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A Qualitative investigation of home-school relationships and children's mathematics learning in- and out-of-school in Bahrain

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Abstract

This study focuses on exploring the perceptions of parents, children, and teachers regarding home-school relationships and mathematics learning in- and out-of-school in Bahrain. It drew on theoretical ideas and research which call for more recognition of the social and cultural resources available in children's homes. It also drew on action research project carried out in a Year 2 classroom in a primary boys school. The data was collected through interviews, focus group, and analysis of photographs taken by children. In addition, novel mathematics learning activities were carried out by the children at home and in school. The results indicated that there were variation between the different groups of parents and between parents and teachers in terms of their perceptions about home-school relationships and mathematics learning in different contexts. Parents with different social and cultural backgrounds had different relationships and types of communication with school. It also showed that children's out-of-school mathematical practices were not highly recognised by the participant teachers and parents in mathematics learning process.

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1. Introduction

Mathematics education is an established area of study which comprises various research trends and theoretical perspectives. These trends rest on different philosophical assumptions derived mainly from both mathematics science and education disciplines as well as other subjects such as philosophy, psychology and sociology.

The philosophy of mathematics focuses on the philosophical assumptions and implications of mathematics. Ernest (1994) suggested that there is a strong link between mathematics philosophy and mathematics education because explicit or implicit philosophical notions can have significant impact on mathematics teaching and learning practices. He distinguishes between two main philosophical approaches: the absolutist approach, which conceives mathematics as a universal knowledge, value- and culture-free; and, the fallibilist approach, which considers mathematics as an outcome of social processes. According to Ernest (1994): "social and cultural issues cannot be denied legitimacy in the philosophies of mathematics and must be admitted as playing an essential and constitutive role in the nature of mathematical knowledge" (p. 10). Therefore, this view has brought with it the implication that

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mathematics educators should pay more attention to the different contexts of learning and their social and cultural characteristics (Lerman, 1990). This shift in the philosophical perspectives has become central to a variety of contemporary mathematics learning theories including the sociocultural theory.

The sociocultural theory, inspired by the work of Vygotsky, has developed a new conceptualisation of how people think and act. Human activity, according to this view, is a structured activity in which collective, rather than, individual learning practices, are mediated. This mediation process occurs through: (1) social interactions which occur when the learner interacts with others in the learning context. This idea was developed further in the formulation of the concept of the Zone of Proximal Development ZPD which focuses on how social interactions can help children to gradually internalise higher cognitive functions and eventually be able to perform difficult tasks in their own (Rowe & Wertsch, 2002; Tharp & Gallimore, 1988), and, (2) tools mediation where cultural or psychological tools such as language, number systems, signs, can play key role on the way people organise, process, and remember information. Kozulin (2003), for example, pointed out that Vygotsky's ideas of mediation by cultural tools and social interaction can have significant educational implications and applications. First, each cultural context can have its own set of cultural tools and situations where these tools can be appropriated. Second, Vygotsky's idea of learning through social mediation contributed to the development of a new approach which conceptualised learning as a process of participation in social activities. Sfard (1998) argued that this participatory approach has challenged the acquisition model of learning which viewed learners as containers to be filled with knowledge and skills through teachers' instruction.

2. Mathematics learning in- and out-of-school

In the last two decades, there has been a growing interest in investigating the effect of cultural contexts and social factors on mathematics education. This growing interest, described by Lerman (2000) as the 'social turn' in mathematics education research was based on learning theories which emphasise the effect of social factors on mathematics knowledge and learning processes. This social turn was motivated in many countries by calls for more attention to the cultural and social factors that can affect children's learning and provide solutions for problems such as underachievement of children from ethnic minorities backgrounds.

Five dimensions of sociocultural research in mathematics education literature were identified in an earlier study (Al-Mahdi, 2009). These approaches were more oriented towards a fallibilist philosophical perspective on the nature of mathematical knowledge.

- *The ethnomathematics approach* (e.g., Bishop, 1988; D'Ambrosio, 1984: 1997; Gerdes, 1986) argues that mathematical knowledge is cultural knowledge which has been developed in all human cultures. This approach raises questions of power and legitimacy as they relate to the dominance of Euro-centrism in mathematics education. Mathematics in this approach is conceived as a cultural product which is developed in particular ways under certain historical, social, and cultural conditions in different cultures. This view challenges the traditional view of mathematics education (i.e. impersonal learning, technique oriented curricula, Eurocentric knowledge) which can alienate certain disadvantaged groups' learning through denying their personal cultural experiences which can conflict with formal mathematics education in schools. Education according to this perspective should seek to develop mathematics as a cultural resource related to learners' experiences.

- *Cultural tools mediation* is a theme highlighted in studies which falls under the broad title of 'everyday cognition' approach (e.g., Carraher *et al.*, 1985; Nunes, 1993). These studies argue that human thinking is embedded in social and cultural activities. They investigated the mediation role of sociocultural tools, such as different cultural systems of signs and skills, on cognition and how people in different cultures can develop certain mathematical procedures to deal with their everyday mathematical aspects. According to this view, learning mathematics in school and outside-school can involve different procedures which are considered as one type of cultural tools. Therefore schools should not teach mathematics as an abstract context-free subject but rather to seek ways of incorporating mathematical concepts learned in school with real contexts and meaningful problems to the learners.

