

# Mathematics from Early Childhood to School: Investigation into Transition

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There is current interest in how the mathematics content, understanding, and practices of the new entrant classroom connects with the learning that children had experienced within early childhood settings. It is acknowledged that children start school with a wealth of mathematical knowledge and experiences and that recognition of this rich resource by the new entrant teacher may facilitate the smooth transition of a child into school. This paper reports on research investigating the existing transition practices between four early childhood education services and four new entrant classes with regard to mathematics learning and teaching. This study found tenuous links between these sectors with regard to transition practices in mathematics.

## Background

There has been a recent surge of interest in the development of mathematics in early childhood as a direct result of research into early mathematics learning. Issues raised by Clements and Sarama (2007) in their synthesis of research into early childhood mathematics in the USA are also evident in New Zealand. The upsurge in the number of American children in early childhood education (ECE) is mirrored in New Zealand, where it is actively and financially encouraged by the Ministry of Education (2002). Clements and Sarama also indicate that increased recognition of the importance of mathematics brings with it concerns in relation to students' mathematical achievements. Researchers have reviewed their position that young children have little or no knowledge of mathematics and now recognise the "mathematical power" (Perry & Dockett, 2005, p. 36) that young children have on entry to formal schooling. The understanding that a child's competence in mathematics at the end of the first year of schooling is a strong predictor of later success in mathematics has raised the awareness of the need for an early focus on mathematics. Clements and Sarama conclude that gaps that develop in a child's knowledge in their early years of schooling are due to the lack of connectedness between their formal and intuitive knowledge and school mathematics.

Kagan and Neuman (1998) suggest that there are high costs in not ensuring continuity between sectors; these costs relate to lower success rate at school, difficulties in making friends, and vulnerability to adjustment problems. Impediments to smooth transitions may develop through different visions and cultures, structural divisions, and communication (Broström, 2002; Kienig, 2002). Margetts (2007) asserts that the complexity of transition, particularly in making sense of the differences and discontinuities between the sectors, must be addressed because, she argues, "starting school is not a simple process" (p. 106). There are changes in the roles, activities, and interpersonal relationships between the teacher, the parent, and the child as the child moves on to school (Bronfenbrenner, 1979). Successful transition to the school setting has been described as an ecological transition between two "microsystems" (Bronfenbrenner). Tensions arise as a result of change from a learning environment based on socio-cultural and co-constructivist ideas of learning (Bronfenbrenner) to more structured activities and formal instruction. Past work on transition has been dominated by concepts of children's readiness and the need for the child to adjust to school and be the one who must change, be resilient, and cope with the difference (Dunlop, 2007). Tensions now exist between this "child-ready" approach and the "school-ready" dialogue; there is a growing expectation that the school setting should be flexible in order to help the child through changes.

According to the New Zealand early childhood curriculum, *Te Whāriki* (Ministry of Education, 1996), teaching in an early childhood setting involves “reciprocal and responsive interaction with others”, building on the “child’s current needs, strengths, and interests by allowing children choices and by encouraging them to take responsibility for their learning” (p. 20). The child is viewed as a competent learner and communicator, and their dispositions toward learning are an important outcome for early childhood education. *Te Whāriki* suggests: “Dispositions to learn develop when children are immersed in an environment that is characterised by well-being and trust, belonging and purposeful activity, contributing and collaboration, communicating and representing, and exploring and guided participation” (Ministry of Education, 1996, p. 45). The child’s dispositions towards learning are reflected in the nature of assessment within early childhood settings (Carr, 2001). Assessment focuses on the child as a learner in specific contexts rather than on achievement objectives and skills. Narratives of incidences of a child’s learning are often in the form of a “learning story” (Carr, 2001) and focus on dispositions such as curiosity, trust, perseverance, confidence, and responsibility.

The Numeracy Development Projects (NDP) are a strong influence on mathematics teaching and learning in New Zealand schools (Ministry of Education, 2001). The key focus of the NDP since 2001 has been to improve student performance in mathematics through improving the professional capability of teachers. The NDP provides a variety of assessment tools for ascertaining a student’s current number knowledge and strategy use. This identification of the student’s learning stages allows the teacher to provide more focused and relevant learning experiences for that student as an individual. This approach is similar to the approaches in early childhood settings; that is, progressing the student to further their understanding. The student’s progress is supported by the teacher’s increased pedagogical knowledge, provision of support materials, and specific assessment.

