

Promoting Preschoolers' Number Sense and Interest in Learning Mathematics:  
How Should Parents Interact with Their Children during Home Numeracy Activities?

CHEUNG, Sum Kwing

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## **Abstract**

Through two related studies, this dissertation investigated how parents should interact with their preschool children during home numeracy activities, such as number board game playing, so as to promote children's number sense and interest in mathematics.

In Study 1, I examined Hong Kong preschool children's number sense development and their competence in playing number board game. Furthermore, I investigated whether parents had utilized number board game playing experiences to foster their preschool children's number sense and interest in mathematics. The relations of the prevalence of various numeracy-related events during number board game playing to children's number sense and interest in mathematics were also explored. Fifty-one Hong Kong three- to six-year-old preschool children were first tested on eight number sense tasks (including object counting, rote counting, missing number, numeral identification, numeral writing, numerical magnitude comparison, addition, and subtraction). Their interest in mathematics was also measured. Then, parents of these children were asked to play a number board game with their children in dyads. The parent-child interactions during the game were coded and analyzed. Results showed that third year kindergarteners (K3) performed better than second year kindergarteners (K2) on all number sense tasks except object counting and rote

counting. K2 children performed better than first year kindergarteners (K1) on all number sense tasks except addition and subtraction. Usually, by K2, children could start to play number board games. When parents played number board game with their preschool children, they seldom elicited children's participation during their turns to move the token. The events "announcing the final number," "announcing the numbers passed through," and "stating the numerical relations of the final number to other numbers" only rarely occurred, though the prevalence of these events was positively associated with some components of children's number sense (e.g., numeral identification, numeral writing, addition, and subtraction).

In Study 2, I investigated the extent to which offering a training program to parents on strategies of interacting with preschool children during number board game playing, together with regular playing of number board games with children, could promote children's number sense and interest in mathematics. Ninety-one K2 children and their parents were recruited as participants; and an experimental design that involved the pre-test-post-test comparisons of four conditions (i.e., the game with a training condition, the game condition, the exercise condition, and the control condition) was used. Results showed that among children who were not very skilled in mathematics, number board game playing shared some similar educational benefits with completing mathematics exercises from books, such as promoting children's rote

counting and two-digit numeral writing skills. When parents received training, number board game playing could even promote children's addition skills. No matter whether parents received training, number board game playing could promote children's interest in mathematics.

Findings of these two studies suggest that home numeracy activities, such as number board game playing, can promote preschool children's number sense and interest in mathematics. Nevertheless, parents may not be aware of the opportunities to incorporate numeracy into these activities. Therefore, training of parents is needed.

## 摘要

本論文透過兩項研究，探討家長與幼兒在家進行數字棋盤遊戲時，應如何與幼兒互動，以培養幼兒的數字感及學習數學的興趣。

研究 1 旨在檢視香港幼兒數字感的發展趨勢，以及不同級別幼兒參與數字棋盤遊戲的能力。此外，研究 1 會考察家長與幼兒進行數字棋盤遊戲時的表現，並探究其與幼兒數字感及學習數學的興趣的關連。因此，研究 1 收集 51 名香港三至六歲幼兒在八項數字感測試的得分，以及其學習數學的興趣水平，並邀請這些幼兒與其家長進行一個數字棋盤遊戲。研究結果發現，在不少數字感測試項目中，各級別幼兒之間都存有顯著的差異。一般而言，低班幼兒已具備參與數字棋盤遊戲的能力。當家長與幼兒進行數字棋盤遊戲，並輪至他們移動棋子時，他們很少邀請幼兒參與其中。雖然「辨讀棋子移動後所停留方格中的數字」、「辨讀棋子移動時所經方格中的數字」及「辨識棋子移動後所停留方格中的數字與其他數字的關連」三項行為在家長與幼兒互動時甚少出現，但有關行為的出現程度與幼兒部份數字感元素有著正向的關連。

研究 2 旨在了解當家長接受親子活動策略訓練後，家長定期與幼兒進行數字棋盤遊戲，能否培養幼兒的數字感及學習數學的興趣。因此，研究 2 以實驗形式，邀請四組共 91 位家長與其低班幼兒在家進行不同的親子活動（經訓練的遊戲組、遊戲組、紙筆練習組，以及控制組），然後比較各組幼兒在前後測的表現。研究結果發現，對數學能力非特別優異的幼兒而言，數字棋盤遊戲與紙筆練習兩

者均能提升幼兒數字序列背誦及兩位數字認讀的能力。當家長接受訓練後，家長定期與幼兒進行數字棋盤遊戲，更能提升幼兒加法運算的能力。不論家長接受訓練與否，定期與幼兒進行數字棋盤遊戲能培養幼兒學習數學的興趣。

歸納以上研究結果，本論文顯示家長可透過與幼兒在家進行有關數字的活動，培養幼兒的數字感及學習數學的興趣。然而，不少家長與幼兒進行有關活動時，往往未有充分把握教學機會。因此，家長有需要接受有關方面的訓練。