- *Social interaction mediation*: Various studies have extended Vygotsky's concept of the ZPD and looked at how children learn through interacting with other expert members. Various concepts were developed in these studies such as scaffolding (Wood *et al.*, 1976), assisted performance (Tharp and Gallimore, 1991), and guided participation (Rogoff, 1990). All these concepts emphasised that an adult's guidance and children's participation in shared activities can make a positive difference to the child's learning. Therefore, parents' support and interactions with their children in shared learning tasks situated in everyday situations should be valued by schools as it can contribute to children's learning.
- *The situated cognition model* (Lave, 1988: 1991; Lave and Wenger, 1991) argues that knowledge is situated in the context in which it is acquired and proposes that learning is a process of participation in communities of practice. This approach develops an understanding of learning as emergent and social, and discusses issues of identity, context, and transfer. The situated cognition perspective challenges the conventional belief which assumes the separation between learning and doing, where mathematical knowledge learned in school is expected to be automatically transferred into other contexts in a straightforward manner. Instead, the situated cognition approach argues that learning and cognition are fundamentally situated. Therefore social and cultural contexts of learning should be taken into account in the mathematics teaching process.

These new learning conceptualisations have highlighted the shift from the view that considers learning as a process of teacher-to-learner knowledge transmission, to a view that considers learning as a social process which involves individual participation with others in social activities. Some of these approaches have drawn attention to the importance of the parental role in supporting their children's learning and the importance of utilising the social and cultural resources of the out-of-school context in mathematics learning.

3. Parental involvement in mathematics learning

Parental involvement in their children's learning is an educational topic which has received growing attention in the last few decades. Parental assistance to their children in different learning tasks is considered as one of important examples of the social interaction ideas proposed by the sociocultural scholars. For example, studies have argued that parental support for children in the home environment can significantly contribute to children's learning in the early years of childhood years. Some of these studies (e.g. Aubrey *et al.*, 2003; Tizard & Hughes, 1984) have shown that children's learning and skills can develop significantly in their early years before starting school. Other studies (e.g. Desforges & Abouchaar, 2003) indicated that the 'at home good parenting' form of parental involvement, such as providing a good foundation of skills, values, attitudes and self concept, is more likely to have a positive effect on children's learning and adjustment.

The traditional stance of home-school relationships tends to be oriented toward the 'one size fits all' approach which would privilege the typical (middle-class and mono-cultural) families and often marginalise other families (low socioeconomic level, low education, and minority groups). Recent parental involvement studies and initiatives have tried to move beyond the traditional stance which favours school-centred parental involvement activities. On the one hand, these traditional stances seem to place certain groups of parents in more advantaged position (e.g. middle class parents who are more likely to share cultural and social characteristics with school staff). On the other hand, these traditional activities tend to consider families from disadvantaged backgrounds (e.g. from working-class, ethnic minorities, or low income backgrounds) as deficient. The new perspectives in home-school relationships reject this deficit view and move towards promoting more acknowledgment and utilisation of the cultural and social resources which are called by some researchers as funds of knowledge (Moll *et al.*, 1995; Moll & Greenberg, 1990), or cultural and social capital (Bourdieu, 1986; Lareau, 2001; Lamont & Lareau, 1988; Lareau & Shumar, 1996; Reay, 1999). Schools and teachers are encouraged to build upon resources available in children's homes and everyday life experiences (see Cairney, 2000; Hanafin & Lynch, 2002; Hyde *et al.*, 2006). In this view, every family, regardless of their economic circumstances, social class or cultural background, can provide valuable

learning opportunities for their children. School should identify these resources and try to utilise them and build upon them in the classroom.

The area of parental involvement in mathematics education has been considered as a key area of study by researchers around the world. Several studies (Aubrey, 1993; 1994; Anderson, 1997; Anderson *et al.*, 2005) which investigated children's pre-school mathematics learning at home support the notion that parents can play a significant mediation role in developing their children's mathematics learning through shared interaction in everyday activities. These interactions can include different procedures such as asking questions and pointing to aspects of the activity in ways that encourage children to extend their level of understanding. We can also infer from these studies that mathematics learning is not restricted to school lessons. Social interactions in the home environment can play a significant role in children's learning and development. Other studies (e.g. Merttens & Vass, 1990) tried to involve parents in their children's mathematics learning through shared homework in the IMPACT project. These ideas were further developed and extended by other researchers (e.g. O'Toole and Abreu, 2003) who used the sociocultural framework to investigate parents' perspectives about their children's mathematics learning and tried to know more about the relationship between children's home culture and mathematics learning. Abreu's studies found that parents' perceptions and experiences in learning and teaching mathematics can be different from those held by teachers or held by other parents with different social and cultural backgrounds. Civil and her colleagues (Civil, Bernier & Quintos, 2003) tried to promote two-way dialogue about mathematics education between parents and teachers through investigating and building upon parents' perceptions and experiences and helping parents to learn more about school mathematics.

