



Strengthening early numeracy learning:

The *Let's Count* program

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1. Executive summary

The importance of numeracy for individuals and nations

Numeracy is the capacity, confidence and disposition to use mathematics in daily life. It includes understanding numbers, patterns, measurement, spatial awareness and data, as well as mathematical thinking, reasoning and counting.

Numeracy is needed for a wide range of everyday activities such as handling money, taking medication and cooking.

It is also critical for economic and social participation in the technology-rich 21st century. For individuals, proficiency in numeracy is positively associated with labour market participation, employment and earning higher wages. It has become an essential skill for all people in the workplace.

For nations, the mathematical skills of their adult population influences the capacity to introduce productivity-improving technologies. This, in turn, contributes to increased living standards. Mathematics, engineering and science are key underpinnings for the future of innovative economies, with an increased global reliance on these knowledge areas. Australia's Chief Scientist has described these areas as part of the essential path to a future that is broadly socially, culturally and economically prosperous.

Australia's numeracy challenge

Across all age groups, there are significant numbers of the Australian population, who do not have, or are at risk of not developing, the mathematical knowledge and skills needed to fully participate economically and socially:

- In their first year of school, one in four children who live in Australia's most disadvantaged communities, do not have the numeracy skills needed for school.
- One in five (17.7%) Year 9 students from a low socioeconomic background, and one in three (31.7%) from an Aboriginal and Torres Strait Islander background, do not meet the national minimum numeracy standard on NAPLAN.
- Australia was ranked twelfth out of 22 nations in the OECD's survey of adult numeracy skills, with one in five Australians being assessed at the lowest skills level.

Developing mathematical skills early

Childhood mathematics skills are predictive of later mathematics learning and achievement. Children who start ahead in mathematics generally stay ahead, and children who start behind generally stay behind. The importance of developing strong early mathematics knowledge, skills and positive dispositions, is clear.

Mathematics in the everyday

The development of mathematical skills begins in infancy and is strengthened during early childhood through day-to-day activities, including play. The mathematical ideas with which young children interact must be relevant and meaningful in the context of their lives. Focusing on the 'everyday', facilitates learning and conveys to children that mathematics is stimulating, fun and relevant. This encourages a positive disposition to using and fostering mathematics skills, which is crucial to children's long-term development and educational outcomes.

Fostering mathematics at home

Families are children's first and most influential teachers. The home learning environment exerts a greater influence on children's educational attainment than their family's socioeconomic background. Many mathematical ideas can be discussed during everyday activities and free-play time. Activities such as bathing, making lunch or sorting laundry, all provide opportunities to foster the development of foundational mathematics and numeracy concepts in children.

Parents' understanding of early mathematics

Many parents are uncertain about early mathematics learning and teaching, not knowing what their child could or should learn or how to help them learn. Many parents spend less time engaging with their children on numeracy activities compared to literacy. This is possibly because they have negative attitudes towards mathematics, are less confident about it, place less value on mathematics, or think their children are less interested in it.

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Supporting parents who are unsure or who have negative attitudes towards mathematics, is critical for the development of their child's mathematics learning. Nurturing and encouraging parents' capacity and confidence to guide their child's development is also valuable. Supporting parents from low socioeconomic backgrounds in this way is particularly important.

Let's Count

Let's Count is an early mathematics program, designed by The Smith Family, Professor Bob Perry (Charles Sturt University) and Associate Professor Ann Gervasoni (Monash University). It was developed, in particular, to support children from disadvantaged backgrounds to develop appropriate mathematics knowledge, skills and positive dispositions, as they prepare to start school.

The program assists educators in early childhood contexts¹ to work in partnership with parents and other family members, to promote positive mathematical experiences for young children aged three to five. It

fosters opportunities for children to engage with the mathematics they encounter as part of their everyday lives, and in turn, talk about it, document it, and explore it, in ways that are fun and relevant to them.

Key principles

Let's Count is based on the principle that children are more likely to have positive experiences of mathematics during their early years if their educators, parents and other family members also have positive dispositions towards mathematics. It is underpinned by:

- Strong partnerships between early childhood educators and families.
- The recognition that all children, parents/carers and educators can be powerful mathematicians.
- The use of play, discussion and investigation as its key pedagogical approach.
- A realisation that mathematics learning can be enjoyable for all, when it is undertaken in a relevant and meaningful context.

¹ Early childhood contexts includes preschools, family day care, occasional care, long day care and mobile early childhood services.

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Program components

Let's Count includes a program of professional learning for early childhood educators, involving two full day workshops, undertaken approximately two months apart. The time between the modules allows for centre-based learning and activities. Educators suggest activities to parents that provide opportunities for them to engage their children in mathematical learning.

Interactions between educators, parents and children occur over the year following the professional learning. Parents receive a take-home resource pack including ideas, tips, games and books to use with their children. The resources, coupled with the advice provided by educators, aim to increase parents' confidence and ability to guide and support their child's mathematical development, particularly in the home environment.

Piloting *Let's Count*

Let's Count was piloted in 2011 in five disadvantaged communities across Australia with the support of BlackRock Investment Management. Sixty early childhood educators and 550 parents participated. The evaluation of the pilot showed educators, parents and children enhanced their dispositions and confidence towards mathematics. For educators in particular, there was clear evidence that *Let's Count* had made a positive difference to their ability to provide for children's mathematics education and to engage families in this.

Expanding and evaluating *Let's Count*

Following the success of the pilot, *Let's Count* was expanded to more communities in 2012, 2013 and 2014. This was possible because of further funding from BlackRock and very significant new funding from the Origin Foundation. Sixty six early learning and care centres, 137 educators, 2,055 parents and 3,905 children participated in 2013. As part of this expansion, Professor Perry and Associate Professor Gervasoni are leading an evaluation of the program, to assess its impact on:

- Children's numeracy knowledge and dispositions as they transition to school.
- Early years educators' knowledge, interest and confidence in mathematics learning and teaching.



- Parents/carers' confidence and knowledge in supporting their children's mathematical learning.

The evaluation has particularly examined the impact of the program on children. The mathematical knowledge and skills of children were assessed before and after they participated in the program, using the Mathematics Assessment Interview (MAI). The MAI assesses eight key areas of mathematics learning.

