Parents' Attitudes towards Mathematics in Pre-school Children

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Abstract

In the current study the main goal is to point out how parents of pre-schoolers encounter the subject of Math at home. Eighty eight Greek parents of pre-school children filled in a questionnaire with several questions referring to topics like the frequency with which they engage in numeracy activities at home or their academic expectations for their child. The main findings indicate that gender of the child does not play a significant role on the academic expectations that their parents have for them before entering Kindergarten. However, those expectations are positively correlated to the frequency that number activities occurred at home.

Introduction

Several studies in the past have established the strong relationship between parental beliefs and literacy in preschool children (Dickinson & De Temple, 1998; Haney & Hill, 2004; Hannon & James, 1990). However, researchers should focus also on Math, especially in preschool children, as school-entry Math (child's age range 5-6) are an important predictor of later achievement (Duncan, Dowsett, Claessens, Magnuson, Huston, Klebanov, Pagani, Feinstein, Engel, Brooks-Gunn, Sexton, Duckworth & Japel, 2007).Considering the fact that parents have the largest part of responsibility in educating their children on this age, this study was focused on how they assess the importance of Math and whether they provide enough opportunities to their preschool children in order to enrich their Math experiences before entering Kindergarten.

Early Math skills

To begin with, children in the very early years of their life do have their first, crucial contact with Math and Math thinking. Around the age of 2 and 3 years, they become aware of the fact that the counting words represent a particular number, not knowing exactly which number (Wynn, 1992). However, how important is it for children to be familiar with Math facts and Math related thinking before entering Kindergarten? According to the longitudinal study of Aunola, Leskinen, Lerkkanen and Nurmi (2004) on the transition point of Finnish children from Kindergarten to 2nd Grade, the results showed that children with higher level scores on mathematical skills in preschool tend to have better performance in the coming years and learn Math faster than their peers who enter school with lower scores. On the other hand, children who enter Kindergarten with low competence in numeracy will remain low in the following years (Jordan, Kaplan, Locunial, & Ramineni, 2007). Math performance in Kindergarten can predict their achievement from 1st to 3rd Grade, proving that early number competence is crucial for elementary school mathematics. In addition, adults can understand

and detect very soon children who face difficulties and provide them with the maximum assistance that they may need in order to learn and absorb knowledge in the most effective way (Jordan, Kaplan, Ramineni, & Locuniak, 2009).

Home Learning Environment (HLE)

Adults can stimulate children's mathematical knowledge in interaction with young children and exert some influence on them (Aubrey, Bottle, & Godfrey, 2003). It is well-known that the family is an important source for the development of early literacy skills (Bennett, Weigel, & Martin, 2002). It may also contribute to the number experiences of children (Blevins-Knabe & Musun-Miller, 1996). Home Learning Environment (HLE), which is the stimulation, the encouragement and the opportunities, which are provided by adults at home, has beneficial effects on literacy and numeracy development of pre-schoolers upon their school entry (Melhuish, Phan, Sylva, Sammons, Siraj-Blatchford & Taggart, 2008). Parents can also inspire their children to perform better at school by setting them high goals for their academic performance and attribute to their achievement effort (Georgiou, 1997; 1999).

Parental Math Attitudes-Social Economical Status

Do parents consider Math knowledge to be important for their children? Adults in the United States, parents or care givers, reported that their children's social skills and general information about the world are more important than being skilled in Math, no matter their marital status, gender, ethnicity, educational level, education in mathematics, or their own past experiences (Musun –Miller & Blevins-Knabe, 1998; 2000; Georgiou & Tourva, 2007; Skwarchuk, 2009). Additionally, parents do not set learning goals for teaching Math at home, since Math are a less interesting learning subject compared to literacy for them and their kids. Thus, they tend to focus and spend more time in promoting literacy than numeracy activities

(Young-Loveridge, 1989; Skwarchuk, 2009). They also believe that preschool curriculum should include less Math teaching (Cannon & Ginsburg, 2008).