Recent projects attempted to move beyond the school-centred view which seems to characterise previous studies and initiatives and tried to find ways of creating more balance in the process of investigating and utilising home and school mathematics. For instance, Fleer *et al.* (2006) tried to utilise teacher awareness about children's learning experiences at home and attempted to find ways for utilising home mathematics resources for school mathematics teaching. Further, Street *et al.* (2005) have developed numerous concepts through their investigation of numeracy practices at home and school. They focused particularly on how the separation of learning between home and school can have an impact on children's knowledge and development. Their concepts (e.g. classification of sites and domains of numeracy practices which take place in- and out-of-school) were particularly useful in distinguishing the various overlapping numeracy practices which take place in different contexts. Finally, the Home School Knowledge Exchange project (Greenhough *et al.*, 2004; Hughes and Greenhough, 2006, 2007) have moved one stage further as they put some of the previous conceptual ideas into practice. They developed a new approach which emphasises mutual knowledge exchange between home and school. The project highlighted interesting aspects of home-school relationships such as conflicts between teaching strategies used at home and those used in school. The study concluded by suggesting that when designing mathematics homework teachers should take into account: providing sufficient information to parents about the required topic and its required strategies, teachers should give more recognition to the role of parents and utilising their knowledge and expertise. Schools should also provide parents with opportunities which allow them to work collaboratively with their children on shared authentic mathematical tasks, and it is important to connect children's authentic home resources and everyday experiences in meaningful way with school mathematics learning.

4. Research problem and significance

This study focuses on two issues through a small scale research project: (1) investigating the area of home-school relationships and thinking about possible ways of facilitating it; and, (2) acknowledging the social and cultural dimensions of mathematics and thinking about ways to connect them to school mathematics. In the earlier literature review, these two areas have often been considered by many educational researchers as potentially key for the progress of primary school education. I also believe that focusing on these two issues can be beneficial as these areas seem to be overlooked in the policies, research, and practices of the educational system in Bahrain. Drawing from the literature to reflect on my previous experience in primary schools in Bahrain, I can argue with some certainty that the general approach of parental involvement activities (e.g. open days, parent-teacher

communication) seemed to: (1) be dominated by a concerns with school learning, (2) have a limited view about the significance of the home as a rich learning environment; and, (3) focuses on one-way (school to home) type of communication. Therefore, I think it is important to develop parental involvement programmes which identify, use, develop, and exchange different resources and funds of knowledge available in the children's homes. Accordingly, I attempted to move away from the narrow view of learning and tried to encourage parents and teachers to see their children as not just as knowledge receivers, but also to understand and appreciate the wonderful ideas of the children and the rich resources of their cultural and social environment. Hopefully, this research may shed new theoretical light on these issues, change some aspects of teaching practices in the case school, and yield useful recommendations for policy-makers, teacher training and teachers in Bahrain.

5. The research objectives and questions

I intended that this study would:

- Explore the perceptions of parents, children and teachers about the topics of home-school relationships and learning mathematics in- and out-of-school
- Introduce new ideas proposed by the educational literature, which emphasise the social and cultural dimensions of mathematics learning.
- Experiment with and utilise these new ideas to design and implement novel mathematical learning activities which would encourage social interaction between parents and their children and utilise home resources to enrich school learning.

The main research questions which guided the study are:

- How do the participant teachers and parents perceive home-school relationships?
- How do the participant teachers and parents perceive children's in- and out-of-school mathematics learning?
- How did the participants in the case classroom (the classroom children, their parents and their class teacher) respond to the mathematical activities introduced during the project?

6. Research design and data collection

The best way to give a general idea of the research methodology used in this study is to present a brief description of the project which organised the data collection process. This project was carried out by me with the help of one class teacher in a Year 2 classroom in a primary school located in a Bahraini rural village. It was based on a qualitative design which drew on ideas from action research and case study. It consisted of three interconnected phases: piloting, preparation, and implementation. In the first two phases I carried out semi-structured interviews which investigated the perspectives of teachers and parents about parental involvement and children's mathematics learning in- and out-of-school. Seven fathers, five mothers and seven teachers were interviewed. In the second and third phases of the project, children were encouraged to explore and identify different mathematical ideas in their everyday situations outside school by using disposable cameras to take photographs of mathematical events or practices. Ideas from the photographs were intended to be used in various ways in subsequent mathematics lesson in an attempt to make children's learning more meaningful. I also wanted through this activity to find out more about children's out-of-school mathematics learning experiences and see how they and their parents conceptualise mathematics knowledge. In addition, this activity tried to encourage children to think more about the connection between mathematical concepts learned in school and other mathematical concepts which can be found in their normal daily life activities. 100 photographs resulted from the camera activity. Then children were videoed in the classroom where they talked about the camera activity and in focus groups where they talked about their photographs in more details. Shared homework activities were developed next. These activities encouraged more parental involvement in their children's mathematics learning through sharing work embedded in everyday mathematical situations. Other activities were done in the classroom which extended ideas from the shared homework activities. These activities generally tried to utilities everyday resources in mathematics lessons and encouraged children to engage in group work and discussions. The shared homework and the classroom activities

were based on everyday themes such as: mathematics in the street, in the vegetable shop, in food, in the human body, in the grocery shop, and in the kitchen.

