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ABSTRACT
Over the last 20 years, the authors have utilised Bronfenbrenner's ecological and bioecological models as a basis for their work investigating children's transition to school, including the place of mathematics learning in this transition. The later bioecological model gave increased emphasis to the role of the individual within contexts, the processes that characterised interactions within and across contexts (proximal processes), and the influence of time. This bioecological model outlined four elements – person, process, context and time – which, together, were described as influencing the development of individuals. While the mathematical learning of young children influences, and is influenced by, all four elements of the model, the critical role of proximal processes in this learning is highlighted in this paper. Our aim is to identify how the four elements of the bioecological model, particularly proximal processes, provide a framework to analyse the experiences of the adults – early childhood educators and parents – involved in an early childhood mathematics education intervention designed to promote engagement with mathematics in playful situations. Data are drawn from 35 early childhood educators and 37 parents over 2 consecutive years (2013, 2014) with generally different participants in each year.

KEYWORDS
Bioecological model; proximal processes; mathematics; early childhood; parents; educators

Introduction

This paper uses Bronfenbrenner's bioecological model of human development (Bronfenbrenner and Morris 2006) to analyse the results of an evaluation of a preschool mathematics education intervention in low socio-economic communities in Australia. The intervention was designed to enhance interactions in families among preschool-age (3–5 years old) children and adults in order to build children's positive dispositions to mathematics as they approached the start of school. We begin the paper with an introduction to Bronfenbrenner's bioecological model, noting its genesis through his earlier ecological model (Bronfenbrenner 1979). We then consider the application of the bioecological model to studies of transition to primary school, thus placing them within our extensive work in this field, and situating the study reported here within our ongoing work. The preschool mathematics education intervention and some results

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from the evaluation are then presented with specific consideration of the importance of the key constructs from the bioecological model.

Ecological and bioecological models

With the focus of our initial work in transition to school being to seek multiple perspectives and to encourage consideration of the contexts involved (Dockett and Perry 2001), we were drawn initially to Bronfenbrenner's (1979) ecological model of human development and, in later work, to his bioecological model (Bronfenbrenner and Morris 2006). The bioecological model builds upon, extends and refines the earlier ecological model. The changing nature of the models, and of our use of them (Dockett and Perry 2001, 2007, 2014a, 2014b), is a valuable reminder that theories can be dynamic, rather than static, as they are tried, tested, refined, applied in different ways and reformulated over time (Einarsdóttir 2014).

Ecological model

While described as a theory of human development, Bronfenbrenner's ecological theory (1979) attended not only to the individual – located at the centre of his concentric systems diagram – but also to the influence of the environments in which the individual was located. Bronfenbrenner's ecological model emphasised the importance of understanding individuals within their (multiple) environments. By drawing on the term 'ecology' to describe his model, Bronfenbrenner emphasised the interactions between individuals and their environment as key contributors to development. Further details concerning the ecological model are available from many sources (Bronfenbrenner 1979, 1994; Dunlop 2014; Rogoff 2003).

Critiques of the ecological model contested the representation of the individual at the centre of multiple contexts, arguing that not all contexts prioritised the individual, and that the model did not give adequate consideration to social and cultural constructs, or to power relations within contexts (Petriwskyj 2014; Rogoff 2003). Further, Vogler, Crivello, and Woodhead (2008, 25) argued that 'while the identification of multiple interacting systems is conceptually elegant, there is a risk of objectifying boundaries and assuming internal sub-system coherence'. In other words, we should not be surprised when boundaries between systems are blurred, or expect that microsystems operate in similar ways for all individuals.

Refinements to the ecological model (Bronfenbrenner 1988, 1994) added increased emphasis to the role of the individual within contexts, the processes that characterised interactions within and across contexts (proximal processes) and the influence of time. Rosa and Tudge (2013) note that these emphases reflected theoretical and conceptual elaborations derived from Vygotsky's (1962, 1978) notions of cultural contexts and the dialectic between individual and the environment; Lewin's (1936) attention to the concept of life space; Elder's (1998) life course theory; and Ceci's (Bronfenbrenner and Ceci 1994) formulation of the importance of proximal processes.

