

Building Partnerships with Families and Communities to Support Children's Numeracy Learning

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The importance of building home, school and community partnerships is increasingly acknowledged since family and community involvement in education is thought to be associated with children's success at school. This paper reports on aspects of an Australian Government commissioned research project that analysed educational partnerships aiming to enhance children's numeracy education. Snapshots of two school case studies are presented to highlight features of effective partnerships and the kinds of numeracy learning they supported.

It is widely recognised that parents and families are the primary educators of children and are responsible for laying down the social and intellectual foundations for their learning and development. This assertion is also grounded in the education research literature, conveying the clear message that parental and community support benefits children's learning, including their numeracy development (Cairney 2000; Epstein, 2001; Horne, 1998).

In Australia, numeracy education has become a high priority for national and State/Territory governments, and the policies and strategies that have been formulated to address this area typically capitalise on the need to build partnerships with homes and communities to support children's numeracy learning (e.g., DEET, 2000; DETYA, 2000a, 2000b). This position on partnerships is consistent with the description of numeracy proposed by Australian educators at the 1997 Numeracy Education Strategy Development Conference: "to be numerate is to use mathematics effectively to meet the general demands of life at *home*, in paid *work*, and for participation in *community and civic life*" (DEETYA, 1997, p. 15, emphasis added). Such an approach to numeracy implies that it is the responsibility of all members of society – schools, families and communities – to ensure that children gain not only mathematical knowledge and skills, but also a repertoire of problem solving and decision-making strategies needed for intelligent citizenship in a rapidly changing world. While government policies aim to encourage schools to develop partnerships with families and communities in their local educational contexts, there has been little research on the nature of effective partnerships and the kind of numeracy learning they might support. These were the issues addressed by the study we report in this paper. The study is part of a larger project that investigated home, school and community partnerships to support children's numeracy development in the primary school years and the one to two years immediately before school.

Partnerships

Epstein (1995) defines home, school and community partnerships as exemplifying a relationship between "three major contexts in which students live and grow" (p. 702) and in which shared interests in and responsibilities for children are recognised. In addition, Funkhouser and Gonzales (1997) state that successful partnerships involve the sustained mutual collaboration, support and participation of school staffs and families at home and at school, in activities and efforts that have a positive effect on the academic success of

children in school. Because home, school and community represent the major overlapping spheres of influence in children's education and development, researchers and practitioners call for their collaboration as partners who "work together to create better programs and opportunities for students" (Epstein, 1995, p. 701).

However, while recent shifts in educational policies are partly based on the recognition that good relationships between parents and schools benefit students, consensus has not been reached about how these effective relationships should be achieved, who holds responsibility for what, and where power and control should reside in making educational decisions. Despite the frequency with which the concept of "partnership" is employed, its manifestation in practice often differs from the rhetoric of educational initiatives. Sarason (1995) argued that the present governance structures of schools define the nature and scope of parental involvement. Parents are usually invited by schools only when it is needed, and staff of some schools want parents to be involved only in specific ways and at times determined by the staff. In relation to mathematics education in the USA, Peressini (1998) found that accepted roles for parents were constructed as ranging from spectator to partner and from the deterrent to catalyst of mathematics education reforms.

Mismatches between home and school environments and failure to recognise parental diversity can create barriers to partnerships (Crozier, 2000). Also, because numeracy events embedded in the everyday activities of families or communities (such as budgeting, shopping, scheduling, playing games, measuring or building things) are less visible than numeracy events taking place in school mathematics classrooms, the school can conceive of the home as a subservient context in which the numeracy concepts and skills taught in school are to be practised and reinforced. The emergence of family numeracy programs has gone some way towards connecting home and school practices by involving parents and children together in meaningful mathematical activities (Horne, 1998). However, the various stakeholders in children's education may still have divergent perspectives on what constitutes partnerships and what their roles should be.

Overview of the Study

The research project aimed to identify, describe and analyse current Australian home, school and community programs and practices. Its design consisted of three phases:

- a questionnaire survey of education organisations, parent and community groups, and an email survey of primary school Principals throughout Australia;
- interviews with key personnel in State and Territory Education Departments, Catholic Education Commissions/Offices, and Associations of Independent Schools;
- case studies of exemplary, sustained numeracy programs featuring home, school, and community partnerships.

