Explorations of Early Childhood – New Entrant Transition in Mathematics

Ngaire M. Davies
Massey University
<n.m.davies@massey.ac.nz>

Karen Walker
Massey University
<k.walker@massey.ac.nz>

There is current interest in how the mathematics content, understanding, and practices of the new entrant classroom connects with the learning the child experienced within early childhood settings. Positive transitions directly impact on children. They are important to the child, to the parent, to the teachers, and to the centre/school. This paper reports on research investigating the existing transition practices between early childhood settings and primary schools with regard to mathematics learning and teaching. We report on interim findings from four early childhood settings.

Background

Positive transitions are important to the child, to the parent, to the teachers, and to the centre/school (Dockett & Perry, 2001). Children start school with a wealth of mathematical knowledge and experiences (Young-Loveridge, 1989). Recognition of this rich resource by the new entrant teacher may facilitate the smooth transition of the child into school (Perry & Dockett, 2004). We are interested in current transition practices in mathematics. By transition practices we refer to the experiences as well as the information, artefacts, and documentary evidence transferred between the early childhood centre and the school regarding the mathematics understanding of particular children.

Our work builds on a sound research base to engage with provision for student learning. Research has shown that transition can pose difficulties for new entrant children (Eyers & Young-Loveridge, 2005; Perry & Dockett, 2004; Peters, 1998) and has a long-term impact on school achievement (Timperley, McNaughton, Howie, & Robinson, 2003). Kagan and Neuman (1998) suggest 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. A successful transition is seamless and ensures the continuity of children's physical, social, and philosophical experiences.

Barriers to smooth transitions vary depending on the individual contexts, on relationships that have developed among ECC (early childhood centres), schools, and parent/caregivers. Neuman (2002) suggests impediments to smooth transitions may develop through different visions and cultures, structural divisions, and communication. Furthermore, it is suggested that the differences between the requirements of these educational settings may invite problems related to adjustment (Kienig, 2002). These requirements are a consequence of different social and academic goals between the school and those of the pre-school setting (Bronström, 2002).

How teaching and learning occurs in an early childhood setting is of paramount interest in the research. According to *Te Whāriki* (Ministry of Education, 1996), the early childhood curriculum, 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). This socio-cultural viewpoint suggests learning stretches across people, places, and things and that the classroom is viewed as a community (Cowie & Carr, 2004). In these shared learning experiences learners and experts (peer or adult) co-construct "as they engage in meaning making" (Cullen, 2004, p. 70). Co-construction "emphasises children and teachers together studying meanings in favour of acquiring facts" (Jordan, 2004, p. 33). Thus in the co-construction process the child's own expertise is acknowledged as being as valid as the teachers – together the child and teacher move learning in the child's topic of investigation.

There are, however, changes in the roles, activities and interpersonal relationships between the teacher, parent, and the child as the child transitions to school (Bronfenbrenner, 1979). Successful transition to the school setting has been defined as an ecological transition between two "microsystems" (Bronfenbrenner, 1979). Broström (2002) suggests that young children feel "suitable" in school (p. 52) – in terms of enjoying a feeling of wellbeing and belonging when they successfully negotiate the daily. Concerns have been raised regarding the "very different expectations" of teachers between the early childhood settings and the school (Timperley

et al., p. 32). Tensions arise as a result of change from a learning environment based on socio-cultural and co-constructionist ideas of learning (Bronfenbrenner, 1979), to more structured activities and formal instruction (Pratt, 1985).

In our study we used as our theoretical framework Bronfenbrenner's analogy of the child's learning environment as "a set of Russian dolls". More specifically we used *Te Whāriki's* "Levels of Learning" framework (Ministry of Education, 1996. p. 19) derived from Bronfenbrenner's ideas of the learner and their engagement within the immediate environment, situated at the first level of learning. The second level extends to the relationships between the immediate learning environments. In the context of early childhood this relates to the home and family, the early childhood setting, and the people within these contexts. Level three encompasses the influence of the adult's environment on their capacity to care and educate. Wider social beliefs about the value of early childcare and education form the final level. *Te Whāriki* is mainly concerned with these first two levels whilst acknowledging the influences of the other two.

Te Whāriki views the child as a competent learner and communicator and includes "dispositions" to learning as an important outcome for early childhood. "Dispositions are a very different kind of learning from skills and knowledge. They can be thought of as habits of the mind, tendencies to respond to situations in certain ways" (Katz, 1988, p. 30). One of the foundations of these dispositions is Bronfenbrenner's idea of "educational competence", for example, persisting in tasks, thinking, and working together. The nature of assessment in early childhood settings has developed to reflect the child's dispositions towards learning (Carr, 2001). This credit approach to assessment is supported in *Te Whāriki:* "[a]ssessment of children should encompass all dimensions of children's learning and development and should see the child as a whole" (p. 30). 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/children's learning is often in the form of a "learning story" (Carr, 2001) and focuses on dispositions such as curiosity, trust, perseverance, confidence and responsibility. Carr further suggests that learning dispositions are one of the key things that children take to school and on into adult life.