The MAI was also used with a similar group of children (similar age, education level and attending the same early years centres), who have not participated in *Let's Count*. This enables the results of two groups of similar children to be compared and to assess the impact of *Let's Count*.

Educators have been surveyed and interviewed at multiple points in time as part of the evaluation. Parents have also been interviewed a number of times.

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Children's results

A comparison of children's results before and after participating in *Let's Count* shows strong growth across a wide range of mathematical areas. The extent of this growth is clearly reinforced through comparing the results of the children who participated in *Let's Count* with a similar group of children who were not involved.

Let's Count has assisted young children in their mathematical learning in a range of key areas, with children achieving to a significantly greater level than their peers who were not involved in the program.

Educators and parents' results

Educators and parents identified that *Let's Count* had a positive impact on children's dispositions towards mathematics. The program supported children to increase their confidence in, knowledge and enjoyment of, and engagement with mathematics.

Let's Count also positively impacted on the knowledge, interest and confidence in mathematics learning and teaching of the educators. They increased their understanding of how their mathematical education practice can be improved.

Both educators and parents noted the greater levels of communication between them, regarding the development of children's mathematics, as a result

of participating in *Let's Count*. Over the course of the evaluation, educators noticed that a greater proportion of parents were talking with them about their child's numeracy learning, and they were doing this more frequently.

There was also greater continuity between children's mathematics learning in the home and in the early learning setting. Both parents and educators were more able to support children's mathematical development as a result of their participation in *Let's Count*.

Conclusion

The evaluation of *Let's Count* shows it has positively impacted on the children, parents and educators who participated. All three groups have enhanced confidence and stronger interest regarding mathematics and more positive dispositions towards it.

Importantly, the Mathematics Assessment Interview shows that the children's skills have grown significantly through their involvement. The mathematical skills of this group of children are greater than those of their peers who did not participate in *Let's Count*.

Through facilitating strong partnerships between families and educators, *Let's Count* has supported children from disadvantaged communities to develop appropriate numeracy skills and dispositions at a critical point in their lives – as they prepare to start school.



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2. The importance of numeracy

Defining numeracy

Numeracy is about far more than understanding numbers. It also includes measurement, spatial awareness, data, creating and recognising patterns, as well as mathematical thinking and reasoning (Australian Government 2009). It includes the knowledge, skills, behaviours and dispositions needed to use mathematics in a wide range of situations (ACARA 2013a). The Organisation for Economic Development and Co-Operation (OECD) defines adult numeracy as the ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations (OECD 2012).

The importance of numeracy for individuals

Numeracy is needed for a wide range of everyday activities such as handling money and budgets, taking medication and cooking. It is also a foundational skill for effective and successful participation in the social and economic life of advanced economies (OECD 2013a).

Changes in workplace practices mean that mathematical application and understanding have become an essential skill for all people in the

workplace, even those in relatively unskilled jobs (Hodgen & Marks 2013). The OECD's 2013 *Survey of Adult Skills* shows that proficiency in numeracy is positively associated with labour market participation, employment and earning higher wages (OECD 2013a).

More broadly, if individuals are to participate in society, they now require a capacity to read and interpret quantitative information, presented for example in the media, through statistics and graphs (OECD 2012).

Numeracy and national wellbeing

The importance of numeracy goes beyond the individual, to have national significance. Nations with large proportions of their adult population with low reading and numeracy skills, are likely to be hampered in introducing productivity-improving technologies, and this will stall improvements in living standards (OECD 2013a).

Australia's Office of the Chief Scientist has noted that the disciplines of mathematics, engineering and science are a critical underpinning for the future of innovative economies, with the world's dependence on knowledge in these areas increasing. Mathematics, engineering and science are "part of the essential path to a future that is broadly socially, culturally and economically prosperous" (Office of the Chief Scientist 2012, p 12).



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3. Australia's numeracy challenge

Given the importance of numeracy, both to individuals and the nation, the numeracy skills of Australia's population across all ages is critical.

Numeracy skills of children starting school

The Australian Early Development Index (AEDI)² assesses children in their first year of school in five areas that are linked to predictors of good health, education and social outcomes (Australian Government 2013). One of these areas is the language and cognitive skills deemed necessary for school, and includes children's interest and skills in literacy, numeracy and memory. Children who are developmentally vulnerable in this area might not show interest in maths and number games, may have marked difficulty with counting or recognising numbers, be unable to name common shapes and have difficulty with time concepts.

Table 1 shows that in 2012, around eight in ten (82.6%) Australian children were on track in the development of their language and cognitive skills, including numeracy. For children from Aboriginal and Torres Strait Islander

backgrounds, the figure was around six in ten (58.0%) and for children living in Australia's most disadvantaged communities, it was around three in four (73.7%). Put another way, in the first year of school, two in five Aboriginal and Torres Strait Islander children and one in four children from Australia's most disadvantaged communities were not on track in their development in the key area of language and cognitive skills, including numeracy.

School students' numeracy skills

Each year, Australian students in Years 3, 5, 7 and 9 are formally assessed across a range of academic skills, including numeracy, through the *National Assessment Program – Literacy and Numeracy* (NAPLAN). Table 2 shows the proportion of students who did not meet the national minimum numeracy standards in 2013. The data is broken down by the socioeconomic background of students and whether or not they are of Aboriginal or Torres Strait Islander background.

Table 1: AEDI results for language and cognitive skills including numeracy, 2012

	Developmentally vulnerable ³ (%)	Developmentally at risk ⁴ (%)	On track ⁵
Australia	6.8	10.6	82.6
Aboriginal and Torres Strait Islander children	22.4	19.5	58.0
Other Australian children	5.9	10.1	83.9
Type of community			
Most disadvantaged	12.0	14.3	73.7
Most advantaged	3.3	7.6	89.1

Source: Australian Government (2013). Extracted from Table 5 on p. 13

² The AEDI is now known as the Australian Early Development Census (AEDC)

³ Below the 10th percentile

⁴ Between the 10th and 25th percentile

⁵ Above the 25th percentile

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Of the Year 3 students, one in 14 (7.2%) from the most disadvantaged backgrounds, did not meet the national minimum standard for numeracy, compared with fewer than one in 100 students (0.3%) from the most advantaged backgrounds. For Year 9 students, the gap was considerably wider, with one in six disadvantaged students (17.7%) not meeting the minimum standard, compared with one in 50 (1.8%) of their more advantaged peers.

