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Let's Count: Improving Community Approaches to Early Years Mathematics Learning, Teaching and Dispositions through Noticing, Exploring and Talking about Mathematics

Bob Perry
Charles Sturt University
<bperry@csu.edu.au>

Ann Gervasoni
Monash University
<ann.gervasoni@monash.edu>

Anne Hampshire
The Smith Family
<anne.hampshire@thesmithfamily.com.au>

Will O'Neill
The Smith Family
<will.oneill@thesmithfamily.com.au>

Let's Count is a preschool mathematics intervention implemented by The Smith Family from 2012 to the present in 'disdvantaged' communities across Australia. It is based on current mathematics and early childhood education research and aligns with the *Early Years Learning Framework. Let's Count* has been shown to be effective in enhancing mathematics learning and dispositions of young children, early childhood educators and families through a longitudinal evaluation undertaken from 2012-2015. This paper reports on the development, implementation and evaluation of *Let's Count* and its likely future trajectory.

Introduction

This paper explores the impact of a new community approach to enhancing the mathematics learning and dispositions of young children in the year before they are eligible to start school, generally when they are 4 or 5 years-old. Most children encounter and learn a great deal about mathematics through their play and other experiences at home, in preschools and child care centres, and in many other places within their communities (Ginsburg, Lee, & Boyd, 2008; Hunting et al., 2012; Moss, Bruce, & Bobis, 2016; Perry, MacDonald, & Gervasoni, 2015). In fact, before finishing their preschool year, many young children, regardless of background, know much of the mathematics that they will be 'taught' in the first year of school (Gervasoni, Perry, & Parish, 2015; Gould, 2012; Peter-Koop & Kollhoff, 2015; Sarama & Clements, 2015). Children's early mathematics knowledge is associated with their later achievement in primary school mathematics and literacy (Carmichael, MacDonald, & McFarland-Piazza, 2013; Duncan et al., 2007; Geary, Hoard, Nugent, & Bailey, 2013). A key factor influencing the ongoing success of children's mathematics learning is their positive disposition to learning mathematics (Carr, 2001). The *Early Years Learning Framework for Australia* (Department of Education, Employment and Workplace Relations (DEEWR), 2009, p. 10) reproduces Carr's definition of dispositions as "enduring habits of mind and actions, and tendencies to respond in characteristic ways to situations, for example, maintaining an optimistic outlook, being willing to persevere, approaching new experiences with confidence." Dispositions such as curiosity, persistence, imagination, and inquisitiveness are important for mathematics learning (Carr, 2001; Ginsburg et al. 2008; Perry, Dockett, & Harley, 2007). Providing mathematics curricula that are challenging and provide opportunities for children to maintain and develop positive dispositions is critical.

Carmichael et al. (2013, p. 16) found that "the socio-economic status of the community in which the family resides was the strongest home microsystem predictor of numeracy

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performance, explaining 10.5% of the variance in the home-community microsystem model". We argue that this finding highlights a significant social justice issue related to children's future educational success and opportunities. This is a major reason for The Smith Family commissioning the *Let's Count* initiative (The Smith Family, 2016).

The Smith Family and *Let's Count*

The Smith Family is an Australian children's charity dedicated to the educational enhancement of children who live in communities facing multiple disadvantages "so they can create better futures for themselves" (The Smith Family, 2016). Through a range of education programs spanning early years education to tertiary education, The Smith Family is currently pursuing this aim in 94 communities across Australia.

Since 2005, The Smith Family, together with the Murdoch Children's Research Institute, has implemented the *Let's Read* program as a way to assist the development of children's literacy skills before they start school. The Smith Family sought to complement *Let's Read* with a program focused on early years mathematics learning to enable all children to develop positive dispositions to learning mathematics prior to their beginning school. The first two authors of this paper partnered with The Smith Family to formulate this program, which became known as *Let's Count.*

Development and Implementation of the Let's Count Program

Let's Count is an early mathematics program designed to assist parents and other family members help their young children aged 3-5 years play, investigate and learn powerful mathematical ideas. Through this play and investigation, the aim is for the children and adults to develop positive dispositions to learning as well as mathematical knowledge and skills. *Let's Count* relies on parents and other family members providing the opportunities for children to engage with the mathematics present in their everyday lives, talk about it, document it, and extend it in ways that are relevant. The program is based in the bioecological conceptualisation of human development (Bronfenbrenner & Morris, 2006) and the current formulations of the importance of play in young children's learning (DEEWR, 2009; Lillemyr, Dockett, & Perry, 2013; Siraj-Blatchford & Sylva, 2004; van Oers, 2010).