Various features of parents can lead us to different outcomes for their children's educational and Math knowledge level. Parents with more than high school education for example, report more home-school conferencing and higher level of school based involvement, followed by more intensive interest in school achievement from parents as well as students (Fantuzzo, Tighe & Childs, 2000).At the same time, students get better scores in reading and face fewer learning problems (Zellman & Waterman, 1998). According to Starkey, Klein and Wakeley (2004) at the beginning and at the end of the pre-kindergarten year, children coming from low income families tend to develop less in Math and have their well-being negatively influenced compared to those coming from middle and higher ones. Brooks-Gunn & Duncan (1997) attribute this fact to probable inadequate or fewer stimuli and experiences provided at home. What motivate parents to get involved in their child's home education are their capability, time and energy to teach, and their child's willingness to be taught (Green, Walker, Hoover-Dempsey, & Sandler, 2007). Moreover, adults who are good at Math and enjoy it more than their own parents did, report having the openness to challenge their own children more with math activities (Musun–Miller et al., 2000; LaFevre, Polyzoi, Skwarchuk, Fast & Sowinski, 2010). Those on the other hand, who feel insecure about their own Math knowledge and abilities, hesitate to teach their kids at home (Cannon et al, 2008).

Gender stereotypes in Math

According to Jacobs (1991), the majority of parents incline to have higher beliefs and standards for their sons' abilities to succeed in mathematics in the future compared to parents of daughters. This tendency affects their children's self-perceptions. As a result, both parental beliefs and children's self-perceptions influence their performance. In the domains of Science

and Math, girls may report and show lower self-competence than boys, according to their school grades, in spite of their strong performance (Kurtz-Costes, Rowley, Harris-Britt & Woods, 2008). According to Yee and Eccles (1988), girls have to put more effort in order to succeed in Math as their parents considered them to be less talented in this subject than other subjects at school and not as gifted as boys in reaching a high numeracy level. Thus, fathers of boys are more demanding regarding their child's academic performance (Yee & Eccles, 1988). Nevertheless, mothers tend to encourage their daughters to count more frequently in Kindergarten, considering that girls would be in need of trying harder in present and following years (Blevins-Knabe et al., 1996).

Home Math-related activities

The most common Math related activity between parents and children is encouraging children to count (Zhou, Huang, Wang, Wang, Zhao, Yang, & Yang, 2005) as this is the kick-off procedure of children developing mathematical knowledge. Activities like shared book reading by parents may engage children in using mathematical language (small, big, lots, etc.) and help pre-schoolers to associate meanings to real life situations and develop their Math related thinking (Anderson, Anderson & Shapiro, 2005; van den Heuvel - Panhuizen & van den Boogaard, 2008). Along with Math worksheets, all those activities can contribute to Math development in early education (Zhou et al., 2005). Pre-schoolers can be educated and helped through several different ways with everyday activities and games. Pre-school play can provide opportunities for children to have a close contact with numeric concepts and make connections with real life situations (Skwarchuk, 2009). Playing linear numerical board games improves children's numerical estimation skills, number comprehension (Whyte & Bull, 2008) and numerical magnitudes comprehension, especially for those coming from low-income families (Ramani & Siegler, 2008; 2009). Furthermore, numeracy books and games, such as Snakes and Ladders, Bingo, dominoes and shopping games, may improve numeracy in 5-year-old children. This improvement is more likely to happen when children are been

pulled out of their classroom and a specially trained teacher is present to assist and guide towards new ways of math-related thinking. They can also be beneficial for children who have difficulties in catching up with their age appropriate knowledge level (Young-Loveridge, 2004). In the case study of Young-Loveridge (1988) pre-schoolers that scored high in activities, were more exposed to numerous Math related activities at home and their parents were more willing to encourage them to play board games, measure ingredients or use the calendar. According to the study of LeFevre, Skwarchuk, Smith-Chant, Fast, Kamawar and Bisanz (2009) numeracy-related home activities correlate with children's developing fluency in basic skills, like addition or number-line knowledge. In their study they proposed a distinction among the Math activities at home: the direct and indirect activities. The direct activities are more focused on numbers (e.g., counting objects, practising number names, printing numbers) whilst the indirect are more real-world tasks (e.g., playing card or board games that involve numbers, cooking, or carpentry). The distinction between direct and indirect activities is interesting as the frequent direct numeracy practice compared to indirect, led to higher and better numeracy skills in young children (LeFevre et al., 2010). It is crucial for the parents to be able to identify the Math related activities, because if they are not, then it is hard for the children to do their connections between experiences in their early environment and school environment (Blevins-Knabe, Austin, Musun, Eddy & Jones, 2000).

