Chapter 8
The Early Years Learning Framework for Australia and the Australian Curriculum: Mathematics – Linking Educators' Practice through Pedagogical Inquiry Questions

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This chapter introduces the *Early Years Learning Framework for Australia* (*EYLF*) and summarises what it has to say about mathematics learning and continuity of learning between preschool and primary school. As well, it discusses the *Australian Curriculum: Mathematics* and its perspective on such continuity of learning. Using a *Numeracy Matrix* developed by the authors with early childhood educators in South Australia, the chapter explores pedagogical links between the *EYLF* and the *Australian Curriculum: Mathematics*. Examples of children's mathematical thinking at both preschool and primary school and of teachers' documentation of this thinking will be used to explore issues of continuity of mathematics learning.

Introduction

The internationally accepted definition of 'early childhood' covers the period from birth to eight years (Organisation for Economic Co-operation and Development (OECD), 2001). This is a time of rapid change, as children grow, develop and learn a great deal about themselves, other people and the world in which they live. Much that young children learn involves mathematics.

Curriculum Frameworks for Mathematics over the Early Childhood Period

For the first time ever in Australia, there are **national** curriculum frameworks that cover the complete span of the early childhood years. For children in prior-to-school settings (mostly aged 0-5 years), there is *Belonging, Being & Becoming: The Early Years Learning Framework for Australia* (EYLF) (Department of Education, Employment and Workplace Relations (DEEWR), 2009), while for children in the early years of primary school (mostly aged 5-8 years), there is the *Australian Curriculum: Mathematics* (AC:M) (Australian Curriculum, Assessment and Reporting Authority

In B. Atweh, M. Goos, R. Jorgensen & D. Siemon, (Eds.). (2012). Engaging the Australian National Curriculum: Mathematics – Perspectives from the Field. Online Publication: Mathematics Education Research Group of Australasia pp. 155-174.

(ACARA), 2011b). Both documents emphasise the importance of children's learning and note some specific outcomes for mathematics learning in the early childhood years. However, each document reflects a different focus on that learning. The EYLF reflects a holistic approach to learning and development, embedded within play-based environments and includes broad learning outcomes. The AC:M is focused on content and proficiency strands, with content descriptions and elaborations.

EYLF outcomes and key components that are pertinent to mathematics learning are a little difficult to find, given the more holistic approach taken and the avoidance of specific learning areas in the document overall. Of most relevance are:

- Outcome 4: *Children are confident and involved learners*, particularly with the two key components:
  - Children develop dispositions for learning such as curiosity, cooperation, confidence, creativity, commitment, enthusiasm, persistence, imagination and reflexivity; and
  - Children develop range of skills and processes such as problem solving, inquiry, experimentation, hypothesising, researching and investigating

  and
- Outcome 5: *Children are effective communicators*, particularly the key component:
  - Children begin to understand how symbols and pattern systems work.

It is also noted in the *Educators' Guide to the Early Years Learning Framework for Australia* (DEEWR, 2010, p. 44) that "Literacy and numeracy capabilities are important aspects of the *Children are effective communicators* Learning Outcome and are vital for successful lifelong learning".

Such outcomes and key components are in distinct contrast to the specific content descriptions in the Foundation Year of the AC:M:

Number and Algebra

- Establish understanding of the language and processes of counting by naming numbers in sequences, initially to and from 20, moving from any starting point
- Connect number names, numerals and quantities, including zero, initially up to 10, and then beyond
- Subitise small collections of objects
- Compare, order and make correspondences between collections, initially to 20, and explain reasoning
- Represent practical situations to model addition and sharing
- Sort and classify familiar objects and explain the basis for these classifications. Copy, continue and create patterns with objects and drawings

Measurement and Geometry

- Use direct and indirect comparisons to decide which is longer, heavier or holds more, and explain reasoning in everyday language
- Compare and order the duration of events using the everyday language of time
- Connect days of the week to familiar events and actions
- Sort, describe and name familiar two-dimensional shapes and three-dimensional objects in the environment
- Describe position and movement

Statistics and Probability

- Answer yes/no questions to collect information (derived from ACARA, 2011a).