It is our contention that what happens at the transition directly influences a child's ability in and dispositions towards mathematics.

Methodology

The research is a one year study which investigates the existing transition practices, in a small town in New Zealand, between early childhood settings and primary schools with regard to mathematics learning and teaching. Our specific research question is: What centre and new entrant practices facilitate positive transitions in mathematics between early childhood settings and primary schools? A case study approach was taken to answer this question. This allowed us focus on "specific instances or situations and to identify, the various interactive processes at work" (Bell, 2002, p. 11). Our principal data gathering approaches include:

- evidence of teacher planning,;
- policies relevant to teaching programmes and transition;
- copies of newsletters;
- information from schools available to parents of children at the ECC;
- copies of assessment;
- photographs of mathematics in action;
- teacher interviews;
- parent questionnaires; and
- observations at the ECC.

To achieve this, in 2007, we focused our attention on four ECC – two kindergartens and two early childhood education and care centres. Each kindergarten employed three teachers and 45 children aged from three years 9 months to five years (five years being school entry age). Children attended the kindergarten five days a week from 9.00am to 12.30pm. The two early education and care centres were privately owned. In the "over two" section of these centres there were three teachers/care givers and 12-15 children in full day care. We report on interim findings from four ECC with a focus on parental perceptions, the structural provisions for mathematics, the assessments that are made with regard to children's mathematical understanding, and how this information is conveyed to the school. Results of this small study are relevant to these project sites and may not be able to be generalised.

Discussion

Structural Provisions

The approach to learning in ECC is holistic in nature based on Bronfenbrenner's idea of the child engaging with the learning environment. Children are immersed in rich learning across a range of subject curriculum areas with a strong focus on the child's interest often embedded in play. Teachers from both centres and kindergartens reflect this approach in their philosophy to mathematics learning:

> children need to have autonomy of their learning and to be able to make some choices for themselves.

Teachers seize a "teachable moment" to progress children's understanding and interest. If a child shows a particular interest the teacher may build on and nurture that interest. This illustrates *Te Whāriki*'s first level of learning, as adapted from Bronfenbenner's ideas, where a "responsive and reciprocal relationship" is developed with the teacher.

> 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.
>
> But often it just kind of happens in that moment in the water trough or the sandpit or you use what is there at the time.

The provision of opportunities for rich mathematical learning and language development arose in areas such as the sand pit, block corner, family corner, water play, with farm animals, toy cars, carpentry, and computer games.

> … the first thing that came into my mind was the mathematical language that is used all around the centre in lots of different areas ... you know the measuring, longer, shorter, longer … with the carpentry, water, sandpit. All of those words classifying and sorting words.

Within the learning environment of the ECC setting children worked alone, in solitary play or in parallel play, or played together. The teacher observed, interacted, challenged, scaffolded, co-constructed, or was not present.

> Working with other children never just by themselves either. There would be a group of children invariably come along. You might start with one but you would end up inviting other children to participate and all the turn taking and the sharing.

More formal activities also provided for mathematics learning such as shape matching, bead threading, puzzles, and jigsaws.

> We have a lot of parents that will come in and work with their children at the puzzles, at the play dough table, at one of our tables that we might have a game set up.

At times a teacher would remain at the activity encouraging and extending the learning through conversations and challenges. Displays of children's work, routines such as roll taking utilising category data and information sharing charts for parents on learning and curriculum also provided a maths focus. Mat time or *whanau* [group] time often provided an opportunity for a mathematics focus as a result of child observations or a teacher initiated focus.

> We definitely bring it [mathematics] out in planned times like that.
>
> 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.

The two centres provided a planned "focus on four year olds" programme. These programmes had either a strong subject focus or allowed children to engage with extra resources less suitable for younger children. Both centres had a strong "preparation for school" approach in these sessions.

Parental Perceptions

Positive relationships between settings are important because they develop continuity between home, ECC, and the new entrant classroom (Bronfenbrenner, 1979). We wanted to unpack the parent/caregiver's view of the transition partnership between "teacher-parent-child". The questionnaire provided information on the parent's perceptions of transition and various aspects of children learning mathematics. Parents believed that in ECC mathematics happens most often as children play with puzzles and games, during mat time, at construction, in water play, and on the computer. According to parents mathematics happens less often in the writing area, with play dough, and in the family corner. Parents think the teachers are working with children on things mathematical most often through conversations, during mat time, and with inside equipment.