The Present Study

The purpose of this study was to investigate the parental attitudes towards Mathematics in pre-school children. First of all, I aim at examining whether parents provide their children more frequently, with direct or indirect mathematical activities and whether the SES influences the frequency of those both those group of activities. The first hypothesis is that (a) parents tend to focus more on direct numeracy activities (Zhou, et al., 2005) than on indirect and (b) families from a lower SES would provide fewer activities to their children

than the higher SES ones (Starkey, et al., 2004). Secondly, I investigate the effects of the gender stereotypes on parental beliefs about their child's Math abilities. The second hypothesis is that parents of boys have higher Math standards for their children, considering how significant is for children to reach several academic benchmarks before entering Kindergarten (Jacobs, 1991). And last but not least, I would like to see how the parental maths attitudes, academic expectations of the child and home activities relate to each other. My third hypothesis is that parental attitudes relate to their expectations and at the same time their expectations relate to the provision of direct and indirect home activities (Musun–Miller et al., 2000; LeFevre et al., 2010).

Method

Participants

For the purpose of this study 110 Questionnaires were sent via email to Greece in friends and family members of four researchers. In total 88 parents of pre-school children took part in this research with 39 boys and 49 girls. The age range of the children was between 3 and 6 years old, (*M* =5.01, *SD* =. 92). Out of the 88 families, 65.9% (*n*=58) had two children, 18.2% (*n*=16) one, followed by 14.8% (*n*=13) and 1.1% (*n*=1) with 3 and 4 children respectively. The questionnaires were filled in by 69 mothers (78.4%), 14 fathers (15.9%) and 5 by both of them (5.7%). Parents were also asked to indicate the higher educational level that they have attained. The majority of fathers had a bachelor's degree (34.5% vs. 30.7%) whereas the majority of mothers had graduated from high school (39.8% vs. 31%). Technical school graduates was the 14.9% and 13.6% and with a master's or higher (e.g. PhD, Post-Doc) was the 10.3% and 9.1% for fathers and mothers respectively. Junior high school graduates were the 9.2% of the fathers and the 2.3% of the mothers. Four mothers (4.5%) indicated their education level as "other", with the specification that they

graduated from a technical institute that a student can attend after high school named I.E.K. (Institouto Epaggelmatikis Katartisis - Vocational Training Institute).

Moreover, parents could designate the amount of hours they and their partner work per week. Twenty eight fathers (34.6%) reported working 40 hours per week, which are the standard weekly working hours, followed by the 17.3% (n=14) that worked 50 hours. On the other hand, 28 mothers (33.3%) reported working full-time (40 hours), while 17 (20.2%) were unemployed. This may be explained by two reasons: firstly, because the majority of families that participated were residents of the country side where it is very common for mothers to consider as first priority staying at home and raising their children rather than working. Secondly, because of the excessive rise of the unemployment rates as a consequence of the economic crisis that Greece suffers in the present.

Finally, the respondents had to indicate the monthly gross income of the family. The majority of participants (48.7%) reported earning a commonly satisfying family income between 1.751 and 3.200 euro per month. It is worth noticing that the 13.6% of the participants refused to respond, probably due to the fact that usually questions regarding the economic status are consider personal sensitive information. Out of the 110 Questionnaires that were distributed, 18 were returned unanswered. Four cases were excluded from the data collection as they were families with children out the age range.

Material and procedure

Parent/ Guardian Questionnaire

The Questionnaire used to this study is a part of a questionnaire named "Language in the brain of children: Do images help to learn and remember words?" which is used for an international study conducted by the University of Leiden in Greece, Hungary and the

Netherlands (See Appendix A). The English Questionnaire was translated by the Greek researchers. As it is mentioned before, respondents had to fill in demographic information, such as the age of the child, parental education or the family's gross income. Parents had also to report their children's academic expectations before entering Kindergarten. In 16 various academic benchmarks (e.g. "print some numbers", "count to 10", "know simple additions" etc.) participants had to choose from a five-point scale their views on benchmarks' importance with 0 standing for not important and 4 for very important. The academic expectations had high reliability, Cronbach's $\alpha = .94$.

Furthermore, respondents had to provide information about the frequency with which they, along with their children, engaged several learning activities at home in the past month. The 27 activities were presented all together in the Questionnaire and not in separate categories and the participants had to choose from a five-point scale, 0 if the activity did not occur to 4 if it occurred almost every day. However, in order to conduct further analyses in the data, two groups were formulated, the direct and indirect activities. The formulation was performed based on the study of LeFevre et al. (2009). The direct activities are more focused on numbers whilst the indirect are more real-world tasks. In this study of LeFevre et. al., in those activities which were compiled from various sources from the researchers, a principal component analysis with Varimax rotation was conducted. The result was the extraction of four factors: (1) number skills (Counting objects, sort by size, colour or shape, counted down, printing numbers, identifying names of written numbers), (2) number books ("Connect-the-dot" activities, using number activity books, number storybooks), (3) games (Card/board games, making collections, being timed), and (4) applications (Wear a watch, measure ingredients when cooking, using calendars, playing with calculators). As direct activities were used the first two factors and the indirect the other two. In the present study, 6 more activities, 4 direct (Doing math in your head, memorizing math facts, learning to add numbers, counting