The four Proficiency Strands: *Understanding, Fluency, Problem Solving* and *Reasoning* are given the following specific foci in the Foundation Year:

- *Understanding* includes connecting names, numerals and quantities ;
- *Fluency* includes counting numbers in sequences readily, continuing patterns, and comparing the lengths of objects directly ;
- *Problem Solving* includes using materials to model authentic problems, sorting objects, using familiar counting sequences to solve unfamiliar problems, and discussing the reasonableness of the answer ;
- *Reasoning* includes explaining comparisons of quantities, creating patterns, and explaining processes for indirect comparison of length (derived ACARA, 2011a).

Young children will move from early childhood programs in prior-to-school settings that are accountable to the philosophies, pedagogies and outcomes of the EYLF to early childhood programs in schools that are accountable to very different philosophies, content and proficiencies in the AC:M. The challenge for all involved is to make this transition into school as successful as possible. One requirement for such success is that the educators involved are able to communicate about the children's prior-to-school mathematics learning and comprehend the significance of this for further learning. This chapter outlines one way in which early childhood educators can link the different pedagogical philosophies and language contained in the EYLF and the AC:M to do this. These links are developed through collaborative interaction based on recognition of, and respect for, the educational value of both prior-to-school and school learning environments.

The Land Between – Transition to School

The EYLF and the AC:M serve different purposes and reflect the different nature of the educational settings for which they are designed. The EYLF makes much of the

underlying principles of secure, respectful and reciprocal relationships in young children's learning and development and the importance of recognising that this learning can be enhanced through partnerships involving families and early childhood educators. The need for high expectations of all in early childhood education, within a context of respect for diversity, imbues the EYLF with an overall social justice approach where all involved are striving for the very best that can be offered for all children. As well, there is an emphasis on early childhood educators as reflective practitioners and ongoing learners.

> A lively culture of professional inquiry is established when early childhood educators and those with whom they work are all involved in an ongoing cycle of review through which current practices are examined, outcomes reviewed and new ideas generated. (DEEWR, 2009, p. 13)

The EYLF mentions the importance of continuity of learning across the transition from prior-to-school years to school years and recognises that different characteristics are likely in schools and prior-to-school settings.

> Transitions, including from home to early childhood settings, between settings, and from early childhood settings to school, offer opportunities and challenges. Different places and spaces have their own purposes, expectations and ways of doing things. Building on children's prior and current experiences helps them to feel secure, confident and connected to familiar people, places, events and understandings. Children, families and early childhood educators all contribute to successful transitions between settings. (DEEWR, 2009, p. 16)

On the other hand, the AC:M does not recognise the existence of the EYLF or, even that children might have learned some mathematics before they come to school. On the contrary, the statement "The early years (5-8 years of age) lay the foundation for learning mathematics" (ACARA, 2011a, p. 6) suggests that a child's mathematical life begins at school entry and that what has occurred to the child beforehand is largely irrelevant. Such a statement would seem to ignore the array of research findings concerning young children's mathematical knowledge well before they start school (Aubrey, 2004; Clarke, Clarke, & Cheeseman, 2006; Ginsburg, 2006; Perry & Dockett, 2005, 2008) and the importance that has been established concerning children's transition to school (Dockett & Perry, 2007; Pianta & Cox, 1999).

In a recent publication, transition to school is defined as

> a dynamic process of continuity and change as children move into the first year of school. The process of transition occurs over time, beginning well before children start school and extending to the point where children and families feel a sense of belonging at school and when educators recognise this sense of belonging. (Educational Transitions and Change (ETC) Research Group, 2011, p. 1)

As they make the transition to school, children establish identities of themselves as learners within the context of school (Dockett & Perry, 2007). A positive start to school is a key factor in promoting children's positive adjustment to, and continued engagement with, school. There is general recognition that transition to school is essentially a process of building relationships and connections, rather than a matter of assessing children's skills or knowledge (Dockett & Perry, 2009). This educational view is sometimes in contrast to the political view, which tends to focus on children becoming 'ready' for school – usually with a focus on literacy and numeracy. However, one reading of the AC:M could be an assumption that what has happened before school is irrelevant anyway. This is contrary to the breadth of research that notes children's competence from birth (Clark & Moss, 2001; Lansdown, 2005).