Another key element of the NDP in 2001 was to “ensure continuity between early childhood education and schools and at various transition points during schooling” (Ministry of Education, 2001, p. 5). Ensuring continuity is further supported in the 10-year strategy for early childhood, which aims “to promote collaborative relationships” (Ministry of Education, 2002, p. 2). Transition is a vital tool in this process to merge schools, with their focus on teaching curriculum content, and early childhood programmes, with their focus on learning dispositions (Peters, 2004).

*The New Zealand Curriculum* (Ministry of Education, 2007) acknowledges and encourages the development of dispositions in the form of “key competencies” (p. 12) that “young people need for growing, working, and participation in their communities and society” (p. 38). Although in its infancy, the implementation of this document heralds, within a formal curriculum, a focus on children’s competencies in developing capabilities for living and life-long learning. The alignment of dispositions and key competencies may also develop a continuity of the learning environments across the sectors (Carr, 2006).

This research investigated the contention that what happens at the transition from early childhood education to primary school directly influences a child’s ability in and dispositions towards mathematics and that a successful transition will ensure the continuity of a child’s physical, social, and philosophical experiences. The research reported here was centred on one key question: “What early childhood education and new entrant practices facilitate positive transitions in mathematics between early childhood settings and primary schools?”

## Methodology

### *Procedure*

The research investigated the existing transition practices, particularly with regard to mathematics learning and teaching, between ECE services and primary schools in a small town in New Zealand. The year-long study began in the ECE settings in June and moved to the new entrant classes in the following February. A case-study approach allowed the researchers to focus on interactions between specific instances or situations (Bell, 2002) within focused time frames. Evidence was systematically collected, enabling the relationships between variables to be studied (Cohen, Manion, & Morrison, 2007). Data collection involved: observations in both sectors; questionnaires to ECE parents (6–8 weeks before the child started school); questionnaires to new entrant parents (6–8 weeks after the child started school), regardless of whether their child had attended a focus (that is, one used in the research) ECE service; interviews with those parents whose child had attended both a focus ECE service and a focus new entrant class; teacher interviews; documentation, including examples of children's work, teacher planning, and assessment information; policies relevant to teaching programmes and transition; copies of newsletters; information about schools that was available to ECE parents; copies of assessments; and photographs of mathematics in action.

### *Participants*

Initial attention was centred on four ECE services: two early education and care centres and two kindergartens. The two early education and care centres (referred to hereafter as centres) are privately owned and open from 7.30 a.m. to 5.30 p.m. on weekdays. In the "over two" section of these centres, three teachers/care givers provide full day care to 12–15 children, a teacher:child ratio of 1:4 or 1:5. The two kindergartens are funded by the Ministry of Education and employ only registered early childhood teachers. They provide early childhood education for under-five-year-olds within set hours and have a teacher:child ratio of 1:15. They are not full day-care facilities.

Early in the following year, attention moved to the two primary schools that many of the ECE children in the study now attended. For research purposes, the schools were labelled Nikau School (decile 4, with 480 pupils) and Punga School (decile 3, with 440 pupils). Nikau School had children continually feeding into either one of two new entrant classes. Punga School had one new entrant class that had been full (25 children) from the beginning of the year and a second new entrant class that was continuing to fill. All four teachers had been involved in professional development through the NDP.

### *Analysis*

This study used the theoretical framework in Bronfenbrenner's (1979) analogy of the child's learning environment as "interconnected systems". Here, the learner and their engagement within the immediate environment (or microsystem) is situated at the first level of learning, and the second level (or mesosystem) extends to the relationships between the immediate learning environments. Successful transition to the school setting has been described as an ecological transition between two microsystems (Bronfenbrenner).

This paper considers five key aspects of the research: structural provisions for mathematics; the assessments that are made with regard to children's mathematical understanding; how information is conveyed between sectors; processes and provisions for transition; and parental perceptions and expectations. The examples are chosen to illustrate the range of transition practices relating to children's mathematical experiences and understandings within this case study. Results of this small study are relevant to these study sites and may not be able to be generalised.