7. The data analysis process

The data analysis process was carried out simultaneously with the data collection process throughout the three stages of the project. It continued after that until the last writing-up stages. Three qualitative references have specifically guided the data analysis process (Kvale, 1996; Miles & Huberman, 1994; Strauss & Corbin, 1998). This process went through three interconnected phases: data reduction, data display and drawing conclusions. During the three stages of the data collection I regularly reviewed, transcribed, and analysed the data. I always went back and forth through the different sets of data, as I needed, for example to refine the interview schedule, to use ideas mentioned in the interviews to develop mathematical homework activities, or to trace interesting idea mentioned by a teacher with other participants in the forthcoming interviews.

8. The findings

The finding section is divided into three parts: the first part discusses the views of parents and teachers regarding home-school relationships, the second part focuses on parents' and teachers' views regarding in- and out-of-school mathematics learning, and the third part presents parents', children's and the class teacher's views regarding the project's outcomes.

(1) Parents' and teachers' views on home-school relationships

The interviews showed that there were three common types of parental involvement practices found in the case school (based on Epstein's (1995) typology). They were: parenting, communication, and providing educational support at home. I found that the other types of parental involvement, such as: volunteering, decision-making, and collaborating with the community, were less common in the case school. Most of the participant teachers and parents focused on school-centered types of parental involvement (e.g. parental help with homework or communication with teachers regarding school issues). They seemed to overlook other types of family-centred types of parental involvement (Goos *et al.*, 2004) such as parental engagement with their children in everyday activities at home which can involve authentic opportunities for learning. In addition, it seemed that the parental involvement model adopted by the teachers in the case school can fit with the model which considers parents as supporters for school learning under the guidance of school and in school's terms (see: Townsend and Walker, 1998) and the consensus model (see: Cairney, 2000) where parents get information from teachers in order to fulfill school goals. The teachers often overlook the significance of children's homes as foundations and rich environments for learning. The findings suggested that communication processes between home and school are complex and influenced by different social and cultural resources and circumstances such as power, gender, and social, linguistic and cultural capital. These findings fit with previous studies which suggested that parental involvement is multifaceted and complex.

The participant teachers highlighted various problematic aspects with the different means of communication which they typically use. They were generally concerned about the communication gap between them and the parents. The participant parents did however use the available means of communication offered by school as well as other informal information resources (e.g. through social networks with other people in the community or through talking with their children) in order to know more about their children and their progress in school. The issue of social capital (Bourdieu, 1986) was evident in these findings as different groups of parents tried to utilise their different types of social relationships and networks to their advantage in order to increase their power positions through gaining more knowledge about the 'regime of truth' used in school (Peressini, 1998).

The participant teachers were generally unsatisfied with the current level of home-school communication. They were generally concerned with the issue of quality and content of parental communication with them. Parents, in the

teachers' view, often demanded action from them in order to improve children's schooling, but at the same time parents do not often collaborate or share responsibilities which can facilitate this improvement. This type of communication usually occurred in one way direction, such as teachers transmitting information to parents. This communication lacked mutual knowledge exchange or two-way communication between home and school (Hughes & Greenhough, 2006) such as when teachers learn more about authentic learning practices taking place at home through shared interactions between parents and children in real everyday situations.

The participant parents often took the first step and initiated communication with teachers, while the teachers seemed to be more focusing on their teaching duties. The participant parents were very keen about their children's academic progress and wellbeing and that seemed to be the main motive for them to take the first step in their communication with teachers. It does not seem that they were invited or encouraged by the teachers to initiate or to increase their communication. Sometimes, the teachers initiated communication with parents regarding serious problematic situations related to their children's achievement, behaviour or health. It seemed that there were few opportunities for parents and teachers to communicate regarding more positive issues such as finding ways to develop children's talents, or exchange knowledge with each other.

There were various difficulties which seemed to hinder home-school communication. Some difficulties were connected with school while others were connected with the families' circumstances. The difficulties connected with school included:

- Typical difficulties such as time management and work loads
- Teachers' negative attitudes towards parental involvement
- Difficulties with dealing with different groups of parents who vary in terms of their education, social and economic backgrounds, pedagogical experiences, expectations, and needs. This variation could make some teachers biased towards certain groups of parents who share a similar understanding and probably marginalise others who are not always in accordance with the school's expectations.
- Prioritising school agendas more than utilising families' resources. The participant teachers often talked about parents as receivers of school information and as providers of support to teachers on school-like tasks at home. The teachers did not often take into account the possibility of utilising parents' resources and expertise
- Teachers' avoidance of more responsibilities
- Lack of policies and initiatives which encourage stronger home-school relationships