Bronfenbrenner's early model (1979) identified ecological transitions as normative changes that occurred within people's lives, and that required some form of adaptation on the part of the individual and/or the environment. Transitions were described as happening primarily at the level of the mesosystem as individuals interacted in different contexts or ecologies. His argument was underpinned by three characteristics of ecological environments: (i) the interdependence of systems, whereby what occurred – or did not occur – in one context was influenced by what happened in other contexts; (ii) the importance of interactive processes between and among people in facilitating change and (iii) each of those involved in the setting understands and perceives actions and interactions in a personal and unique way. As a consequence, it was argued that the understandings of individuals contribute to the setting and their perceptions of it.

Bioecological model and transition to school

The bioecological model (Bronfenbrenner and Morris 2006) outlined four elements – person, process, context and time (PPCT) – which, together, were described as influencing the development of individuals. We explore each of these elements below and consider the ways in which we have used them in our transition to school work, situating the mathematics education intervention in time, as children prepare to start school; in the contexts of families and educational settings; and through interactions between children and adults and among adults as the children start school.

Person characteristics of the individual influence developmental outcomes. In any situation, individuals bring with them a range of personal characteristics drawn from their biological as well as their experiential history. They include characteristics in the categories of demand, resource and force (Bronfenbrenner and Morris 2006). Demand characteristics – such as temperament, age, gender and appearance –may influence not only the ways in which individuals engage in interactions, but also the ways in which others interact with them. In considering starting school, a child's age or gender, for example, can influence educators' interactions with and expectations of them (Dockett and Perry 2002; Graue 1993).

Resource characteristics include 'the mental and emotional resources such as past experiences, skills, and intelligence and also the social and material resources' of individuals (Tudge et al. 2009, 200). When considering the transition to school, some of our colleagues have utilised the term 'virtual backpacks' to encompass resource characteristics (Margetts 2003; Peters 2014; Peters et al. 2009).

Force characteristics relate to dispositions, influencing each individual's motivation, persistence, curiosity and the like (Bronfenbrenner and Morris 2006). Factors such as children's responsiveness to others – adults and children – and the ease with which they form positive connections with others in new contexts are likely to influence their transitions to school. As well, the willingness to take risks and persist in learning tasks are included in this category.

Proximal processes are defined as the

> progressively more complex reciprocal interactions between an active, evolving, biopsychological human organism and the persons, objects, and symbols in its immediate external environment. To be effective, the interaction must occur on a fairly regular basis over extended periods of time. (Bronfenbrenner and Morris 2006, 797)

Key characteristics of proximal processes are their increasing complexity, reciprocal nature, interactive basis and regularity (Jaeger 2016). Proximal processes occur within relationships – not only with people, but also with objects and symbols. In relation to transition to school, proximal processes could include the interactions between parents and children as they 'prepare' for school; conversations and interactions with other children about what school is, or might be, like; and pedagogical strategies employed by educators in different settings. Proximal processes play an important role in helping individuals 'come to understand their world and formulate ideas about their place within it' (Tudge et al. 2009, 200). The impact of proximal processes is dependent on the other three elements identified – the characteristics of the developing person; the environments in which the actions and interactions occur; and their timing (Bronfenbrenner and Morris 1998). As well, the effectiveness of proximal processes can

> depend, to a substantial degree, on the availability and involvement of another adult, a third party, who assists, encourages, spells off, gives status to, and expresses admiration and affection for the person caring for and engaging in joint activity with the child. (Bronfenbrenner and Morris 2006, 823)

Such 'third parties' – early childhood educators, school teachers and parents – are very important in a child's transition to school.

Context was a predominant feature of ecological theory, with its attention to micro-, meso-, exo- and macrosystems. The importance of systems (contexts) in bioecological theory remains, with microsystems identified as primary sites for proximal processes. Despite this, what occurs within one system can influence what occurs within other systems, and experiences from several systems can generate both consistency and tension. For example, experiences within the mesosystem created when the microsystems of school, prior-to-school and home overlap, can be particularly important in supporting children and families as they manage the transition to school (Dockett and Perry 2007).