## Findings and Discussion

### *Structural Provisions*

#### *Early childhood education services*

The approach to learning in ECE is holistic in nature, based on Bronfenbrenner's (1979) idea of the child engaging with the learning environment. In ECE settings, children are immersed in rich learning across a range of subject curriculum areas; a strong focus on the child's interest is often embedded in play. ECE teachers reflect this approach in their philosophy to mathematical learning:

Children need to have autonomy of their learning and to be able to make some choices for themselves. (Kindergarten teacher)

If a child shows a particular interest, the teacher may build on and nurture that interest, illustrating Bronfenbrenner's first level of learning as a "responsive and reciprocal relationship":

It happens throughout the whole engaged curriculum. It doesn't stand as a solitary stand-alone exercise unless it is extending a child's interest. So it is based around a child's interest and we can seize an opportunity and teachable moment and extend it. (Kindergarten teacher)

The provision of opportunities for mathematical learning and language development arose in areas such as the sand pit, block corner, and family corner. Water play, play with toy animals or cars, carpentry, and computer games were commonplace in all ECE settings:

The water trough, tipping, measuring, pouring, full. You know, that measurement stuff. Colours as well in the water trough. Sandpit where digging holes. (Centre teacher)

Within the learning environment, children worked alone, in solitary play or in parallel play, or played together. The teachers observed, interacted, challenged, scaffolded, co-constructed, or were not present. More formal activities, such as shape matching, bead threading, puzzles, and jigsaws, also provided for mathematical learning. At times, a teacher would remain at the activity, encouraging and extending the learning through conversations and challenges. Mat time or whānau [group] time often provided an opportunity for a mathematics focus as a result of child observations or a teacher-initiated focus:

I was working with a little boy who was going 1, 2, 3, and I thought, there is a whole heap of stuff there ... So that is why I thought of bringing in [at mat time] the actual 1, 2, 3 ... It's not giving him the knowledge, it's like developing an awareness. (Kindergarten teacher)

The two centres provided a planned "focus on four-year-olds" programme, with a strong "preparation for school" approach. The weekly sessions had either a strong subject focus (literacy or numeracy) or allowed these children to engage with extra resources less suitable for younger children. The numeracy emphasis was on children developing an awareness of numbers. The children were also encouraged to concentrate, complete simple tasks, and develop social skills:

The focus-on-four programme is mostly a preparation for school. For instance, just learning their numbers for a start. Learning to recognise 1 to 10, maybe 1 to 20, learning to count it, and learning to write them. That's what I had hoped in my programme. (Centre teacher)

Margetts (2007) suggests that a component of successful transition is the provision of culturally important academic and social understanding and skills before the child starts school. However, she cautions that care must be taken to ensure that developmentally appropriate early childhood programmes are not changed to be more like a school class. This care was reflected by both kindergartens, where no allowances were made for those children about to move to a new entrants' class:

The whole *Te Whāriki* is more of a holistic approach to children's learning. They will learn all those things in due course through stages of development, through their own interest-driven activities. (Kindergarten teacher)

### *School new entrant classes*

The approach to learning in a school setting may be viewed as a change in focus from personal, social, and emotional development in the ECE setting to the formal beginning of specific subjects and prescribed content (Stephenson & Parsons, 2007). Having lessons is a big contrast to the socio-cultural experiences emphasised in the ECE setting. In Bronfenbrenner's (1979) framework, this move is towards the second level of learning. The children are being affected by what is happening outside their own microsystem.

Mathematics learning in the four new entrant classrooms was teacher-initiated, with focused learning intentions. The teachers had fixed ideas as to the particular needs of new entrant children and planned and directed the children's learning accordingly. Similarly to a New Zealand study of five new entrant classes (Sherley, Clark, & Higgins, 2008), the teachers were in control of the learning environment, providing activities to "plug the gaps" in children's knowledge:

I guess you are really quite restricted, but you have your planning and guidelines for numeracy project, so usually that really controls most of what you do. (Punga teacher)

In all four classes, children were placed in achievement groups from their first day at school and experienced formal whole-class mat time followed by group rotations. Opportunities for less structured learning were provided during times without teacher contact, when groups of similar-ability children were provided with specifically focused games or equipment designed to stimulate self-generated activities. While teachers expressed a belief in the importance of play and in learning through play, they did not reflect this in practice. There was a strong belief that games or activities from the NDP replicated the children's earlier experiences of learning through play:

I suppose that helps them transition. I suppose we just expect them to start participating in the games. (Nikau teacher)

When children were in the non-contact group, they had some control over their learning in their choice of equipment, but they had little opportunity to interact with the teacher. The teacher was unable to scaffold or respond interactively to children's initiations because the teacher was engaged elsewhere in instruction or classroom management:

I think there is an expectation of when they come [pause] well how they behave when they are at school, and numeracy time is a set time. So we cater to those children by doing games. (Nikau teacher)

One classroom teacher provided practical experiences and opportunities for "free" play so that children could experience confidence and success:

It is a bit of both, really. That is where I have developmental-type activities – so they have a little bit of structure on the mat. Then they have freedom of other activities [and] at the same time they are learning that rotation process. (Punga teacher)

It has been demonstrated that children in classes in which teachers have used more developmentally appropriate practices exhibit less stressed behaviours (Margetts, 2007). Stephenson and Parsons (2007) suggest that children become impassive and disempowered with more formal approaches to teaching, which may lead to anxiety and low self-esteem. Perhaps more teacher professional development is needed to develop a comprehensive understanding of the pedagogy appropriate for children in transition. In another small New Zealand study, Belcher (2006) suggests that teacher beliefs and lack of understanding of the NDP may limit the experiences they provide. Although it has been suggested (Margetts, 2007) that school teachers should be responsive and reflective in the early weeks of schooling to the diversity of backgrounds, little evidence was found in this study of authentic social contexts for learning.

## Assessment

### *Early childhood education services*

Narrative assessments were the most common form of documentation in the ECE services. These tended to document, in written and photographic form, the dispositions exhibited by the child rather than focusing on a specific subject. The foreground of these narratives described the whole experience to ensure that the complexity of the learning was preserved (Carr, 2001). Within the background, there was evidence of specific mathematical concepts being developed, practised, or achieved. For example, one kindergarten teacher wrote for a child:

You enjoyed your time in the water, filling bottles using jugs and small containers. You had really good concentration and showed awesome control when pouring the water into the bottles. You lined the new cylinders up from smallest to largest and filled these too. You were not only developing your fine motor control but discovering all about volume. (Learning Story)

*Te Whāriki* suggests a very clear purpose of assessment is to “feedback to children on their learning and development [and it] should enhance their sense of themselves as capable people and competent learners” (Ministry of Education, 1996, p. 30). Peters (2004, p. 8) suggests that this focus on learning dispositions “provides a potential link between sectors, and is consistent with the definition of numeracy underpinning the Numeracy Strategy” which is “to be numerate is to have the ability and inclination to use mathematics effectively in our lives, at home, at work, and in the community” (Ministry of Education, 2001, p. 1).

### *School new entrant classes*

The assessment practices undertaken at school are very different from those in the ECE services. In the study by Sherley et al. (2008), the five teachers whom they interviewed did not attend to the knowledge and skills that the children already had on entry to school. This was confirmed in this study:

A huge jump for children who didn't know anything [about numeracy] when they started. (Nikau teacher)

Teachers indicated their use of either the Individual Knowledge Assessment for Numeracy (IKAN) checklists (Ministry of Education, 2005) or the Numeracy Project Assessment (NumPA) tool (Ministry of Education, 2006) to assess children, in some cases, in the first few days of arrival at school. Concerns have been raised regarding the use at a new entrant level of such tools (Peters, 2004), with their focus on narrowly defined goals and checklists meaning that little attention is paid to the situated nature of learning experienced by children before they start school:

We do observation assessment for the first six weeks and then in the sixth week, we do the NumPA Form A ... and after that we carry on with a tick chart, one from the numeracy project stage that they are at. (Nikau teacher)

So they come out at 0 [Stage 0 of Number Framework], so they don't know any of the things [that the NDP assesses]. (Nikau teacher)

The reporting practices on children's progress were consistent across both schools in this study. Each school completed an oral and written report at six weeks as to how the child had settled in and the progress they were making. Contrary to findings from Belcher (2006), parents spoke confidently about having or being able to receive information easily on their children's progress in numeracy:

We had an interview after the six weeks and they went through how she was and how she was sort of ordering numbers and they have been introducing numbers out of sequence so that they could place them in the order. (Parent, Nikau)

## *Parental Perceptions*

Positive relationships between sectors are important because they develop continuity between home, ECE settings, and the new entrant classroom (Bronfenbrenner, 1979). The researchers in this study wanted to unpack the parent/caregiver's view of the transition partnership between teachers and parents of the child. A questionnaire given to ECE parents provided information on the parents' perceptions of transition and on aspects of children's learning of mathematics within the ECE environment. A similar questionnaire focusing on new entrant classes was given to the school parents in the second phase of the research.