Let's Count involves professional learning for early childhood educators that aims to enhance mathematics learning and teaching and strengthen partnerships between early years educators and parents. The key message in the *Let's Count* program is *Notice, Explore and Talk about Mathematics*, reflecting the theoretical basis of the program. The professional learning consists of two modules that each involve a full day of workshops, with approximately two months between each module for site-based learning and activities. The theme of Module 1 is noticing, exploring and talking about everyday opportunities for mathematics and opportunities for educators to consider how they might engage with parents to support children's mathematics learning. Module 2 focuses on celebrating and extending the mathematics that educators observe children using and learning. Ongoing interactions between educators, parents and other family members, and children over the educational year follow from this professional learning. Educators use a variety of strategies to connect with families and stimulate mathematics learning.

Supported by Blackrock Investment Management, The Smith Family implemented a pilot of *Let's Count* in five of its community sites in five states in 2010. An evaluation of the pilot program (Perry, Gervasoni, & Kearney, 2012), targeting educators and adult

family members only (not children), showed that *Let's Count* assisted early childhood educators and parents and other family members to enhance children's mathematical engagement, learning outcomes and dispositions. A number of recommendations were made for improvement but the key one was that *Let's Count* should be scaled for implementation in all of The Smith Family sites. With the support of the Origin Foundation, The Smith Family asked the authors to revise the materials prepared for the pilot program pursuant to The Smith Family implementing the program in 12 more communities in 2013 and 2014 and conducting a longitudinal evaluation of the program.

Longitudinal Evaluation of *Let's Count*

The first two authors of this paper were contracted by The Smith Family to conduct a longitudinal evaluation of the *Let's Count* program over the implementation years 2013-2014. Three key research questions framed the evaluation:

1. How does participation in *Let's Count* impact on children's numeracy knowledge and dispositions as they make the transition to school?
2. What is the impact of *Let's Count* on the educator participants' knowledge, interest and confidence in mathematics learning and teaching?
3. What is the impact of *Let's Count* on families' confidence, and knowledge about noticing, investigating, and discussing mathematics with their children?

The *Let's Count* Longitudinal Evaluation used a multi-methods approach, collecting data from educators and parents through surveys and telephone interviews, and from children through individual mathematics assessment interviews. Data were gathered in two of the implementation communities in 2013 (focused on ten early years centres) and these two plus another two new communities in 2014. To investigate the first research question, data about children's mathematics knowledge were collected and analysed to gauge growth in knowledge for the cohorts of children who experienced *Let's Count* during 2013 and 2014. The mathematical knowledge of these cohorts at the end of the year was compared with a quasi-experimental "comparison" group of preschoolers from the original two community sites whose data were gathered at the end of 2012. To explore questions 2 and 3, surveys with educators and interviews with parents and educators were used to gain insight about 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. With reference to previous publications and as yet unpublished data, this paper reports on the main aspects of the evaluation, with particular emphasis on the interviews with parents and educators about the impact of *Let's Count.*

Impact of *Let's Count* on Mathematics Learning and Teaching

The main aim of *Let's Count* is to improve children's mathematics learning prior to their beginning school. The intervention focused on building awareness amongst educators and parents about how to promote children's learning through noticing, exploring and talking about the mathematics in everyday activities. The impact on children's learning has been reported elsewhere (Gervasoni & Perry, 2015a; Gervasoni et al., 2015; The Smith Family, 2015). Data were generated through children's responses to the *Mathematics Assessment Interview* (MAI; Clark et al., 2002; Gervasoni et al., 2011). Assessment tasks involved number, measurement and geometric reasoning. All assessments were led by trained

assessors and responses were coded independently by the research team. More than 120 children were assessed each year. In summary, the findings demonstrated clearly that the cohorts of children who experienced *Let's Count* in 2013 and 2014 showed noteworthy growth in performance on the MAI from the beginning of their preschool year to its end. The extent of this growth was reinforced by comparison of the *Let's Count* cohort's end of year performance on the MAI with those of the 'comparison' group. On almost every measure, the *Let's Count* cohorts bettered the performance of the comparison group, with many comparisons showing statistically significant differences. This suggests that a family's involvement in *Let's Count* is associated with greater mathematics learning for their children than might be typically expected. These findings provide the backdrop for reporting insights gained about the impact of *Let's Count* for parents and educators based on their interview data.

