

INVESTIGATING PARENTS' EXPLICIT AND IMPLICIT HOME NUMERACY PRACTICES IN MULTIETHNIC CONTEXTS

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This paper explores theoretical and methodological issues surrounding explicit and implicit features of home numeracy practices. The analysis draws on parents' interviews conducted as part of studies aimed at understanding the mediating role of parents in their child's mathematics learning in multicultural schools.

1. Introduction

The beneficial uses of home numeracy can often be unnoticed and are embedded within the course of day-to-day living. Young-Loveridge (1989) documented some of the benefits of using everyday activities such as shopping and baking as a learning tool in numeracy. However, while the beneficial use of such tools is not a new concept to researchers working in the field of mathematics' learning, it often goes unrecognised by parents.

Gallimore and Goldenberg (1993) reviewed a series of studies in which they had investigated literacy practices in Latino families in the United States. They found that a key factor in the way the activities were framed was the parents' representations of school literacy. They found that "as soon as the parents construe an activity as the 'teaching of literacy', their prevailing conception of literary development is activated, driving the interaction and determining the script-in-use" (pp. 328-329). For instance, they found that parents overemphasised correct answers (e.g. reading a word accurately) to the detriment of reading for meaning. Though there are grounds to speculate that similar subtle (implicit) processes may be in operation regarding the relationship between home and school mathematical practices, this is an area under-researched.

This paper draws on parents' interviews conducted as part of studies aimed at understanding the mediating role of parents in their child's mathematics learning in multicultural schools (O'Toole, in progress; Abreu, Cline & Shamsi, 2002). Our focus on parents of school children in multicultural schools, foregrounds questions not addressed in previous studies. In particular it tries to understand parents' practices in supporting their children's mathematical learning considering both their unique cultural heritage (e.g. Pakistani, English, etc...) and their shared socio-cultural experiences resulting from having children in the same local school. The process of interviewing and the data provided by the parents revealed, among other things, that the use of numeracy at home could be both explicit and implicit.

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2. Developing an approach to examine implicit and explicit numeracy practices

Numerical practices can be embedded in the course of everyday social practice to such an extent that the members in question (in this instance, parents and their children) have little or no awareness that they are doing it. This paper raises issues about the differences between those parents who have a deeper understanding of the usefulness of implicit numeracy practices, thereby turning them into explicit numeracy practices.

Gallimore and Goldenberg (2001) provide an interesting framework for being able to understand and incorporate the links between the child's cultural influences and their achievement in school. This framework is based on two units of analysis, which they refer to as 'cultural models' and 'cultural settings'. Cultural models can be understood in terms of a shared understanding of how the individual perceives the way the world works, or should work. It includes within it "encoded shared environmental and event interpretations, what is valued and ideal, what settings should be enacted and avoided, who should participate, the rules of interaction, and the purpose of the interactions" (p.47). Cultural models are influenced by the historical context in which they have been manifested and developed. More importantly in this instance, they are often hidden and unrecognisable to the individual and quite often assumed to be shared by others around them. Cultural settings refer to those activities, which cause people to come together to perform a joint activity. Quite often these activities are mundane and played out in the repetitious routines of everyday life, such as the parent who counts the items on a shopping list with the help of a child. Or in the case of this mother who, when asked if she plays board games at home with her child replied "we do that, snakes and ladders. I haven't thought of that as maths, but yeah". This kind of activity is an example of what parents find hard to describe, and what researchers seek to tap into.