Many early years educators suggest that what should be sought as children move from prior-to-school settings is continuity of content and pedagogy. Taken together, however, the EYLF and AC:M do not seem to facilitate this and do not really consider what such continuity might be. Continuity of children's learning may well be the ideal. However, this will need to be built by educators as they consider broader issues such as pedagogical continuity, continuity of expectations and experiences, as well as continuity in relationships and support across the prior-to-school and school sectors. There does seem to be agreement that promoting continuity does not mean that contexts should become the same – that is, that prior-to-school and the early years of school become the same. Indeed, there is strong evidence that young children want school and prior-to-school to be quite different; they do not want more of the same as the start school (Dockett & Perry, 2007).

One of the challenges for educators will be to build appropriate continuity. This will involve a great deal of collaboration, cooperation, understanding and commitment from all early childhood educators. Without such efforts, there is a risk of a 'push-down' curriculum in the prior-to-school years and curriculum in the early school years that is disconnected from previous learning. The EYLF and the AC:M, of themselves, do not help facilitate such continuity. The remainder of this chapter reports on one way in which early childhood educators from both prior-to-school and school settings can build such continuity through their own reflective pedagogical practice.

Early Childhood and Powerful Mathematical Ideas

On the surface, prior-to-school settings and first-year-of-school classrooms look quite different. The pre-eminent pedagogical approach in prior-to-school settings is still play, even though there is greater acceptance of other approaches such as sustained shared thinking and, even, some exposition, following the work of the *Effective Provision of Pre-school Education* project (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2004) which is reflected in the EYLF. While these approaches are also present in first-year-of-school classrooms, there is a much stronger emphasis on more 'formal' pedagogies and situations where assessment *of* learning subsumes assessment *for* learning (Goldstein, 2007).

One of the ways in which some continuity can be discerned in mathematics across prior-to-school and first-year-of-school settings is to consider the powerful mathematical ideas that are experienced by children in these settings. There have been many listings of the key sets of powerful mathematical ideas (Clements, Sarama, & DiBiase, 2004; National Council of Teachers of Mathematics (NCTM), 2000, Perry & Dockett, 2008). By using a set of powerful mathematical ideas, the authors have been able to build an approach which shows promise for assisting educators to bring together the EYLF and the AC:M. The development of this approach is outlined below.

Brief History

The Southern Numeracy Initiative (SNI) was established in South Australia in 2004 with the following aims:

- to develop and implement successful teaching and learning practices to improve numeracy; and
- to challenge teachers to explore their beliefs and understandings about how children develop their understanding of mathematics, and how this can be supported through the teaching program.

Within the broader SNI project, preschool educators developed an important aid to their reflective practice in mathematics: the *Numeracy Matrix*. This was a large table (56 cells) in which seven powerful mathematical ideas derived from a variety of sources lie on one axis (Department of Education, Training and Employment (DETE), 2001, NCTM, 2000, Perry & Dockett, 2002):

- mathematisation;
- connections;
- argumentation;
- number sense and mental computation;
- algebraic reasoning;
- spatial and geometric thinking; and
- data and probability sense;

Eight developmental learning outcomes (DLOs) used in the South Australian preschool curriculum lie on the other axis:

- Children develop trust and confidence;
- Children develop a positive sense of self and a confident and personal group identity;

- Children develop a sense of being connected with others and their worlds;
- Children are intellectually inquisitive;
- Children develop a range of thinking skills;
- Children are effective communicators;
- Children develop a sense of physical wellbeing; and
- Children develop a range of physical competencies (DETE, 2001)

These last outcomes are brought together through 'pedagogical inquiry questions'—questions asked of early childhood educators about the practices they use to assist their children attain both the powerful mathematical ideas and the DLOs. The pedagogical inquiry questions are inputs to the teaching/learning endeavour designed to assist the educators to plan and assess children's learning in both dimensions. This use of pedagogical inquiry questions, rather than student outcome statements, arises from the belief that the key determinants of children's successful outcomes are the pedagogical relationships and practices of educators with the children (Laevers & Heylen, 2004). Table 1 provides an example of one cell in the original numeracy matrix.