Parents are able to articulate quite clearly their perception of their child's mathematics knowledge. This includes the child's capacity to:

- Use and understand positional language (90%);
- Recognise shapes (90%);
- Compare lengths and heights (85%);
- Say the number names in order (varying competencies from 6 to 30);
- Accurately count a group of objects (varying competencies from 5 to 30);
- Perform simple addition (70%);
- Compare volumes (63%);
- Perform simple subtraction (49%);
- Tell you the days of the week, using a calendar (40%);
- Understand fractions (10%); and
- Tell the time to the hour and half hour clock (3%).

Parents held similar views about mathematics learning in a new entrant classroom. They see mathematics as being simple and incorporated into everyday situations, fun, challenging, and engaging children's interests.

> Very basic – using objects for counting and subtracting – then to introduce written number and know their values.

> 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.

Assessment

We found narrative assessments were the most common form of documentation in the ECC. These tended to document, in written and photographic form, the dispositions exhibited by the child rather than focus on a specific subject. The child is actively engaged in their learning environment and not simply achieving a skill. 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 mathematics concepts being developed/practised/achieved. For the audiences reading these – child, teachers, parents and *whanau*/family – there is far more to be found here than a simple mathematics skill. This focus on a broader audience links well to *Te Whāriki*'s second level of learning.

> 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)

Narratives are generally stored in an individual child's portfolio and are available at any time to teachers, children, and family. Within the portfolios teachers attempt to include a variety of voices as this contributes to the development of a rich picture of the child. This highlights the relationship between the two learning environments of home and centre.

> We have just really been promoting the stories from home and the family voices and to try and get them to contribute to children's interests.

Teachers cannot always fully judge the meaning behind a child's action but may get a fuller picture through conversations with the child and/or parent (Carr, 2001).

> She just thrives on painting activities and creates wonderful pieces of artwork. It has been observed that J is very interested in painting circles. … Mum explained to us that in the weekend J was learning about the different shapes. This could link to why she has really enjoyed creating circles. (Learning Story)

Carr (2004) highlights that formative assessment should include "where to next" and possibly some puzzlement.

> H may have a strength with the number system. We will offer more resources to stimulate his interest. (Learning Story)

Te Whāriki suggests a very clear purpose of assessment is to "[f]eedback to children on their learning and development [and] should enhance their sense of themselves as capable people and competent learners" (Ministry of Education, 1996, p. 30).

Anecdotal assessments were made by individual teachers and these were shared at planning meetings. From these assessments, resources and activities were planned and offered to meet the interests of the children; however, children were not required to carry out these activities. At times these assessments formed the basis of the plan for the *whanau* or mat time.

So I suppose the planning for us can we see an interest and then we bring in the resources. That would be in our session evaluation we would look at that and how we would extend it.

Information Sharing

There were no specific policies between any of the ECC or schools determining what should be shared and the format it should take. Teachers in charge of the junior school from both schools visit the kindergartens a few times a year with varying purposes. One kindergarten seemed to view these visits simply as a roll gathering exercise by the schools, while the other had a closer relationship with the school and more comprehensive information was shared and programmes discussed. These relationships indicate the "professionalism and collegial development" of the third level of learning (Ministry of Education, 1996, p. 19).

> The DP, [deputy principal] she will come down once a term but that's more for who's likely, for rolls and stuff. But with the A school we have just got once or twice a term they either come here or we go there, have a catch up about different children.

Early childhood teachers considered that the portfolios contained sufficient information for the new entrant teacher to use as a starting point in getting to know the child.

> 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.

They were unsure that the new entrant teacher would use a child's portfolio. It was left to parents to decide if they would take it to school. When asked if they specifically suggested to parents they could take the portfolios into the schools they didn't.

> I haven't actually come to think of it.

One centre provided a written report of the child when they left the centre. These reports reflected the strands of *Te Whāriki* and were left to parents to decide if they would take it to the school.

> He is able to count confidently and is able to match numerals to objects. (Excerpt from written report identifying the Communication strand – Expressing a point of view)

Parents' expectation of what information the new entrant teacher would seek about the child's maths understanding was gathered from the questionnaire. Parents overwhelmingly expected discussion with parent/caregiver (89%), discussions with child (85%), a written report from early childhood teacher (80%), and to a slightly lesser extent the child's portfolio (70%) as prime information sources. Parents considered that verbal reports from early childhood teacher (36%) were less likely.

Conclusions

We noted the diverse and rich mathematical experiences available to the children within each of the ECC. Assessments were very holistic in nature focussing on dispositions to learning. Subject curriculum areas were not emphasised but were evident in the background when reading the assessment narratives. Parents were able to articulate clearly how their children learn maths in ECC and their expectations of how connections should be made to this learning in the new entrant classroom. We anticipate changes in the roles, activities, and interpersonal relationships between the teacher, parent, and the child as the child transitions to school (Bronfenbrenner, 1979).