Time was included as one of the core elements of bioecological theory and was systematised into the theory through the introduction of the chronosystem (Bronfenbrenner 1988). The prominence of time was highlighted with references to microtime – the consistency of proximal processes; mesotime – how often proximal processes occur; and macrotime – historical time (Rosa and Tudge 2013). This focus emphasised both time and timing: not only what happened in the present, but also what had happened in the past and what was likely to happen in the future (Bronfenbrenner and Morris 2006). Consideration of time contributes to understanding issues of continuity and change. Just as individuals change, so too do contexts and cultures.

Each of the elements of PPCT is important within Bronfenbrenner's bioecological model. However, Bronfenbrenner came to view proximal processes as the driving factor in development (Jaeger 2016).

The bioecological model has underpinned much of our work in transition to school. We have noted previously that

> it prompts attention to the relationships and interactions associated with starting school, the characteristics and resources each individual (be they a child, family member, or educator) brings with them to the transition, recognition of the various systems or contexts in which children and families are located, as well as attention to specific events, patterns of interactions and historical context. (Dockett, Petriwskyj, and Perry 2014, 4)

Mathematics education plays a role in effective transition to school (Perry, MacDonald, and Gervasoni 2015). In the remainder of this paper, we focus on one preschool mathematics education initiative and the ways in which the PPCT model has provided the theoretical and analytical framework for the initiative.

The Smith Family and *Let's Count*

In 2010, The Smith Family[1] embarked on a project designed to promote young children's mathematics learning, based on evidence that, on average, children living in disadvantaged communities do not perform as well academically as children of the same age living in more advantaged communities (Carmichael, MacDonald, and McFarland-Piazza 2013; Caro 2009). It is also known that there is great potential for children living in low-income communities to benefit from mathematics intervention programmes (Sarama and Clements 2015). Evidence such as this, along with their significant social justice commitment, led The Smith Family to begin the development of the *Let's Count* programme focused on early years mathematics learning, with the aim of promoting children's positive dispositions to learning mathematics prior to their beginning school.

Development and implementation of the Let's Count *programme*

Let's Count is designed to assist family members, supported by early childhood educators, help their young children (aged 3–5 years) play with, investigate and learn powerful mathematical ideas, with the aim of developing positive dispositions to learning as well as mathematical knowledge and skills. *Let's Count* relies on educators supporting family members to provide 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 programme draws from bioecological theory (Bronfenbrenner and Morris 2006) and the importance of play in young children's mathematics learning (Siraj-Blatchford and Sylva 2004; Worthington and van Oers 2016). *Let's Count* was developed through The Smith Family by the first author of this paper and Ann Gervasoni.

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 by focussing on everyday opportunities for mathematics and opportunities for educators to consider how they might engage with parents to support children's mathematics learning. Ongoing interactions between educators, parents and children over the educational year follow from this professional learning. The programme encourages educators to use a variety of strategies to connect with families and stimulate mathematics learning. The key message in the *Let's Count* programme is *Notice, Explore and Talk about Mathematics*.

Evaluation of a pilot found that *Let's Count* assisted early childhood educators and parents to promote children mathematical engagement, learning outcomes and dispositions (Perry, Gervasoni, and Kearney 2012). *Let's Count* was refined and a further pilot programme was conducted during 2013 and 2014. Outcomes of the longitudinal evaluation of the programme have been reported extensively (Gervasoni and Perry 2016; Perry et al. 2016). This paper uses results of this evaluation to illustrate the importance of the bioecological model in understanding the impact of *Let's Count*.

Evaluation of Let's Count

The longitudinal evaluation of *Let's Count* used a multi-methods paradigm to answer the following three questions:

(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?

Answers to these questions have been reported earlier (Gervasoni and Perry 2016; Gervasoni, Perry, and Parish 2015; The Smith Family 2015), along with the impact and future trajectory for *Let's Count* (Gervasoni and Perry 2016; Perry et al. 2016). In this paper, however, the characteristics of *Let's Count* and the data from the adults involved in the longitudinal evaluation are reported through the four elements of Bronfenbrenner's bioecological model, with the aspiration that this might stimulate other early childhood mathematics education researchers to consider utilising the model in their work.