As with the AEDI outcomes, the numeracy skills of children from Aboriginal and Torres Strait Islander backgrounds were well below that of other Australian children. Among Year 3 students, one in six (15.7%) Aboriginal and Torres Strait Islander children did not meet the minimum national standard, compared with one in 50 (1.6%) other Australian children. Among Year 9 students, close to one in three (31.7%) Aboriginal and Torres Strait Islander students were performing below the minimum standard compared with one in 14 (6.5%) other Australian students.

Year 12 participation in mathematics

The proportion of Year 12 students taking higher levels of mathematics has been declining for the last two decades (Kennedy, Lyons & Quinn 2014). In 2010,

72 percent of Year 12 students studied mathematics, with around only 40 percent of this group studying the higher level mathematics required for some university courses (Office of the Chief Scientist 2012).

Numeracy skills of adults

The OECD's *Survey of Adult Skills*⁶ (OECD 2013a) assessed Australia as having average proficiency in numeracy and ranked it twelfth out of 22 nations. Countries such as Japan, Finland and the Netherlands all performed well above Australia, both on average scores and the proportion of adults who achieved the top three levels. There was also one in five Australian adults who attained only Level 1 or below.

The survey showed similar findings for young adults, with Australians aged 16 to 24 years, assessed as having average numeracy skills, but below a number of countries such as Netherlands, Finland, Japan and Korea (OECD 2013b).

The data from across various ages of the population highlights a range of challenges Australia is facing regarding numeracy, now and in the future.

Table 2: Young people not meeting national minimum standards in numeracy, NAPLAN 2013

Socioeconomic background		
Student Year level	Most disadvantaged (%)	Most advantaged (%)
Year 3	7.2	0.3
Year 5	11.9	1.0
Year 7	8.6	0.6
Year 9	17.7	1.8
Aboriginal and Torres Strait Islander background		
	Aboriginal and Torres Strait Islander students (%)	Other Australian students %
Year 3	15.7	1.6
Year 5	24.3	3.6
Year 7	19.1	2.5
Year 9	31.7	6.5

Source: ACARA (2013b) Extracted from tables on pp. 48, 54, 112, 118, 176, 182, 240, 246. **Note:** These figures do not include students who were exempt from testing. Socioeconomic background of students is measured by parental education. 'Most disadvantaged' includes those students whose parent(s) had a highest education level that was at or below a Year 11 or equivalent qualification. 'Most advantaged' includes those students whose parent(s) had a highest education level at or above a bachelor degree.

⁶ Assessment is of those aged 15 to 74 years. It measures participants' numeracy skills, with Level 5 being the most advanced level.

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4. Developing children's early mathematics skills

The development of mathematics and numeracy begins in infancy (Lipton & Spelke 2003) and is strengthened during early childhood through day-to-day activities, including play (Ginsburg, Lee & Boyd 2008; Perry & Dockett 2013; van Oers 2010). Through activities and play, very young children can learn a range of mathematics and numeracy skills (Ginsburg et al. 2008).

Early mathematics and numeracy development is also enhanced when a child engages in activities and play with an adult who selects opportunities for children to learn important mathematics skills and ideas (Cannon & Ginsburg 2008; Skwarchuk, Sowinski & LeFevre 2014).

Mathematics in the everyday

The mathematical ideas with which young children interact must be relevant and meaningful in the context of their current lives (Australian Government 2009).

A focus on the 'everyday', facilitates learning and conveys to children the notion that problem solving, through mathematical skills and concepts, is stimulating, fun (Ginsburg et al. 2008) and relevant (van Oers 2010).

This encourages a disposition towards mathematics that motivates children to use problem-solving skills when they encounter new and unknown material or situations (LeFevre et al. 2009).

Children's mathematical dispositions are reflected in the way they approach tasks – through confidence, willingness to explore alternatives, perseverance and interest. Developing a positive disposition to using and fostering foundational mathematics and numeracy skills is crucial to children's long-term development and educational outcomes (Clements & Sarama 2013).

Mathematics and play

Play is an important vehicle for the mathematical development of young children (Clarke & Robbins 2004; Hunting et al. 2012; van Oers 2010). As the *Early Years Learning Framework*⁷ notes:

Play provides opportunities for children to learn as they discover, create, improvise and imagine. When children play with other children, they create social groups, test out ideas, challenge each other's thinking and build new understandings. Play provides a supportive environment where children can ask questions, solve problems and engage in critical thinking. Play can expand children's thinking and enhance their desire to know and learn. In these ways, play can promote positive dispositions towards learning (Australian Government 2009, p. 15).

Fostering early mathematics skills in the home environment

Families are children's first and most influential teachers (Australian Government 2009). While family factors such as parents' education and socioeconomic background are important, the extent of home learning activities exerts a greater influence on children's educational attainment (Melhuish et al. 2008). The quality of parent-child interactions during early childhood plays a particularly important role in enhancing children's transition to school (Bernier, Carlson & Whipple 2010; Perry & Dockett 2008).

Many children develop strong mathematics skills and knowledge before they start school (Clarke, Clarke & Cheeseman 2006; Gould 2012; MacDonald 2013). The home environment can incorporate planned routine activities, such as bathing, making lunch or sorting laundry and free-play that fosters the development of foundational mathematics and numeracy concepts in children (Ginsburg et al. 2008; Kleemans et al. 2012; LeFevre et al. 2009).

⁷ This Framework was developed by the Council of Australian Governments to assist educators to provide young children with opportunities to maximise their potential and develop a foundation for future success in learning. It is a mandatory component of the National Quality Framework for Early Childhood Education and Care.

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Mathematical ideas such as 'same' or 'different', 'more' or 'less', 'left' or 'right', naming shapes and dates, encouraging sorting, sequencing, measuring and counting and, introducing concepts related to subtraction and addition, can all be discussed during everyday activities and free-play time (Blevins-Knabe et al. 2000; LeFevre et al. 2009). Participation in mathematical activities at home is related to children's acquisition of mathematics in school (LeFevre et al. 2009) and parents' numeracy expectations are important prerequisites in the development of early numeracy skills (Kleemans et al. 2012).