Cases were selected from analysis of questionnaire and interview data on the basis of evidence of impact in terms of evaluation of outcomes and program sustainability so as to sample a range of partnership initiation strategies, partnership dimensions, numeracy practices, target groups of educationally disadvantaged students, and geographical locations. Visits to each case study site lasted 3-6 days and involved: observation of classrooms, school staffrooms, teacher-parent interactions, and families in their homes; interviews with teachers, school administrators and support staff, and parents; and analysis of teaching materials, policy documents, and evaluation reports. Analysis of the case studies focused on partnership features and numeracy practices as outlined below.

Partnership Initiation

Through initial analysis of our questionnaire and interview data we developed categories to distinguish between different ways in which partnerships are initiated and funded. *Top-down* partnerships are initiated and sponsored by an education system with uniform program goals and processes across schools. *Top-supported* partnerships rely on an education system for some overall sponsorship or coordination but schools design and control the program. *School-generated* partnerships are initiated by a school independently of an education system, although this may involve resources available from the system. *Home/community-generated* partnerships have their origins in these sectors and are designed and implemented with input from families and community members.

Partnership Dimensions

Current research on parental involvement in children's education has developed several frameworks for understanding the various ways in which schools connect with families and communities. We drew on Horne's (1998) and Epstein's (1995) work in this area to identify six dimensions of partnerships:

- *Parenting*: support provided to families to ensure children's health and safety and develop parenting skills that prepare children for school;
- *Communicating*: establishment of effective interaction between school and home;
- *Volunteering*: parents' and families' volunteering and observing at the school or in other locations, to support students, teachers and/or programs in the school;
- *Learning at home*: parents' monitoring and assisting their children with homework and other learning activities;
- *Decision-making*: parents' participation in school decisions, governance and advocacy activities through curriculum committees, school councils and parent-teacher associations;
- *Collaborating with the community*: formation of links between schools and local businesses, after-school care providers, higher education and other community-based agencies.

Numeracy Practices

We operationalised the DEETYA (1997) description of numeracy quoted in the introduction to this paper by looking for evidence of three aspects of numerate practice and the knowledge and competencies associated with each (cf Willis, 1998). Thus numeracy involves:

- using mathematics: students need to understand and be able to use mathematical concepts and skills. This requires *mathematical* knowledge/competence.
- using mathematics effectively: students need to be willing and able to choose and apply mathematical concepts and skills to deal with unfamiliar problems (as in "working mathematically"). This requires *strategic* knowledge/competence.
- meeting the general demands of life: numerate practice is revealed in real world tasks that have a purpose. This requires *contextual* knowledge/competence.

The following section presents snapshots from case studies of a school-generated partnership and a top-down partnership. These snapshots have been chosen because they highlight different aspects of numerate practice and different perspectives on

communicating and learning at home as dimensions of home-school-community partnerships.

Case Study Snapshots

Perth Primary School: A School-Generated Partnership

This case study of an urban middle class school involves a school-generated partnership between teachers, parents, and students at all year levels. It illustrates a school-wide approach to numeracy education that adapts to the current and changing needs of the participants. The success of this approach depends very significantly on having a number of people in the community with similar goals and plenty of enthusiasm. A central person in this case is the Principal. Her involvement in numeracy partnerships goes back 18 years to her time working in the central office of the State education department and includes her later involvement with both the Family Maths program and the professional association for mathematics teachers. Within her own school the Principal has worked at developing a team approach to emphasising mathematical thinking.

Numeracy practices. An approach to numeracy that emphasises the strategic use of mathematical knowledge underpins the classroom philosophy from kindergarten on. In the very early years teachers emphasise mathematical concepts such as place value and patterning through number and word games, and they encourage the children to make and verify conjectures. For example, pre-school teachers introduced the idea of estimation by asking the children to guess the number of small items in a jar and then think about how they could verify their guess. Later the children were asked to compare estimates for two jars of different dimensions. Ways of verifying their results included using the objects to create bar graphs, as well as simply counting. Throughout, the teachers talk about thinking, drawing on past experience with like tasks, and choosing among a variety of acceptable ways to solve the problem.

