

How Children Learn through Schemas



by Dr Anne Meade and Lauren Ryan

About Schemas and Learning

“Schemas link directly to how the young brain develops and grows. They are a vitally important element in young children’s learning and development.

Children need opportunities to practice repeatedly what they know and can do. So what is known becomes better known” (Louis, 2013)

“Schema” is a word used to describe small thought structures in our brains. Schemas help human beings to organise and process input from our senses and language into categories and concepts. They are ‘building blocks’ for memories and they enable tamariki to extend their thinking. Children aren’t the only ones fascinated by patterns. Adult artists, mathematicians, musicians and gardeners, for example, are especially aware that the world has an underlying order.



Does your child often like to:

- Spin round and round?
- Turn the wheels on scooters and buggy parts?
- Draw lots of circles?

*Through their exploration of these actions, they learn how **they** turn and how **objects** turn.*

This is an example of the rotation schema.

Cover photo: James illustrates **containment schema** learning for us.

What Happens in the Brain

When children repeat the same sort of actions time after time, they are opening a ‘window’ into their minds for adults to see how they learn about categories or patterns in the world. The human brain’s ability to capture, store and retrieve memories is what makes learning possible.

Babies and toddlers repeat similar actions again and again, thereby building categories into their brain structures. When they drop objects from a table or sing a line from a song over and over again, they are working on a thread of thought, seeking to find a pattern and prove that they have got it ‘sorted’- **babies and toddlers are statistical thinkers.**

“At first, schemas are part of the brain’s development through the senses and movement of the baby or toddler. ... Knowing about schemas helps adults working with very young children to tune into each child but this also informs teachers’ planning” (Bruce, Louis & McCall, 2014, p. 58).

In 2000, when Anne Meade spoke to an audience of medical neuroscientists, they were fascinated that schema learning research in early childhood education settings had uncovered how subconscious memories form in young children through play.

Some important memory systems are:

- Short-term memories and long-term memories;
- Autobiographical narrative memory;
- Explicit memories (of facts or events); and
- Unconscious (implicit) memories.

Our implicit memories include all the patterns we’ve learned that we are no longer aware of. They get embedded in our brains via our urges to practise them again and again. That practising is more obvious in young children. When a schema is confirmed via enough evidence, tamariki store it in their subconscious mind – it becomes an unconscious memory.

What do schemas look like at Daisies?

Some examples of commonly-observed schemas that fascinate tamariki are:

- Rotation;
- Lines or planes—horizontal, vertical, grids and diagonals; circles, arcs; area;
- Trajectory;
- Transporting;
- Enveloping (wrapping or lathering), containing (in bags, boxes);
- Going through a boundary;
- Enclosing (fence-like);
- Arc, core and radial;
- Transforming;
- Assembling and scattering;
- Ordering in a sequence, e.g., by size;
- Connecting and disconnecting;
- Positioning.

FLOW

The times when someone is involved in, concentrating hard and clearly enjoying an experience have been described as “flow” (Csikszentmihalyi, 1990).

Learning when in flow has a strong emotional element to it: ideas that capture a child’s interest boosts their energy to learn more. Thus, flow and strong engagement are important for motivation to learn. Educators notice that often young children in ‘flow’ are deeply fascinated with exploring a schema.



Ruby (3.10) spends 30+ minutes in “flow”, exploring the concept of ‘area’ on a mathematical ‘plane’. She painted a series of coloured ‘areas’, carefully maintaining the boundaries of each, until she had painted the whole ‘area’ of the page.