out money) and 2 indirect (Measuring length/widths, using mathematics-related computer software) were added, taken from a newer study of LeFevre et al. (2010). As a result of this combination, two factors were formed with 12 direct activities and 11 indirect, Cronbach's α: .90 and .86 respectively (see Appendix B).

Finally, the participants had to provide information about their own Math attitudes by indicating whether they agree or not with 7 statements regarding Math and reading (e.g., 'When I was in school I was good at mathematics'; 'I find reading enjoyable', etc.) by using a four-point scale with 1 to standing for strongly disagreement and 4 for strongly agreement. The parental math attitudes' scale had high reliability, Cronbach's α = .72.

Participants were informed about the confidentiality of their responses and they were reassured that the information provided will be used only for scientific purposes from the University. The Questionnaire was sent to family and friends of the researchers in four different Greek cities: Athens, Thasos, Nafplio and Ierapetra of Crete. They were issued in hard copies or sent via email either to several friends with pre-school children or to Kindergartens where some of the researchers' family members work as teachers. After completing each questionnaire, respondents returned them to the researchers either via post or via email directly from parents to them. After the return of the filled in questionnaires all answers were collected into SPSS data files, using the program "SPSS Statistics 17.0".

Statistical Analysis

The numerical data were described by their mean and standard deviations, while the categorical by frequencies. The normality of the data was tested with the standardized values of Skewness and Kurtosis and their reliability by measuring the Cronbach's α. The missing values for the monthly income variable which was used to describe the SES of the

participants, were replaced with the mean number of the variable, as their percentage was about 14% (n= 12) out of the 88 values in total.

In order to test the first part of the first hypothesis (a) of whether parents provide to their children more direct activities than indirect, first I excluded from my analysis the letter-related activities (reading words, print alphabet letters, print words and learn names of alphabet letters) so that I could test only the numeracy related ones. The means of the two groups of activities, the direct and indirect, were compared with a dependent *t*-test. The null hypothesis of the *t*-test was that the mean of a numerical variable is not significantly different for the two dependent groups. The effect size was also estimated. The second part of the first hypothesis referred to (b) whether the Social Economic Status (SES) of the participants influences the frequency with which both groups of activities occurred at home. SES was assessed with the following variables: parental highest level of education, the amount of weekly working hours of parents and the monthly family income (White, 1982; Bradley & Corwyn, 2002). A multiple hierarchical regression was conducted to check for a possible relationship among those variables, with the group of activities as the dependent variable and the variables describing the SES as the independent. The assumptions of the normality of residuals and their homoscedasticity were examined with Scatterplots.

The second hypothesis was whether the gender stereotypes have an effect on parental academic beliefs. As parental academic beliefs, the variables referring to the benchmarks that a child can reach before entering Kindergarten are used. An independent *t*-test was applied between the parents of boys and the parents of girls as predictor variables and all the benchmarks summarized as one criterion variable, estimating also their effect size. The null hypothesis of the *t*-test was that the mean of a numerical variable is not significantly different for the independent groups.

The last hypothesis referred to the relationship among the parental math attitudes, the academic expectations of the child and the home activities, both direct and indirect. The seven variables concerning math attitudes were also summarized in one group variable. After checking the reliability of that group of variables, Cronbach's $\alpha = .74$ and according to the "If item deleted" SPSS Output, 2 variables referring to language arts and reading were excluded, Cronbach's $\alpha = .80$. A partial correlation was conducted to see whether there is a relationship among attitudes, expectations and the home activities, with the activities controlled.

Results

A *t*-test was conducted to test the first hypothesis. By examining the outcomes, the null hypothesis was rejected, as parents reported to provide more direct activities ($M = 23.97$, $SE = 1.27$) than indirect ($M = 16.27$, $SE = 1.07$), $t(76) = 10.27$, $p = .00$, $r = .76$. This effect size is considered as large, which indicates that the strength between those variables is large.

Table 1 depicts the multiple hierarchical regression which was conducted to test the second scale of the first hypothesis. The predictors, which are the SES of each family, do not make a significant contribution to the frequency with which numeracy related activities both direct and indirect, occur at home.

