

Tensions in mathematics home-school partnerships

Bridget Wadham
University of Auckland
<bridgetnz@gmail.com>

Lisa Darragh
University of Auckland
<l.darragh@auckland.ac.nz>

Fiona Ell
University of Auckland
<f.ell@auckland.ac.nz>

Home-school partnerships in mathematics are increasingly seen as a significant contributor to learners' success in school mathematics. Partnering with learners' families can, however, be challenging for schools. This study focused on an exploration of home-school partnership practices in one culturally diverse, low socioeconomic school in Auckland. Teachers completed a questionnaire about their perceptions of the home-school partnership, and parents participated in one of five focus group interviews designed with the cultural and linguistic diversity of the school at the forefront. Findings reveal that a number of tensions between aspects of mathematical practices of the home and school exist.

The school and the home are influential contexts in which a child learns and develops. Many parents want to know what their child is being taught at school, and how to support their learning at home. Many teachers want to know more about how to engage and work with parents, and to know what occurs in students' educational home lives. Whilst many schools aim to have effective home-school partnerships, achieving this goal is a lengthy and complicated process. In areas that are culturally and linguistically diverse, schools face the additional challenge of how to equitably and respectfully cater for the different groups of people in their community. It is important to know what is needed to develop effective home-school partnerships, and what is needed to improve existing ones. Mathematics poses particular challenges for home-school partnerships as the teaching and learning of mathematics differs around the world, and parental experiences and expectations can vary widely from school practices.

This study reports on an investigation into the effectiveness of the mathematics home-school partnership within one diverse school in a low-socio economic area of Auckland, New Zealand (predominantly comprised of families self-identifying as Tongan, Indian, Samoan, or Māori). It aimed to identify existing practices present in the mathematics home-school partnership, and explore what is needed to support an improved reciprocal relationship.

Literature

When parents choose to be involved in their child's education a number of benefits are expected. The child's self-efficacy may improve (Fan & Williams, 2010), academic achievement may rise (Sheldon, Epstein & Gallindo, 2010) and attendance at school may increase (Bull, Brooking, & Campbell, 2008; Epstein, 2009). In mathematics specifically: effort, concentration, and attention should improve (Gonzalez, Willems, & Holbein, 2005) and the rate of academic progress should quicken (Chang, Choi, & Kim, 2015). In contrast to these benefits, some unfavourable outcomes are possible, but on a considerably smaller scale. If parents use different mathematics strategies at home than those taught at school, they themselves may experience frustration (Amituanai-Tolosa, McNaughton, Lai, & Airini, 2009), and the child may experience confusion or be reprimanded by the teacher (Mistretta, 2013).

2019. In G. Hine, S. Blackley, & A. Cooke (Eds.). *Mathematics Education Research: Impacting Practice (Proceedings of the 42nd annual conference of the Mathematics Education Research Group of Australasia)* pp. 731-738. Perth: MERGA.

Research suggests that many parents are involved in their child's education through what they do at home. In a study of 246 parents (Patrikakou & Weissberg, 2000) it was found that 74% regularly checked their children's homework was completed and made significant other efforts to support their child's education. Theodorou (2008) found that parents living in overcrowded households made sure their children had a designated space for studying. Within New Zealand, one study in a Kura Kaupapa Māori (immersion school) found that 39 out of the 40 students had support for learning mathematics at home (Young-Loveridge, Taylor, Sharma, & Hawera, 2006). When parents are not involved in their child's education, it may be due to some form of barrier blocking their way, or because the morals and values held by the parents do not align with supporting school-like education at home (Olsen & Fuller, 2008).

Issues of parental involvement specifically concerning mathematics acknowledge that there is a general perception about mathematics being a difficult subject (Fisher & Neill, 2006) and that many parents may have had negative experiences within mathematics at school (Civil et al., 2005). Furthermore, Maher (2007) found that only about one-third of parents actually know how their child is progressing and achieving in mathematics. The most prominent problem that arises, seen in research internationally, is caused by the school mathematics curriculum being different from the knowledge that parents hold.

A mismatch between school mathematics and parental mathematics is a common experience for immigrant or minority parents. When the mathematics knowledge shared by the school does not match that of the parents, a barrier is established (De Abreu & Cline, 2005; Mistretta, 2013; Takeuchi, 2018). It is notable that some studies describe how immigrant and minority parents act to remedy the faults they perceive in the westernised mathematics curriculum. In a study by Li (2006), Chinese parents bought textbooks and set extra drills, as they viewed their children's mathematics homework as insufficient. Similarly, a study by De Abreu and Cline (2005) found Pakistani parents (based in the United Kingdom [UK]) imported text books from Pakistan, as they were unhappy with the difficulty and pace of the UK mathematics curriculum and believed their children were not acquiring sufficient mental arithmetic skills.