By the time the students reach Year 5 they appear to be comfortable with the idea that mathematical activity entails attention to strategies and reflection on learning. This is evident in the way they are required to set out their workbooks to make explicit their problem solving strategies. On a double page spread there is space under the overall heading Mathematical Thinking for them to make notes in response to the sub-headings “Restatement of question in own words”, “Working”, “Reflection (what did I learn?)”, and “Extension (what if?)”. Across a range of problem solving activities there was evidence that children were in fact using this heuristic to articulate and support their thinking, demonstrated by written comments such as “I think my answer is accurate because I picked up a pattern” and “I learnt that when something is right in front of me I don’t have to take the hard way”.

In contrast to the classroom approach children experienced at school, we found that parents placed greater importance on acquiring mathematical knowledge via memorisation and “drill and practice” exercises than on developing strategic knowledge with problem solving tasks. For example, one mother regularly asked teachers to provide more mathematics homework and extension work and insisted on her children doing mathematics exercises every afternoon, but never checked their work or discussed it with them. Parents often expressed a lack of confidence with mathematics and a concern to understand what was taught at school so they could help their children at home, and the

desire to address these concerns is at the heart of the school's efforts to involve parents in their children's numeracy education.

Partnership dimensions. The school's perspective on parental involvement exhibits the partnership dimensions of *communicating* and *learning at home*, evident in such strategies as having a "Maths Corner" in the school newsletter and offering individualised "take-home packs" of mathematics activities to parents who request additional materials to use with their children. However, the most interesting initiatives involve fortnightly Maths for Parents sessions, where the Principal and teachers discuss some topic identified by parents themselves (usually involving current curriculum issues and pedagogical approaches), and parents' participation in a mock WALNA (Western Australia Literacy and Numeracy Assessment) test after which the Principal goes through the paper and discusses the kind of mathematical knowledge and skills being assessed. At these sessions we observed that parents were concerned they were not familiar with current mathematics teaching approaches that differed from their own experiences at school; for example, they expressed some anxiety that their children were not learning "tables" by rote. There was a clear feeling from the parents that children should be drilled (and by implication tested) on "tables" and given more homework. This was despite the fact that they remembered hating learning tables and said that they themselves never mastered mathematics. Teachers spent some time demonstrating to parents that everyone has their own efficient strategies for mental and written computations and emphasised that developing this kind of flexibility and fluency was encouraged in modern schools. They also offered suggestions for ways in which parents might meaningfully incorporate mathematical thinking into everyday activities such as sharing out food or comparing the shapes of traffic signs.

A number of advantages accrue from the fact that the school's approach is not formalised into a "program". No single person or group has ownership of what happens and it is everyone's responsibility to develop the students' confidence and mathematical thinking. Further, activities are readily adapted to the needs or opportunities of the moment or child. Distributed ownership and flexibility ought to be positive factors for the sustainability of this school's numeracy approach.

Distance Education Centre: A Top-Down Partnership

Distance education is a well established practice in Australian education and may be the longest running partnership between schools, homes and communities. This case study focuses on a Distance Education Centre in rural New South Wales as an example of a top-down partnership. As the curriculum is the same as in regular schools, teachers at the Centre are provided with standard materials from a central publishing unit from which they then select according to the needs of their students. Materials are sent out to homes where parents supervise the child's learning. In fact the parents are doing much more than making sure the student works through the material. They organise the home and its routines to make learning possible through setting aside a classroom area and fitting learning activities into the child's day. They commonly are very active in guiding children's learning and finding ways to make links with their everyday experiences. Teachers at the Centre, however, are adamant that when parents are in this role they are neither parents nor teachers but "supervisors".

Numeracy practices. Although students work with the same mathematics syllabuses as their classmates in regular schools, supervisors (i.e., parents) are able to modify activities to accommodate their own learning contexts, create their own learning materials, or use

everyday events and experiences to explain mathematical concepts. Rather than working through the units as given, supervisors may purposely select topics to take advantage of numeracy learning opportunities within the children's home environment. This results, for example, in spatial and measurement activities being integrated into real life contexts long before number concepts are moved beyond pencil-and-paper representations. From a numeracy perspective, mathematical and contextual knowledge and competencies are often developed hand in hand when children learn via distance education. It seems likely also that transforming standard learning materials into contextualised activities may contribute to the development of strategic knowledge as "working mathematically", especially in terms of investigating, conjecturing, using problem solving strategies and applying and verifying (Curriculum Corporation, 1994). An example from the case study, involving a family building a mud brick house, serves to illustrate this point. In the context of making mud bricks, the supervisor/parent and child can *investigate* whether they have enough clay and straw to finish building a wall, *conjecture* as to what would happen if they used more water in the mix, use *problem solving strategies* to make some trial bricks with different proportions of ingredients, and *apply and verify* by calculating the amount of ingredients needed and building the wall.

