

A STUDY OF THE INFORMAL  
AND FORMAL KNOWLEDGE OF  
NUMBER POSSESSED BY  
CHILDREN IN THEIR FIRST YEAR  
OF SCHOOL

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### CERTIFICATE

I certify that the substance of this thesis has not already been submitted for any degree and is not being currently submitted for any other degree.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

A solid black rectangular box used to redact the signature of the author.

(signature)

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## INTRODUCTION

This study dealt with two issues associated with development of early number knowledge possessed by young children in their first year of school. Traditionally, young children entering their first year of school were seen to possess no knowledge, and it was the role of the teacher to impart knowledge to children. Piaget (1952) proposed that children develop knowledge which they bring to school and continue to build on from their own experiences. This theory of learning is known as constructivism. Other researchers (Baroody, 1987; Fuson, 1988; Gelman & Gallistel, 1978; von Glasersfeld, 1989) have elaborated on Piaget's constructivism in the early development of number, proposing that children develop their own informal mathematics before entering school. The process of development of early number knowledge in young children aged 4, 5 and 6 years has been the focus of recent research (Carpenter & Moser, 1983; Fuson, 1988; Steffe & Cobb, 1988; Wright, 1991, 1994) which has developed a number of theories about stages and levels involved in the process. A number of researchers (Aubrey, 1993; Urbanska, 1993; Wright, 1992, 1994; Young-Loveridge, 1989) have considered the number knowledge possessed by young children in their own regions; finding that many young children possess a well developed number knowledge beyond that expected of them on beginning school.

There is little current literature available on the mathematical knowledge of children entering Queensland schools and their progress in their first year of school. Evidence suggests that children entering their first year of school in Queensland may possess knowledge of number beyond that expected. Furthermore, the effect of the first year of formal number instruction in school on young children beginning school is not clear, particularly within the Queensland Education System. Hence two aims were defined for this investigation. Firstly, the study assessed the informal knowledge of number that children, beginning their first year of school in Queensland, brought with them. Secondly, the study traced the development and interaction of formal knowledge with informal number knowledge throughout the first year of school.

Further aspects of the research included a detailed description of the processes used by children to solve simple addition and subtraction tasks, place value questions, and reversibility problems. An assessment of the suitability of the Queensland Syllabus for children in their first year of school was also observed. Of particular interest was the progress of individual students over the year who showed differing levels of ability in number.

Both studies were conducted using the same series of interview questions. The longitudinal study used the questions in three interviews throughout the year. Data collected was considered in light of the work of Carpenter and Moser (1983), Fuson (1988); and Steffe and Cobb (1988) on stages of early number development. Also, the SOLO taxonomy of Biggs and Collis (1991) was used as a theoretical model. The SOLO model facilitated analysis of the interviews conducted over the year, and also, it was a means for assessing the progress of the group and development of number concepts throughout the study.

The study is detailed and discussed here in seven chapters. Chapter One is a review of current literature concerning theories on number development, and research in the understanding of number in young children, specifically aged four-to-six years.

Chapter Two reviews the SOLO Taxonomy as a theoretical model. The development of the model based on the work of Piaget and structure of SOLO are outlined including the Modes and the Levels featured in the SOLO model. The application of SOLO to teaching strategies and learning cycles is discussed, along with current number research using the SOLO model. Finally, the relevance of SOLO to this study is considered.

The study design is detailed in Chapter Three. A brief description of the Queensland school system and Year One syllabus is provided along with a profile of the schools involved in the study. The interview questions are detailed and a data analysis plan is provided.

Chapter Four discusses the results of the initial study conducted in February of the first year of school. Chapter Five details the levels observed throughout the longitudinal study with a description of overall trends and progress over the year. Chapter Six considers the response categories in terms of the SOLO Taxonomy.

Finally, Chapter Seven draws together the results and findings of the study. This chapter considers the limitations of the study then presents the overall result of the study and a discussion of other aspects raised throughout the study. Finally, the implications for theoretical development in terms of levels of number understanding in young children and areas of further research are presented.