Telephone interviews with educators and parents were conducted twice in 2013 and on three occasions in 2014 – within three weeks of the first workshop, mid-year and near the end of their *Let's Count* year. The numbers interviewed are shown in Table 1. Data were transcribed and analysed using constructivist grounded theory methods (Charmaz, 2014).

Table 1
Number of educator and parent interview participants in 2013 and 2014

	Number of Interview Participants					
	Interview 1		Interview 2		Interview 3	
Year	2013	2014	2013	2014	2013	2014
Educators	14	27	13	22	16	19
Parents	8	38	0	36	10	33

Impact on Educators and Pedagogies

Analysis of the interview transcripts showed that *Let's Count* provided educators with many opportunities to enhance the mathematical outcomes of children and their families. As well, educators enhanced their own dispositions and confidence towards mathematics. Seven themes emerged from analysis of interview transcripts:

1. Engaging families with mathematical learning and *Let's Count*;
2. Continuity of mathematical learning between early childhood setting and home;
3. Impact of *Let's Count* on educator confidence, professional identity and pedagogical practice;
4. Awareness of the potential of everyday tasks for prompting mathematics discussion;
5. Sustainability of *Let's Count;*
6. Children's engagement with mathematical learning and mathematical concepts; and
7. Importance of mathematical language.

Although pedagogical change for educators was never a stated aim of the *Let's Count* professional learning program, analyses of the interview data suggest that there were many changes in educators' pedagogies. Findings associated with the first two themes were reported by Gervasoni & Perry (2016). In this paper we report on two different themes.

Impact of Let's Count on educator confidence, professional identity and pedagogical practice

Many of the educators interviewed expressed the feeling that *Let's Count* had impacted on their confidence and practice. Equally, educators had noticed and commented on many colleagues and parents' growth in confidence and competence around mathematics. Some illustrative comments from educators are included below:

> I suppose what we've taken away from going to the inservice or the training the other day is that maths is in everything you do. It's just making it more visible.

> It's just been overwhelming how staff, once they get that concept in their head, how they're looking for it [maths] everywhere. It's been really beneficial to enlighten staff who might not have actually thought of activities in that way before.

> 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 a complicated sort of thing 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.

> How do I feel about maths? ... I used to think of maths as sums. You know, when you think of maths you think of sums, like sitting at a high school desk trying to do these sums that you can't work out. But having now looked 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 and I suppose the measurement side of things we've been really working on with the kids and water volume and things. 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.

> You want to be a mathematician for life, not just while you're in school. Like we're readers for life, I think it's very important for children to be mathematicians for life now as well.

In the perceptions of these preschool educators, *Let's Count* impacted on their teaching practice, their perception of what mathematics might be and their confidence in engaging children in mathematical activities rather than shying away from them as so many early childhood educators have done in the past (Anthony & Walshaw, 2007; Moss et al., 2016).

Mathematical language had been mentioned in conjunction with learning in the 2013 interviews but, in 2014, it was regularly discussed as an end in itself and an important addition to the pedagogies of educators. There are some interesting perceptions on the importance of mathematical language:

> Well they do a lot of maths but they don't realise it. We talk about how long … We give them the words, the language for what they're doing. One little boy this morning said to me 'Look what I've made, come and see, we've made a really long thing' and I said 'How long is it?' and he said 'Well it's longer than this'. We kept going on about it, I said 'What have you used?', he said 'I made some long and some short blocks' and I said 'Well what else can we do with it?', sort of thing. So it's just conversation.

> We've all just become more aware of taking advantage of when we can use that [mathematical] language in other areas of learning. In those little times and just using the language that we didn't do maybe as much before. So that's probably been a really big thing. … And we're all getting quite good at it, so we're all just like 'Oh I've got another thing'. So the actual program itself hasn't changed, just our awareness of those moments has become stronger.

These educators see that their pedagogical practice has changed through the use of more mathematical language that can be understood and used by themselves and the children.

