Chapter 10
Do Hong Kong Parents Engage in Learning Activities Conducive to Preschool Children's Mathematics Development?

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Abstract The success of students from Chinese-heritage cultures in international tests of mathematics has led researchers to examine whether the reasons for these students' success lie in their superior mathematics-related cognitive skills, the school environment or the home. This book chapter contributes to the research literature by focusing on the contribution of parents from Chinese-heritage cultures to their children's success in mathematics. Specifically, I examined the use of interaction strategies fostering counting skills within a sample of 174 families with preschool-aged children from Hong Kong, a city that ranked third in the latest PISA results in mathematics. In addition, I also explored whether parents' interactional behaviour was related to factors such as socioeconomic status (SES), class level of the children, parents' proficiency in and past motivation to learn mathematics. The results showed that the three most frequent strategies were counting forward, using real objects to illustrate mathematics concepts and providing prompt questions. SES was only a significant predictor for the use of prompt questions, while children's class level contributed to the strategies of counting backward and using worksheets. Finally, parents' motivation significantly predicted the use of stories to teach number concepts. Implications for future studies are discussed.

Keywords Hong Kong parents · Preschool children · Mathematics learning · Interaction strategies · Chinese-heritage culture

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Introduction

The release of the latest PISA results on mathematics (OECD 2014) was reaffirming to educational authorities, teachers and parents in Asia. The three countries or cities that top the performance chart all share a Chinese heritage: Shanghai-China, Singapore and Hong Kong-China. There are two important aspects of the results. First of all, the results are consistent with extant data showing the superiority of students in Chinese-heritage cultures in tests of mathematics achievements (e.g., Mullis et al. 2008; OECD 2001, 2003; Stevenson et al. 1986, 1990; TIMMS 2011; Wang and Lin 2009). Secondly, consistent with previous findings (Hsu 2007, cited in Anderson et al. 2010), there appeared to be little differences related to socioeconomic status (SES) in the top-performing countries. This presents a sharp contrast to past studies conducted in English-speaking countries which often have found a strong SES effect on children's academic achievement (e.g., Bradley and Corwyn 2002; Chiu and Khoo 2005; Chiu and Zeng 2008; Perry and McConney 2010; Sirin 2005).

Different approaches have been used in order to explain the remarkable mathematics achievement of students in Chinese-heritage cultures. Some studies used the cognitive approach which focuses on how differences in mathematics-related skills contribute to students' mathematics achievement (for information related to the types of skills predicting mathematics achievement, see e.g., Kytala and Lehto 2008; Taub et al. 2008; Zhang et al. 2014). An important skill hypothesised to be important for mathematics achievement concerns counting (see e.g., Ryoo et al. 2014). In terms of pronunciation, a Chinese number tends to contain fewer syllables than the corresponding number in English (e.g., Dehaene 1997). For example, the number 577 has 5 syllables in Chinese compared to 9 syllables in English (compare *wu3 bai3 qi1 shi2 qi1* 五百七十七 vs. five hundred and seventy-seven). However, Miller (1987) found no reliable cross-cultural differences in the way children skip or double count objects. Later cross-cultural comparisons also revealed minimal differences in general skills (e.g., physical size comparison) predicting mathematics achievement (e.g., Rodic et al. 2014).