Street, Baker and Tomlin (2001) also sought to understand the social aspect of the uses of numeracy by using theoretical ideas borrowed from literacy research. They have adopted the concepts of numeracy practices and numeracy events to help explore the social characteristics of numeracy. Numeracy practices are understood as the wider social relations of the practice of using numeracy, whereby the practice is influenced by the values, beliefs and the experiences within the social context. A numeracy event is the occurrence of the use of numeracy that is integral to the lived experience at that time. Although, it does not necessarily follow that the event is visible or explicit to the social actors. Furthermore, shared mathematical knowledge and numerical practices can transcend both contexts as the child makes the transition from school to home and back again (Abreu, Cline & Shamsi, 2002). However, some numeracy practices feature more dominantly in one context than the other. It is not unusual to find that school practices are present at home. However it is less common to find home practices in school. There is going to be some crossover between the sites in which these practices are used. This cross-over, which Abreu et al (2002)

describe as transitions, is an aspect of the person's experience of the relationship between practices that need to be examined (see also Gorgorio, Planas and Vilella, 2002). We should be seeking ways to find out what are the "cultural models" that influence the way a parent would utilise numeracy practices in the home site and ask to what extent are parents aware of the many numerical activities they can do with their children. This proposal is summarised in the following table. This table reveals some of those numeracy practices that transcend different social spheres and is a modified version of the one used by Street, Baker and Tomlin (2001) including the proposed units of analysis by Gallimore and Goldenberg (2001).

	CULTURAL MODELS		
CULTURAL SETTINGS WHERE THE NUMERACY EVENTS TAKE PLACE		Schooled Numeracy Practices	Out-of-School Numeracy Practices
	School Site	Working on number bonds, times tables, fractions	Dates, measuring, Pokemon cards, money, playground games
	Home Site	Homework, shop bought texts, times tables	Pocket money, times, laying the table, shopping, setting the video, counting car number plates, counting stairs

3. Finding the way to tap into the parents' explicit and implicit home numeracy practices

Data from parents, teachers and children was collected using the episodic interview (Flick, 2000; 2002). This paper will address the data from parents only. The episodic interview is distinct from other interview techniques in that it develops links between subjective definitions of topic concepts, and the concrete examples of situations for the participant. It actually invites the participant to give examples of relevant instances they have had in the past and their opinions about the subject matter. The interview question is set out in two parts, the first part asking for an opinion about the topic (i.e. Does your child get involved with counting money or doing the shopping, everyday activities that might involve maths?) and the second part of the question invites the concrete response (i.e. Could you describe some of those situations?). This was particularly useful for drawing out experiences of using explicit and implicit numeracy practices because parents drew on and described real circumstances in their past as well as in the present. The data was analysed by drawing out those instances where implicit or explicit uses of maths was mentioned and then coded according to themes.

4. Some findings: Parents' explicit and implicit home numeracy practices

The parents participating in the two studies examined in this paper had children in primary schools situated in fairly large town in the South East of England. The town has a very ethnically diverse population, which is reflected in the ethnic diversity of children in schools. This population was evident in the classrooms with children from many different ethnic backgrounds, which may reveal a number of home influences in children's numeracy learning. The analysis presented here involved two stages. In

the first stage, interviews with four parents were analysed (O'Toole, in progress). These parents came from four different ethnic groups as detailed in Table 2. Their children were in year two (aged 6/7 years) and had been chosen by the class teacher to participate in the study on the basis of whether they were high or low achieving.

Table 2. The parent interviews analysed for explicit/implicit home numeracies

<i>Parents</i>	<i>Name of Child²</i>	<i>Level of Achievement</i>
Black Caribbean mother	Sherrese	Low achieving girl
White British mother	Michael	High achieving boy
Indian mother	Rajesh	Low achieving boy
White British mother	James	High achieving boy

The analysis of the four interviews discussed in the paper revealed four main types of home practices parents identified as mathematical. These four types were: (1) school homework; (2) mimicked school based activities; (3) pocket money and shopping; (4) games. The first three types were explicitly identified as mathematical by all parents. However, it was apparent there was some controversy in relation to the use of numeracy in games.

To probe our understanding further, in the second stage of the analysis we re-visited 24 parents' interviews from Abreu, Cline and Shamsi (1999, 2002) study. This analysis focused only on the way they talked about games. These parental interviews with 12 White and 12 Pakistani families were obtained in a series of linked case studies including schoolchildren, their teachers and their parents. They included parents of children aged 6-11 years of age, with high versus low achievement in school mathematics.