Table 1. Numeracy matrix cell

	DLO: Children are intellectually inquisitive
Powerful mathematical idea: *Argumentation*	What opportunities do we give children to put forward a mathematical argument and to justify it? How do we assist children to gain confidence in their ability to explore, hypothesise and make appropriate choices in their mathematics?

In this cell are two pedagogical inquiry questions designed to challenge early childhood educators to reflect on what they are doing to help children develop both the powerful mathematical idea and the developmental learning outcome. Further details about the initial iterations of the *Numeracy Matrix* can be found in Perry, Dockett, and Harley (2007b) and Perry, Dockett, Harley, and Hentschke (2006).

The *Numeracy Matrix* has been used in various forms to facilitate a number of early childhood mathematics initiatives in South Australia since its initial development through the SNI (Perry, 2011; Perry, Dockett, & Harley, 2007a). For example, the pedagogical inquiry questions in the matrix have been linked to narrative assessment of mathematics learning through 'learning stories' (Carr, 2001; Perry et al., 2007a), with the result that children's mathematical knowledge is celebrated and teachers can link their assessment and planning for individual children in meaningful ways. The effectiveness of these links has been identified by educators:

> The numeracy matrix allowed me to identify and extend mathematical learnings occurring in children's everyday experiences.
>
> Learning stories are a really powerful way of collecting, sharing, presenting and reflecting upon children's mathematical learning. I've enjoyed the opportunity to experiment and develop different ways of creating learning stories. (Perry et al., 2007b, p. 130)

Using the *Numeracy* Matrix to Link the EYLF and the AC:M

The possibility that a variation on the *Numeracy Matrix* might be used to help link the EYLF and the AC:M was first addressed in 2010 (Perry, 2011). It was noted that there were strong similarities between the DLOs and the EYLF outcomes (Table 2). As well, the powerful mathematical ideas used to develop the various versions of the *Numeracy Matrix* were recognised in the EYLF:

> Spatial sense, structure and pattern, number, measurement, data, argumentation, connections and exploring the world mathematically are the powerful mathematical ideas children need to become numerate. (DEEWR, 2009, p. 38)

Analysis of the descriptors of the powerful mathematical ideas used earlier (Perry & Dockett, 2008) and the three content strands and four proficiencies of the AC:M provide the mapping shown in Table 3.

Table 2. Relationship between EYLF outcomes and SACSA Developmental Learning Outcomes

EYLF Outcome	Developmental Learning Outcomes
Children have a strong sense of identity	Children develop trust and confidence Children develop a positive sense of self and a confident and personal group identity
Children are connected with and contribute to their world	Children develop a sense of being connected with others and their worlds
Children have a strong sense of wellbeing	Children develop a sense of physical well being Children develop a range of physical competencies
Children are confident and involved learners	Children are intellectually inquisitive Children develop a range of thinking skills
Children are effective communicators	Children are effective communicators

Table 3. Relationship between original powerful mathematical ideas and AC:M content strands and proficiencies

AC:M content strands and proficiencies	Powerful mathematical ideas
Number and Algebra	Number sense and mental computation
	Algebraic reasoning
Measurement and Geometry	Number sense and mental computation
	Spatial and geometric thinking
Statistics and Probability	Data and probability sense
Understanding	Connections
	Mathematisation
Fluency	Connections
	Mathematisation
Problem Solving	Mathematisation
	Argumentation
Reasoning	Argumentation

Adaptation of the *Numeracy Matrix* to reflect the EYLF outcomes and the AC:M strands and proficiencies has generated a mechanism for linking the two national curriculum documents (Table 4[1]). The use of pedagogical inquiry questions within the revised *Numeracy Matrix* means that early childhood educators can be asking themselves the same questions about their own pedagogical practice but answering them through links to whichever of the two curriculum documents pertains to their setting. If early childhood educators reflect on their mathematical pedagogies using the inquiry questions, they can use these, in conjunction with learning stories or other documentation and planning tools, to provide some continuity between mathematics learning in prior-to-school and school settings. However, this process achieves a lot more than this. It also provides early childhood educators with a language through which they can communicate with their colleagues across the pedagogical divide between prior-to-school and school services: a divide which is not helped by the substantial differences in the EYLF and the AC:M.