Other studies used the sociocultural approach which emphasises how agents in the environment, such as teachers and parents, create the context for children's success in mathematics (e.g., Chen 2005; Hung 2007). Gu (2006) found that the school learning environment had more effect on school mathematics achievement in Hong Kong than in Canada in a secondary analysis of the PISA 2003 data. However, the fact that school environment has a major role in students' mathematics achievement does not necessary imply that classroom teaching is "innovative" in Chinese-heritage cultures. Studies focussing on classroom learning revealed that teachers of mathematics in Chinese-heritage cultures tend to adopt a more teacher-centred approach in comparison to their counterparts in other countries (e.g., Leung 1995). There appeared to be much fewer peer interactions and small group discussions, since the teaching in the Chinese classrooms were mostly teacher-led and conducted in the whole-class setting. In addition, direct and explicit instruction and problem practice (within and outside classroom) are essential features of mathematics lessons in these cultures. A lesson typically begins with a revision of the content from the previous lesson, followed by the teacher's direct explanation of a mathematical concept, the presentation of sample problems and further in-class and take-home practice. Since classroom teaching may not contain the main reason for the students' success, other studies turned to the area of parenting practice and proposed that parents in Chinese-heritage cultures create the context for their children's success in mathematics by directly communicating to their children their academic expectations and other important values (e.g., academic pursuit is an important goal in life; success derives more from diligence than intelligence) (e.g., Ho 2000, 2006; Leung 2002; Leung et al. 1998; Phillipson 2009; Phillipson and Phillipson 2012). This view was confirmed, for example, in a series of studies focussing on school-aged children in Hong Kong which showed that parental expectations mediated the relationships between cognitive abilities and achievement in mathematics (Phillipson 2006; Phillipson and Phillipson 2007, 2012).

The brief review above suggests that parents appear to play a stronger role than teachers or cognitive abilities in shaping the academic achievements of students in Chinese-heritage cultures. Since the role of parents may vary with the developmental status of their children and because cross-cultural differences in mathematics achievement appear to emerge as early as the preschool years (e.g., Ryoo et al. 2014), examining the contribution of parents with preschool children is as important as studying parents with school-aged children. Past studies conducted in Shanghai (e.g., Gao 2010; Zhou 2006; Zhou et al. 2009) suggested that parent-child interactions relating to mathematics, especially counting (e.g., talking about numbers, modelling counting words and counting procedures), may serve as the primary developmental mechanism in promoting young children's number understanding in the early years. These types of interactions focus on facilitating children's attention to number, modelling basic number skills, and helping children to practice and apply new number skills. The study described in this chapter contributes to the literature and extends previous studies by focusing on how parents in Hong Kong facilitate their *preschool children's* mathematics learning before school becomes a primary source for mathematics education. In addition, since parents' attributes, such as their past motivation to learn mathematics and their proficiency in the subject (see e.g., Dandy and Nettelbeck 2002), might influence their behaviour, this chapter also explored whether these parental attributes influence parent-child interactions relating to mathematics. Specifically, I will address the following research questions:

- *What is the style of interaction between parents and preschool children in Chinese-heritage cultures?*

I addressed this question by exploring the types of parent-child interaction strategies relating to mathematics learning. The strategies include: the use of stories to teach number concepts, the use of real objects to illustrate a concept (e.g., counting the number of cookies on a plate. One, two, three. Three cookies), the use of prompt questions while children interact with real objects (e.g., when the child is about to get the chicken wings on a plate, the parents ask how many chicken wings there are on the plate), relating a mathematical concept to real life situations (e.g., ask children to assist buying things according to a shopping list), the use of statistics (e.g., creating a pictogram showing the total number of family members who like apples), counting forward (e.g., 1, 2, 3, 4, 5, 6, 7, 8…), counting backward (e.g., 30, 29, 28, 27….), and using worksheets. These eight strategies were chosen because they are all related to number concepts, especially counting, but differ mainly in the amount of contextualisation. The first five strategies are more contextualised than the last three, and rely less on rote memory/drilling. In addition, the strategies of interest are more specifically related to early mathematics learning than the types of family involvement traditionally described in the literature (e.g., cultural communication, social communication, homework supervision, and cultural activity as used in the PISA studies, see Ho 2006).