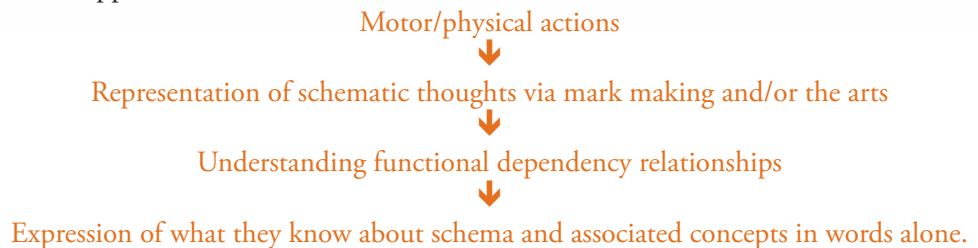
Saying, “S/he is fascinated by ...” indicates that an adult has noticed signs of schema learning, although may not yet recognise the specific schema being explored. To identify which one, look for a pattern in the child’s actions and then ask: ‘What idea lies within these repeated experiences?’

The Role of the Teacher in Supporting Schemas

Kaiako at Daisies notice when tamariki express “urges” to explore or practise a schema again and again. They recognise that repetitive actions give them a signal to study the child’s mind. Kaiako don’t respond with a prohibition, “please don’t do that again; it’s driving me crazy.” Rather they think creatively and propose different resources and experiences that extend the child’s encounters with the schema to consolidate his or her implicit memories and skills.

To label schema learning as “urges” may unwittingly invite educators to stand to one side, switch off their professional educator mode, and do nothing. However, kaiako at Daisies don’t do this, because they seek out opportunities for “sustained, shared thinking” (Siraj-Blatchford, 2010) in their practice. They plan relevant varied experiences for the child to encounter the schema again. During shared-thinking interactions, they assist the child’s progress through levels of thought associated with schema learning. Helping tamariki become more aware of their implicit memories, means unconscious memories transform into conscious memories (Meade & Cubey, 2008).

Children’s schema thinking progresses and becomes more complex across time with adult support:



The functional dependency level of thought is when children understand that some things happen as a sequence of connecting actions: understanding functional dependency helps children understand cause and effect.

Arlo's fascination with the trajectory schema

There is a schematic theme in Arlo's photo portfolio - he is fascinated with trajectories. At the playground, Arlo loves to swing and whiz down a slide; at Daisies, he is a regular on the swing or twister, and challenges himself to jump from outdoor equipment. Many photos of Arlo in the bush show him exploring the stream's trajectory.

Arlo moving trains on train tracks is frequently captured in photos at home and at Daisies. *This passion grew stronger in both settings as Arlo's parents and centre friends joined him in making more complex tracks.*

Arlo's key teacher recognised that his focus on tracks indicated that his schema thinking had progressed to the level of functional dependency - he now understood that trains need connected tracks in order to move from A to B, and sloping tracks help trains to gather speed.

Arlo also began to explain in words his plans for building, say, long train tracks and/or on different levels. By age 3.8 (aided and abetted by co-constructing teachers and parents), Arlo was building sophisticated infrastructure for trains. Kaiako also recognised that Arlo was working on understanding the concepts of **movement** along tracks, and sometimes, **speed and/or momentum**.





Many ideas that tamariki explore through schema-related play form the basis of early mathematical, architectural, scientific and literacy knowledge. Here's an example of a way to link a schema and mathematics concepts.

Schema	What is the idea about?	What are the common repeated actions in play?	What [concepts] may this child be thinking about?
Trajectory	Lines of movement	Throwing, dropping or pushing objects, running, swings and slides, hoses and spray bottles	Height, speed, distance, momentum and length

Notes: This is an excerpt from a chart devised by Susan Harper at Wilton Playcentre in Wellington and reprinted in Getting Started Schemas (van Wyjk, 2008).

Clara explores Connecting and Positioning

In her e-portfolio:

“Clara, recently I wrote the story about you learning to stand up on the stool. Now that you have mastered this, late last week you took standing on the stools to a new level. You connected all the stools together - which took a bit of trial and error to get the perfect positioning- and then carefully stood up on them and walked along.

You tried out different ways of moving along the row of stools, such as, sitting and sliding, using both your feet and hands (spider crawling), and walking.