The difficulties connected with the parents' circumstances which influenced home-school communication process included:

- Most of the participant teachers wished that parents would be more considerate of school regulations and teachers' schedules
- Most of the participant parents and teachers indicated that families' circumstances can influence their communication with school. They highlighted numerous factors such as economic difficulties faced by some parents (e.g. long work hours and large families), gender (e.g. mothers' embarrassment of dealing with male teachers), and capital (educational level, pedagogical experiences, and linguistic capital). Some parents were more in sync with school culture and more able to fulfill the teachers' tacit expectations, while other parents were quite reluctant to voice their concerns to teachers because they felt that they lacked the skills and experiences which would allow them to take a more powerful position in school

Although most of the participant teachers expressed their feeling of inadequacy regarding the quality of home-school communication, they did not take further action or develop new ideas in order to improve their communication with parents. It generally appears that the idea of creating strong home-school relationships was not prioritised in the school's and in the Ministry's agendas.

The parents' levels of communication were categorised into three broad levels as follows:

A small group of parents had a very low level of communication with school. There were different factors which hindered them from building constructive relationships with the school (as discussed above). Most of the parents

who did not communicate adequately with school often had low educational levels or had difficult socio-economic circumstances. Some of those parents tried to utilise alternative strategies to compensate for their lack of direct involvement or direct communication with teachers through for example asking elder siblings to help younger ones and asking other relatives to communicate with school on their behalf. These parents' sense of embarrassment and attempts to avoid being blamed by teachers regarding their children's academic or behavioural problems were mentioned in the interviews as possible reasons for some parents' lack of communication with the school.

Most parents belong to the second group of parents who communicate regularly with teachers, but tended to focus on routine issues and mainly intervened in problematic situations. Their communication tended to be of one-way (school to home) type. They usually received information from the school, but rarely exchanged information about their children's performance or interests at home. The teachers felt that in this type of communication parents ask for solutions, but they do not engage by providing essential help which could increase the chances for achieving successful results.

A small group of parents was described by the teachers as communicating more efficiently. These parents are usually more educated and have some pedagogical experience. They were considered to have better communication with school as they share responsibilities, work together with teachers, and exchange information with teachers in two-way mode of communication. This type of communication shares some features with the knowledge exchange idea and two-way communication proposed by Hughes and Greenhough (2006). This group of parents seemed to have the essential social and cultural capital which allows them to achieve this level of consonance with teachers' expectations.

The findings of the project paralleled the above views provided by the participant parents and teachers regarding the three types of communication. Through the process of discussing the parents' responses regarding the project's mathematics activities, the participant parents from the 'advance educational level' group seemed to be quite distinctive in terms of their relationships with teachers and their educational experiences. They utilised their knowledge and familiarity with school culture to create special relationships with teachers. In these relationships they tried to create a balance between showing respect to their child's teacher as well as providing suggestions and constructive criticism. These parents also seemed to have social networks with other teachers which allowed them to achieve their goals. Other parents in the 'average educational level' group who participated in the interviews tended to use the regular type of communication as they focused more on routine issues and concentrated on behavioural aspects more than academic aspects. These parents tried to avoid any kind of criticism towards the class teacher and usually asked him to help and increased their communication with him only in problematic situations. They also did not give further suggestions or give comments which could be directly connected with teacher's work. Finally, the only parent who belonged to the 'basic education level' group and participated in the interviews was quite distinctive as he tried to compensate for his lack of education through using alternative strategies such as creating friendly relationships with school staff, paying frequent visits to school and surprising the class teacher through visiting him in the classroom in order to get more information about what is going on.

These findings also suggest that the project's activities were quite successful in providing opportunities for all groups of parents and children – with very few exceptions – to participate and benefit from this new work. The findings also suggested that not all parents who have lower levels of education or lower communication with the school are necessarily distant or unwilling to participate in new initiatives introduced by schools. Some parents might try to compensate for their lack of education by adopting alternative strategies such as asking other family members to help. The project offered various new ideas which intended to achieve this aim. These ideas included: learning more about parents' views through seeking their feedback and suggestions in feedback sheets attached with each homework activity, and through interviews and open meetings. The project was successful in identifying some practical ideas and highlighting some important aspects which can be further developed in the future by other researchers and other projects.