4.1 Explicit home numeracy practices

School homework: Most obviously, parents mentioned homework as one of the numeracy practices, which they undertake with their children at home. Homework turned out to be an important source of information for understanding their child's achievement, their child, their child's development and the school as an institution. More importantly, homework was the main resource that parents had for understanding if their child had any difficulties with mathematics.

Mimicked school numeracy practices: The second most frequently referred to home numeracy practices mentioned by parents were those which mimicked school based learning, but did not come from the school. One prevalent use of 'school like' numeracy were shop bought books which reflected the type of mathematics the children came across in the statutory school exams. James' mum, the White mother of a high achieving child told the interviewer:

² Names of people are pseudonyms

We have got some books that we bought; I think they were Letts² books, for children aged 5-7, and there's ones on adding and subtracting and multiplying and all this kind of thing, we've given him a number of those to do.

Other 'school like' practices include, buying educational aids like counters, times tables books, flash cards and producing worksheets which are like the ones that come from school. Some of the parents had become very skilled at making explicit numeracy practices, like learning times tables, into a practice which the child doesn't realise he is implicitly part of. Michael's mum told me:

We were doing tables on the way to school because part of my way of educating him is to incorporate that at different times of the day. So not to say 'we will sit at the table in ten minutes' well we do say 'we'll sit at the table in ten minutes' but not always to do it that way. So if an opportunity arises then, so sometimes on the way to school, or any time when I'm cooking a meal I'll say to him 'Michael, what's five, nines?' and he actually seems to respond quite well to that. Doesn't appear to be pressured by it or phased by it at all. So that's what we tend to do.

Another home numeracy practice, which seems particularly prevalent in younger children (in this case 6/7 year olds) is children frequently ask their parents to make up sums for them. However, when speaking to parents it is clear that when they provide examples of this behaviour there is a great variation in the types of 'sums' they will give their children to do. The interviewer asked the mother of Sherrese, the Black Caribbean low achiever what types of sums did she make up herself [or get her mother to write for her] and she said "just adding or taking away, she'll say ten add five...she'll write ten add five equals, do a little box and put the answer in it". This type of calculation for a child of Sherrese's age, coming to the end of her second year, is quite basic. However, her mother sees her enthusiasm for working out these sums as an indication that she is successful in numeracy. In contrast Wahib³, a Pakistani high achiever is receiving a very different level of coaching at home from his brother, who is ten years old. His brother told the interviewer:

He mostly likes, there are pieces of paper and quite a lot of books that I saved from last years and am also like, writing down questions and answers, he gets them like, hundred per cent. Like hundred plus two hundred, like these questions, take aways, multiplies and all this and he understands really good

Both of these numeracy practices are explicit in the sense it is recognised that there may be some usefulness to learning numeracy. The question arises, would a parent who had a greater understanding of what a child of this age should be able to mentally calculate help devise sums for the child, which are of more value?

Pocket money and shopping: Home numeracy practices that had a beneficial and practical use were mentioned in all the parent interviews analysed for this paper. One of the more explicit and 'practical like' uses of numeracy for children is pocket money and shopping. Parents often have an awareness of the usefulness of shopping,

² A Letts book is a home learning guide available to buy in shops which mimics the school curriculum

³ Wahib's brother happened to be present while his father was interviewed and frequently interposed his own comments

although the way this practice is used varies. For example, one parent said that her daughter went shopping with her but revealed that she added up the grocery shopping on a calculator. Another parent recounted that her son went with her to the shop and handed over the money, but they never used this time to make any calculations, neither adding up the cost nor working out the change. Both of these children were low achieving and took a considerably longer time in the class to work out mental calculations. On the other hand, the mother of a high achieving child gave her child money at school fetes and gave her control over using these finances. There may be some speculation about whether these findings reflect the kind of findings described by researchers into literacy. It is possible that certain numerical practices at home contribute to the learning of school-based practices more than others. In the aforementioned case, the parent is seeking to engage the child in the process of mathematical reasoning and taking control of it. This kind of independence is crucial for the current way school mathematical practices are structured, where there is an emphasis on ‘real-life’ numeracy as well as increasing mental strategies.