- *What predicts parents' interactional behaviour?*

I addressed this question by examining the factors that contribute to parents' use of specific interaction strategies. The factors include: SES, class levels of the children (at entry to preschool vs. at exit from preschool), parents' past mathematics proficiency in school (henceforth parental proficiency), and parents' past motivation to learn mathematics (henceforth parental motivation). SES is chosen because whilst there appear to be little SES-related differences in mathematics learning outcomes among school-aged children, the presence of initial SES differences in math-related parent-child interactions remains a possibility. Children's class level was also used because parents' choice of a particular strategy (e.g., the use of stories vs. using worksheets) might be sensitive to the class level of the children. Parental proficiency and motivation were included because I want to explore whether these variables influence parents' use of interaction strategies. Previous studies tended to focus on motivation of learners rather than their parents (e.g., Chen et al. 1996).

- *From parents' viewpoint, what enables students in Chinese-heritage cultures to have superior performance on international tests of mathematics in comparison to their peers in other cultures?*

I examined this question by exploring whether parents think that the success is due to factors such as students' diligence, presence of high-quality teachers, additional training provided by private tutors, difficult syllabus, parental devotion and expectations. Since two of these factors concern parents (parental devotion and expectations), I also explored whether parents' beliefs about these two factors were related to their interactional behaviour at home.

Hong Kong was chosen as the site for this study for three reasons. First, it has a unique history. Because of its status as a former British colony, new ideas from the West (e.g., the sociocultural approach to learning) were often assumed to reach the city before reaching the rest of China. Second, Hong Kong parents are known to be strong "interventionists". They might require their children to engage in developmentally inappropriate activities with the hope of increasing their children's competitive edge over other children. There were anecdotal reports of Hong Kong pre-schoolers spending too much time on after-school learning activities (HKET 18/07/2014). Finally, conflicting ideas are known to co-exist in the Hong Kong

Chinese culture. In the case of religion, Christianity, Buddhism and Taoism could co-exist within the same family. In the area of education, conflicting learning approaches (e.g., phonics and whole language in the area of language learning) are often adopted in the same preschool language classroom (personal observation). It is unclear whether math-related interaction strategies which differ in terms of contextualisation can co-exist. All these reasons make Hong Kong a fertile ground for a case study of parent-child interaction relating to mathematics.

Methods

Participants

The survey included 174 families whose children (83 females, 88 males) were attending either the first (N = 77) or final (N = 94) year of their preschools (in Hong Kong, preschool education lasts for 3 years and serves children between 3 and 6 years of age). For the younger age group, the mean age of the children was 42.67 months (SD = 4.28 months), ranging from 39 to 46 months. For the older age group, the mean age was 67.91 months (SD = 4.98 months), ranging from 60 to 72 months. Sixty seven of the children were enrolled in a competitive, high cost preschool (monthly school fees = HKD$ 3,200 or USD$ 411), which I characterise as a "high SES" school. The rest of the children were enrolled in a school located in a government-run shopping mall in a district that has one of the lowest median income levels and the highest unemployment rate in Hong Kong (Hong Kong Census and Statistics Department 2013), which I characterize as a "low SES" school. The school fees of the children in the low SES school were highly subsidized by the Hong Kong Government through a fee-subsidizing program (monthly school fees = HKD$ 1,409 or USD$ 181). With respect to the educational level of the parents, in the high SES school, 55.2 % of the fathers and 50.7 % of the mothers had a university degree or above. In the same school, 77.4 % of the families had household income higher than HKD$ 40,000 per month (approximately USD$ 5,155). In the low SES school, only 27.3 % of the fathers and 21.4 % of the mothers had a university degree or above. A total of 71.4 % of the families had monthly household income lower than HKD$ 20,000 (approximately USD$ 2,577). Since school SES is related to children's learning over and above individual SES, even in Chinese populations (Zhao et al. 2012), I used the dichotomised SES data at the school level in subsequent analyses. With respect to the parents' self-reported proficiencies in mathematics and past motivation to learn mathematics, on a scale of 1–7, the mean values were 4.53 (SD = 1.16) and 4.57 (SD = 1.24) respectively. Further analyses revealed SES differences in parents' self-reported proficiency in mathematics, $F(1, 172) = 18.02$, $p < 0.01$, with higher SES parents reporting a higher self-reported proficiency in mathematics (4.99 vs. 4.25). The results for self-reported past motivation to learn mathematics was marginally significant, $F(1, 172) = 3.84$, $p = 0.05$.