Data from early childhood educators and parents were generated during telephone interviews about the implementation and impact of *Let's Count*. Educators and the families with whom they worked were interviewed twice in 2013, and the 2014 cohort was interviewed three times. In each year, the first interview occurred soon after the first professional learning workshop for educators (Gervasoni and Perry 2016). In total, 101 educator interviews and 125 parent interviews were conducted.

Let's Count and the bioecological model

Data from the interviews were coded under the four elements of the bioecological model. This proved a challenging assignment as many of the statements made by educators or parents displayed aspects of more than one element. Nonetheless, for clarity, each data statement will be presented under only one of the elements.

Person

Each person – child, parent, family member or educator – involved in *Let's Count* brings a range of person characteristics to their understandings of mathematics. These characteristics also 'invite or discourage reactions from the social environment' (Bronfenbrenner and Morris 1998, 1011). For example, adults' previous experiences with mathematics contribute to their person characteristics, including their motivation to engage with mathematics, as well as dispositions such as curiosity and persistence. Educators noted the change in their own attitudes towards mathematics:

> … 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.

Parents, too, reflected on the impact of their prior experience on their confidence with mathematics:

> I would say I never was probably really good at maths at school. It took me forever to get fractions, but apart from that I was middle of the range in maths I suppose. Not my strength and not my weakness either. … probably at primary school level [I enjoyed maths]. Secondary it got a bit intense for my liking. But primary school was good.

Educators also reported changes in their attitudes towards children's capabilities to engage with mathematics:

> I'm really seeing the children … Just their knowledge has just blown me away, of what concepts they're understanding. Their 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 that was '10 Red Apples' from Dr Seuss. They had noticed that there was 10 on each of the animal's heads and then I chose three children to show me 10 [on their] 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.

This same growing awareness of children's capabilities was echoed by parents:

> I think one of the things that surprised me lately is her ability … . She's been asking me to join numbers together to tell her what they equal. So she said 'If I've got 5 and 5 how many is that?' This is on the way home in the car from preschool actually, 'And 6 and 6 and how many is that?' And 'How many are my toes and how many are my fingers?'

While there is evidence from the interview data that all three categories of person characteristics – demand, resource and force – play a part in the success of *Let's Count*, demand characteristics such as age and gender seemed less important than matters of experience and disposition.

Process

In *Let's Count*, proximal processes are the central driver around the development of the programme, as relationships are built within groups of children, among educators and within families, as well as between members of each of these groups. *Let's Count* ran for about 9–10 months in each setting during the pilots in 2013 and 2014. This provided an extended period of time during which proximal processes could be established and enhanced.

One of the principles underpinning *Let's Count* is that, with appropriate support, family members are capable of noticing, supporting and challenging children's mathematical learning on a regular basis. A major influence on that family support comes from the educators, who themselves engage in proximal processes with family members, as well as the children. Hence, proximal processes are integral to *Let's Count* in three ways: in promoting parents/family members' confidence and understandings of young children's mathematics; supporting families to build and use a range of proximal processes in interactions with their children; and facilitating educators' increasingly complex interactions with children. Both parents and educators witnessed these processes.

Parents and educators both commented on the value of their interactions – many of which constitute proximal processes involving collaboration, feedback, and suggesting follow-up materials or resources. Often the educator and parents are playing the ‘third party’ role highlighted by Bronfenbrenner and Morris (2006):

> I think we’re probably just getting a bit more engaged with the preschool because they are trying to involve us a bit more in the activities and I feel like there’s a bit more … Because of the [*Let’s Count*] program and what they’re trying to achieve with it, there’s probably a few more things going on and they’re probably giving me more feedback about what they’re trying to teach the kids as a result of the program. (Parent)

> I like the way the parents are really involved and it’s more about them, because that will hopefully continue on for the rest of their child’s schooling; and for other children that they may have in their family as well. (Educator)

These interactions are possible because of the relationships that have been built or extended between parents/family members and educators.