4.2 Games: explicit / implicit home numeracy practices? Or, not mathematical at all?

In the analysis of the first four interviews we found that for the parents of high achieving children in the data set reported here, the pre-school years were a time when certain home games were important in helping children’s basic counting skills. The games parents referred to were, counting baby-grow poppers, counting building bricks, dot-to-dot drawing books, counting stairs, looking a number fridge magnets and counting cars or buses. On the other hand Rajesh’s mum, an Indian parent of a low achieving child in year two (6/7 years old) still utilised dot-to-dot books as the main home numeracy game. In contrast, by the time the high achieving children had gone to school board games, card games and computer games had become the more dominant type of ‘game like’ home numeracy practice. If we return to Gallimore and Goldenberg’s (2001) notion of cultural models, we can tell that Rajesh’s mother has a different model or representation of what is useful to his education. She emphasised that learning about the world around him was the principle purpose of home education. Rajesh’s mother says:

We’ve always done things, but not purposefully done things. Like we’ve always taught them education like ‘this is a table, and that is a thing’ ...so it’s just like basic everyday things like you go to the supermarket and they see things like Monsters Inc [children’s film]

Sherrese’s mum, the parent of a low achieving child from a Black Caribbean background had no board games or other maths games in the house. However, she did say that her children would make up shop keeping games together. She told me:

Sherrese is the shop keeper and he’s [her brother] coming to buy something and they put all these foreign coins in [the till] and then you know, he’ll say ‘can I have so-and-so’, ‘that will be thirty pence please’. So she’ll say ‘you give me fifty pence or you give me a pound and I’ll give you the change’

At first glance the beneficial use of this game could be very positive and indicate an explicit use of numeracy at home. But if the children are using foreign coins, which they may not recognise, then this reduces the chances of the siblings using real calculations for working out change. There are a number of instances where there is a possibility for using maths, which is not utilised concretely in practice. On the other hand, this white mother of a high achieving girl has a very explicit understanding of the way board games contribute to her child's mathematical learning:

But she, you know, she's always played games, you know, snaps to snakes and ladders, to other games. I mean it all helps with maths

It is possible to see here that a numeracy practice that can be less visible or explicit to one parent becomes more heightened to other parents. It seems to us that this visibility is a consequence of the cultural models, which give a frame to the practices.

When we revisited Abreu, Cline and Shamsi's parents' interviews we found further support for the notion that underlying the use of games to teach numeracy in an explicit, implicit or non-mathematical way, is parents' cultural models. We found that for some parents the idea that numeracy is embedded in games (in particular in board games) and that these can promote the child's understanding of mathematical concepts just seemed absent. This was particularly true for some Pakistani parents, who at a first glance appeared not to understand the question as in the following extracts:

Parent of a year-2, low achiever, boy

I: So does Kashif also like, I mean does he enjoy doing activities involving numbers? Like games for instance, does he like these activities involving use of counting, numbers, maths? (pause) Which games does he play?

P: He likes mostly men's games, such as wrestling

Parent of a year-6, low achiever, boy

I: Okay so do you try to push him to become involved in games which involve the use of maths?

P: No I haven't ever said just about maths, we've just thought that he should play less games, any games, for example he shows more...for football, or sometimes he like cycling or he wants to play with the computer for a while longer so we tell him not to...he should sit and study, this would include all subjects, we've not told him especially for maths

The researchers' attempts to make parents talk about "games that involve maths" was not meaningful for these two Pakistani parents. Thus, they ignored the request of the researcher to talk about games that involve number and just talked about what they perceived as games. The parent of another Pakistani, year-4, low achieving boy, also elaborated the explanation advanced by the above parent that games compete with engagement in school learning. As we can see in the following extract his concerns

were (i) that games can be too interesting; and, (ii) he was not sure that even if they involved numbers that necessarily will contribute to his child learning of maths.

