

Let's Count: Evaluation of a Pilot Early Mathematics Program in Low Socioeconomic Locations in Australia

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The *Let's Count* pilot early mathematics program was implemented in five early childhood educational contexts across Australia during 2011. The program used specifically formulated materials and workshops to enlist the assistance of early childhood educators to work with parents and other family members of children in their settings to help develop these children's awareness, confidence and skills in early mathematics. The pilot program was evaluated by the authors of this paper using a multi-methods approach. The evaluation was focused on the success of the *Let's Count* program in bringing early childhood educators, parents and other family members together, to enhance children's mathematical engagement, learning outcomes and dispositions.

Let's Count is a new early mathematics program commissioned by The Smith Family to assist parents and other family members to help their young children aged 3-5 years notice, explore and talk about powerful mathematical ideas in ways that develop positive dispositions to learning as well as mathematical knowledge and skills. It relies on parents and other family members providing the opportunities for the children to engage with, talk about, and document the mathematics in their everyday lives, and to extend it in ways that are relevant to them. *Let's Count* is not a mathematics teaching program. However, it does involve early childhood educators in the role of advisers to parents and family members of the children in their settings. This can have the impact of encouraging these educators to consider their own pedagogical approaches in mathematics and add to their repertoire of successful practices.

Let's Count fits well with the *Early Years Learning Framework for Australia* through its use of play and investigation as key pedagogical approaches and through its contribution to Learning Outcome 5: *Children are effective communicators*.

Children bring new mathematical understandings through engaging with problem solving. It is essential that the mathematical ideas with which young children interact are relevant and meaningful in the context of their current lives. Educators require a rich mathematical vocabulary to accurately describe and explain children's mathematical ideas and to support numeracy development. 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)

Background to the *Let's Count* Program

Let's Count is based on current research literature in three important areas:

1. the role of families in young children's learning;
2. play and investigation in young children's mathematics learning; and
3. young children's learning of mathematics.

This section of the paper explores each of these areas briefly in order to establish the research basis for the program.

The Role of Families in Young Children's Learning

Families are important contexts for young children and can have major impacts on their learning opportunities.

Most children grow up in families and, in their early years especially, families have a major impact on children's lives, influencing their developing patterns of thinking, feeling and behaviour. Families also have a critical role in instilling fundamental values in children, which in the vast majority of cases enables them to become ethical and law-abiding citizens. Although children may spend a lot of their time in contexts other than their family, the emotional intensity of families and the durability of kinship ties mean that learning in this context is likely to be extensive and long lasting. (Bowes, Watson, & Pearson, 2009, p. 91)

Children's experiences within their families influence their learning and dispositions towards learning. Resources provided to the child by the family, home routines and environment strongly predict educational and behavioural outcomes for children well into the primary years (Melhuish et al., 2008). For example, living in poverty can restrict families' abilities to provide materials and associated learning opportunities for their children. However, there are many examples of children living in poverty who have achieved positive educational outcomes. Often this is due to particularly strong, positive approaches from family members. In many ways, it is not the nature of the family that makes the difference. Rather, it is what happens within the family that is important (Melhuish et al., 2008).

Despite the recognised importance of family involvement at all levels of their children's education, there is evidence that many families – notably those described as having 'disadvantaged' backgrounds – do not actively participate (Miedel & Reynolds, 1999). Multiple reasons have been advanced for this lack of participation, including a perceived lack of partnership between families and educators (Brooker, 2003).

While the development of positive, fruitful and collaborative partnerships with families can be quite time-consuming for early childhood educators, such partnerships are of great importance in children's learning and underpin the *Early Years Learning Framework for Australia* (DEEWR, 2009).

Learning outcomes are most likely to be achieved when early childhood educators work in partnership with families. Educators recognise that families are children's first and most influential teachers. (DEEWR, 2009, p. 12)

Play and Investigation in Young Children's Mathematics Learning

Much has been written about the importance of children's play in their learning (Shonkoff & Phillips, 2000). The *Early Years Learning Framework for Australia* makes the following comments about the importance of play in young children's learning:

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 to learn. In these ways, play can promote positive dispositions towards learning. (DEEWR, 2009, p. 15)

The great potential for mathematics in children's play has long been recognised (Lee & Ginsburg, 2007; Perry & Dockett, 2008). However, this potential can only be realised if the mathematics in children's play is noticed, explored and talked about. Having access to a 'knowing adult' is important.

