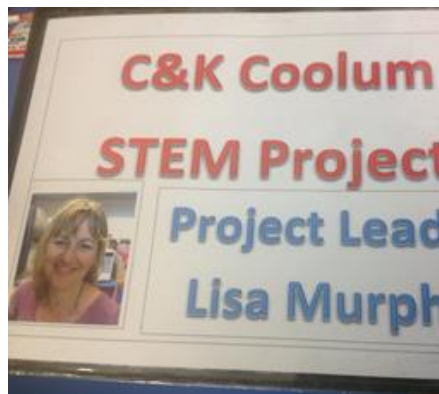
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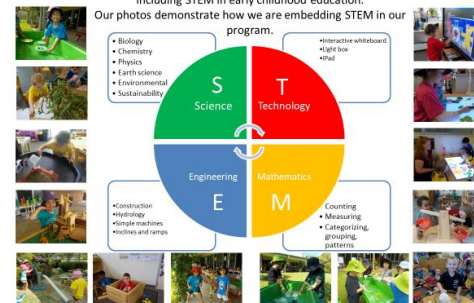


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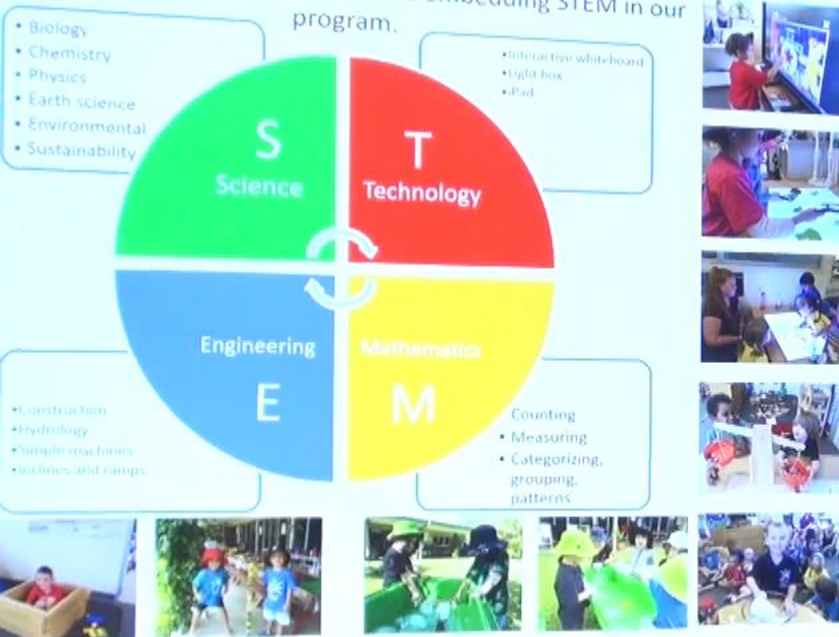
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Beaconsfield Kindergarten has been selected to contribute to the C&K working group for including STEM in early childhood education.



Kindergarten has been selected to contribute to the C&K working group for including STEM in early childhood education. Our photos demonstrate how we are embedding STEM in our program.



Working collaboratively with your teaching team



STEM is interdisciplinary.
STEM is now promoted as a major curriculum area in Early Childhood, Primary and Secondary
Stem = Science, Technology, Engineering, Maths.

Why focus on STEM?

- STEM is everywhere – Science, Technology, Engineering Maths
- Strength in the STEM disciplines has been linked to the economic prosperity of developed countries
- In Australia the results in standardised testing in some of these disciplines has not improved since 1995 (Thomas, Hillman, Wernett, Schmid, Buckley & Mundene, 2013)
- Why STEM in Early Childhood?**
 - Because integration is what we do best
 - The focus in ECE is the whole child
 - Because hands on learning is our focus
- Following children's interests and learning are at the core of our planning.
- Engagement with the activities to construct knowledge is what we do.
 - Because positive dispositions is what we do
 - Children in the early years develop long term habits of learning.

Technology	Science	Engineering	Maths
Robotics	Chemistry	Chemical	Measurement
Coding	Biology	Mechanical	Dimensions
Telescopes	Geography	Civil	Formulas
Transmission	Astronomy	Electrical	Physics
Environmental	Hydrology	Architecture	Geometry
Hydrology	Physics	Dimensions	Volume
Photography	Geology	Measurement	Quantity
Connections	Organising systems	Constructivism	Capacity
Communications	Classification	Design	Counting
Imagery	Hypothesising	Planning	Numeral
Research	Discovery	Geometric shapes	Estimation
Knowledge	Experimenting	Materials	Comparing
Information	Investigation	Balance	Calculation
Discovery	Problem solving	Fit	Size
Processes	Theorising	Contours	Compressions
Problem solving	Data Collection	Leveraging	Shapes
Computers	Variations	Speed	Multi – faceted
Emailing	Phenomenon	Ramps	Sets
Digital	Rotation	Incline	Fit
Podcast	Momentum		Plus
Recording	Incline		Add
Machinery	Innovation		Subtraction
Media	Gravity		Division
	Exploring		Multiplication
	Dissection		
	Health		
	Friction		
	Centrifugal Force		

This is not a complete list add words as you discover or consider a NEW word applies to STEM



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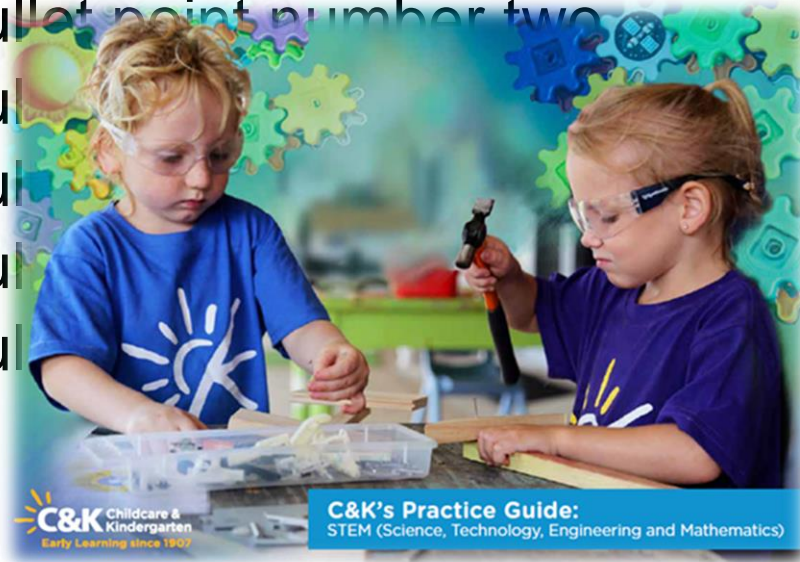
Educators insights and learning

- create inspiring, well-organised & resourced environments
- use academic language and help children understand concepts
- support children to observe and evaluate their ideas and conclusions
- apply concepts to their everyday world
- help children to think about their own process
i.e. “How did you know that?”



C&K Practice Guide STEM

- Bullet point number two
- Bul
- Bul
- Bul
- Bul
- Bul



What is STEM?
Why does it matter?
What do I need to know?
How do I do it?
Where can I to find out more?
So what?
Useful Websites



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Partnership with Queensland Museum

- WSFB – 2017, 2018, 2019

Reflections for educators to consider

- Am I providing an environment to spark curiosity?
- Is there uninterrupted time for children to explore, test and develop their ideas?
- Do children have resources and support to represent their thinking through mediums that are relevant and of interest to them?
- Do I have a structure or routine for developing children's thinking?



To have curious children we need
to have curious educators.



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