[1] *The authors are grateful to the expertise of Di Hogg who was a major contributor to the development of this version of the Numeracy Matrix.*

Table 4. Numeracy Matrix linking EYLF and the AC:M

EYLF Outcomes/ AC:M Strands and Proficiencies	**Number and Algebra**	**Measure-ment and Geometry**	**Statistics and Probability**	**Under-standing**	**Fluency**	**Problem Solving**	**Reasoning**
OUTCOME 1 **Children have a strong sense of identity**	What opportunities do we provide for children to seek new challenges and persist in their problem solving? In what ways do we assist children to represent varied physical activities and games through patterns and symbols? How do we encourage children to explore different perspectives in mathematical problem solving?	How do we encourage children to work collaborat-ively with peers during measure-ment activities? In what ways are children able to demon-strate flexibility and make choices when playing with collections of everyday shapes and objects?	How do we encourage children to develop a notion of fairness in their lives?	How do we encourage children to play and interact purposefully with the mathematics they experience in their lives? What do we do to assist children link real world represent-ations of mathematics with their own mathematical words and symbols?	How do we encourage children to use different communi-cation strategies to organise and clarify their math-ematical thinking? What opportune-ities do children have to show their patterning abilities?	How do we encourage children to use the process of play, reflection and investiga-tion to solve math-ematical problems? How do we assist children to gain confidence in their ability to explore, hypoth-esise and make appropriate choices in their math-ematics?	How do we encourage children to demonstrate flexibility and to manage different mathematical ideas as they are presented to them by peers?

EYLF Outcomes/ AC:M Strands and Proficiencies	Number and Algebra	Measure-ment and Geometry	Statistics and Probability	Under-standing	Fluency	Problem Solving	Reasoning
OUTCOME 2 **Children are connected with and contribute to their world**	In what ways do we establish an environment that promotes children's exploration? How do we encourage children to explore patterns? In what ways do we provide opportunities for children to reflect upon their mathematical pattern making? What opportunities do we provide for children to feel confident in their under-standing of symbols and patterns in their environment?	What opportunities do we provide for children to see the purpose of measurement in their world? How do we provide opportunities for children to apply and challenge using a variety of measurement experiences? In what ways do we encourage children to explore relationships among collections of shapes? What opportunities do we provide for children to develop awareness of similarities and differences among shapes and objects?	How do we assist children to gather information, ask questions, seek clarification and consider possibilities about their own lives?	What opportunities do we provide for children to reflect upon and respect diversity and connections between people's mathematical knowledge and strategies? How do we encourage children to see the mathematics in their worlds and to use that to develop new mathematical ideas?	What opportunities do we provide for each child to demonstrate enthusiasm for new mathematical tasks? What opportunities do we provide for children to connect different mathematical ideas they learn?	What opportunities do we provide for children to explore different perspectives as they attempt to solve mathematical problems? How do we encourage children to help develop and maintain agreed values and socio-mathematical norms of behaviour in their groups?	How do we encourage children to integrate their mathematical thinking with their commun-ication skills so that they can justify their opinions? What opportunities do we provide for children compare and contrast their ideas with those of other children?

EYLF Outcomes/ AC:M Strands and Proficiencies	Number and Algebra	Measurement and Geometry	Statistics and Probability	Under-standing	Fluency	Problem Solving	Reasoning
OUTCOME 3 **Children have a strong sense of wellbeing**	What opportunities and support do we give children to take risks when developing under-standings about number? How do we encourage children to generate a range of ideas and to use the processes of play, reflection and investigation to find answers to problems?	How do we give children opportunities to expand their measurement language? How do we use play to develop opportunities for children to explore measurement? What opportunities do we provide for children to make discoveries that are new to them about shape and space? How do we encourage children to move confidently in space and perform different movement patterns with growing spatial awareness?	How do we encourage children to make choices in their lives? What opportunities do we provide for children to predict and manage change in their daily routines?	How do we encourage children to take risks as they seek to find the mathematics in everyday life? What opportunities do we provide for children to use mathematics to help predict and manage change in their daily lives?	What do we do to assist children experience success in their mathematics learning? What opportunities doe we provide for children to investigate the mathematical aspects of their cultures?	How do we encourage children to interact with others to explore ideas, negotiate possible solutions and share their mathematical learning? What skills do we develop to assist children undertake mathematical problem solving in pairs or in larger groups?	What opportunities do we provide for children to develop confidence in expressing their mathematical ideas? How do we provide the best possible environment in which children can create and synthesise using mathematics?