(2) Parental involvement in mathematics learning in- and out-of-school

The findings suggested that most of the participant parents and teachers recognised the importance of mathematics in their children's and their everyday lives; however they often overlooked the influence of external social and cultural factors on the process of mathematics learning. These social and cultural resources (e.g. families' funds of knowledge, children's out-of-school mathematics practices, different cultural tools embedded in children's participation in different communities of practices) were often not accommodated by teachers in the classroom or by parents at home. Mathematics knowledge as taught in the school was often considered by the participant parents and teachers as a multi-purpose knowledge which can be generalised with little difficulty in other out-of-school contexts. These theoretical assumptions generally held by parents and teachers could have a significant influence on the way mathematics is taught at home and in school. For example, most of the participant parents and teachers emphasised routine transmission teaching methods which involve the mechanical application of learned procedures and stressing fixed right answers. Some teachers tried to extend their teaching strategies by using some ideas adopted from constructivist theory. However, they still viewed mathematics learning as an individualist and internal process and paid little attention to the influence of social and cultural factors on children's learning and they rarely utilized children's out-of-school mathematics practices in a meaningful and intentional way in their classroom teaching. Mathematics as learned in the school was often abstracted from the real life contexts of the learners and their social and cultural experiences were often not visibly integrated in mathematics lessons. In addition, most of the participants viewed mathematics learning as an individualistic mental process based on the acquisition metaphor (Sfard, 1998). There was limited awareness among them about the importance of children's participation in different social interactions, the different cultural tools they used in their everyday life activities, and the values which they associate with certain cultural tools in certain social contexts. Some teachers tried to break the routine cycle of teaching by introducing new ideas but often faced various difficulties which inhibit their efforts.

9. The outcomes of the project

I can say here that I tried – with the cooperation of the class teacher – to raise the parents' and teachers' awareness about the importance of giving more attention to the real social and cultural worlds of the children and their families and to provide more opportunities utilising their funds of knowledge in order to extend and enrich children's mathematics learning. The project provided opportunities and instigated changes which can be summarised as follows:

- In contrast with the dominant perspective in Bahrain, in this study I tried to look at mathematics education from a different perspective which puts social and cultural aspects in the front position. The project's activities provided opportunities for more interactions among the classroom children both in- and outside the classroom (e.g. through their interactions in the camera activity and the classroom activities). The project activities also provided opportunities for the children to interact with their parents, family members and other people (e.g. shopkeepers) in joint problem solving tasks
- The project's activities provided opportunities for the children to engage in mathematical dialogues and encouraged them to express and exchange their experiences with others (e.g. through the classroom presentations and through the focus groups)
- The project's activities helped in learning more about the extended social worlds of the children outside school, the psychological and material tools which they utilise in different events situated in different contexts, and issues such as power and values connected with particular cultural tools or participation in communities of practices (e.g. how they used different mathematical vocabularies, money names, number systems which differs between home and schools)
- The project's activities provided practical examples about how teachers can utilise children's out-of-school mathematics practices to extend and enrich school mathematics. The activities also provided the children with opportunities to explore, identify and utilise a wide range of mathematics practices and to engage in meaningful and authentic mathematics learning

- In the project, I took into account that parents are not necessarily one homogeneous group. I tried as much as I could to provide opportunities for different groups of parents to take part in the project and its activities in different ways. The interviews with parents and teachers extended my understanding of the similarities and differences between parents and teachers and between the different groups of parents. The interviews allowed me to know more about the parents' and teachers' theoretical understanding about mathematics and the frameworks which underlie their teaching practices and the conflicts between home and school mathematical pedagogies. The findings also suggested that the differences between home and school pedagogies can influence some children

The project also investigated the impact of the project's activities on children's mathematics learning. For example, the outcomes of the camera activity can be summarised in what follows:

- The children's accounts about the content of the photographs, the places where they were taken, and the mathematical ideas embedded in these situations contributed to extending their ideas to include more advanced concepts
- Discussing the mathematical ideas found in some photographs allowed me to not to just to learn more about the children's understanding, but also to correct some of the children's misunderstandings regarding some mathematical ideas.
- Providing more opportunities for the children to talk about their experiences
- Learning more about the mathematical language used by the children: for example most of the children often used the old currency 'Indian' names (e.g. Rupee, Anna) when talking about their experiences about using money. Another issue was that some of the children found difficulties in shifting between the Arabic / Eastern numbers used as the main medium in instruction and curriculum in school, and the Arabic / Western numbers which are widely used in out-of-school contexts
- Learning more about the children's out-of-school mathematical practices: the children took photographs of different everyday situations in different contexts. These photographs and the following explanations provided by the children in the interviews gave a vivid picture about their out-of-school contexts and their mathematical practices there. These included their environments, activities and places which they like, social relationships and cultural resources and their views about mathematics and how they use it in school and out-of-school.

The children's views regarding the project's mathematical activities discussed in the focus group interviews provided interesting opportunities for me to learn more about the children as they talked in the interviews and in the classroom about their learning experiences which emerged during their work on the project's activities. The children provided different views about whether they found any differences between the project's activities and the typical textbook exercises and which type of activities they preferred more. Their accounts about how their parents responded to the project's activities, their interests, skills and their out-of-school mathematical practices were all explored and discussed in detail.

10. Implications of the study

The implications of this study on the educational context in Bahrain can be summarised as follows:

Teachers should seek parents' help and support and build upon parents' experiences and knowledge. Parents of all different social, cultural, and educational backgrounds should be involved in their children's education and they should be seen as holding different experiences and knowledge and not deficient. Their knowledge and experiences should be identified, acknowledged and utilised in school learning processes. Teachers should exchange their knowledge with parents' knowledge in a two-way mutual manner. Teachers should also learn more about their children's characteristics, out-of-school activities, and their social, cultural and educational backgrounds. Schools should encourage hard-to-reach parents to be more involved through identifying their needs and concerns and building upon their resources instead of viewing them as deficient.