Parents' understanding of early mathematics

Many parents spend less time engaging with their children on numeracy activities compared to literacy, possibly because they have negative attitudes towards mathematics, are less confident about it, place less value on mathematics, or think their children are less interested in it (Lukie et al. 2014). Many are uncertain about early maths learning and teaching, not knowing what their child could or should learn or how to help them learn (Cannon & Ginsburg 2008).

Supporting parents who are unsure or who have negative attitudes towards mathematics is critical for the development of their child's mathematics learning. Nurturing and encouraging the capacity and confidence of parents to guide their child's development is also important (Blevins-Knabe et al. 2000). Providing these support mechanisms is particularly important for parents from low socioeconomic backgrounds (Ginsburg et al. 2008).

Early and later mathematics skills

The importance of developing early mathematics knowledge and positive dispositions is highlighted by their relationship to later mathematics learning. School-entry maths skills are predictive of later maths learning and achievement (Carmichael, MacDonald & McFarland-Piazza 2013; Duncan et al. 2007). The acquisition of higher order mathematical skills relies on the acquisition of foundational skills. Children who do not learn earlier skills are disadvantaged when they are asked to learn later skills (Bailey 2014).



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5. The *Let's Count* program

Let's Count is an early mathematics program, designed by The Smith Family, Professor Bob Perry and Associate Professor Ann Gervasoni. It was developed in recognition of the importance of early numeracy for children's long-term wellbeing. In particular, it aims to support children from disadvantaged backgrounds to develop numeracy skills, knowledge and positive dispositions, as they prepare to start school.

The program assists educators in early childhood contexts, to work in partnership with parents and other family members, to promote positive mathematical experiences for young children, aged three to five. It fosters opportunities for children to engage with the mathematics they encounter as part of their everyday lives, and in turn, talk about, document and explore it, in ways that are fun and relevant to them.

Key principles

Let's Count is based on the principle that children are more likely to have positive experiences of mathematics during their early years, if their educators, parents and other family members, also have positive dispositions towards mathematics. It is underpinned by:

- Strong partnerships between early childhood educators and families.
- The recognition that all children, parents/carers and educators can be powerful mathematicians.
- The use of play, discussion and investigation as its key pedagogical approach. This aligns with the *Early Years Learning Framework for Australia* (Australian Government 2009).
- A realisation that mathematics learning can be enjoyable for all, when it is undertaken in a relevant and meaningful context.

Program components

Let's Count includes a program of professional learning for early childhood educators consisting of two modules, each involving a full day workshop, with approximately two months in between the workshops. The sessions aim to develop and/or strengthen the skills and confidence of the educators to support

parents and other family members regarding their children's numeracy development. They focus on both theory and practice and how educators can work with parents using play, investigation and intentional teaching approaches to support early mathematics.

The time between the modules allows for centre-based learning and activities. These include strengthening the partnership between the educator and parents regarding early numeracy. During this time, educators suggest activities to parents that provide opportunities for them to engage their children in mathematical learning. Educators also provide advice on appropriate language to use in these situations. The aim is to increase the confidence of parents and other family members to support their children to notice, discuss and explore powerful foundational mathematical concepts.

The second professional development session provides educators with the opportunity to share the activities they have used, what they have learnt and to discuss any challenges that may have arisen in engaging with families.

Supporting the home environment

Ongoing interactions between educators, parents and other family members and children occur over the year following the professional learning. Parents also receive a take-home resource pack which includes ideas, tips, games and books to use with their children. The resources, coupled with the advice provided by educators, help parents guide and support their children's mathematical development, particularly in the home environment.

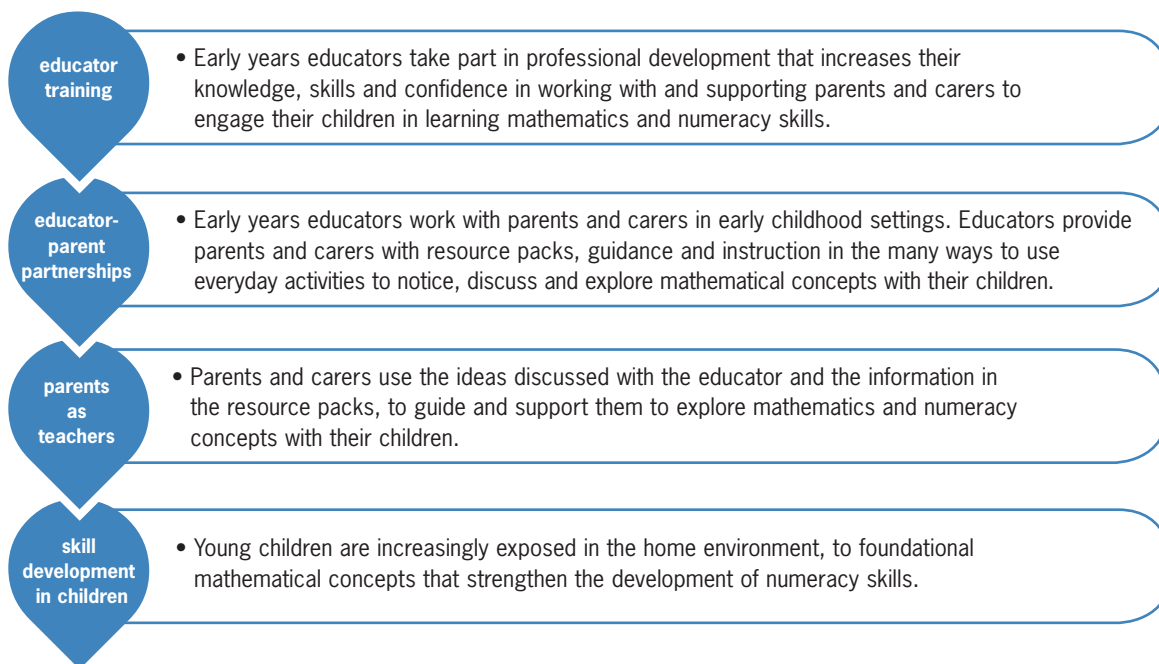
Through *Let's Count*, children have the opportunity to explore mathematics and numeracy concepts in the home on a more frequent and sustained basis. This in turn, helps develop more positive mathematical dispositions and higher order skills that are important for subsequent development.