EYLF Outcomes/ AC:M Strands and Proficiencies	Number and Algebra	Measure-ment and Geometry	Statistics and Probability	Under-standing	Fluency	Problem Solving	Reasoning
OUTCOME 4 **Children are confident and involved learners**	What opportunities do we provide for each child to accept new challenges, make new discoveries and celebrate effort and achievement? What do we do to encourage children to use symbols and different representations of their mathematics?	How do we ensure that children have confidence to access and use resources for measurement? How do I support children to choose what to measure, how to measure and how to represent their measurement? What opportunities do we give children to explore their local environment and record what they see using visual means?	How do we support children to explore groups to which they belong, based on particular attributes? What opportunities do we provide for children to explore the ideas and concepts of data representation?	How do we encourage children to actively explore mathematical problems and investigate relevant problems through mathematics? What opportunities do we provide for children to connect their mathematical ideas?	How do we encourage children to use mathematics to be a critical consumer of everyday products? How do we encourage children to move confidently in space and perform different movement patterns with growing spatial awareness?	How do we encourage children to use technology to help them solve mathematical problems? What do we do to assist children develop persistence in their mathematical problem solving?	How do we encourage children to question why their and other people's mathematical ideas work? How do we encourage children to seek more than one answer to a mathematical problem?

EYLF Outcomes/ AC:M Strands and Proficiencies	Number and Algebra	Measure-ment and Geometry	Statistics and Probability	Under-standing	Fluency	Problem Solving	Reasoning
OUTCOME 5 **Children are effective communicators**	What opportunities do we give children to explore, hypothesise, take risks and engage in symbolic and dramatic play with confidence? How do we encourage children to represent number in a variety of ways? How do we encourage children to talk about and represent their findings? How do we encourage children to demonstrate an under-standing that symbols are a powerful means of communica-tion?	How do we assist children to use pattern making and pattern continuation for problem solving and investigation? How do we encourage children to participate in group discussions and brainstorms around the properties of shapes? How do we encourage children to use different communicati on strategies to describe shapes and their properties?	How do we encourage children to collect, analyse and represent data about their physical activity? How do we encourage children to begin to recognise, discuss and challenge unfair attitudes and actions?	How do we encourage children to gather information and ask questions that might be answered by this information? What opportunities do we give children to describe their mathematical thinking?	How do we encourage children to contribute to collaborative group work in mathematics through taking on a variety of roles?	How do we encourage and support children to talk about and represent their efforts to solve mathematical problems? What opportunities do we give children to document their solutions to mathematical problems?	How do we encourage children to participate in group discussion and justification about the solution of mathematical problems?

As with all previous iterations of the *Numeracy Matrix*, this one should be seen as a work in progress. The pedagogical inquiry questions are meant to be relevant to the particular contexts in which early childhood educators find themselves. While those in Table 4 have been developed by educators, they should not be seen as fixed. Educators are encouraged to develop pedagogical inquiry questions that reflect their own contexts and the children within these.

Early childhood educators in schools and prior-to-school settings can reflect on their practices through the pedagogical inquiry questions which can be attached to either the EYLF or the AC:M, depending on whether the educators focus on the first column of the matrix or the first row. Using the matrix, a prior-to-school educator could communicate with a school educator during a child's transition to school to highlight what the child did in response to, for example, *encouragement to use symbols and different representations of their mathematics* (EYLF Outcome 4 and AC:M Number and Algebra). Using this pedagogical inquiry question as a starting point the two educators could discuss the child's response either from the perspective of the child being a confident or involved learner or from the perspective of the child learning particular number and algebra ideas. If the previous versions of the *Numeracy Matrix* can be taken as a guide (Perry et al., 2007a; Perry, 2011), the most likely is that educators will talk about both the outcome and the strand, setting up a situation which recognizes children's prior, current and future learning.

