

Numeracy Enacted: Preschool Families Conceptions of Their Children's Engagements with Numeracy

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The Catch the Future project was part of the DEST Literacy and Numeracy Innovative Projects Initiative and sought to improve literacy and numeracy outcomes for children living in low socio-economic circumstances in a region South-east of Melbourne. The intervention strategy that was implemented focused on children in preschool and child-care centres in the year prior to beginning school. Families were invited to take home a disposable camera and to capture the numeracy and literacy activities that their children were engaged in everyday literacy and numeracy activities. Opportunity was provided for them to share these and discuss them with other parents. Similarly, early childhood teachers were invited to document and share with each other their literacy and numeracy practices. This sharing included the presentation of feedback from the parent meeting. This paper will focus on the parents' conceptions of numeracy as reflected in the photographs and the focus group meetings. The photographs represented a rich range of contexts and mathematics that are embedded in the children's experiences at home and in the community.

Many children have well developed numeracy skills before they begin formal education (Aubrey, 1993; Ginsberg, 2002; Kilpatrick, Swafford, & Findell, 2001; Urbanska, 1993; Young-Loveridge, 1989). They frequently engage in informal mathematics in their everyday contexts (Bottle, 1998; Ginsburg, 2002). But what is the nature of the numeracy activities that children engage in at home or in the community? Guberman (2004) argued from his recent study that "engagement in cultural practices outside of school may have a profound impact on the knowledge that children bring to the classroom, knowledge that may provide a base for school instruction" (p. 145). How aware are families of the numeracy opportunities and contexts in which their children engage?

Outline of the Study

The focus of this study was an investigation into how families from lower socio-economic circumstances and educators in early childhood centres conceptualise and enact literacy and numeracy in their respective contexts. Through mapping the literacy and numeracy experiences of children in the home and in the early childhood centre it was hoped that the researchers could understand better how literacy and numeracy are perceived, constructed and enacted by children across contexts.

The study was informed by sociocultural theory, an approach in which attention is paid to specific social, cultural and historical aspects of development (Daniels, 2001). Qualitative data were gathered throughout the study in order to build a picture of how children work mathematically and engage in literacy within their home, community and preschool. The qualitative data were important for moving teacher thinking for intervention from considering only how to change the child, to a self-examination of teacher programs. For example, traditional thinking for intervention would build a program that "fixes up" the child through building a pathway for the child to where other less disadvantaged children are working, thinking and developing. However, more contemporary thinking (see Figure 1, from Willis, 2001) would be to change teacher

programs in ways which supported a diverse range of strategies for building literacy and numeracy outcomes for children – still arriving at the overall outcome, but in ways which engaged more with learners’ experiences- as shown below.

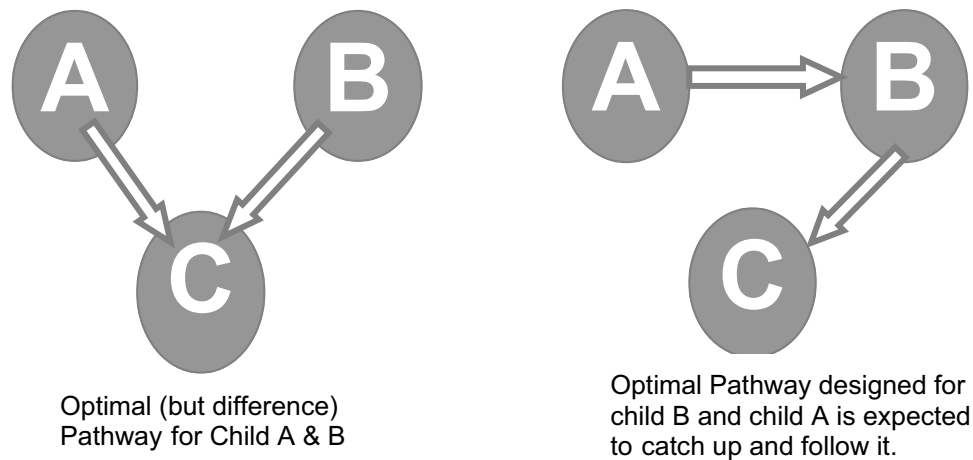


Figure 1. Alternate pathways. (Willis, 2001).

This view “does not treat the curriculum as neutral or ‘innocent’” (Willis, 2001) but rather suggests that children are different and schools and teachers need to understand, map and determine how programs can be built in ways that cater for diverse or different pathways for literacy and numeracy.