Parents ( $n_1^1 = 114$ ,  $n_2^2 = 55$ ) believed that in ECE services, mathematics happens "often" as children play with puzzles and games (43%), during mat time (45%), at block construction (30%), in water play (29%), and on the computer (32%). Parents think the ECE teachers interact with children on things mathematical "all the time" through conversations (33%) and "often" during mat time (49%) and with inside equipment (43%). ECE parents agreed on how mathematical learning occurs through play in the early childhood setting and believed school numeracy to be the more formal learning of numbers. However, they anticipated that school mathematics would still be simple and incorporated into everyday situations, fun, challenging, and engaging children's interests. All ECE parents expected to see changes from structured play-based activities to more formal teaching and learning in school (Stephenson & Parsons, 2007):

Very basic. I would expect the transition between formal learning and learning by play to be fairly slow at first to help the child settle into school. (Parent, centre)

The parents' perceptions of "mathematical learning" changed once the child had started school ( $n_1^1 = 59$ ,  $n_2^2 = 28$ ). Nine (33%) of the parents whose children were in the new entrant classroom responded consistently across all options that they "did not know" where mathematics occurred within a new entrant classroom. The rest of the parents believed that mathematics occurred "all the time" in the maths corner and in structured mathematics lessons and "often" in puzzles and games. When asked how the teacher helped their child learn mathematics, 46% (13 parents) "did not know", 21% (6 parents) responded that teachers used a formal mathematics lesson "all the time", while others said that teachers "often" used conversation (25%, 7 parents), mat time (25%, 7 parents), and formal lessons (18%, 5 parents). Findings supported those of Belcher (2006) that parents "were unaware of the extent of their children's shift" (p. 114) as they moved from early childhood to the school environment.

Parents were able to articulate quite clearly their perception of their child's mathematical knowledge both before and after starting school. Parents indicated that their children showed competence in: the use and understanding of positional language, recognising shapes, comparing lengths and heights, saying the number names in order (to 20), and accurately counting a group of objects (to 10).

## *Formal Transition Process*

Within the process of transition (involving the child and parent/s as the child moves from an ECE service to school), it was difficult to isolate any formal process pertaining to mathematics. The researchers assumed that successful transition of the child would have a direct impact on the child's mathematical learning. Successful transition is said to be a result of a process designed to familiarise participants with the school environment and the challenges and demands associated with starting school (Broström, 2002; Margetts, 2007). Within Bronfenbrenner's (1979) theoretical framework of "levels of learning", the child is affected by situations in which they participate and also by decisions

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<sup>1</sup> Number of questionnaires distributed

<sup>2</sup> Number of questionnaires returned

and events outside the child's environment of which they have no knowledge or control. Hence, Margetts (2007) recommends that transition programmes should create links between and actively involve children, parents, families, and teachers, and, furthermore, the "voice" of all participants should be valued and information shared.

The new entrant teachers in this study did not visit the ECE service before a particular child started school. For one kindergarten, visits from Punga School (two to three a year) were more a roll-gathering exercise. The second kindergarten had a closer relationship with Nikau School, and alternating visits were arranged once a term for teachers to share common interests:

Kiwi [a kindergarten] is our main feed into school, so we try and go and see them once a term. It is pretty informal, and we sit there with our lists and say "What about this child?" and "Who would be good with this one?" (Nikau teacher)

It is a pity because I think as a new entrant teacher it would be great to go out and visit and see what's happening. (Punga teacher)

In the four ECE services in the study, school visits before the child started school were the ultimate responsibility of the parent or caregiver. Material was available in all four ECE services for parents, providing them with information about all the local schools, together with information on the enrolment and transition process.