Table 1.

Hierarchical Regression Analyses for the Socioeconomic Variables Predicting All Numeracy Related Home Activities, Both Direct and Indirect.

	B	*SE B*	β	*Sig*
Step 1				
Constant	43.01	8.65		
Family monthly income	-0.97	2.13	-.057*	.65
Step 2				
Constant	41.00	9.52		
Family monthly income	-1.70	2.35	-.099*	.5
Highest level of education: mother	-0.09	1.97	-.006*	.97
Highest level of education: father	1.64	2.12	.115*	.45
Step 3				
Constant	44.75	13.5		
Family monthly income	-1.32	2.45	-.077*	.54
Highest level of education: mother	-.075	1.20	-.005*	.97
Highest level of education: father	1.25	2.30	.088*	.59
Amount of weekly working hours: mother	-0.06	0.12	-.065*	.62
Amount of weekly working hours: father	-0.04	0.17	-.037*	.78

Step 1: R^2=.003, ΔR^2= 003, Step 2: R^2=.014, ΔR^2= 011, Step 3: R^2=.019, ΔR^2= 005. * p > .05

Furthermore, in order to test any significant differences between the gender of each pre-schooler and the academic benchmarks they can reach before entering Kindergarten, an independent *t*-test was conducted. This *t*-test was applied in a new variable that was computed from all benchmarks and the genders of the children. The results indicated that the expectations of the respondents for their sons (M= 49.94, SE = 2.23) were slightly lower than

the expectations for their daughters (*M*= 50.80, *SE*=1.54). However, this difference is not significant t (75) = -0.32, p >.05, r = .03.

Last but not least, the variable which summarized all benchmarks were found positively related to the frequency of the activities provided at home, r = .34, p <.01. Parental math attitudes on the other hand, were not related neither with the benchmarks or the activities. Based on that result, I conducted also two regressions for the direct and indirect activities separately as dependent variables and the variable including all academic benchmarks as independent. The results are shown in Table 2 which supports the importance of the direct activities.

Table 2.

Summary of Regression Analyses for Direct and Indirect Activities Related to a Summarized Variable of Academic Benchmarks.

Variables	Direct Activities			Indirect Activities		
	B	*SE B*	β	*B*	*SE B*	β
Summarized Benchmarks	.22	.10	.25*	.05	.09	.06
R^2			.07			.00
F			5.07			.29

*p < .05

Discussion

The present study is trying to investigate reasons that may influence the parental Math attitudes in preschool children and activities they use at home. This field of research is considered as highly important, as early Math are crucial for pre-school children since Kindergarteners with lower numeracy competence than their peers, remain low in the following school years (Jordan et. al., 2007). In this study, data were collected from parents,

who are the main educating source for children of this age and they are responsible for assisting at the growth of children's general concept by the adequate stimuli (Aubrey, Bottle & Godfrey, 2003). Home Learning Environment can contribute to characterizing a child at the age of 5 as a struggler, an intermediate of a high-achiever (Melhuish et al., 2008). Greek parents, who participated in this study by filling in a questionnaire, reported that they often provided more activities focused on numbers than real-world tasks. In addition, the frequency that those direct activities occurred was significantly related with academic benchmarks their child should reach before entering Kindergarten.

According to previous studies parents are able to identify more easily the possible academic importance of the direct numeracy related activities for their child (Blevins-Knabe et al., 2000); therefore they do encourage their children to count more often (Zhou et. al., 2005). The first hypothesis of the study was confirmed indicating that the frequency of providing those activities at home is higher than the frequency of the indirect numeracy activities. The second part of the first hypothesis that families with lower SES would provide fewer activities than families with higher SES was not confirmed. It is worth mentioning here that the rate of missing values in the question concerning the family income, reached the 13.6%. Possible explanation is that indicating the family income in a questionnaire can be considered as sensitive personal information to give, especially when the participant reside in a small society. The social desirability may have influenced the participants in order to give responses that didn't depict reality or not respond at all. Unfortunately, because of the amount of missing values, the variable SES is not representative of our sample, and this could be the main reason for not statistically supporting my second hypothesis.

The second hypothesis was referring on the gender stereotypes and that parents of boys would have higher expectations than the parents of girls. In contrast with the study of Jacobs et. al. (1991) the gender doesn't play significant role for parents when it comes to the

academic benchmarks their children should reach before entering Kindergarten. As a matter of fact, parents of girls had slightly higher expectations of their daughters, consistent with the study of Blevins- Knabe et al. (1996) which professes that mothers tend to encourage their daughters to count more often, than the mothers of boys.