Using the *Numeracy Matrix*

In this section of the chapter, two learning stories are presented to illustrate how sensitive and reflective educators can use the pedagogical inquiry questions integral to the *Numeracy Matrix* to assist them in assessing and planning children's mathematical activities. Learning stories are qualitative snapshots, recorded as structured written narratives, often with accompanying photographs that document and communicate the context and complexity of children's learning (Carr, 2001). They include relationships, dispositions and an interpretation by someone who knows the child well. They are "structured observations in everyday or 'authentic' settings, designed to provide a cumulative series of snapshots" (Carr & Claxton, 2002, p. 22).

The first learning story presented here has been written by a preschool educator working in a rural area of South Australia. The second has been written by a teaching assistant in a remote school in South Australia. The authors of this chapter are very grateful to these educators for allowing the learning stories to be reproduced here. Confidentiality requirements mean that neither the educators nor the children involved can be named (pseudonyms are used for the children).

Samson[2] knows a BIG number

Samson was sitting playing at the play dough table and I went to have a chat with him about making a number game. Samson said to me, 'I know a really big number – a million.' I asked Samson if he knew how to write one million in numerals and, as he didn't, I showed him. After briefly looking at the numbers I had written down (1,000,000) Samson said, 'Now I get it, a million is six zeros. A thousand is a one and three zeros. A hundred, one and two zeros. If you took three zeros away (from a million) it would be a thousand.' I asked Samson what the number would be if I replaced the one with a six and he told me it would be six million. Samson then said that he knew an even bigger number, a fillion! I said that there was not a number called a fillion but there was a billion (with nine zeros) and a trillion (with twelve zeros). He was very impressed by the number of zeros in these numbers.

Follow up

Following our conversation Samson decided to paint a picture. He painted numbers from zero to fourteen on his paper. I asked Samson why he had stopped at number fourteen and he said that fourteen was his favourite number, he just likes the four.

Figure 1. Samson knows a BIG number

A preschool educator might link this learning story particularly to the EYLF Outcome 4: *Children are confident and involved learners*, although it would be possible to link it with other EYLF outcomes. When speaking with a first-year–of-school educator about Samson, the preschool educator might concentrate on the confidence Samson has shown. The school teacher will be interested in this confidence as well but will also focus on the number knowledge being displayed. Hence, this learning story could bring the two educators together through the *Numeracy Matrix* cell shown in Table 5.

Table 5.Numeracy matrix cell

	Number and Algebra
OUTCOME 4 **Children are confident and involved learners**	What opportunities do we provide for each child to accept new challenges, make new discoveries and celebrate effort and achievement? What do we do to encourage children to use symbols and different representations of their mathematics?

Both of these pedagogical inquiry questions have relevance to Samson's learning story. Opportunities have been provided for the child to seek the pattern involved in writing the standard symbolic representations of big numbers and to celebrate

[2] *Samson is 4 years old*

the effort and achievement resulting from this opportunity. The activity created a challenge for the child and Samson was encouraged to accept the challenge of even bigger numbers. In fact, he set himself this challenge, confident in his previous experience with big numbers. The educator has assessed Samson's understanding of the patterns that he is developing and shown that his pattering seems to be robust.

While Samson and the educator are working simultaneously on **Number and Algebra** and **are confident and involved learners**, the emphasis will be on the EYLF outcome for the preschool educator. A first-year-of-school educator about to receive Samson into her classroom might be more interested in how this knowledge of numbers, number symbols and patterns could be extended even further. Nonetheless, using the pedagogical inquiry questions in this cell of the *Numeracy Matrix,* the two educators can discuss what opportunities the child already has had and what opportunities he might be given when he gets to primary school, thus facilitating some continuity of pedagogy which might otherwise have been missing. This will mean that not only will the school educator know what the child knows about big numbers but will also have some ideas about how the child knows these things and how he likes to learn about them. As well, the learning story tells both educators that while Samson seems to have substantial knowledge about big numbers and the ways that they are recorded, he also likes to revert to his safe and familiar spaces, represented by his 'favourite' number.

The long and short of it

Harry[3], today you played Red Rover on the tennis courts. Everyone lined up and the caller called over people wearing shorts. You looked down at your legs and seemed unsure as to whether you were wearing shorts or long pants. When you bent forward, your shorts got longer; it was a bit of a puzzle.

You turned to the person next to you and compared what they were wearing with what you were wearing.

You looked back and forward from their legs to yours. Your friend said, "go on Harry, you've got shorts on."