Educators (including parents and teachers) who are effective in promoting children's learning through play often engage in sustained shared thinking, where children and adults

together work through an issue, solve a problem or clarify understandings (Siraj-Blatchford 2009). Sustained shared thinking occurs within the context of responsive, trusting relationships where all show genuine interest as they engage with issues or questions, suggest or clarify explanations, and are provoked to consider alternative explanations, as well as potential consequences of these. When adults engage in sustained shared thinking with children there is potential for all participants to develop confidence in their own abilities as learners as well as develop new understandings.

Young Children's Learning of Mathematics

There has been some reluctance amongst early childhood educators to include mathematics as part of the formal curriculum (Sarama & Clements, 2002; Perry & Dockett, 2008). However, the past decade has seen a significant shift in thinking, with young children celebrated as capable mathematical thinkers and learners (Lee & Ginsburg, 2007; Sarama & Clements, 2002). This is reflected in the Australian Association of Mathematics Teachers and Early Childhood Australia statement that

all children in their early childhood years are capable of accessing powerful mathematical ideas that are both relevant to their current lives and form a critical foundation to their future mathematical and other learning. Children should be given the opportunity to access these ideas through high quality child-centred activities in their homes, communities, prior-to-school settings and schools. (AAMT & ECA, 2006, p. 1)

In a recent survey of early childhood educators in four states of Australia (Hunting, Mousley, & Perry, 2012), there was overwhelming agreement from educators that young children were capable of mathematical activity well before they started school. This result echoes those in many other studies with the general agreement that all young children are capable of accessing powerful mathematical ideas and should be afforded opportunities to access these ideas through high quality child-centred activities in their homes, communities, and prior-to-school settings (Faragher, Brady, Clarke, & Gervasoni, 2008; Lee and Ginsburg, 2007; Perry & Dockett, 2008; Sarama & Clements, 2002).

Let's Count Pilot Program

During the first half of 2011, the *Let's Count* early mathematics program was piloted in five sites experiencing social and economic disadvantage, in five states across Australia. *Let's Count* included a program of two full-day modules of face-to-face professional learning for early childhood educators in each site with approximately two months between each module. The themes and aims of the modules were:

- Module 1: Noticing and exploring everyday opportunities for mathematics
- Module 2: Celebrating mathematics

The first module provided information about *Let's Count* and its theoretical and practical bases. It also included discussions, workshops and activities to prepare the educators for working with parents and other family members from their settings to notice, explore and talk about mathematics using play, games, singing, investigation and intentional teaching.

Between modules, the early childhood educators also completed the following activities, along with others that they suggested during the first professional learning day:

- making a photographic and/or video record of the mathematics being experienced by children in their settings;
- keeping a journal of the ways in which these children use mathematics;
- noting interactions with family members around mathematics in the families;

- preparing a presentation for the second professional learning day that showed children's mathematical experiences in the setting;
- collating their families' documentation of mathematical experiences outside of the setting for presentation on the second professional learning day; and
- writing a learning story about their experience of *Let's Count*.

The second module of professional learning provided opportunities for the early childhood educators to celebrate what they had done in the program and to develop an action plan about how to sustain and extend *Let's Count* in each site. The day concluded with discussions about the evaluation of the program.

Evaluation of the *Let's Count* Pilot Program

The aim of the evaluation was to ascertain the success of the pilot offering of the *Let's Count* program in bringing early childhood educators, parents and other family members together, to enhance children's mathematical engagement, learning outcomes and dispositions. The research questions for the evaluation were:

1. How has *Let's Count* assisted early childhood educators and parents and other family members to enhance children's mathematical engagement, learning outcomes and dispositions?
2. What improvements can be made to the *Let's Count* structures, materials and personnel in order to ensure its sustainability as it is scaled from five sites to all eligible sites in Australia?

The evaluation study used a multi-methods approach in which educators undertook written surveys at the time of the first workshop (Time 1) and directly after the second workshop (Time 2) and individual telephone interviews at Times 1 and 2, and four months after the second workshop (Time 3). Parent interviews were undertaken post-program only. Table 1 reports the number of participants at each of the five pilot sites who completed surveys and/or participated in interviews.

Table 1.

Numbers of Participants in Workshops, Surveys and Interviews

State	Workshop Participants	Survey Time 1	Survey Time 2	Interview Time 1	Interview Time 2	Interview Time 3
NSW	24	19	10	4	4	4
QLD	9	9	3	4	3	2 (plus 3 parents)
SA	18	18	15	4	2	2
TAS	5	4	4	1	1	2
VIC	8	8	7	4	3	1
Totals	64	58	39	17	13	11 (plus 3 parents)

All data from the two rounds of surveys were entered into SPSS for quantitative analysis. For the most part, these analyses consisted of frequency counts and simple statistical techniques such as crosstabs and χ^2 calculations. Qualitative data from the surveys was used in conjunction with interview data to provide a clear picture of the respondents' attitudes to mathematics and mathematics pedagogies.