The final hypothesis was that the attitudes of parents towards Math are be related with the academic expectations they have for their children and their expectations are be related with direct and indirect activities provided at home. In the partial correlation that was conducted, it was found that only their expectations are related to the activities provided at home, consistent with the study of LeFevre et al. (2010). It is possible that parents provide more often home numeracy activities and stimuli, showing a preference in direct activities which imply that parents want to be aware of activity academic importance when they set high goals for their child.

For future considerations of this study it would be beneficial first of all, if the parents could fill in the questionnaire present the researchers, in order to ensure that the participants would pay the appropriate attention in giving their responses and reassure them about the confidentiality of the procedure Furthermore, the children could have been tested as well in order to confirm the validity of the parental responses. A test could have been developed in the format of a game where children would be able to see different pictures of activities and game covers on the screen and they would have to identify the activity and indicate whether they engage this activity with their parents or not and how often that happens. Part of this test could be also board, card and video game covers, real or foils, where the children should point out the games that they recognise and state something to prove their knowledge.

Conclusion

Summarizing, this research examined the parental attitudes towards Math in pre-school children. This study should be considered as an effort for the arousal of parental interest towards Math. Parents should be urged to provide their children with the adequate stimuli and experiences, in order to have them reached their age appropriate level before entering Kindergarten. Further research can possibly replicate present results and add more insights into the parental interest towards Math. To conclude with, hopefully this study successfully provides important information and result to this complex field of study.

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Appendix A

Questionnaire for the Parent or the Guardian: "Language in the brain of children: Do images help to learn and remember words?"

What language(s) do you speak at home?	
What is the dominant language in your home?	
What language(s) does your child speak?	
What is the dominant language of your child?	

Date (day, month, year)		
Name of your child		
Gender		
Age		
How many children do you have?		
Age and gender of other children	Age	Boy / girl
	Age	Boy / girl
	Age	Boy / girl
	Age	Boy / girl

Person filling in the questionnaire	☐ Father ☐ Mother ☐ Father and mother ☐ Other, namely …
Highest completed educational level of the mother	☐ Elementary school ☐ High school ☐ Vocational ☐ Bachelor's degree ☐ Master's degree or higher ☐ Other, namely …
Highest completed educational level of the father	☐ Elementary school ☐ High school ☐ Vocational ☐ Bachelor's degree ☐ Master's degree or higher ☐ Other, namely …
Do you have a job? If yes, how many hours a week do you work?	
Does your partner have a job? If yes, how many hours a week does he/she work?	
How much is your family's gross income in a month? *Please feel free to not answer this question if you are uncomfortable.*	☐ Less than € 900 ☐ Between € 900 and € 1.250 ☐ Between € 1.251 and € 1.750 ☐ Between € 1.751 and € 3.200 ☐ Between € 3.201 and € 4.200 ☐ More than € 4.201

Do you read … … a daily newspaper (including electronic versions)? … educational or informational books and / or magazines? … fiction / novels? … e-books or audio books?		Which one (did you read last)?
Could you please name the title(s) or the author(s) of the book(s) you have read recently?	1 2 3	
How often do you buy a book?	☐ More times a week ☐ About once a week ☐ About once a month ☐ A few times a year ☐ (Almost) never	
Do you have a library subscription?	☐ Yes ☐ No	
How often do you go to a library?	☐ About once a week ☐ About once a month ☐ A few times a year ☐ (Almost) never	
Do you read when your child is around (meaning that the child can see you read)?	☐ Very often ☐ Often ☐ Occasionally ☐ (Almost) never	
About how many books do you have in your home?		

The following questions regard your and your child's habits. Please do not ask your child about these questions, just indicate what you know or think.		
Do you have products on the following media platforms that are suitable and available to your child at home?		If yes, could you please give an example?
… workbooks (e.g. with letters and numbers)?	Yes No	
… educational games (e.g. magnetic letters or numbers)?	Yes No	
… educational video games (e.g. Elmo's A-to-Zoo Adventure video game or Make 10 – number game for Nintendo)	Yes No	
… purely entertaining video games (e.g. action, adventure, princess or sport games)	Yes No	
… educational computer programs or apps (e.g. Dr. Seuss book apps or Miffy plays with numbers software)	Yes No	
… purely entertaining computer games	Yes No	
… board games (e.g. Chutes and Ladders)? (*including electronic board games)*	Yes No	
…card games (e.g. UNO)? (*including electronic card games)*	Yes No	
Does your child…		If yes, could you please give an example?
… watch educational television programs? (e.g. Sesame Street, Dora the explorer)	Yes No	
… play educational games on websites? (e.g. http://www.poissonrouge.com/http://www.sesamestreet.org/)	Yes No	
Do you play word games with your child? (e.g. rhyming or finding words	☐ Often ☐ Sometimes	