During the development phase of the project, staff working in the childcare centres and preschools invited families to take home disposable cameras, and photograph their child participating in literacy and numeracy activities in their home and community.

Photographs were developed and families prepared photo albums of their child’s everyday experiences. Selected photo albums were reproduced into a digital format and made into a PowerPoint presentation. Participating families came together, sharing their child’s experiences with each other, using their photo albums. Researchers and families discussed the everyday literacy and numeracy contexts that the children experienced. The selected photographs were loaded into a PowerPoint, alongside the parents’ comments and shared with both teachers and principals/directors in the centres and schools.

The focus of this paper is the families’ conceptions of numeracy as evidenced through the photographs and the discussions at the initial focus group meeting with parents.

Sample and Data Collection

Families from four pre-schools and one child-care centre were involved in the study. Only children and their families who were in the year prior to school entry were invited to participate. A total of 52 families returned their photographs.

Sixteen families participated in the family workshop where families shared their photographs in small groups. Each of the groups had a facilitator and a scribe. The scribe recorded the conversations directly into a laptop *in situ*. An overall facilitator monitored the group conversations to ensure that families discussed the following (Using Rogoff’s [1998] three lenses):

what everyone could see in the photographs about literacy and numeracy (personal lens);

what only the family could see in the photograph that is literacy and numeracy (interpersonal lens); and
what literacy and numeracy practices were so much a part of everyone's everyday life that you could no longer see them (institutional/cultural lens).

Findings

It was clear from the discussion with parents and from viewing the photographs that in most cases the mothers were the photographers. It is not clear who decided on the nature and extent of the photographs, however from the parent discussion the most common practice seemed to involve some child input. It was decided to initially categorise the photographs based on the question "What was the range and nature of the numeracy conceptions evidenced in the photographs?" This required an interpretation, as only the visual image was available. There were a small number of photographs for which additional data from the parent focus groups were available. Where available this information was used.

The photographs were first sorted into literacy, numeracy or unclear. The unclear category included both those photographs that could have represented either, such as an unidentifiable drawing task. The unclear category also included a large number of general images such as pictures of family member and shots that were dark or out of focus. At this stage an additional category was developed for images of the computer or video (IT based activities) that could not be classified as numeracy or literacy. There were 186 literacy, 170 numeracy and 28 IT based images.

Range and Extent of Numeracy Conceptions

The numeracy examples were further categorised based on the nature of the mathematical activity being evidenced. These categories were both mathematical and context oriented. This reflects a difference in the way the images were presented by the parents. In addition to the images, the associated comments from the parents are included here. These provided valuable additional insights into the selection as the photograph and comments in Figure 2 illustrates.

"he took it that as far as he was concerned, he was allowed to take the photos – there's the family dog.

But that's how we started him counting, one dog, one cat, by two and a half he was able to count to ten!"



Figure 2. Photograph and explanation.

Numeration. The largest category of images involved direct numeration (58 images). This included contextualised examples such as recognition of house numbers and counting down on the microwave as well as more formal numerical charts, the writing of numbers and numerical games. The numbers involved were mostly single digit but the selection of larger numbers was also evident (see Figure 3). This conceptualisation of numeracy as

number is not surprising. It is interesting and even surprising that parents went beyond this at all.



Figure 3. Sample numeration images.

Shape and spatial activities. There were 46 images of children engaging in spatially-focused activities including drawing shapes and making shapes. There was also a recognition of contextualised space experiences.

I let him cut his sandwiches, use his hand skills. He likes his sandwiches in different shapes. He cut a little square. Then it is cut into triangles. He is learning his own shapes.

There were children using shapes and blocks. Jigsaw puzzles were included in this category unless they were specifically numerical in which case they were categorised as numeration.

Cooking. There were 20 images categorised as cooking. These mostly involved the measuring of ingredients, however the sequence illustrated in Figure 4 suggests a rich and varied mathematical experience.



Figure 4. Sequence of cooking images.

Game playing. A number of the images involved children playing games individually, with friends and with adults. These included strategy games, sorting games, mathematics related computer and video games, memory games and traditional games such as monopoly. There were 16 game playing images plus a number of specific number recognition games that were categorised as numeration.

Money. Twelve of the images presented money, cash registers or shopping situations. These were a particular focus of the comments from the parents.