Figure 1 shows how *Let's Count* supports educators, parents and children, with the end goal being to strengthen children's positive dispositions and mathematics learning.

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Figure 1: *Let's Count* influences educators, parents and children



Piloting *Let's Count*

In 2009, The Smith Family began a two-year partnership with BlackRock Investment Management to develop, pilot and evaluate *Let's Count*. The pilot began in 2011 in five disadvantaged communities across Australia. Around 60 early childhood educators participated and they engaged with around 550 parents and other family members whose children were attending the early childhood education and care centres in which the educators worked.

The evaluation of the pilot showed that the program provided participants with many opportunities to enhance the mathematics learning of children. Educators, parents and children enhanced their dispositions and confidence towards mathematics. For educators in particular, there was clear evidence that *Let's Count* had made a positive difference in their ability to provide for children's mathematics education and to engage families in this (Perry, Gervasoni & Kearney 2012).

Expanding *Let's Count*

Following the success of the pilot, further funding from BlackRock and significant new funding from the Origin Foundation was secured, to make *Let's Count* available to more communities. The Origin Foundation support also included funding for a more comprehensive evaluation, with a particular focus on the program's impact on the participating children.

Table 3 shows the number of communities, early learning and care centres and educators, parents/carers and children who were involved in *Let's Count* in 2012 and 2013. In 2012, 70 educators from nine disadvantaged communities across Australia participated in the *Let's Count* professional development sessions. These educators subsequently engaged over 1,000 parents and other family members, with around 2,000 three to five year old children benefitting. In 2013, around 140 educators participated in the program for the first time. They engaged over 2,000 new parents and family members, with close to 4,000 children benefitting.

Table 3: *Let's Count* program participants, 2012 and 2013

	2012	2013
Communities	9	13
Early learning and care centres	33	66
Educators	70	137
Parents/carers	1,050	2,055
Children	1,995	3,905

6. *Let's Count* evaluation and results

Professor Bob Perry from Charles Sturt University and Associate Professor Ann Gervasoni from Monash University are leading an evaluation of the expanded *Let's Count* program, across 2012 to 2014. The evaluation aims to assess the impact of the program on:

- Children's numeracy knowledge and dispositions as they transition to school.
- Early years educators' knowledge, interest and confidence in mathematics learning and teaching.
- Parents/carers' confidence and knowledge in supporting their children's mathematical learning.

Assessing children's mathematical knowledge and skills

Given the pilot evaluation focused on educators and parents, the later evaluation has particularly explored the impact of the program on children. It compares the mathematical knowledge and skills of children before and after they participated in *Let's Count*. It also compares their achievement with a similar group of children (that is, children of a similar age, at the same level of their education and attending the same early years centres) who have not participated in the program.

Both groups of children were assessed using the Mathematics Assessment Interview (MAI), which is a

nationally recognised activity-based tool (Gervasoni et al. 2011). The MAI assesses eight areas of mathematics learning that correspond to the concepts, skills and knowledge expected at the first year of formal schooling, as identified in the *Australian National Mathematics Curriculum* (Perry & Gervasoni 2014). These areas include whole numbers (such as counting and division), measurement (such as length) and geometry (such as properties of shapes).

Table 4 shows the numbers of young children involved in the evaluation. In late 2012, 125 children eligible to start school in 2013 participated in a Mathematics Assessment Interview. These children all attended the early childhood education and care centres whose educators were to undertake the *Let's Count* professional development sessions early the following year. These children did not participate in *Let's Count*.

In early 2013, 141 children eligible to start school in 2014, who were going to participate in *Let's Count* during 2013, were also assessed using the MAI. At the end of 2013, 116 of these children were re-assessed using the same instrument.⁸

This evaluation approach enables two important comparisons to be made regarding children's mathematical knowledge and skills:

- Before and after they participate in *Let's Count*.
- Between similar children who participated in *Let's Count* and those who did not.

Table 4: Number of children whose mathematics knowledge and skills were assessed

Dec 2012 (5 yrs old)	March 2013 (4 yrs old)	Dec 2013 (5 yrs old)
125 children Did not participate in <i>Let's Count</i>	141 children	116 children
	Children who participated in <i>Let's Count</i> and were assessed before and after the program	

⁸ The remaining children had either left the centre or were not present during the re-assessment period.

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Counting and ordering numerals

Table 5 includes some of the children's results from the MAI (for counting and ordering numerals). It shows that children who participated in *Let's Count* improved their ability to successfully complete the four tasks. For example, only around one in five (17%) of these children were able to count to 20 prior to participating in *Let's Count*, but around half (54%) successfully completed this task at the end of the program. Importantly, this compares to only 37% of children who did not participate in *Let's Count*.

Only four percent of children who participated in *Let's Count* were able to order three one-digit numbers prior to them being involved in the program. Following their involvement in the program, two thirds (66%) of the children successfully completed this task. This compares to just under a half (47%) of children who did not participate in *Let's Count* being able to complete the activity.

For both of these tasks, the differences in results for children who participated in the program and those who had not been involved, were statistically significant (meaning the differences did not happen by chance).

Table 5: Percentage of children successful with counting and ordering numerals tasks

Task	March 2013 (4 yrs old)	Dec 2013 (5 yrs old)	Dec 2012 (5 yrs old)
Rote count to 10	66	93	87
Rote count to 20	17	54*	37*
Order numeral cards 0 to 9	10	59*	31*
Order 3 one-digit numbers	4	66*	47*

Note:*The differences between these scores are statistically significant. The children in columns 2 and 3 are the same group of children and they participated in *Let's Count*. The children in column 4 did not participate in *Let's Count*.

Pattern, measurement and small set tasks

Table 6 provides some of the children's results for patterns, measurement and their ability to produce small sets of objects. It shows that those who participated in *Let's Count* achieved better results than children who had not participated. Again, the results were statistically significant.

For example around a quarter of children (23%) were able to order four different sized candles, from shortest to longest, before they participated in the program, with this increasing to close to seven in ten (68%) by the end of the program. This compares with just over half (54%) of children who were not involved in *Let's Count*.