Impact on Families

A small number of adult family members were interviewed twice during 2013 about the impact of *Let's Count*, at the beginning of the year and again near the end of the year. In 2014, more parents were interviewed up to three times using a schedule similar to that of the educators (see Table 1). Six themes were identified through analysis of the transcripts:

1. Noticing children's mathematical learning and facilitating that learning in the everyday;
2. Parent – educator communication about mathematics and *Let's Count*, with an emphasis on strengths of all involved;
3. Children's growing confidence, knowledge and enjoyment of/engagement with mathematics;
4. Importance of mathematical language;
5. Positive impacts within families, extending to older and younger siblings' inclusion in mathematical activities at home; and
6. Sustainability of *Let's Count*.

In this paper, we concentrate on examining two themes that have not previously been reported and discussed by Gervasoni & Perry (2016).

Positive impacts within families, extending to older and younger siblings' inclusion in mathematical activities at home: While *Let's Count* has clearly impacted on the children and the parents who have been immediately involved with it, there is evidence to suggest that the impact has also been felt by other members of the family. The approaches drawn from *Let's Count* have impacted on the overall awareness of mathematics and mathematical learning in the family. This augurs well for the longitudinal impact of *Let's Count*. Several excerpts from the interviews illustrate this point:

> I've noticed the little one actually taking things [in] more so than Max did because Jack is showing him which numbers are what and how to count. It's really good.

> We've got two school-aged boys. And you know there's a lot of focus on literacy and not necessarily numeracy. So you know, they bring home their home readers but there's never really anything [about] numeracy in that. So it's been good for us all to kind of do that, measurements, counting, the time. Yeah they've definitely participated in it.

> It's really, really taking advantage of moments where she can learn and enjoy maths without having to be sitting in a classroom, learning. That's been really good, because then I've thought about it, the rest of the family have thought about it. Her brother has really benefited because he gets excited because she is, and he's only 3. So I think it's been really good.

Again, the development of children's mathematical language is a critical part of their learning. Many parents noted the importance of mathematical language and their role in assisting its development in their children:

> Maybe I'm using that word mathematics with him more. So like perhaps before we might say he's helping me, we're making muffins or something and we're measuring half the cup, before I might have just said to him, 'Ok, this is half a cup, let's measure it'. Whilst now I would highlight to him that this is actually mathematics, so that he puts the connection together. … That's probably the main thing that I've changed.

> It's been a lot of noticing things in her surroundings that I don't think she would have noticed before, based on the fact that she has had exposure to the words and the language and the concepts. So you know, like an example was the other day she just noticed a clock they had at Bunnings [hardware store] and then she was trying to tell me the time and talking about the hands and things like that. Even playing games she uses language like halves and that's a quarter. Before she would never have, never, you know, been talking like that.

There are some striking similarities between what educators and family members have said about the importance of mathematical language and the ease with which they feel they can introduce it to their children, as well as the ease with which the children assume the language when it is introduced in a relevant and meaningful way.

Conclusion

This paper explores some of the vast amount of data available about the impact of the *Let's Count* program on mathematics learning and teaching and adds to the findings reported elsewhere. It is clear that the *Let's Count* approach has had a positive impact on young children's mathematical learning and dispositions and the learning, dispositions and pedagogical practices of those adults and other family members who are part of their lives. On the basis of the *Let's Count* longitudinal evaluation, the first two authors recommended that "The Smith Family, in conjunction with early childhood education providers and appropriate funding authorities, seek to implement the *Let's Count* program in all sites in which it has a presence" (Gervasoni & Perry, 2015b, p. 7). The Smith Family has carried out this recommendation and *Let's Count* will soon be scaled up across Australia. Thus *Let's Count* has already made a significant contribution to enhancing community approaches to improving Australian children's mathematics learning and teaching in the years prior to schooling. This impact will extend once *Let's Count* is implemented in more communities across Australia and is further evaluated and researched.

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Practical Implications from *Let's Count*

Let's Count is a social justice response to the fact that the educational outcomes for the cohort of children living in 'disadvantaged communities' is, on average, substantially lower than for those living in more advantaged circumstances. Between 2013 and 2015, The Smith Family, supported financially by the Origin Foundation, implemented *Let's Count* with 385 educators and 5775 children and their families. In 2016, The Smith Family has implemented the program in 33 'disadvantaged' communities, reaching another 370 educators and 5550 children and families. *Let's Count* is making a major contribution to supporting the education of children and families living in these communities. The *Let's Count* program and its longitudinal evaluation have several practical implications for mathematics learning, teaching, curriculum, and policy development.