with the same initial letter)	☐ (Almost) never
Does your child try to read shopping lists, the names of stores, text on the milk container etc?	☐ Often ☐ Sometimes ☐ (Almost) never
Does your child ever write letters or words?	☐ Often ☐ Sometimes ☐ (Almost) never
Does your child write letters of his or her name?	☐ Often ☐ Sometimes ☐ (Almost) never
Please do not ask your child to answer these questions.	
Can you write down how you think your child would write his or her name?	*By lines and circles he thinks that he is writing his name*
Do you have an idea how your child would write the word 'Mom'?	
Or the word 'Dad'?	
Or the word 'ball'?	
Can you indicate which letters your child already knows?	
Does your child type on the computer (e.g. for browsing the Internet, writing e-mails)?	☐ Often ☐ Sometimes ☐ (Almost) never
Does your child listen to stories on CD, DVD, the Internet or other electronic devices (e.g. iPad) (e.g. Living Books: Little Monster At School or Dr. Seuss	☐ Daily ☐ Weekly ☐ Monthly ☐ Less often or none

book apps)?	
If yes, could you give an estimate on how many of these electronic stories do you have at home?	
Could you please indicate how many minutes/hours your child watches television… on a regular weekday? on a regular weekend?	
Does your child have a television in his/her bedroom?	☐ Yes ☐ No
Have you seen your child "reading" a book without an adult?	☐ Often ☐ Sometimes ☐ (Almost) never
Does your child read children's magazines (e.g. Highlights)?	☐ Daily ☐ Weekly ☐ Monthly ☐ Less often or none
Do you go to the library with your child?	☐ More times a week ☐ About once a week ☐ About once a month ☐ A few times a year ☐ (Almost) never
Do you sing with your child?	☐ Daily ☐ Weekly ☐ Monthly ☐ Less often or none
Could you please give an estimate on how many hours a family member reads to the child during a week?	
About how many children's books do you have in your home, including electronic books?	

Can you indicate in which contexts the child is read to from the followings *(You can indicate more):*	☐ At home ☐ At a family member's place ☐ At a friend's place ☐ During traveling or waiting somewhere outside of home (e.g. at the doctor's) ☐ In the library ☐ During an after-school activity ☐ Others, namely …
At what age was the child first read to or told a story to?	☐ Before the child started speaking ☐ After the child started speaking
Do you think reading to your child is important?	☐ Yes ☐ No
Do you think it is important to read daily to your child?	☐ Yes ☐ No
If so, do you get to read every day?	☐ Yes ☐ No
When do you read to your child? (e.g. bedtime)	
How often do you read to your child?	☐ Every day ☐ Every other day ☐ Less often
If every day, do you read more times a day?	☐ Yes ☐ No
About how long do you read for during such a reading?	
From which book did you read this week?	(title, author)
Can you please name a maximum of three (other) favorite books of your	1

child?	2 3
How often does your child ask you to read?	☐ Daily ☐ Weekly ☐ Monthly ☐ Less often or none
How high can your child count? *(Please do not ask your child to answer this question.)*	

Benchmarks

In your opinion, how important is it for children to reach the following benchmarks prior to entering kindergarten? *(Circle 0 if not important and 4 if very important).*

1. Print some numbers (between 0 and 9)	0	1	2	3	4
2. Rehearse the alphabet	0	1	2	3	4
3. Read a few words (e.g. mom or dad)	0	1	2	3	4
4. Identify/recognize some alphabet letters	0	1	2	3	4
5. Know all the alphabet letters	0	1	2	3	4
6. Identify/recognize all the written numbers (between 0 and 9)	0	1	2	3	4
7. Print all the alphabet letters	0	1	2	3	4
8. Know simple additions (e.g. 2+2=4)	0	1	2	3	4
9. Count to 100	0	1	2	3	4
10. Count to 10	0	1	2	3	4
11. Print some alphabet letters	0	1	2	3	4
12. Know some alphabet letters	0	1	2	3	4
13. Know more complex additions (e.g. 7+4=11)	0	1	2	3	4
14. Print all the numbers (between 0 and 9)	0	1	2	3	4
15. Print his / her name	0	1	2	3	4
16. Identify/recognize some written numbers (between 0 and 9)	0	1	2	3	4