Survey Tool

An investigator-designed questionnaire consisted of four sections seeking information on the families' demographic details (e.g., parental education, income levels), parents' beliefs (e.g., factors contributing to the superior mathematics performance of students in Chinese-heritage cultures), types of interaction strategies aiming to promote preschool children's mathematics learning (e.g., the use of stories, real objects and prompt questions helping young children to learn mathematics) and parents' attributes relating to mathematics (e.g., past proficiency in and motivation to learn mathematics). The items in the questionnaire came from another ongoing study that examines the type of interaction strategies used by Hong Kong preschool teachers when they teach children mathematics. The draft questionnaire was first reviewed by a panel of three experts in the field of early numeracy development, and then piloted on five Hong Kong Chinese families. Based on family feedback, the items were subsequently revised and clarified. The questionnaire was re-administered to the same families two weeks after the first administration. Only one family changed their responses substantially because the mother had given up a full time job temporarily and therefore spent more time with her children.

Analysis

All analyses were conducted using SPSS version 19.0 (SPSS Inc., Chicago IL 2011). Missing data was handled with listwise solution. Raw scores were used in the analyses. All variables were inspected for univariate outliers (>3 SDs from mean), and no outliers were found. To simplify data analyses, I first conducted a series of *t*-tests to examine whether the interaction strategies of interest were related to children's gender. No gender differences were found (all *p*s > 0.10); hence further analyses collapsed data across gender. I then explored whether the interaction strategies employed were sensitive to the class level (at entry to preschool vs. at exit from preschool) of the children. The analyses showed significant class-level differences only for two of the variables: counting backward (t (171) = −5.52, $p < 0.001$) and the use of worksheets (t (171) = −2.24, $p < 0.05$), with parents more likely to use worksheets and backward counting with children who were in their final year of preschool education than in the first year.

Results

Table 10.1 shows the means, standard deviations and the correlation coefficients of the variables. On a scale of five (1 = never; 2 = rarely; 3 = sometimes; 4 = usually; 5 = always), parents reported more use of the following strategies than other strategies: counting forward (Mean = 3.70), presenting real objects (Mean = 3.40)

Table 10.1 Means, standard deviations, and correlation coefficients among all variables

	Mean	SD	Correlation									
			1	2	3	4	5	6	7	8	9	10
Parents' proficiency	4.53	1.16	–									
Parents' motivation	4.57	1.24	0.580**	–								
Stories	2.84	0.773	0.170*	0.226**	–							
Real objects	3.40	0.876	0.083	0.089	0.394**	–						
Prompt questions	3.29	0.879	0.205**	0.176*	0.391**	0.564**	–					
Relate to real life	2.99	0.905	0.135	0.086	0.314**	0.314**	0.586**	–				
Statistics	3.04	0.982	0.149	0.158*	0.249**	0.138	0.293**	0.423**	–			
Counting (forward)	3.70	0.850	0.214**	0.156*	0.303**	0.381**	0.427**	0.365**	0.318**	–		
Counting (backward)	2.76	0.974	−0.002	0.114	0.197**	0.045	0.215**	0.328**	0.369**	0.231**	–	
Use of worksheet	2.98	0.943	0.146	0.138	0.395**	0.194*	0.281**	0.376**	0.253**	0.221**	0.379**	–

* indicates $p < .05$, ** indicates $p < .01$

and providing prompt questions (Mean = 3.29). Stories and counting backward did not appear to be common interaction strategies (Mean values = 2.84 and 2.76, respectively). Correlation matrix shows that the correlations among all the interaction strategies were significant except for the correlation between real objects and statistics/counting backward. The significant correlations suggested that parents' use of contextualised strategies (e.g., the use of stories, presenting real objects) and decontextualized strategies were related (e.g., the use of worksheets).