Table 6: Percentage of children successful with pattern, measurement and small sets tasks

Task	March 2013 (4 yrs old)	Dec 2013 (5 yrs old)	Dec 2012 (5 yrs old)
Match patterns	49	85*	72*
Continue pattern	16	48*	34*
Order 4 candles shortest to longest	23	68*	54*
Make a set of 5 teddies when asked	63	89*	77*
Make a collection of 7 when shown the number 7	59	84*	63*

Note:*The differences between these scores are statistically significant. The children in columns 2 and 3 are the same group of children and they participated in *Let's Count*. The children in column 4 did not participate in *Let's Count*.

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Spatial and calculation tasks

Children's results for spatial and calculation tasks are included in Table 7. Three in five (61%) of the children who were involved in *Let's Count* were able to successfully complete the quite complex task of dividing 12 teddies between four mats, by the end of the program.

Only one percent of this group was able to do this prior to the program, and only three in ten (31%) of the children who did not participate in *Let's Count* were successful with this task.

Table 7 also shows that children who participated in *Let's Count* were more likely than children who did not participate, to successfully complete a task related to the properties of triangles.

Table 7: Percentage of children successful with spatial and calculation tasks

Task	March 2013 (4 yrs old)	Dec 2013 (5 yrs old)	Dec 2012 (5 yrs old)
Knows all triangles	81	94*	83*
Calculates total for 2 teddies in 4 cars	39	64	58
Divides 12 teddies between 4 mats	1	61*	31*

Note: *The differences between these scores are statistically significant. The children in columns 2 and 3 are the same group of children and they participated in *Let's Count*. The children in column 4 did not participate in *Let's Count*.



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The impact of *Let's Count* on early years educators

In addition to assessing the impact of *Let's Count* on children, the evaluation explored its effect on early years educators. It surveyed educators twice – once prior to them participating in the first professional development session and then following the second professional development session.

Sixteen educators were also interviewed at three points in time – within three weeks of both

professional development sessions and close to the end of 2013.

A key aim of *Let's Count* is to increase the quality and quantity of engagement educators have with parents regarding their children's numeracy learning. The surveys therefore asked educators what proportion of parents were talking with them about numeracy and how frequently this occurred. The results are included in Tables 8 and 9. They show that the educators perceived that both a larger percentage of parents were talking with them about their child's numeracy and they were doing it more frequently.

Table 8: Proportion of parents who spoke with educators about their child's numeracy learning, 2013

Proportion of parents	Survey 1 (%)	Survey 2 (%)
All	0	6
Most	7	12
Some	58	76
None	35	6

Table 9: Frequency of parents speaking with educators about their child's numeracy learning, 2013

Proportion of parents	Survey 1 (%)	Survey 2 (%)
Daily	0	0
Weekly	0	24
Occasionally	65	67
Never	35	9



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Themes from interviews with educators

A number of themes emerged from the interviews with educators which identified the impact of *Let's Count* on them, their engagement with parents and families and the children in their care.

Engaging families with mathematical learning

Educators used a range of strategies to get families involved in *Let's Count*. These included one-off events, sending home resources and including *Let's Count* in their everyday dialogue with families. As educators expressed it:

The way you can communicate to parents about maths is probably... the biggest thing that I got out of it, because a lot of parents that I've observed... once you start talking about maths, they sort of, well shut down a little bit, and just think about maths as numbers. Whereas it's sort of opening up that book ... just reading their favourite bedtime story you can bring out how many mice are in the story... so it's not so textbook type maths learning, it's more everyday living.

I think the main difference it made was the way we engaged the parents in it...it was just little things like putting notices out, little newsletters and also we had a board out the front where we put a little maths problem and the parents could sort of get involved. It was just something they could do on the way home or on the way in. Like counting buses or plan your trip somewhere, things like that...and that sort of got the parents really interested and talking about maths a lot more.

Continuity of mathematics learning between early childhood setting and home

Many of the educators emphasised how *Let's Count* enhanced the continuity of children's mathematics learning between the early childhood setting and home. Importantly, the program reinforced the key role parents have in their children's mathematical development.

I think it's been a positive thing for building relationships with parents because they've felt we're acknowledging them as their child's educator... respecting the ideas that they have, like we're not pretending we're the experts, we're asking them for their ideas and passing those on to other people and even using some of them here. So I think it's a good way to build positive relationships with parents.

Our day book has different things that we've been doing and I know parents look at that and go home and do it. Like we have parents that made a volcano with their child. So they looked at the measurement side of things and ingredients and things that they would need. That was good to see that what we'd done at kinder had followed on at home... this year we've noticed we've got a lot more children that are really strong in their counting. So I definitely put that down to parent and even grandparent involvement.

We've got a book out that we have asked the parents for ideas about what they do at home and we've been getting lots of good ideas in there, like socks snap, if they're doing the washing ...so the parents are talking a bit more about it and feeling that they can contribute to that. That's really good because we can see that the children are then continuing that at home as well.

*I think it's become a very family orientated project at home, especially with *Let's Count*. We have a *Let's Count* bag that's gone home with individual children that are in the program, plus we've sent home one that can go weekly to a different family and we've found that it's brought the family on board a lot more and thinking about maths at home. So they've got quite excited and I've had some children share their stories of how they're working at home.*

Impact on educators' confidence, professional identity and pedagogical practice

Many of the educators indicated that *Let's Count* had impacted on their confidence and teaching practice. They had also noticed a growth in confidence and competence around the mathematics of many of their colleagues.

How do I feel about maths? ...I used to think of maths as sums. You know...like sitting at a high school desk trying to do these sums that you can't work out. But now looking at maths in a different way, I kind of see that it is everywhere and we do use it every day. So I'm starting to feel a bit more confident with that.

I'm probably more confident with doing things now with the kids, where before I would have been like 'Oh that's just too hard'. But it's not... We've been looking at fractions and different things and the kids really love it. And I suppose if you're confident in being able to present that, the kids just take more out of it than if you're not so confident, they won't be as interested.

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I personally didn't feel very strong in maths before starting Let's Count and...I wouldn't have done as many maths group times. However, now I find that in every single group time that I'm doing, whether it be literacy or science, I'm still bringing that maths concept into it and the children are grasping on to the different concepts of maths as well.