The two schools offered different processes for the child who was about to start school. At Nikau School, parent/s formally enrolled the child and then toured the school with the principal and met the child's class teacher. At this stage, future class visits were discussed. The number of visits depended on the request from the parent, with the parent's attendance optional:

Usually, it's for one-and-a-half hours ... They are allowed as many as they like or as few as they like, we don't mind. ... Some people don't come for any, and other people come for 10. The average is probably five visits. I leave it up to the parents now, I don't say anything to them. (Nikau teacher)

As part of the transition process, Punga School offered school sessions called "Ready-Go". The child and a parent/caregiver were encouraged to attend up to 10 weekly sessions from 1.30 to 3.00 p.m. in a spare teaching space. Sessions could have between 4 and 17 children, who were from nine local ECE services or who had no ECE experience. The assistant principal had developed a regular programme, which for the children started with mat time and focused on social skills and literacy, while the parents had a "guest" speaker, such as the school principal or an administration person who outlined school policy or practices. The children then completed a range of activities with parental and teacher support. Children also had up to three class visits immediately before starting school. Parents, new entrant teachers, and ECE teachers spoke very positively about the "Ready-Go" programme:

I think it was great that there was the Ready-Go programme just so the parents as well as the children were familiar with the environment of the school and who was who. (Parent, Punga)

It is to give the children an easier start to school. Where they are learning basic things like sitting on the mat, putting their hand up, and also learning some early language skills. (Punga teacher)

It was wonderful to see the children [those preparing to start school] coming up to her to say hello. Because they know her because of the Ready-Go programme. How cool that is for those children and for her for when they do go to school; it has broken down so many of those barriers. (Kindergarten teacher)

Parents from both schools spoke positively of how the class visits helped settle and meet the social needs of their children:

Yes, I think so, because then she knew her classroom, knew her teacher, knew some of the children that were already in the classroom. (Parent, Nikau)

The two new entrant classes at Nikau School combined to provide an “exploration” time for the children, usually one day a fortnight for 80 minutes, where children experienced self-selected activities. Teachers saw this time as an important link back to early childhood for new entrant children. They also encouraged children on school visits to attend the exploration sessions:

Normally hooks all our kids into coming into the school. Because they go, “Oh that’s like kindy – I quite like it here now.” (Nikau teacher)

However, it was also apparent that the transition process did not necessarily successfully meet the needs of all children:

But for some children, starting anywhere new is going to be traumatic because of their personality you know. ... I guess we just manage on a case-by-case basis. (Nikau teacher)

Concerns were also raised regarding those children who did not attend any ECE service:

They are the ones who are going to take longer to settle, longer to learn. ... No pre-school, and they are taking a long time to get underway. (Punga teacher)

### *Information Sharing*

There were no specific policies between any of the ECE services or schools determining “what and how” should be shared on transition. Lead teachers from the junior school of both schools visited the kindergartens – but not the centres – a few times a year, for various reasons. These relationships indicate the “professionalism and collegial development” of the third level of learning described by Bronfenbrenner (1979) as the “exosystem”.

ECE teachers considered that the portfolios of narrative assessments contained sufficient information for the new entrant teacher to use as a starting point in getting to know the child. However, they were unsure whether the new entrant teacher would use the portfolios. It was left to parents to decide if they would take their child’s portfolio to school:

I put this in the child’s profile book with a link about the learning involved, and I thought, wouldn’t this be great if I could hand it on to the teachers so they had a knowledge of where they were at. But I don’t know, maybe they have their own assessment. (Centre teacher)

New entrant teachers had little knowledge of the learning focus and placed little value on the child’s portfolio:

What kind of things the children have been doing. What kind of things they are interested in. That sort of thing. Because they don’t do any kind of assessment at all. It would be kind of useful to know what kinds of things they do know. (Nikau teacher)