In the past month, how often did you and your child engage in the following activities? *Circle 0 if the activity did not occur, 1 if it occurred less than once a week, but a few times a month (1-3 times), 2 if it occurred about once a week, 3 if it occurred a few times a week (2-4 times) and 4 if it occurred almost daily.*

1. Counting out money	0	1	2	3	4
2. Counting down (10, 9, 8…)	0	1	2	3	4
3. Making collections (e.g. a sticker collection)	0	1	2	3	4
4. "Connect-the-dot" activities	0	1	2	3	4
5. Counting objects	0	1	2	3	4
6. Playing board games	0	1	2	3	4
7. Using number activity books	0	1	2	3	4
8. Playing with/using a calculator	0	1	2	3	4
9. Identifying names of written numbers	0	1	2	3	4
10. Reading words	0	1	2	3	4
11. Learning to add numbers (e.g. 2+2=4)	0	1	2	3	4
12. Measuring length/widths	0	1	2	3	4
13. Printing alphabet letters	0	1	2	3	4
14. Using calendars and dates	0	1	2	3	4
15. Memorizing math facts	0	1	2	3	4
16. Using mathematics-related computer software	0	1	2	3	4
17. Printing numbers	0	1	2	3	4
18. Measuring ingredients when cooking	0	1	2	3	4
19. Having your child wear a watch	0	1	2	3	4
20. Doing math in your head	0	1	2	3	4
21. Printing words	0	1	2	3	4

22. Learning the names of alphabet letters	0	1	2	3	4
23. Playing card games	0	1	2	3	4
24. Being timed (e.g. measuring how quickly you run)	0	1	2	3	4
25. Talking about money when shopping (e.g. "which costs more?")	0	1	2	3	4
26. Sort things by size, colour or shape	0	1	2	3	4
27. Reading number storybooks	0	1	2	3	4

Can you think of other ways to encourage mathematical learning in your home beyond the ones we included questions for?	
Can you think of other ways to encourage literacy development in your home beyond the ones we included questions for?	

Please read the following statements. Using the following four-point scale, please indicate the degree to which you agree with the statement by circling the appropriate box.

	Strongly Disagree	Disagree	Agree	Strongly Agree
When I was in school, I was good at mathematics.	1	2	3	4
When I was in school, I enjoyed mathematics.	1	2	3	4
The career path I have chosen is mathematics related.	1	2	3	4
When I was in school, I was good at language arts activities such as	1	2	3	4

reading.				
I find mathematics activities enjoyable.	1	2	3	4
It is important for my children to be exposed to mathematical concepts every day.	1	2	3	4
It is important for my child to be read to every day.	1	2	3	4

The following questions relate to your thoughts on education and teaching.				
Please indicate how much you agree with the following sentences.				
	Strongly Disagree	Disagree	Agree	Strongly Agree
I think it is the parents' responsibility to teach their children…				
… moral values and religious education	1	2	3	4
… healthy and safe behavior	1	2	3	4
… creativity	1	2	3	4
… to express oneself well with language	1	2	3	4
… to deal with numbers (e.g. counting and solving math problems)	1	2	3	4
… general knowledge of the world	1	2	3	4

… reading and writing	1	2	3	4
… using a computer	1	2	3	4
… sports and games	1	2	3	4

Appendix B

Direct and indirect activities as occurred from the combination of the studies of LeFevre et. al. in 2009 and 2010.

Direct Activities	Indirect Activities
1. Counting out money	3. Making collections (e.g. a sticker collection)
2. Counting down (10, 9, 8…)	6. Playing board games
4. "Connect-the-dot" activities	8. Playing with/using a calculator
5. Counting objects	12. Measuring length/widths
7. Using number activity books	14. Using calendars and dates
9. Identifying names of written numbers	16. Using mathematics-related computer software
11. Learning to add numbers (e.g. 2+2=4)	18. Measuring ingredients when cooking
15. Memorizing math facts	19. Having your child wear a watch
17. Printing numbers	23. Playing card games
20. Doing math in your head	24. Being timed (e.g. measuring how quickly you run)
26. Sort things by size, color or shape	25. Talking about money when shopping (e.g. "which costs more?")
27. Reading number storybooks	