I can remember learning all this when I was at university and learning to be a teacher... it was really good to revisit that ...it is nice to still talk about mathematics rather than...always numeracy which sounds like it's just all about numbers all the time. When it's mathematics it covers everything and that's the lovely thing...I think this program is filling that gap. I think it needs to get out to all the teachers and staff out there, that mathematics is everywhere.

I think it's just really broadened our understanding of it, but it's also given us lots of really great ideas that we can put into our program. Sort of simplified it. I think you get stuck in your head that it has to be complicated, or that little kids can't do it or whatever. But it's really sort of opened our eyes to the things that the children already could do and then how we can expand on that and work with that.

Some of the educators also commented on how Let's Count had positively impacted on parents' confidence in their own mathematical ability.

A lot of the discussion was more around people's perception of maths and what their experience was as children or in school with mathematics. The majority of parents when you talk to them about maths just baulked at it and thought well I was never any good at maths. Most people said that, especially mothers...generally the mothers would say that they were terrible at maths...But when we sort of showed them a bit more about what we were doing at the kinder that was maths, they sort of realised that they weren't really that bad at maths at all. So it was a nice way of educating the parents without them realising.

Awareness of mathematics in everyday tasks

The interviews showed that the concept that there is mathematics in everything has clearly been accepted by many of the educators.

Whatever we're involved in, even with the gardening outside, we look at how many plants we have planted, we look at the pictures of them when their

fruits develop, what shape is it...whatever we do we're attempting to incorporate maths throughout.

Straight away the staff were almost like whatever situation we were doing, it wasn't just about the book, it was also about the maths concept in it. It wasn't just about group time, suddenly it was also about maths concepts sort of thing. So it became more of our day to day language, whereas previously it had really been biased towards literacy. It's sort of becoming more second nature now, as opposed to sort of 'Oh my gosh, I've got to do this maths stuff'.

Children's engagement with mathematics

Educators' understanding of what children are capable of and how disposed they are to learning, comes in large part, from their observations of children in play and other contexts. The Let's Count educators described the advances in the mathematics learning of the children in their care. In some cases, these advances have been surprising and quite dramatic.

I'm really seeing the children ... their knowledge is just blowing me away, of what concepts they're understanding, of like symmetry and patterns. And now it's starting to be more about adding. Last week we worked out that 10×3 is 30 and that was from a story book...They had noticed that there were 10 apples on each of the animal's heads and then I chose three children to show me 10 hands. And then they were able to count along and find out that that actually meant 30 apples in total. And that all came from the children ... so they just have been absorbing the maths and really extending them further with just like the slightest bit of encouragement, which is fantastic.

The child that's really taken to the graphs is one that I would not have expected. ...he's also getting other friends involved too...it started off as being just him and a friend, writing their names and arguing about who had the most letters... but then we ended up measuring feet, so it was two of the girls talking about who had the prettier and bigger shoes. Yeah, so then we chased around and made a graph of everyone's feet.

There's a couple that from the start of the year would never, ever have had a go...and they're now the ones that have always got their hand up first to get in there and start the counting game. So that's a big improvement, just children's self-confidence.

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My children have built so much over this year that their concepts all around are starting to grow. I mean, they're transitioning to school so really we've studied a lot of maths this year ...what I've noticed is how they ask for the maths to be incorporated. ...I have got one little boy who was very negative at the beginning of the year about actually engaging in games, full stop. And now I've actually got him requesting to stay in the group that has the games each day and actually sharing in the maths with other children ...he is from probably a less academic environment...and so for him to embrace the games and really take on board the maths is just brilliant.

I wish that everybody had the opportunity to do Let's Count, like as in the whole of New South Wales, because I've just seen such big improvement in the children's concepts of maths and preparing them for school next year...if they've got one more ability to sort of ...comprehend maths and how it works, then they're going to be so much more comfortable in a new setting and really participate to their fullest.

The impact of Let's Count on parents and carers

Eight parents who participated in Let's Count in 2013 were interviewed at the beginning of the program. These parents, plus another two parents, were also interviewed at the end of 2013. A number of themes emerged from these interviews.

Noticing and facilitating children's mathematical learning in the everyday

All parents talked about noticing mathematical concepts as part of their everyday interaction with their children and extending those concepts where children showed interest. In many cases, parents indicated that Let's Count was an important influence on this happening.

Having that program has just boosted my confidence enough to say ok well she's catching on to this very quickly, she's doing all the right things, she's talking about it at home, just in general conversation...like, she's just coming up and saying 'I did this and this today'. Like it's just a bit of a confidence boost and saying ok... maybe she is going to be ok to go to school.

...it was a nice reminder, just how simple things can be at home and uncomplicated and immediate in your environment around you.

Her birthday was on the 16th of October so I wrote '16' down the bottom and then I took thirty days away from that, adding squares and numbers, counting down and she realised that it was only twenty eight days or something like that until her birthday. And each day we'd cross it off and it would have the date of the month on it, until it got to October. It will say the first of October and then she would know that she would only have sixteen days until her birthday by counting the blocks in between.

Yeah, it's definitely increased, because he's sort of so vocal with it you sort of realise that there's a lot of maths in almost every situation that you're in.

We've always had that sort of learning mathematics basis but it's definitely just made me a little more aware of using the more technical terms with her. Because she's going to learn what they mean eventually, so it's really important to start using those straight away.

Children's growing confidence, knowledge and engagement with mathematics

By the end of the evaluation period, parents were able to give many examples of how their children were engaged with mathematical concepts, were confident to 'have a go' and enjoyed mathematics. Parents also reported genuine surprise at their children's increased mathematical capabilities.

Just knowing that she can probably count 1 to 100 is like a big thing to me. But the other day she picked up counting by 10s to 100. So that kind of threw me off and I went wow, now let's just go with this because this could be the easier way to count to 100...when she learnt how to count by 10s, that was cool.

She comes out with things every day. Something that really surprised me ... we were talking about my birthday and that I'm turning 22 and she said 'Oh mummy, you're turning 22, isn't that two two', as in like 2-2, and I was like 'Yes, that's a number' and then she's just like 'So how do we add ...what do we do to get to that number', ...she was just trying to work out how to get to twenty two, like all different scenarios.