Parents’ expectation of what information the new entrant teacher would seek about the child’s mathematical understanding was gathered from the questionnaire given 6–8 weeks before the child started school (n1 = 114, n2 = 55). ECE parents overwhelmingly expected discussions with the parent or caregiver (89%, 49 parents), discussions with the child (85%, 47 parents), a written report from the ECE teacher (80%, 44 parents), and, to a slightly lesser extent, the child’s portfolio (70%, 38 parents) to be the prime information sources. However, in the follow-up questionnaire with the new entrant parents (n1 = 58, n2 = 28) regarding information that the new entrant teacher sought, only 50% (14 parents) said the teacher had had discussions with the parent and 46% (13) with the child. Only 25% (7) of the parents could say that the new entrant teacher had acknowledged their child’s previous mathematical learning. New entrant teachers appeared to want little information from the ECE experience:

We don’t actually get anything from the early childhood setting as far as records go to do with the child’s academic achievement. (Punga teacher)

I think that is something that is really lacking in New Zealand across the board. ... A lack of contact between kindergarten and school. It is almost like you go to kindy, right that's over. Now you go to school, and there is no flow, and I haven't seen anywhere there is. (Nikau teacher)

Teachers have little understanding of each other's educational settings. By sharing information, teachers may better understand the changes the child will experience during transition (Belcher, 2006). The key competencies outlined in *The New Zealand Curriculum* (Ministry of Education, 2007) provide an avenue for closer links between sectors (Belcher, 2006; Carr, 2006; Peters, 2005) because the attention of the primary school sector is drawn to developing life-long competencies. The focus on dispositions and key competencies could initiate closer links between the sectors and help ease the process of transition.

## Conclusions

The richness of mathematical learning experiences that children bring with them to school has been well researched (Aubrey, 1993; Perry & Dockett, 2004; Young-Loveridge, 1989). Perry and Dockett (2005) analysed the many mathematical experiences that children have in early childhood that demonstrate "immense knowledge ... including mathematics" and the "mathematical power of young children's skills in mathematising, making connections and argumentation" (p. 36). There was limited recognition by the new entrant teachers in this study of their new entrants' mathematical power and the need to nurture it by providing learning experiences that make connections to the children's existing mathematical understanding.

Within this small study of four ECE services, there was a diverse range of mathematical experiences available to the children within each of the ECE settings. Assessments were very holistic in nature, focusing on dispositions to learning. Subject curriculum areas were not emphasised, but they were evident in the background of the assessment narratives.

Involvement in the NDP dominated the teaching of mathematics in the four new entrant classes. Children experienced structured numeracy lessons involving whole-class mat time followed by achievement-group rotations. The use of NDP activities and games during group rotation were believed to replicate the ECE learning approach. NDP assessment tools, which were the main methods of assessment, did not allow for assessment of the nature of children's previous mathematical learning.

Parents were able to articulate clearly how their children learn mathematics in ECE services and what their expectations were for how connections should be made to this learning in the new entrant classroom. There was a high expectation among parents that some information sharing would take place regarding their child during the move to school. However, very limited dialogue took place. ECE teachers expected the portfolios of narrative assessments would provide adequate information, but this source was not used by the new entrant teachers.

There was considerable variation in the extent to which early childhood and new entrant teachers were prepared to adapt learning approaches for children moving to school. The changes anticipated by the researchers in the roles, activities, and interpersonal relationships between the teacher, the parent, and the child as the child moves to school (Bronfenbrenner, 1979) were confirmed.

It was evident that positive transition practices in mathematics between the early childhood setting and the new entrant classroom were tenuous. Further effort is needed to make the recommendation in *The New Zealand Curriculum* (Ministry of Education, 2007), "this new stage [the transition from the ECE setting to school] in children's learning builds upon and makes connections with early

childhood learning and experiences" (p. 41), become a reality. A future focus on dispositions and key competencies could well initiate closer links. From this small case study, it is clear that the need for a reform of transition practices warrants further investigation to ensure that "schools can design their curriculum so that students find the transitions positive and have a clear sense of continuity and direction" (Ministry of Education, 2007, p. 41).

## Recommendations

- Discourse should be promoted between the sectors to develop further understanding.
- The use of subject-specific assessment in the narrative assessments from early childhood settings should be promoted.
- A more "appropriate" method for assessing new entrant children should be developed.
- In the NDP booklets, teaching approaches and activities provided in pre- and early-counting stages should reflect more closely learning approaches from early childhood settings.
- Key competencies and dispositions should provide an avenue for closer links and less obvious differences in learning and assessment approaches between sectors.
- Transition programmes that include a focus on mathematical learning should be promoted.

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