P: Well when he's with his cousins they play Monopoly...but I never really encouraged him in...

I: Okay its his own?

P: Its his own, he asked me several times to get some board games and stuff but I don't know, some reason I, because when kids get involved in it too much because they're very interesting you know...they will just start, Ludo will yes I don't know how much it will help in mathematics

Two thirds of our sample of 12 Pakistani parents did not seem to see board games as relevant to their children's home learning of numeracy. This "cultural model" was not unique to the parents of the low achieving children. The following are extracts from parents of two year-2 high achieving boys.

I: Okay, can you tell me if Sush enjoys games involving the use of numbers, of maths?

P: We haven't brought any such games

I: Board games which have numbers, which involve maths, does he enjoy playing those sorts of games?

P: I actually give him different sorts of games, he doesn't have maths games ... The computer games he has are also different, like races and so on, that type

In Abreu et al. interviews though the white-British parents reported more engagement with board games, not all of them necessarily saw these games or try to make them mathematical. Thus, for instance, the mother of a year-2 low achieving boy talked about playing "Monopoly", but did not consider the game had anything to do with maths.

I: Okay, you've already mentioned that you play a lot of board games at home. Can you tell me what types of games they are?

P: ...I mean Snakes and Ladders... The normal games like Monopoly, I mean we play...but I mean that's a game where you've really got I mean its not nothing to do with maths I mean its just a game with, a maze game

And, the parents of a high achieving year-2 boy implied that they intentionally do not make the games mathematical.

I: Do you try and push him to get involved in activities involving numbers or maths?

F: No we don't really push him

M: No not

F: We don't really push him at all

M: No, not really

To sum up, parents understanding and awareness of maths games tended to reveal themselves in three ways: (i) no use of maths games; (ii) use of maths games but benefits not recognised; (iii) use of maths games and benefits recognised. Parents'

adoption of one of these ways was not random, but influenced by particular cultural models. The different representations of the usefulness of home numeracy games suggests that parents' values inform the kind of activities that take place in the home, and these are not always consonant with the values of the school. Support for Street, Baker and Tomlin's (2001) understanding of the social and cultural nature of numeracy, are made explicit through the quotes above. The findings also support and expand Abreu's (1995) previous work on whether the relationship between home and school numeracy affects school performance. Abreu's study of children of Brazilian farm workers reveals complexities in the association between home numeracy and achievement in school. Firstly, in her sample, home numeracy was so diverse from school numeracy that engagement in home numeracy could hinder achievement rather than help. Secondly, social valorisation between home and school numeracy practices meant that the value attributed to home numeracy was very low. Future research will benefit from understanding links between the values placed on numeracy practices and achievement, while taking into account the complexity of the issue.

5. In Conclusion

The two different frameworks used for studying home numeracy practices have been particularly useful in this effort; Street, Baker and Tomlin's (2001) distinction between implicit and explicit uses of numeracy on researching home and school numeracy practices and Gallimore and Goldenberg's (2001) cultural models and cultural settings. The combination of these two theoretical stances provided a robust framework for analysing the data reported in this paper. The latter research framework is particularly relevant to understanding numeracy practices in a multicultural setting because the idea of cultural models and settings addresses a 'shared way of perceiving the world' (pp. 47) which includes what is of value and what should be rejected. What links this framework to the explicit and implicit work, is the fact that cultural models are often so subtle and embedded with our idea of being, that they go unrecognised by the people holding them. As a result of this, it can be quite hard to construct a new cultural setting, hence the struggle that some of the parents revealed in the Abreu, Cline and Shamsi's data on home numeracy games. Tied in with the cultural models notion, is the way the 'shared ways of perceiving the world' has an historical basis to it, influenced by the values that have been carried through time. It may be that some of the parents perceived ideas about what counts as home numeracy were such a part of their cultural models, that the link between what is explicit and what is implicit becomes stronger. Furthermore, the cultural models and settings theory was a positive way of analysing the variability of those groups that have often been assumed to be homogenous.

