The Social Origins of Pre-fraction Knowledge in Three Year Olds

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Where do young children's ideas about fractions and sharing come from? We have looked at this question with four year olds - pre-school children just about to begin formal schooling. In a study of more than 200 children (Hunting & Sharpley, Ch. 2 this vol.) 60 per cent were observed to use what we have called the dealing strategy. The dealing strategy is a procedure for distributing a collection of discrete items equally between recipients. It involves a cyclic and systematic item-to-recipient sequence of actions which guarantees each recipient has an equal quantity. Children of age four also have a spectrum of ideas about the fraction one half (Hunting & Davis, Ch. 3 this vol.).

Researchers have begun to focus on the origins of informal mathematics knowledge that children acquire prior to that taught in classrooms (see for example, Carpenter & Moser, 1984; English, 1990; Gelman & Gallistel, 1978; Irwin, 1990; Miller, 1984; Steffe & Cobb, 1988; Resnick, 1989). In particular, there have been some studies of the role of home and family in forming early mathematical understandings (Saxe, Guberman, & Gearhart, 1987; Walkerdine, 1988; Walkerdine & Lucey, 1989).

Observation and informal conversation with parents suggested to us that there are a multitude of moments in the home and at play when opportunities to develop the precursors of numerical thinking, and in particular fractional number, occur. For example, opportunities to observe or participate in sharing out sweets, dividing desserts, cutting toast and sandwiches, sharing toys, helping prepare meals, and so on, are but some

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of the potentially rich situations upon which meanings for later mathematical symbolism and notation might be associated.

The aim of this study then, was to further investigate the origins of children's fraction knowledge in children of age three. We were keen to study similar questions as we had done with four year olds, but we decided to search for clues about how young children come to acquire the (relatively) sophisticated skills we had observed in our earlier research. To this end we deliberately set out to design a study that would allow us to gain some understanding of home and environmental factors that might explain how young children developed the cognitive skills of dealing, and other mathematical concepts associated with fractions. In particular, we wanted to talk to parents about activities their children engaged in, as well as interactions with others, and especially the role subdividing food portions might play. Specific questions of interest included:

- Do three year old children know the dealing procedure? If so, what is its nature and extent? Specifically, how do three year olds distribute discrete items in simple sharing tasks involving dolls?
- What do three year old children understand by the terms one half, one quarter?
- What environmental influences seem potent for provoking development of the dealing procedure? In particular, are there particular factors in the home which contribute to young children's pre-fraction knowledge, and if so, what might these factors be?

We decided to investigate aspects of interest of young children's pre-fraction knowledge by individual interview. Each interview was video recorded. Information about home and family influences was gathered by giving the video tape to the parents to view privately, followed by an interview at the parent's home to discuss the video interview, evaluation of responses to a questionnaire developed for the study, and records of general information about home activities elicited through conversation with parents.

Method

Twenty one children from two different pre-schools were individually interviewed using the clinical method (Hunting, 1983; Opper, 1977). Twelve children (mean age 3 years 8 months) attended a private kindergarten for three year olds two half days per week in the Melbourne outer Eastern suburb of Warrandyte. Parents' combined income was spread evenly across three broad bands: $20,000-35,000; $35,000-50,000; and greater than $50,000 per year. Their occupations represented a cross