He's counting his money from his money box (referring to photo). I let him spend his money, teach him about his money. (He must learn that) he can't have everything, and I teach him to save his money, collect and count out the pocket money.

She likes to take her purse (when we go to the shops) and pay for it herself. She gets cross with me if I give her the right amount of money. (She says) "I didn't get the change!" Otherwise she feels she's getting ripped off. It's a big learning curve.

We have lots of games and CDs to keep them busy; lots of things she likes to do. My son is really good at maths, and she really likes to do what he is doing, and he likes the calculator, and that is what she is doing (referring to photo). She is counting her pocket money to see if she has enough to buy what she wants to buy.

Sorting and Classifying. There were seven images categorised as sorting or classifying. The following quote relates to the image in Figure 5.

He likes the Melways and plays with his cars for hours lining them up and counting and sorting them.



Figure 5. Sorting cars.

Measuring. There were eight measurement-focused images that included a height chart, a watch and a clock. Some contextual examples were included comparison of length and the use of dress patterns.

Travel/ location related. The images and comments evidence some parents' awareness of the mathematical aspects of location.

Well the number thing, we go walking every day and they got into the habit of counting the numbers on the house and sometimes it would take us half an hour extra because we were counting. My daughter has an uncanny sense of direction. She will say we are nearly at Nannie's. We went to the snow, and she had been to Healesville Sanctuary and she recognised that. It actually blows me away sometimes, like if I go a different way she says, "That's not right!"

Clearly these children were engaged in rich and varied mathematical environments and the parents had some awareness of the range of mathematical activities in which their children were engaged.

Impact on the Families

Many of the parents related that through being involved in the project they had become much more aware of the scope of literacy and numeracy experiences they engaged in on a day-to-day basis. They were able to make explicit the incidental, though not accidental, numeracy opportunities.

There is much more to this literacy and numeracy than you realise, you know, from day one.

Every time I tuned in he was actually learning, everything was literacy and numeracy.

We read to them, we write, but you don't realise you do it (develop literacy and numeracy with their children). It is just embedded.

Conclusion

Drawing on Rogoff's (1998) three foci of analysis, this study demonstrated the extensive numeracy enactments occurring within many families in lower socio-economic circumstances. The study highlighted not only the rich constructions of mathematics that individual children were achieving (personal focus of analysis), but also the important interpersonal relationships that were actively supporting and extending these constructions

(interpersonal focus of analysis). Further, it evidenced the value placed by families within the study on supporting their children's learning in numeracy (community focus of analysis), as is illustrated in the following quotes from parents at the family workshop.

Here she is measuring out the flour and here we are making fairy bread, It is just us at home, and so here we are playing board games, like memory and the cards, and she has to work out which is which... This is her coming shopping with me and she is counting out the bananas, I said that I wanted three.

We did a letter drop, because we have a fundraiser. I gave B a pile and said I will do these numbers and you do those. Shapes, we play a game, like in the summer and we will look at the clouds and she will say "Mummy that cloud looks like a triangle" or she might count how many cars going by. We play I spy with my little eye, we might change it to shapes or colours.

Setting the table, knife and forks. Before J came along, S knew it was one more. (He knows) who is missing, "so we only need four". He has learnt to subtract, cups. The same thing, he realises there is only two of them, so he will only get two cups out. Eggs – one day I asked him to get four eggs. (Then I asked him) "How many brown eggs have we got and how many white eggs?" Or he will get them himself and can tell me.

These quotes from the parents provide evidence of rich informal mathematics in these everyday experiences. The nature of these and the parents' ability to articulate them was a surprise to many of the teachers in the project:

It is interesting because I think they are doing a lot at home, but we are not aware of it under its titles.

(I was surprised) to see that some families were working with children in the kitchen. They pulled up a stool and did counting and measuring.

Most readily acknowledged that they had previously underestimated their families:

'I was surprised by those who took up the offer (to be involved in the project); their socioeconomic backgrounds. They were just as keen as the others to be involved in the project. S (one of the parents from a low socioeconomic background) knows. She uses the terminology.'

Graham, Nash and Paul (1997) argue that "it is imperative that we understand children's understanding of mathematics prior to formal schooling" (p. 37). The challenge for preschool and early years teachers is to connect and build upon this rich base of mathematical experiences in ways that acknowledge and support the family's role. To cater for different and diverse pathways of these children.

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