Teachers should also learn more about how parents teach their children at home, and provide parents with more information about how mathematics is taught in school. Teachers should learn more about the importance of children's participation in different social interactions, the different cultural tools they used in their everyday life activities, and the values which they associate with certain cultural tools in certain social contexts.

Teachers and school administrators should provide more opportunities for parents who belong to different social, cultural, educational backgrounds to be involved in school-centred parental involvement activities (e.g. communication, decision-making, volunteering etc.) and also recognise and build upon home-centred parental involvement activities such as utilising parents' close relationships with their children and their shared engagement in authentic out-of-school practices.

The Ministry of Education in Bahrain should work more on developing policies and initiatives which encourage stronger home-school relationships. They also should encourage more collaborative or action research work in schools in order to learn more about the students' and their families' funds of knowledge and utilise this knowledge to extend and enrich children's learning in school. The Ministry of Education should also organise more in-service and pre-service training for their teachers in the area of home-school relationships and in learning in different contexts.

References

- Al-Mahdi, O. (2009). *Home-school relationships and mathematics learning in-and out-of-school: collaboration for change: a qualitative case study in a Bahraini primary school*. Unpublished Doctoral Thesis, Graduate School of Education, University of Bristol. (Supervisors: Professor Martin Hughes and Dr Pamela Greenhough).
- Anderson, A. (1997). Families and mathematics: A study of parent-child interactions. *Journal for Research in Mathematics Education*, 28(4), 484-511.
- Anderson, A., Anderson, J., & Shapiro, J. (2005). Supporting multiple literacies: Parents' and children's mathematical talk within storybook reading. *Mathematics Education Research Journal*, 16(3), 5-26.
- Aubrey, C. (1993). An investigation of the mathematical knowledge and competencies which young children bring into school. *British Educational Research Journal*, 19(1), 27-41.
- Aubrey, C. (1994). An investigation of children's knowledge of mathematics at school entry and the knowledge their teachers hold about teaching and learning mathematics, about young learners and mathematical subject knowledge. *British Educational Research Journal*, 20(1), 105-120.
- Aubrey, C., Bottle, G., & Godfrey, R. (2003). Early mathematics in the home and out-of-home context. *International Journal of Early Years Education*, 11(2), 91-103.
- Bishop, A. (1988). *Mathematical enculturation: A cultural perspective on mathematics education*. The Netherlands: Kluwer Academic Publishing.
- Bourdieu, P. (1986). The forms of capital. In J. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241-258). Westport CT: Handbook Press.
- Cairney, T. (2000). Beyond the classroom walls: the rediscovery of the family and community as partners in education. *Educational Review*, 52(2), 163-174.
- Cairney, T. (2000). Beyond the classroom walls: the rediscovery of the family and community as partners in education. *Educational Review*, 52(2), 163-174.
- Carraher, T., Carraher, D., & Schliemann, A. (1985). Mathematics in the street and in schools. *British Journal of Developmental Psychology*, 3, 21-29.
- Civil, M., Quintos, B., & Bernier, E. (2003). *Parents as observers in the mathematics classroom: Establishing a dialogue between school and community*. Paper presented at the NCTM research precession, San Antonio, TX.
- D'Ambrosio, U. (1984). Socio-cultural bases for mathematics education. *Proceedings of the ICME-5, Adelaide, Australia*.
- D'Ambrosio, U. (1997). Where does ethnomathematics stand nowadays?. *For the Learning of Mathematics*, 17(2), 13-17.
- Desforges, C., & Abouchar, A. (2003). *The impact of parental involvement, parental support and family education on pupil achievement and adjustment: A literature review*. UK: The Department for Education and Skills.
- Epstein, J. (1995). School / family / community partnerships: Caring for the children we share. *Phi Delta Kappan*, 76, 701-712.
- Ernest, P. (1994b). Introduction. In P. Ernest (Ed.), *Mathematics, education, and philosophy: An international perspective* (pp. 1-8). London: Falmer Press.
- Fleer, M., Ridgway, A., Clarke, B., Kennedy, A., Robbins, J., May, W., et al. (2006). *Catch the future: Literacy and numeracy pathways for preschool children*. Australia: Australian Government, Department of Education, Science and Training.
- Gerdes, P. (1986). How to recognise hidden geometrical thinking: a contribution to the development of anthropological mathematics. *For the Learning of Mathematics*, 6(2), 10-17.
- Goos, M., Lincoln, D., Coco, A., Frid, S., Galbraith, P., Horne, M., et al. (2004). *Home, school and community partnerships to support children's numeracy*. Australia: Department of Education, Science and Training.
- Greenhough, P., Hughes, M., Andrews, J., Feiler, A., McNess, E., Osborn, M., et al. (2004). *Home School Knowledge Exchange: Activities and conceptualisation*. Paper presented at the Teaching and Learning Research Programme 5th Annual Conference, Cardiff.
- Hanafin, J., & Lynch, A. (2002). Peripheral voices: parental involvement, social class, and educational disadvantage. *British Journal of Sociology*

of Education, 23(1), 35-49.