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 children have in prior-to-school settings demonstrating "immense knowledge … including mathematics" (p. 36) and the mathematical power of young children's skills in mathematising, making connections, and argumentation. The role of the new entrant teacher is to recognise this mathematical power and to nurture it by providing learning experiences that make connections to their existing mathematical understanding (Perry & Dockett).

The second phase of the research may confirm the recommendation in The New Zealand Curriculum (Ministry of Education, 2007) that "this new stage [the transition from ECC to school] in children's learning builds upon and makes connections with early childhood learning and experiences" (p. 41). We will further investigate transition practices to determine the extent 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).

Acknowledgement. The authors wish to acknowledge that this project was funded through the New Zealand Ministry of Education's Numeracy Development Projects. The views expressed in this paper do not necessarily represent the views of the New Zealand Ministry of Education.

References

Aubrey, C. (1993). An investigation of the mathematical knowledge and competencies which young children bring into school. *British Educational Research Journal, 30*(5), 27-41.

Bell, J. (2002). *Doing your research project: A guide for first-time researchers in education and social science*. Buckingham: Open Press University.

Bronfenbrenner, U. (1979). *The ecology of human development.* Cambridge, MA: Harvard University Press.

Broström, S. (2002). Communication and continuity in the transition from kindergarten to school. In F. Fabian & A. Dunlop (Eds.), *Transitions in the early years: Debating continuity and progression for young children in early education* (pp. 52-63). London: RoutledgeFalmer.

Carr, M. (1998). Taking dispositions to school: keynote address to seminar on transition to school. *Childrenz Issues, 2*(1), 21-24.

Carr, M. (2001). *Assessment in early childhood settings.* London: Paul Chapman.

Carr, M. (2004). *Assessment in early childhood education: Keeping it complex, keeping it connected, keeping it credible*. Wellington: Te Tari Puna Ora o Aotearoa New Zealand Childcare Association.

Cowie, B., & Carr, M. (2004). The consequence of socio-cultural assessment. In A. Anning, J. Cullen, & M. Fleer (Eds.), *Early childhood education: Society and culture* (pp. 95-106). London: Sage Publications.

Cullen. J. (2004). Adults co-constructing professional knowledge. In A. Anning, J. Cullen, & M. Fleer (Eds.), *Early childhood education: Society and culture* (pp. 69-79). London: Sage Publications.

Dockett, S., & Perry, B. (2001). Starting school: Effective transitions. *Early Childhood Research and Practice, 3*(2). Available on-line http://ecrp.unic.edu/v3n2/dockett.html.

Eyers, G., & Young-Loveridge, J. (2005). Home-school partnerships in mathematics education. *SET: Information for Teachers*, 1, 43-47.

Jordan, B. (2004). Scaffolding learning and co-constructing understandings. In A. Anning, J. Cullen, & M. Fleer (Eds.), *Early childhood education: Society and culture* (pp. 31-42). London: Sage Publications.

Kagan, S., & Neuman, M. (1998). Lessons from three decades of transition history. *Elementary School Journal, 98*(4), 365-380.

Katz, L.G. (1988). What should young children be doing? *American Educator* (Summer), 29-45.

Kienig, A. (2002). The importance of social adjustments for future success. In F. Fabian & A. Dunlop (Eds.), *Transitions in the early years: Debating continuity and progression for young children in early education* (pp. 23-37). London: RoutledgeFalmer.

Ministry of Education. (1996). *Te Whāriki: The early childhood curriculum.* Wellington: Learning Media.

Ministry of Education. (2007). *The New Zealand curriculum.* Wellington: Learning Media.

Neuman, M. (2002). The wider context. In F. Fabian & A. Dunlop (Eds.), *Transitions in the early years: Debating continuity and progression for young children in early education* (pp. 8-22). London: RoutledgeFalmer.

Peters, S. (1998). Gathering and sharing information on young children within the context of the transition of school. *SAMEpapers*, pp. 107-122.

Peters, S. (2003). Theoretical approaches to transition. *SET: Information for Teachers*, 3, 15-20.

Perry, B., & Dockett, S. (2004). Mathematics in early childhood education. In B. Perry, G. Anthony, & C. Diezmann (Eds.), *Research in mathematics education in Australasia* (pp. 103-125). Flaxton, QLD: Post Pressed.

Perry, B., & Dockett, S. (2005). What did you do in maths today? *Australian Journal of Early Childhood 30*(3) 32-36.

Pratt, C. (1985). The transition to school: A shift from development to learning. *Australian Journal of Early Childhood*, *10*, 11-16.

Timperley. H., McNaughton. S., Howie, L., & Robinson, V. (2003). Transitioning from early childhood education to school: Teacher beliefs and transition practices. *Australian Journal of Early Childhood, 28*(2) 32-38.

Young-Loveridge J. (1989). The development of children's number concepts: The first year of school. *New Zealand Journal of Educational Studies, 24*(1), 47-64.