You decided that you were indeed wearing shorts and took off across the court.

The next time that the caller called for people wearing shorts, you had no hesitation. You took off across the court and ran so fast that nobody could catch you.

What was the learning?

Harry today you were presented with a puzzle, were you wearing long shorts or short longs, and why did they get longer every time you leant forward?

I saw you look for a solution to the puzzle by comparing what you had on with what your friend had on. Your friend offered you an answer, and you showed respect for their opinion by accepting it as the answer. The next time the caller wanted people wearing shorts to cross the court; you remembered what you had learnt earlier and took off without hesitation.

What's next?

We can support your problem solving skills by offering you a variety of experiences that challenge your thinking such as computer games, matching puzzles and math and science experiments.

[3] *Harry is 5 years old.*

Figure 2. The long and short of it

This learning story highlights the importance of children's observations and language as they explore measurement challenges they meet in everyday life. The keen observation of the educator almost begs for further discussion with Harry around what happens to his shorts as he leans forward. This discussion will inevitably involve the language of mathematics and will encourage the development of stronger comparison skills. The *Numeracy Matrix* provides other opportunities for educators to analyse the current activity and to plan future tasks. For example, Table 6 offers four pedagogical inquiry questions of relevance to Harry's scenario.

Table 6. Pedagogical inquiry questions from several Numeracy matrix cells

	Measurement and Geometry	Understanding
OUTCOME 2 **Children are connected with and contribute to their world**	What opportunities do we provide for children to see the purpose of measurement in their world?	How do we encourage children to see the mathematics in their worlds and to use that to develop new mathematical ideas?
OUTCOME 3 **Children have a strong sense of wellbeing**	How do we use play to develop opportunities for children to explore measurement?	How do we encourage children to take risks as they seek to find the mathematics in everyday life?

In terms of the reporting of Harry's perplexing situation – at least perceived as perplexing by the educator – he was certainly in a situation where measurement helped him understand his world and where he was able to explore measurement ideas whilst playing. He perceived his shorts from a number of perspectives as he bent his body and he also dealt with his friend's perspective on the dilemma. All of this required him to portray his dilemma in terms of mathematics. In terms of planning for future tasks, the educator has suggested supporting his explorations of measurement skills and development of his understandings through a number of activities in which there are elements of 'controlled' risk, allowing Harry some control without endangering his emerging willingness to engage in risk-taking behaviours in measurement. While prior-to-school and school educators might analyse this learning story from different perspectives, the pedagogical inquiry questions linking the two curriculum documents provide a common language through which pedagogical continuity can be generated.

Conclusion

The benefits for children of a positive start to primary school are well documented (Dockett & Perry, 2007; Dunlop & Fabian, 2007; Peters, 2010; Pianta & Cox, 1999). Part of a successful start to school is recognition that young children often bring a great deal of mathematical knowledge and many dispositions towards mathematics learning with them. Some of this knowledge is drawn from the "canonical curriculum for school mathematics" (Nebres, 1987 cited in Perry & Conroy, 1994, pp. 87) but much of it has been learned from everyday experiences.

For the first time, Australia has national curriculum documents that will be used in all prior-to-school and school settings. The two documents have the potential to impact critically on young children's mathematics education. The transition to school period will be very important in ensuring that the mathematics learning that children have accomplished partly under the auspices of the EYLF is not missed by the AC:M with its more formalised approach to young children's learning. On the other hand, the transition to school will be very important in ensuring that young children are not disadvantaged as a result of their learning inspired by the EYLF when they meet the learning inspired by the AC:M. The chapter has reported on a strategy through which the two national curriculum documents covering early childhood mathematics education in Australia can be used to support recognition of young children's mathematics knowledge and understanding in both contexts. The introduction of the *Numeracy Matrix* in South Australian preschools and schools has enabled educators in both sectors to use common language and constructs in order to communicate about mathematics learning. The *Numeracy Matrix* may provide one way in which the two curriculum documents might be brought together to enable young children to start school successfully, at least in terms of their mathematics education. It also promotes recognition of the important role of educators in prior-to-school and school settings as catalysts for young children's mathematics learning, as it highlights the centrality of their actions and interactions with children, families and each other.

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