- Hughes, M., & Greenhough, P. (2006). Boxes, bags and videotape: enhancing home-school communication through knowledge exchange activities. *Educational Review*, 58(4), 471-487.
- Hughes, M., & Greenhough, P. (2007). 'We do it a different way at my school': Mathematics homework as a site for tension and conflict. In A. Watson & P. Winbourne (Eds.), *New directions for situated cognition in mathematics education* (pp. 129-151). London: Kluwer Academic Publishers.
- Hyde, J., Else-Quest, N., Alibali, M., Knuth, E., & Romberg, T. (2006). Mathematics in the home: Homework practices and mother-child interactions doing mathematics. *Journal of Mathematics Behavior*, 25, 136-152.
- Kozulin, A. (2003). Psychological tools and mediated learning. In A. Kozulin, B. Gindis, V. Ageyev & S. Miller (Eds.), *Vygotsky's educational theory in cultural context* (pp. 15-38). Cambridge: Cambridge University press.
- Kvale, S. (1996). *InterViews: An introduction to qualitative research interviewing*. Thousand Oaks, Ca: Sage.
- Lamont, M., & Lareau, A. (1988). Cultural capital: Allusions, gaps and glissandos in recent theoretical developments. *Sociological Theory*, 6(Fall), 153-168.
- Lareau, A., & Shumar, W. (1996). The problem of individualism in family-school policies. *Sociology of Education, Special issue on sociology and educational policy*, 24-39.
- Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life*. Cambridge, New York: Cambridge University Press.
- Lave, J. (1991). Situating learning in communities of practice. In L. Resnick & S. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 63-82). Washington, DC: APA.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New York: Cambridge University Press.
- Lerman, S. (1990). Alternative perspectives of the nature of mathematics and their influence on the teaching of mathematics. *British Educational Research Journal*, 16(1), 53-61.
- Lerman, S. (2000). The social turn in mathematics education research. In J. Boaler (Ed.), *Multiple perspectives on mathematics teaching and learning* (pp.19-44). Westport, CT: Ablex Publishing.
- Merttens, R., & Vass, J. (1990). *Sharing maths cultures: IMPACT Inventing maths for parents and children and teachers*. London: The Falmer Press.
- Miles, B., & Huberman, A. (1994). *Qualitative data analysis* (2nd ed.). CA: SAGE Publications.
- Moll, L., & Greenberg, J. (1990). Creating zones of possibilities: Combining social contexts for instruction. In L. Moll (Ed.), *Vygotsky and education: Instructional implications and applications of sociohistorical psychology* (pp. 319-348). New York: Cambridge University Press.
- Moll, L., Amanti, C., Neff, D., & Gonzalez. (1992). Funds of knowledge for teaching: Using qualitative approach to connect home and classroom. *Theory Into Practice*, XXXI(2), 132-141.
- Nunes, T. (1993). Sociocultural context of mathematical thinking: Research findings and educational implications. In A. Bishop, K. Hart, S. Lerman & T. Nunes (Eds.), *Significant influences on children's learning of mathematics* (pp. 27-42). Paris: UNESCO, Education Sector.
- O'Toole, S., & Abreu, G. (2003). *Investigating parents' explicit and implicit home numeracy practices in multiethnic contexts*. Paper presented at the 3rd Congress of European Research in Mathematics Education.
- Peressini, D. (1998). The portrayal of parents in the school mathematics reform literature: Locating the context for parental involvement. *Journal for Research in Mathematics Education*, 29(5), 555-582.
- Reay, D. (1999). Linguistic capital and home-school relationships: Mothers' interactions with their children's primary school teachers. *ACTA SOCIOLOGICA*, 42, 159-168.
- Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.
- Rowe, S., & Wertsch, J. (2002). Vygotsky's model of cognitive development. In U. Goswami (Ed.), *Blackwell handbook of childhood cognitive development* (pp. 538-554): Blackwell Publishing.
- Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher*, 27(2), 4-13.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. London: SAGE Publications.
- Street, B., Baker, D., & Tomlin, A. (2005). *Navigating Numeracies: Home/school numeracy practices*. Dordrecht, The Netherlands: Springer.
- Tharp, R., & Gallimore, R. (1988). *Rousing minds of life: Teaching, learning and schooling in social context*: Cambridge University Press.
- Tharp, R., & Gallimore, R. (1991). A theory of teaching as assisted performance. In P. Light, S. Sheldon & M. Woodhead (Eds.), *Learning to think* (pp. 42-62). London: The Open University.
- Tizard, B., & Hughes, M. (2002). *Young children learning* (2nd ed.). Oxford: Blackwell Publishing.
- Townsend, T., & Walker, I. (1998). Different families: new issues for school. In T. Townsend (Ed.), *The primary school in changing times: The Australian experience* (pp. 80-95). London: Routledge.
- Wood, D., Bruner, J., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Child Psychiatry*, 17, 89-100.