> I think it’s been a positive thing for building relationships with parents because they’ve felt that we’re acknowledging them as their child’s first educator for their own child. And you know, respecting the ideas that they have, like we’re not pretending that 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. (Educator)

The experiences underpinning *Let’s Count* were designed to engage strategies previously identified as effective in promoting proximal processes (Jaeger 2016), including drawing on children’s everyday experiences – particularly play – to emphasise active involvement, both in the experiences and in the processes of meaning-making; engaging in authentic experiences using mathematics; encouraging children to pose questions and set goals that can be addressed through mathematics; highlighting the importance of communication and enjoyment; and providing feedback and encouragement. These elements are noted in the following example:

> [One child] wants to measure his bed, the information came from his mother first and then we discussed it with the child. The mother came in and said ‘Oh he really wants to measure his bed’ and I went ‘OK, we can do that, we can work out a way to do that with you’. So … it depends on developing a rapport between the educator and the parent through discussion. (Educator)

Context

Processes that support the development of mathematics occur within microsystems – such as the home, the preschool, the local community, as well as cultural and social groups. For the child, becoming a mathematician involves all of these contexts – even though experiences may occur only within one microsystem, becoming a mathematician ‘occurs, in a conceptual sense, at the intersection of all the microsystems’ that involve the child (Jaeger 2016, 178). Becoming a mathematician occurs within a mesosystem.

Illustrative of the significance of the mesosystem, parents noted occasions when children drew on experiences within the preschool microsystem to understand what was happening at home.

> 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 … 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. (Parent)

In similar ways, educators took note of children's experiences in other microsystems to inform their own actions:

> Well a lot of the children play soccer games or a sports game where they see a team, a player wearing a number … We had lots of children who recognised numbers from where they've been in their life, like bus numbers. We added timetables to their play area so they could see numbers. And then we talked about time as well. Because that sort of all came around because of the catching a bus, buses come at a certain time. (Educator)

Among the early childhood educators in particular, there developed a belief that there was mathematics in everything, in every microsystem. Context was central to a number of the comments made by both parents and educators:

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

> Nowadays with the family just baking a cake or just hanging out the washing to understand that you're actually encouraging your child to do mathematics and stuff like that well you know, it gives you more of a push to encourage your child to do it. (Parent)

Time

The element of time and its influence on children's developing mathematical understandings was noted by parents and educators. Reference to microtime was concerned primarily with the contingency of responses from adults – with both parents and educators describing the importance of seizing the moment and responding when children indicated an interest in mathematical learning, such as when a question was asked in the car or when a child sought specific involvement from an educator. There was also recognition that the building of relationships among people takes time:

> 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?'. (Educator)

References to macrotime were of two main types: reflections on what mathematics was like when adults were at school and comments relating to the current educational landscape, particularly strategies to have children 'ready for school', in the context of perceptions of high academic expectations for young children and the challenges adults associated with children 'falling behind':

> I've got a son who can count to 100 and he asked me today if I could count to 100. I said 'Yes, I can count to 100 and I can even count to 1000' and he was just like so astonished, 'I'll never be able to count to 1000'. … He's 4, he's not 5 till the end of the year. … So just acknowledging to him too that one day he'll be able to do it, so that was quite cool. (Educator)

> I think that will help them when they get to school, hopefully the maths terms that they're hearing aren't new to them because they've already heard them and know a little bit about what it might be about before they get there. So, it's not just all brand new stuff. (Educator)

Discussion

The elements of the bioecological model can be used to analyse the *Let's Count* programme and to consider the reasons for its success. However, it is the confluence of these elements that provides the greatest explanatory power in considering the impact of the programme. These elements are integrated into the mantra of *Let's Count*: *Notice, Explore and Talk about Mathematics*.

Notice

Many of the adult participants were surprised by the mathematical thinking of the young children with whom they interacted through *Let's Count*. The resource characteristics of the children were noticed by the adults and this noticing prompted them to provide opportunities for the children to continue their exploration of mathematical ideas. The adults were also noticing how the *Let's Count* programme was helping them to change their and the children's force characteristics, such as their attitudes towards mathematics, and their dispositions to be involved in the children's mathematics learning. Through their involvement as 'third parties', there also seemed to be a reconsideration of the importance of each of the adult groups – parents and educators – in each other's eyes.