Partnership dimensions. As with the Perth Primary School case study, the main dimensions of this partnership are related to *communicating* and *learning at home*, although in quite a different configuration since here the home is the primary site for learning and teachers are distanced from it. Telecommunications between participants in this partnership are frequently problematic. Students are supposed to have weekly teleconferences with their teachers, but some families have no telephone line and communication via mobile phone is unreliable. Even greater difficulties arise in relation to computer-based communication, since where there is Internet access the download rate is often so slow as to make it virtually useless. Audio tapes are the most common form of two way communication but the delay between submitting completed work and getting feedback from a teacher reduces their efficacy. The focus of any talk tends to be on the printed materials and concrete learning aids provided and how best to use them.

Novice supervisors essentially rely on the Distance Education packaged materials to teach their children mathematics at home. Those supervisors who lack personal "mathematics confidence" tend to worry if their child is not completing units on time. Not surprisingly, these parents attempt to engage their children with all the tasks provided and tend to approach activities in the recommended sequential order. They do not always appreciate the role of the concrete materials in supporting mathematics learning, and indeed very little background information or rationale is provided in the package. Consequently, the support these parents offer their children mirrors the type of teaching experiences they encountered at school. Most parents break this cycle although it may take several years for those individuals who lack confidence in their own mathematical ability. Generally, the first signs of creating more flexible learning contexts arise as they begin to ask other parents how they are supporting their child's learning. This form of sharing is fostered by the Centre and its teachers in a number of ways, for example, by ensuring that supervisors have the telephone number of others who are relatively experienced or have children of a similar age. Isolated students and their parents are also brought together through mini-schools and camps to share ideas that extend the uses of the provided materials, and these opportunities for communication between parents in their supervisory roles appear to be crucial in supporting children's numeracy learning at home.

Discussion

Our study extends previous research on educational partnerships by elaborating a framework for analysing key features of partnerships that support numeracy learning. The case study snapshots illustrate some of the insights we gained from our research into the nature of effective partnerships between schools and students' families and communities and the kinds of numeracy learning they support. Effective partnerships, whether arising from uniform State wide programs or school-based initiatives, were specific to participants' needs and contexts at a local level and often involved the whole school or whole family. While these partnerships were characterised by mutual cooperation and shared interest in children's learning, the roles of participants differed. This is evident when we consider the nature of home-school *communication* and ways in which schools connect with families to support numeracy *learning at home* – two partnership dimensions that were highlighted in the case study snapshots.

Most schools would claim to welcome two-way communication with the home, yet in practice schools and teachers tended to see their role as providing information to parents about current approaches to numeracy teaching rather than inviting parental input on curricular decision making. This was the case, for example, at Perth Primary School. Distance education, however, seems to offer a unique context for two-way communication, since parents take on a supervisory role that gives them more responsibility for negotiating individualised curriculum modifications with their child's teachers and fellow parent/supervisors. The role of parents in assisting their children's numeracy learning at home typically involves monitoring take-home activities that reinforce the mathematical knowledge and skills taught at school. Exemplary school numeracy programs also build strategic knowledge through a focus on mathematical thinking and problem solving, and encourage parents to take a similar approach in helping their children at home. However, parent's lack of confidence in their own ability to understand mathematics in this way makes it difficult to forge home-school partnerships around a view of numeracy as strategic mathematics. And even though some schools endeavour to help parents recognise numeracy learning opportunities in the home environment, we suspect that the rich variety of numeracy events embedded in home and family contexts remains invisible to most parents and teachers. A significant issue arising from our research is the lack of awareness in schools and the community generally about the nature of numeracy in its broadest sense. In addition to community education campaigns, pre-service and in-service education needs to develop teachers' capacity to "see" numeracy in everyday life. As the principal agents of numeracy education, teachers may then be better able to assist parents and community members, and children themselves, to appreciate the role of numeracy at home, in paid work, and for informed citizenship.

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