References

- Abreu, de.G. (1995). Understanding how children experience the relationship between home and school mathematics. *Mind, Culture, and Activity*, Vol.2(2), 119-142.
- Abreu, G. de, Cline, T., & Shamsi, A. (1999). *Mathematics learning in multiethnic primary schools* (ESRC - R000 222 381). Luton: Department of Psychology, Luton University.
- Abreu, G. de, Cline, T., & Shamsi, T (2002). Exploring ways parents participate in their children's school mathematical learning: case studies in multiethnic primary school. In Abreu, G. de, Bishop, A., & Presmeg, N.C. (Eds.) *Transitions between contexts of mathematical practices* (pp. 123-147). Kluwer Academic Publishers
- Flick, U (2000) Episodic Interviewing. In Bauer & Gaskell (Eds.) *Qualitative Researching with Text, Image and Sound: A Practical Handbook*. UK: Sage Publications.
- Flick, U. (2002). *An introduction to qualitative research*. London: Sage
- Gallimore, R., & Goldenberg, C. (1993). Activity setting of early literacy: home and school factors in children's emergent literacy. In E. A. Forman, N. Minick, & C. A. Stone (Eds.), *Contexts for learning: sociocultural dynamics in children's development* (pp. 315-335). Oxford: Oxford University Press.
- Gallimore, R., & Goldenberg, C. (2001). Analysing cultural models and settings to connect minority achievement and school improvement research. *Educational Psychologist*, 36(1), 45-56
- Gorgorió, N; Planas, N. & Vilella, X., (2002). 'Immigrant children learning mathematics in mainstream schools'. In G. de Abreu, A.J. Bishop & N.C. Presmeg (Eds.), *Transitions between Contexts of Mathematical Practice* (pp. 23-52). Dordrecht: Kluwer Academic Publishers.
- Street, B., Baker, D., & Tomlin, A. (2001). Researching Home/School Numeracy Practices: theoretical and methodological issues. http://www.kcl.ac.uk/depsta/education/research/Street_MathsInterest_KCL4.1.pdf
- Young-Loveridge, J. (1989). The relationship between children's home experiences and their mathematical skills on entry to school. *Early Child Development and Care*, Vol. 43, 43-59.

Something is, therefore, implicit when it is not directly stated but is either suggested in the wording or necessary to effectuate the purpose. For example, There is a morality implicit in his writings. She implicitly said she likes white shoes by saying she likes all colors but tan. In the first example, the writer may not have clearly or directly laid out a moral vision, but it is understood through the characters, their actions, and their experiences. A good way to keep explicit vs implicit apart is to remember that Implicit is an Implied or Indirect statement. Both of these start with the letter "I". Explicit starts with an "E" and is Spelled Out, so there is no confusion.

Summary. Implicit and explicit have near opposite meanings, so it's important to remember their difference. Parents' blatant and subtle ethnic prejudice and parenting style are measured together with children's explicit and implicit ethnic prejudice in pupils and parents of preschool and primary schools in the region of Rome, Italy (N = 318). Results show that parents' subtle prejudice predicts children's implicit prejudice regardless of the parenting style. It is arguable that both can be influenced by parents' attitudes and practices in different ways. At the explicit level, children tend to imitate and conform to the explicit attitudes and behaviors of their parents. Also for implicit ethnic attitudes, a number of studies report a similarity between children and adults' patterns of prejudice (e.g., Sinclair et al., 2005a; Dunham et al., 2006; Castelli et al., 2009; Vezzali et al., 2012). Explicit and implicit linguistic tools. Our research concentrates on the linguistic tools often used in online communication. In particular, we focus on implicit and explicit ways of communication. As noted, information can be presented in the text as statements, suppositions and opinions. The results show that in implicit messages Twitter users implemented such linguistic tools as:

- Irony: "Teavana is expensive!" "Should a NC judge order kids out of home school into public school because he doesn't like it?"
- Quotations: "The more corrupt the state, the more numerous the laws." Cornelius Tacitus (55-117 A.D.); "You cannot strengthen the weak by weakening the strong".