Relations Among Interaction Strategies, SES, Children's Class Level, Parents' Self-reported Proficiency in Mathematics and Their Past Motivation to Learn Mathematics

Next, I examined the extent to which the various predictor variables contributed to parents' interaction strategies. For each interaction strategy, a multiple regression model was run with SES, children's class level, parents' self-reported proficiency in mathematics and their past motivation to learn mathematics as predictors. In total, eight regression models were run. SES and children's class level are coded as dummy variables (0 = low SES, 1 = high SES for the SES variable; 0 = at entry to preschool, 1 = at exit from preschool for the children's class level variable). The results for each regression model are as follows:

Use of stories. The regression model was significant, F (4, 168) = 3.51, $p < 0.01$, accounting for 7.7 % of the variance. Among the four predictors, only parents' past motivation to learn mathematics contributed significantly to the use of stories ($\beta = 0.19$, t (168) = 2.10, $p < 0.05$).

Use of real objects. The regression model was not significant, F (4, 163) = 1.26, $p > 0.05$. None of the predictors were significant (all ps > 0.07).

Prompt questions. The regression model was significant, F (4, 169) = 5.15, $p = 0.001$, accounting for 10.9 % of the variance. Among the four predictors, only SES contributed significantly to the model ($\beta = 0.234$, t (169) = 3.05, $p < 0.01$). The result indicated that the more affluent parents were more likely to ask prompt questions when their children were manipulating objects in comparison to the lower SES parents.

Relate to real life. The regression model was not significant, F (4, 168) = 1.78, $p > 0.05$. None of the predictors were significant (all ps > 0.14).

Statistics. The regression model was not significant, F (4, 166) = 1.65, $p > 0.05$. None of the predictors were significant (all ps > 0.30).

Counting forward. The regression model was significant, F (4, 168) = 2.62, $p < 0.05$, accounting for 5.9 % of the variance. However, none of the four predictors contributed significantly to the model (all ps > 0.11).

Counting backward. The regression model was significant, F (4, 168) = 8.70, $p < 0.001$, accounting for 17.2 % of the variance. Among the four predictors, only class level contributed significantly to the model (β = 0.39, t (168) = 5.50, $p < 0.01$). Parents were more likely to do backward counting with their older children than with their younger children.

Use of worksheets. The regression model was significant, F (4, 168) = 2.61, $p < 0.05$, accounting for 5.8 % of the variance. Among the four predictors, only class level contributed significantly to the model (β = 0.18, t (168) = 2.33, $p < 0.05$).

Reasons Why Students in Chinese-Heritage Cultures Had Superior Performance in International Tests of Mathematics

Next, I was interested in the factors that parents attribute to the success of students in Chinese-heritage cultures in international tests of mathematics. Parents were asked to judge six statements (binary options: agree or disagree): (1) The local mathematics syllabus is difficult (henceforth syllabus); (2) There are lots of high calibre mathematics teachers in Asia (henceforth teachers); (3) Students in Chinese-heritage cultures are diligent (henceforth diligence); (4) Mathematics tutors in after-school classes contribute greatly to students' achievement in mathematics (henceforth tutors); (5) Parents in Chinese-heritage cultures are devoted to helping their children to achieve (henceforth parental devotion); and (6) Parents in Chinese-heritage cultures have high expectations of their children's academic performance (henceforth, parental expectation).

As shown in Fig. 10.1, diligence and parental expectation were the two most important factors (84 and 79.9 % respectively) in why parents think students in Chinese-heritage cultures have superior performance in international mathematics tests compared with students from other cultures. With respect to the role of other potential factors, tutors appeared to be as important as teachers (79 vs. 78.2 %). Finally, 75.6 and 73.6 % of the families believed that the students' success can be attributed to parental devotion and the difficult syllabus respectively.