One of the key messages of *Let's Count* is that there is mathematics in everything. On several occasions, educators and parents reported noticing mathematics in their own environments and also reported children doing the same. However, given the different *person* characteristics involved, there is often different mathematics noticed.

Noticing mathematics takes *time*, in both micro and macro forms. Many of the parents and educators have seen the value of *Let's Count* continuing into the future. They have also projected from past experiences and compared how they felt about mathematics then and after experiencing *Let's Count*.

Explore

Let's Count emphasises the role of play and investigation in children's learning. The programme is firmly based on the belief that young children learn through play, particularly with scaffolded support from more knowledgeable others (DEEWR 2009). Noticing more of what the children are thinking about means that adults are becoming aware of the 'invisible' exploration that children undertake.

When children or adults notice mathematics in their contexts, there is often strong motivation to continue exploring that mathematics. For example, rote counting, while perhaps not the most illuminating mathematical activity possible, does provide a challenge. Provided this challenge remains a personal one rather than a competition, for either children or parents, exploration can continue.

Talk about

It has long been known that the active use of language is important in the development of mathematical ideas (Ellerton and Clements 1991; Riccomini et al. 2015). This importance is emphasised in the Australian curriculum framework for the early years (DEEWR 2009) and was one of the major themes from both parents and educators in the evaluation of *Let's Count*. 'Talking about' mathematics in everyday lives encourages all participants to sustain powerful interactions over extended periods of time. Increases in confidence and capability among adults and children have helped develop the complexity of these interactions. Both parents and educators have remarked on the capabilities of young children to deal with such complexity. 'Talking about' mathematics has clearly been a key proximal process throughout *Let's Count*.

Role of proximal processes

In the bioecological model, Bronfenbrenner identified proximal processes as the 'engine' driving development. While each element of *Let's Count* contributes fuel to this engine, the processes of *notice, explore* and *talk about* afford many opportunities to engage proximal processes. Following Bronfenbrenner's lead, we argue that effective interactions to support the mathematical learning of young children involve proximal processes, built on a framework of noticing children, their interests, their existing understandings and individual characteristics, the contexts in which they are located and their situatedness in time. In other words, effective processes are proximal processes that take into account the person, context and time elements of the bioecological model.

Proximal processes involve children interacting, over time, with others and with a range of materials and resources – including mathematical symbols and concepts – located within specific contexts. Becoming a mathematician occurs within mesosystems, where, conceptually, children recognise and engage with mathematics that may have occurred in one context, but that has relevance and application in other contexts. Supporting children's mathematical development requires reciprocal interactions: reciprocal in the sense that all participants make an active contribution to the interaction; and in the sense that interactions are responsive, building on and extending children's understandings. Such responsiveness is facilitated when the adults in children's lives acknowledge their existing mathematical understandings and can call on appropriate resources to challenge and extend these.

The most effective proximal processes tend to occur between those who have strong relationships (Jaeger 2016). From this basis alone, it would seem essential to engage families in the promotion of young children's mathematical development. However, family members are not the only ones who may have strong relationships with young children. Educators and peers too can engage in sensitive and responsive interactions with children who enable them to recognise existing competencies and to extend the complexity of interactions over time. The opportunity for each of the adult groups to act as a 'third party' to the other in interactions with children has been critical to the success of *Let's Count*.

Conclusion

Bronfenbrenner's bioecological model did not claim to be a theory of mathematical development. However, the elements of the PPCT model can be used to explore what individuals bring to their mathematics learning, processes that underpin such learning, contexts in which such learning occurs, and the importance of both time and timing in developing understandings. These elements have been integrated into the *Let's Count* programme, through the mantra *Notice, Explore and Talk About Mathematics,* recognising that supporting children's mathematical development involves working collaboratively with those who are in a position to facilitate meaningful, ongoing, regular, reciprocal and increasingly complex interactions with mathematics at their core. While early childhood educators in contexts outside Australia may not be able to adopt the complete *Let's Count* programme, they can adopt the mantra in their own mathematics programmes, assured that it is closely tied to the elements of the bioecological model.

Note

1. The Smith Family is an Australian charity dedicated to supporting the education of children who live in communities facing multiple disadvantages.

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