Children's Mathematics Learning before They Begin School

Data from the *Let's Count* Longitudinal Evaluation highlight that by the end of their preschool year, a substantial proportion of children had already reached many of the Foundation Level mathematics outcomes in the *Australian Curriculum: Mathematics*. Not only does this finding show that *Let's Count* aligns well with the mathematics curricula children experience at school, but it also provides evidence to be considered in any revision of the *Australian Curriculum* and reinforces the practical need for teachers to refine their pedagogies based on assessment of children's current mathematical knowledge.

More Confident Mathematics Educators and Families

Data from the *Let's Count* Longitudinal Evaluation suggest that educators who participate in *Let's Count* become more confident about developing young children's mathematics learning and language. Similarly, parents report that they are more confident and deliberate in their role of engaging with their children's mathematics and mathematics language in the context of their everyday activities. This impact reaches beyond *Let's Count* children to their siblings and other family members. The practical implications of these findings link more confident adults to more mathematically successful children

Increased Awareness amongst Politicians and the Community about the Importance of Mathematics Learning in the Early Years

In 2015, the Smith Family released a report of the interim outcomes of the *Let's Count* Longitudinal Evaluation (The Smith Family, 2015) that was distributed to all Australian Federal, State and Territory members of parliament and key stakeholders. This advocacy and the resulting media attention have built awareness of the importance of early mathematics learning and strategies that parents can use to support their children's mathematics learning. As a result, the Australian government has recently granted The Smith Family $4 million over 4 years to implement *Let's Count* widely across Australia. This will make *Let's Count* available to all 94 of the 'disadvantaged' communities supported by The Smith Family, considerably expanding the reach and impact of the program. The Smith Family also aims to develop online resources with the funding which will help support growth and sustainability of the program. The practical implications of this scaling of *Let's Count* will assist in meeting both political and educational outcomes.

Early Childhood Mathematics Teacher Education and Online Delivery

The approach, evidence, research reports and articles arising from *Let's Count* and its evaluation have influenced pre-service and in-service teacher education in Australia. Also, as part of the post-pilot development of *Let's Count* from 2012, an online version of the program was developed into an elective subject at one of the author's university. From 2013 to 2015, 321 students in five states and a handful of international countries undertook the subject (MacDonald, 2015; Perry & MacDonald, 2015). This subject provides one model for future online delivery of the *Let's Count* educator professional learning, with practical implications as *Let's Count* is scaled to more sites.

Professional Learning for Educators

The power of *Let's Count* lies in the simple but powerful mantra *notice, explore and talk about mathematics* in everyday contexts. When this *Let's Count* mantra is applied within families and preschools, children's mathematics learning thrives. It is likely that this mantra would also work in the first years of primary school. As such, practical implications around optimal transitions to school and continuity of mathematics learning abound.

Concluding Remarks

Let's Count, the program, and its longitudinal evaluation have demonstrably impacted on the learning and practices of many children, families and educators. Given the communities in which The Smith Family works, there are both educational and social justice dimensions to this impact and the practical implications that arise.

As well, *Let's Count* and its evaluation have influenced thinking in Australia around the STEM agenda. When *Let's Count* was first developed there was little or no public debate about the issue of STEM, particularly at the early childhood level. That has changed considerably in the last few years. *Let's Count* has strongly contributed to highlighting the importance of the early years in the STEM discussion and the importance of parents/family in helping children, particularly children living in 'disadvantaged' communities, to thrive mathematically. While much of the STEM debate has focussed on secondary and tertiary mathematics, *Let's Count* and its longitudinal evaluation helped to influence the debate about the need to start early if you want people to be do well at mathematics; that all children, educators and parents can succeed at mathematics; that mathematics dispositions and not just skills are important; that parents living in 'disadvantaged' communities can and do play a key role in their children's mathematics development; and that helping young children to learn mathematics is not that hard! Now both the Australian Prime Minister and the Minister for Education and Training talk about the importance of developing children's mathematics from the early years onwards. As already demonstrated, that can have many positive practical and policy implications.

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