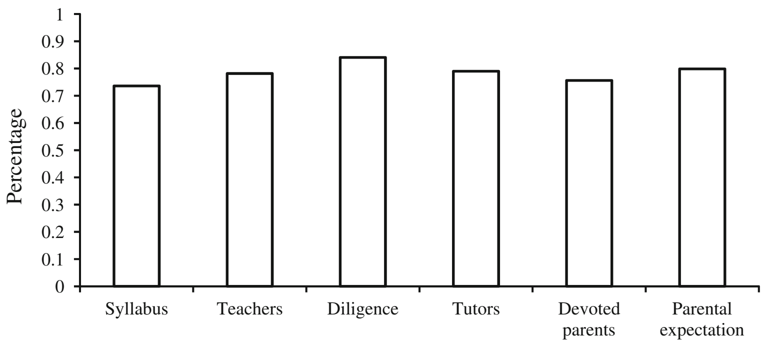

Fig. 10.1 The percentage of parents who supported each statement

In the final step of analyses, I investigated whether parents' responses to two of the statements (statement 5: parental devotion; and statement 6: parental expectation) were related to their use of interaction strategies at home. These two statements were chosen because they are specifically related to parents' attributes. A series of *t*-tests was conducted to explore if the parents who supported these statements used the home interaction strategies differently from those who did not. To simplify data analysis, I categorized the eight interaction strategies into two types (contextualised and decontextualized). The results showed that the parents who supported the statements did not differ from those who did not in their use of contextualised or decontextualized strategies (all $ps > 0.20$).

Discussion

The results from the present study are consistent with those in previous studies conducted in China (e.g., Zhou 2006; Zhou et al. 2009) where counting (forward counting) was the most important home activity relating to mathematics. In addition, in their interaction with children, parents tended to adopt a more direct and explicit approach to help children learn mathematics. Specifically, they were more likely to make use of real objects when illustrating a mathematical concept (e.g., counting the number of cookies on a plate) and provide prompt questions to help children reflect on concepts (e.g., when the child is about to get the chicken wings on a plate, parents will ask how many chicken wings there are on the plate). In addition, although some strategies are more contextualised than others, the majority of the strategies (except for statistics, backward counting and the use of real objects to illustrate a mathematical concept) were significantly correlated with one another. This indicates that the use of the more contextualised strategies does not preclude the use of the more decontextualized strategies (e.g., worksheets). The co-existence of differing strategies is perhaps not surprising and is consistent with the pragmatism deeply rooted in the Chinese culture. A famous saying of Mr Deng Xiaoping, the deceased former leader of the People's Republic of China, once said, "It does not matter whether a cat is black or white. It is a good cat when it can catch mice." Such pragmatism might have led parents to use whatever strategies that they know, irrespective of the theoretical basis behind a particular strategy.

With respect to the factors which might contribute to parents' interaction strategies, SES was only a significant predictor for the strategy of providing prompt questions. The data suggest that in the early years there may be relatively few SES-related differences in the way parents in the Chinese-heritage cultures help their children learn mathematics. This might also explain why the impact of SES was relatively weak in the Chinese-heritage cultures in comparison to other cultures (e.g., Anderson et al. 2010) and why students in Asia performed better than their American counterparts, even after SES is held constant (Zhou et al. 1999; cited in Ryoo et al. 2014). For parental proficiency, it was not a significant predictor in any of the regression analyses. For parental motivation, it was only a significant predictor for the use of stories. The parents who were more motivated to learn mathematics in the past used more stories to engage their children to learn mathematics. Finally, children's class level was only a significant predictor for backward counting and the use of worksheets. The result showed that whilst having high expectations of their children's achievement, the parents were also sensitive to their children's developmental status. In particular, they understand that it is futile to push younger children who cannot count forward to count backward and to require children with weak fine motor skills to work on worksheets.