You showed the same carefulness and concentration as you did when you learnt to stand on the stool. I think the row of stools made it slightly easier to get up on top as there was a longer surface to use to find your balance. However, there was also a challenge for you to move along them.

Here are some of the photos I took.”





It was interesting that once kaiako helped Clara to understand the idea of connection, we recognised that her schematic thinking extended this idea of connection in two other ways. First, she began incorporating the schema of positioning in her explorations and she included another schema idea, the idea of vertical. Clara positioned the ladder to go up (see the photo above). By bringing the two schemas together—working at a functional-dependency level of thought—Clara could physically and mentally work on the concept of **height**.

When working with the positioning schema, tamariki can also be learning about order, sequencing, symmetry and mapping.

Second, Clara began to talk about her actions while exploring. This is the beginning of demonstrating her knowledge through both physical (motor) explorations and symbolic representation in her language.

Jacob had been fascinated with the **connecting** schema for months, constructing rail tracks and block structures. We recognised Jacob's higher level of thinking about connecting when he used his knowledge for a real-life purpose - he built this bridge across a wet moat from his 'island' to dry ground. He's also using the word 'connecting' in conversations.



Open and closed **arcs** are schema fascinations that help lay foundations for writing the alphabet and technical drawing. Here, Greta was 'drawing' open and closed arcs with Perspex tiles and polished stones, possibly thinking about the difference between concentric circles and spirals. Arcs are important features in the formation of letters, and Greta has a strong reason for being interested in them as the letters in her name use many arcs.



Links with Te Whāriki

Schema learning fits with Exploration learning outcomes: strategies for active exploration, thinking, reasoning and developing working theories for making sense of the natural, physical and material worlds.

When out in the nature, tamariki love to explore spatial schemas such as ‘verticality’, and ‘spatial positions’ such as the visual map seen below.



How to identify learning schema at home

Repetitive actions don't only consolidate children's thinking - their exploration of schemas makes their learning visible to adults.

Schema learning often involves a lot of repetition! This can drive parents crazy. However, when adults find out that repetitious actions point to schema learning and shows the ‘cogs turning’ inside the child's mind, their viewpoint changes dramatically.

From that moment, they can gain great satisfaction from observing a child's actions and thoughts, and from helping the child consolidate their thinking about places and things.



Further reading about schema learning in the early years

Ask to join the Facebook group: [Schemas Discussion Group](#)

This is the group for those interested in schemas.

Indulge in further reading

Atherton, F. & Nutbrown, C. (2013). *Understanding Schemas and Young Children: From birth to three*. London: Sage.

Louis, S. & Featherstone, S. (2013). *Understanding Schemas in Young Children: Again! Again!* London: Featherstone.

Meade, A. & Cubey, P. (2008). *Thinking Children: Learning about Schemas*, 2nd edition. Maidenhead: Open University Press/ Wellington: NZCER Press.

van Wyjk, N. (2008). *Getting Started with Schemas. Revealing the Wonder-Full World of Children's Play*. Auckland: NZ Playcentre Federation.

References

Athey, C. (2007). *Extending Thought in Young Children: A Parent-Teacher Partnership*. London: Paul Chapman.

Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience*. New York: Harper and Row.

Siraj-Blatchford, I. (2010). *A Focus on Pedagogy: Case studies of Effective Practice*. In Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I. & Taggart, B. (Eds.). *Early Childhood Matters. Evidence from the Effective Pre-school and Primary Education Project*. London: Routledge.

Acknowledgements

Thank you to the families of Arlo, Clara, Jacob, James, Molly and Ruby for their permission to share their child's schema learning.

Lauren Ryan is a former Education Leader from Daisies and Dr Anne Meade is co-owner of Daisies.

This booklet is one in a series about early childhood education. For more information go to

www.daisies.co.nz and visit our [facebook](#) page.

© Daisies Early Education & Care Centre 2017

5 Earp Street, Johnsonville, Wellington