I think just lately a lot of it has been his addition, which is very surprising because I suppose you don't expect them to be doing any of that yet. Like it's not just a once off, he's walking up to you nearly every day... and he goes '6 + 2 is this' or you know,

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he's just coming up doing addition which is really good but it's out of the blue. Like it's not like we've asked him to do it ...he's very excited about it and ...he's just so happy with himself that he can do it.

What I've noticed are things like ... for setting the dinner table, she's started to do that now and she's like 'How many forks do I need? I need two kids' spoons, two big spoons, that equals four spoons'...She says things like, 'I've only got five clips and I need six to make it match together'. We were driving and she's like 'What's the distance from Newcastle to home?'...we also had this boomerang at home and she's asked me for a measuring tape...and she lined the tape up from one end to the other and she began to read the numbers.

...one of things that has most impressed me, she understands the definition of symmetry. Yeah, so that was one of the things that the teachers were really impressed with as well, ...she actually got the concept of it. That was pretty spectacular.



Overall findings

The *Let's Count* evaluation shows the program has had a positive impact on the children, educators and parents who participated. There is strong growth in children's mathematical knowledge and skill across a range of areas. The extent of this growth is reinforced by comparing these results with a similar group of children who did not participate in the program. *Let's Count* has assisted young children in their mathematical learning in a range of key areas, with children achieving to a significantly greater level than their peers who were not involved in the program.

Educators and parents identified that *Let's Count* had a positive impact on children's dispositions towards mathematics. The program supported children to increase their confidence, knowledge, enjoyment of and engagement with mathematics.

Let's Count also positively impacted on the knowledge, interest and confidence in mathematics learning and teaching of the educators who participated. They increased their understanding of how their mathematical education practice can be improved.

Both educators and parents noted the greater levels of communication between them, regarding the development of children's mathematics, as a result of their participation in *Let's Count*. There was greater continuity between children's learning in the home and the early learning setting, and both parents and educators were more able to support children's mathematical development.

The evaluation has clearly shown that *Let's Count* has made a positive difference to the confidence and mathematical dispositions of all participants – children, educators and families.

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7. Conclusion

Numeracy is an essential skill for everyday living and a prerequisite for economic and social participation in the technology-rich 21st century. The mathematical skills of a nation's population are an important determinant of its ability to innovate and to be socially, culturally and economically prosperous.

Significant numbers of Australians, across all age groups, do not have, or are at risk of not developing, the mathematical skills needed to fully participate.

Childhood mathematics skills are predictive of later mathematics learning and achievement. The development of mathematics and numeracy skills begins in infancy and is strengthened during early childhood through day-to-day activities, including play.

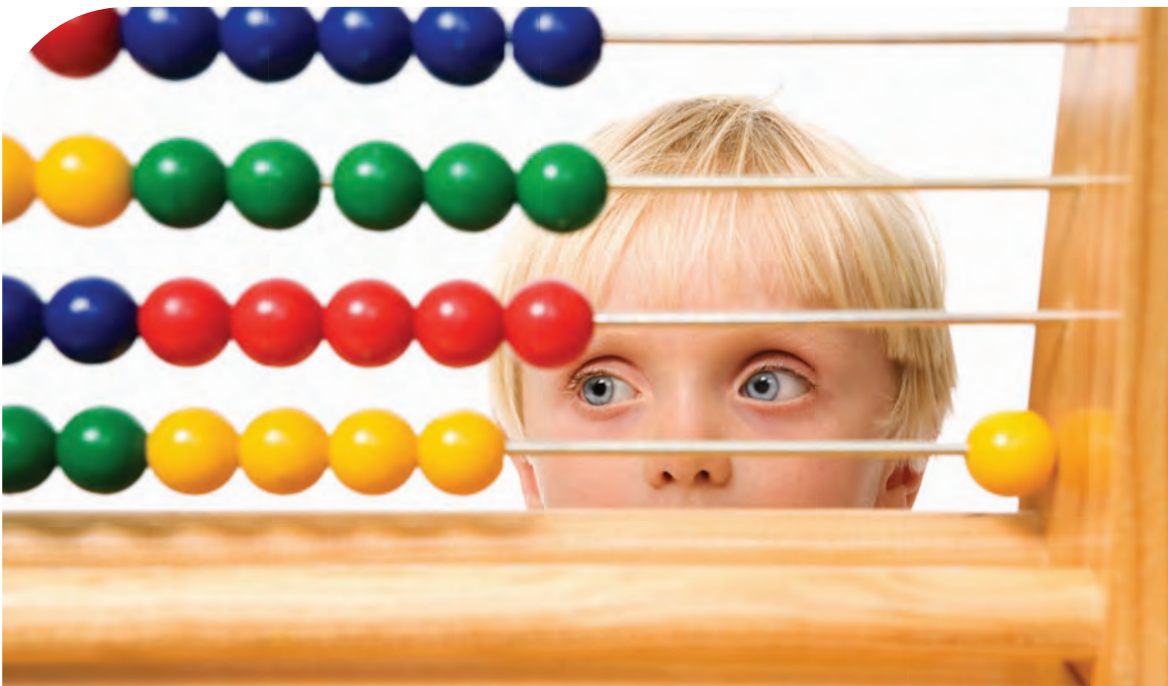
Families are children's first and most influential teachers. Yet, many parents are uncertain about early maths learning and teaching, not knowing what their child could or should learn or how to help them learn. Nurturing and encouraging the capacity and confidence of parents to guide their child's mathematics development is important.

Let's Count is an early mathematics program, developed, in particular, to support children from disadvantaged backgrounds to foster numeracy knowledge, skills and positive dispositions as they prepare to start school.

The evaluation of *Let's Count* shows it impacts positively on children, parents and educators who participate. All three groups have enhanced confidence and stronger interest regarding mathematics and more positive dispositions towards it.

Importantly, there is strong evidence that the children's mathematics skills have grown significantly through their involvement. The skills of this group of children are greater than those of their peers who did not participate in *Let's Count*.

Through facilitating strong partnerships between families and educators, *Let's Count* has supported children from disadvantaged communities to develop appropriate mathematics knowledge, skills and dispositions at a critical point in their lives – as they prepare to start school.



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A three year partnership between The Smith Family and the Origin Foundation has enabled a significant expansion and comprehensive evaluation of the *Let's Count* program.

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