All the interviews were audio-recorded and transcribed for analysis. An initial coding frame was established for the interview data using a coding procedure based on the principles of grounded theory (Strauss & Corbin, 1998). Each interview was double coded using this coding frame. Codes were then coalesced to generate broad categories of responses. Any discrepancies in coding were resolved through discussion and agreement between the coders. The coded data were analysed using NVivo.

Results and Analysis

In this paper, we report only educator data from three categories:

- noticing and talking about mathematics and making it explicit;
- changing attitudes towards mathematics and growing confidence about the potential of mathematics; and
- engaging families and building relationships with mathematics.

Noticing and Talking About Mathematics and Making It Explicit

Data pertaining to this category were generated through the interviews with educators, with some change discernable over the life of the program. Issues raised in the following statements from educators were consistent across the group of respondents.

It's about recognising what they're [parents] wants are and reassuring them that it's [*Let's Count*] not going to be sitting down at desks learning mathematics. It's basically play based. And also giving them ideas about how they could be following through at home. (Interview Time 1)

For a parent, when you talk about maths it's about number and counting and adding this to this. So it's just sort of broadening their view of what maths actually is and how it can be incorporated into everyday life. It's more from the parent perspective I think things have changed for me primarily. (Interview Time 2)

We started off I made an obstacle course and I with the other staff that we stuck up words on the wall so that as the children were doing or going through the obstacle course we got them to use words like 'over' and 'under' and 'through' and 'next to' and things like that. And simply did that once, it has been a consistent thing in every group since. I always have to now set up the obstacle course and the children and the parents have actually taken on board the language. (Interview Time 3)

The *Let's Count* mantra of 'notice, explore and talk about' mathematics has been embraced successfully by the educators and they can see the message being utilised by at least some of their parents.

Changing Attitudes towards Mathematics and Growing Confidence about the Potential of Mathematics

Educators' confidence and positive attitudes to mathematics impact on the quality of their teaching of mathematics and the mathematical outcomes of the children with whom they interact (Perry & Dockett, 2008). In both iterations of the survey for educators, participants were asked to indicate where they felt they fitted along a continuum from absolutely disliking mathematics (indicated by a score of 1) to feeling that mathematics is the best thing ever (indicated by a score of 10). Difference scores were calculated for 'liking mathematics' for the 37 participants who answered this question in both iterations of the survey. These are reported in Figure 1.

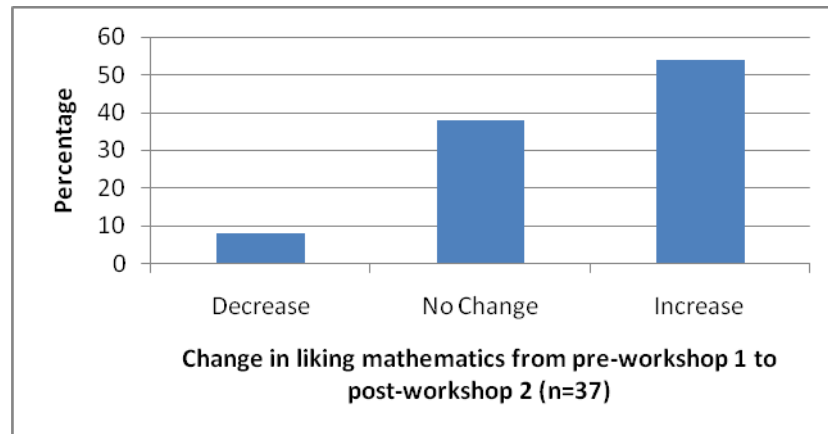


Figure 1. Changes in 'liking' ratings from Survey 1 to Survey 2.

Educators' perceptions about liking mathematics were significantly different over time (Wilcoxon Signed Ranks Test, $z=3.365$, $p<0.005$). From just prior to training in the *Let's Count* program to the completion of the second training workshop, 54% of participants reported an increase in their liking of mathematics, while only 8% reduced their 'liking' score. This suggests that the educators, in general, found the *Let's Count* experiences 'to their liking'.