By considering all these findings together, it appears that factors other than SES and parents' attributes (such as past proficiency in and motivation to learn mathematics) might have stronger influence on children's achievement in mathematics, as the study showed that school SES and parents' motivation have limited influence on their behaviour with preschool children. The factor in the home environment that has a stronger predictive power may well be parental expectation, as has been suggested in extant studies (e.g., Phillipson and Phillipson 2012).

With regards to parents' views of what makes students in Chinese-heritage cultures successful in international tests of mathematics, my findings were largely consistent with the results from previous studies (e.g., Leung 2002). In particular, the parents in the present study believed that diligence was more important than the other factors of interest: parental expectation, teachers, tutors, parental devotion and the difficult syllabus. The greater importance attached to diligence is interesting because it might empower and disempower learners at the same time. Emphasis on diligence is empowering when learners think that diligence can override the effect of intelligence in academic achievement. However, it is disempowering when the roles of learners' enjoyment is downplayed to the extent that all that matters is diligence and it does not matter whether the learning process is enjoyable/engaging or not. The emphasis on diligence and the under-emphasis of enjoyment are exemplified in the following Chinese proverbs: (1) "diligence is good, while play is bad for you." (qin2 you3gong1, xi4 wu2yi4; 勤有功, 戲無益); (2) "with persistence, you can turn a rod into a needle." (zhi3 yao4 you3 heng2xin1, tie3bang4 ye3 ke3 mo2cheng2 zhen1, 只要有恒心, 鐵棒也可磨成針). These deep-rooted values might explain the lack of engaging mathematics activities in the Chinese classrooms reported in previous studies (e.g., Leung 1995) and the less frequent use of stories in parent-child interaction in the present study.

Another important finding in the present study is that the parents appeared to think that parental expectation and after-school mathematics lessons (provided by tutors) were important contributors (nearly as important as teachers!). There are two implications. First, future studies of students' achievement in the Chinese-heritage cultures should control for the role of tutors when evaluating the impact of home and school on children's achievement in mathematics. Second, while high expectations might correspond to better learning outcomes, by accepting parents' academic expectations, learners might have to persevere in classrooms that are less than stimulating and have to spend extra hours after school receiving tuition in mathematics. The perseverance and the extra efforts can be justified in the name of diligence. In the affective dimension, past studies revealed that students in China and Taiwan suffered more mathematics anxiety than their counterparts in the USA (e.g., Ho et al. 2000). Future studies should take into account learners' anxiety and their level of enjoyment during mathematics activities.

Last but not least, while previous studies (e.g., Phillipson and Phillipson 2007, 2012) suggested that parental expectations mediate children's cognitive abilities and their academic achievement, paradoxically, parental expectations were not related to parents' use of either contextualised or decontextualized interaction strategies in the current study. Neither was parental devotion related to their interactional behaviour. These results suggest that parents' behaviour might be decoupled from their beliefs. In other words, what they expect of their children might not be related to the way they interact with their children. If parents' expectations do not affect children's learning outcomes via mathematics-related interaction strategies, future studies should explore the mechanism that governs the relations among parental expectation, children's cognitive abilities and their achievement in mathematics.

Conclusion

The current study has provided new insights into the potential mechanisms underlying the success of students in Chinese-heritage cultures in international tests of mathematics. First, parents set the stage for their preschool children's achievement in mathematics by making use of both contextualised and decontextualised interaction strategies in the home environment. In addition, developmental models for children's development in mathematics may be different across cultures. In particular, in Chinese-heritage cultures, SES might play a lesser role in children's mathematical development. This could be due to the SES variable being overridden by other variables such as parental expectations which are closely linked with important cultural values, e.g., success derives more from diligence than from intelligence. Furthermore, the role of "significant others", such as tutors for mathematics, should be investigated in future studies that focus on the overall sociocultural environment which supports students in Chinese-heritage cultures to learn mathematics.

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