Educators were asked in each of Surveys 1 and 2 to indicate their agreement with 12 statements regarding their attitudes to mathematics. Cross tabulations were carried out between scores at the first and second implementations of the survey to ascertain the level of movement between AGREE and NOT AGREE across the *Let's Count* period. For all of the 12 statements, the movement was 'positive' in the sense of the educators reporting more positive inclinations towards mathematics. While the numbers of participants who responded to both surveys was relatively small ($n=37$), it is interesting to note that of the 12 statements canvassed, all but three of them showed statistically significant positive movement (at the $p<0.005$ level). Those statements for which statistical significance was demonstrated were:

- At school my friends always came to me for help in mathematics
- I am quite good at mathematics
- I have always done well in mathematics classes
- *I felt the need to study mathematics beyond high school*
- *I have no trouble understanding anything that is based upon mathematics*
- *I do well on tests that require mathematical reasoning*
- Mathematics is a thing of beauty
- It's important for everyone to pass Year 12 mathematics
- *Mathematics does not make me feel inadequate*

(Note that negatively worded statements have been written in the positive, had their coding reversed and are shown in italics.)

Given that some of these statements relate to 'historical' information that should not have changed, it would seem that there may be an overall 'more positive feeling' about mathematics that has taken place during the period of the *Let's Count* program. There are several instances in which data from educator interviews have reinforced this feeling of being more positive about mathematics, seeing the potential to develop mathematical ideas through a play-based program run by parents and, in fact, attributing these to *Let's Count*. For example,

We don't need to be masters of mathematics. Just let's change our attitude towards maths. Let's recognise that mathematics is everywhere all around and it's enjoyable, it's easy. You don't need anything special to do it. (Interview Time 2)

Well, *Let's Count* it just was a very positive experience for me and also the biggest thing for me is that it gave me confidence. The confidence to expand things and to actually initiate conversations, more conversations around mathematics and encourage parents a lot more to use or think about mathematical concepts in everyday life. (Interview Time 2)

It's been just a really positive experience for me. It's given me a lot of confidence to take different learning out there and encourage parents to add something to what they're already learning. (Interview Time 3)

Oh it's made a big difference. I used to hate maths. Maths wasn't my strong point in school but by sitting down and doing this program with the kids I've had a lot of fun doing it. I've been able to break down more complex problems and being able to get the point across to the kids in a simpler format. I think I might have probably a better understanding of things. (Interview Time 3)

Data from both surveys and interviews suggests that the *Let's Count* pilot program has had positive impact on the educators' attitudes to mathematics and the potential they see for families to play and investigate mathematics with their children.

Engaging Families and Building Relationships with Mathematics

During the course of the evaluation, educators consistently shared concerns about how they might engage families with the *Let's Count* program. Concerns varied depending on the nature of the settings and opportunities available for the family engagement. This is consistent with evidence that the successful engagement of families is, in part, linked to the types of educational spaces families encounter and the extent to which they feel comfortable and empowered within these spaces (Miedel & Reynolds, 1999). Educators reported that *Let's Count* provided opportunities for them to partner with parents in ways that were different from their normal interactions. These partnerships may have begun with mathematics through *Let's Count* but were often extended more broadly:

They [parents] became quite excited that this was happening. They were very willing participants. They would come in and ask to swap games and take other games home. They talked about their children's learning periodically, when they dropped them off or picked them up. They've said, even in their written stuff, they didn't know who was having more fun, the parents or the children, when they were doing all these things outside in their own time. (Interview Time 2)

Let's Count has got me thinking more about how to engage parents and get them to do the activities with the child rather than me doing them and them choosing whether or not they want to engage. (Interview Time 2)

I think it has strengthened our relationship with the parents. They understand that we weren't trying to force it down their throats ... They've learnt from the whole process as well. ... It's definitely strengthened the bond that we have with the parents. (Interview Time 3)

Conclusion

Let's Count has provided participants with many opportunities to enhance the mathematical outcomes of children and their families. As well, educators, parents and children have had the opportunity to build or maintain positive dispositions and increased confidence towards mathematics. Educators reported the value of *Let's Count* to their own mathematics education confidence, knowledge and skills and to their abilities to engage with the families from their settings.

Many of the educators reported how they had used some of the methods discussed during *Let's Count* Workshop 1 to engage families in innovative ways beyond the *Let's*

Count program. They were very strong in their praise for the skills they had built under the auspices of *Let's Count*. For almost all of the educators who participated in the pilot program, *Let's Count* seems to have made a positive difference in their approaches to children's mathematics education as well as engagement of the families in this education. This in turn has fostered confidence in their own abilities to assist in the mathematical development of their children. It would seem that the *Let's Count* pilot program has been successful in many ways. The challenge now is to build on this success as the program moves to scaling across Australia.

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