Within the New Zealand context, available research regarding parental involvement generally involves Māori and Pasifika populations. It illustrates how these populations view mathematics differently than westernised methods and place a higher value on mathematics in meaningful contexts. In Meaney and colleagues (2013) one Māori father described how mathematics is not just about numbers in a classroom, but used in ways that his ancestors saw as practical in their daily lives (such as reading the stars and knowing when to plant crops). The importance of relating mathematics to the real-life contexts of Pasifika students is also an area of focus for researchers in New Zealand (Hunter, 2010; Hunter et al., 2016) who aim to support teachers in developing culturally responsive mathematics teaching practice.

Many teachers also appear to hold stereotyped perceptions about levels of parental involvement, based on a parent's education level, culture, or socio-economic status. They may also perceive well-educated parents as being more active in their child's education than less-educated parents (Bakker et al., 2007). Some teachers may hold deficit perceptions about immigrant and minority parents, presuming that they 'don't care' or are 'not involved' (Theodorou, 2008) and also perceive much lower levels of home-based involvement than the parents themselves report doing (Bakker et al., 2007; Nakhid, 2003). Contributing to these misperceptions is that when teachers differ culturally or educationally from their students, they are less likely to know the parents and more likely to believe they are disinterested in their child's education (Epstein & Dauber, 1991). If teachers hold certain perceptions (as mentioned above), this will likely influence their behaviour and they may act

or respond differently depending on the student or parent. Weininger and Lareau (2003) found that teachers were far more dismissive of questions and concerns from working and lower-class parents during reporting evenings. Bakker et al. (2007) reported that some teachers made less effort to attempt engagement with parents from low income homes, and additionally lowered their expectations for the students themselves. Hunter et al. (2016) proposed that teachers may not understand the other values or responsibilities students from certain families hold. This misunderstanding can cause tension between the school and home agendas, and may further support teachers' perceptions that parents are not interested in their children's education.

More knowledge is needed about mathematics home-school partnerships within New Zealand settings, in particular – diverse schools in low socio-economic areas. As such, the research questions informing this study were:

- How do teachers perceive parents' interest and involvement, and what do they do to support parents to understand their children's learning of mathematics?
- What challenges do parents and teachers experience in partnering around mathematics learning?

Methods

The research project took place in a large multicultural primary school catering for students from Year 0-6, in a low socio-economic area in South Auckland, New Zealand. The study had 35 participants in total, 18 teachers and 17 parents. Of the parent participants, one was male (a father) and 16 were female; 14 were mothers and two were grandmothers. Four of the participants self-identified as Tongan, three as Samoan, three as Māori, one as Niuean, and six as Indian (either born in India or Fiji).

The study comprised of two separate procedures; one for teachers and one for parents. Teachers completed an online questionnaire comprising of ten open-ended questions. Parents took part in focus group interviews. Five focus groups were arranged. The first four focus groups were culturally homogeneous (Māori, Samoan, Tongan, and Indian) and participants were offered the support of a translator (which was used within the Samoan and Indian focus groups). The fifth focus group had a diverse range of ethnicities and cultures, as these participants indicated they wished to attend an English language focus group. The conversations lasted approximately 40-70 minutes.

Correspondingly, two methods of data analysis were used. Content analysis for the teacher data and thematic analysis for the parent data. Content analysis was used as it is a valuable strategy in providing evidence for interpretations, as well as identifying diversity within a given area (Maxwell, 2010). Each question asked of the teachers was analysed to identify the types of responses, and then the frequency of each response was recorded. Braun and Clarke's (2012) six-phase model for thematic analysis was used to analyse the focus group data. This model allowed patterns of meaning across the data set to be gathered, in order to gain a sense of the collective experiences of parents.

Results

Teacher Questionnaires

Some key findings that derived from the teacher questionnaires were that teachers perceived parents lacked mathematical knowledge:

“They may not have the understanding to help their children with more complex maths concepts.”

“Families may think that they do not know enough about the subject to assist their children’s learning”

“Parents need to upskill their own knowledge and ability.”

Comments such as these were evident throughout the questionnaire responses. Additionally, teachers described a number of ways in which parents are shown how to help their children with mathematics at home. These included maths packs, workshops and homework:

“Made maths packs for them and invited them for a meeting to show them how it is to be used.”

“The weekly homework sheet has a big emphasis on maths, learning recall of basic facts.”

Finally, when asked about the perceived needs for partnerships between home and school mathematics, the response was overwhelmingly centred on training the parents so that they could understand better the mathematics taught at school.

“Understanding how we teach maths at school (mental strategies versus vertical algorithm) and what we cover in the curriculum”.

Overall, the data clearly demonstrated that teachers within the school generally perceived that parents do not have the knowledge to effectively support their children with mathematics. This finding was mainly shown through the reported perceptions that parents need to understand how mathematics is taught at school. In addition, there was repeated use of the term ‘algorithm’ within the teacher responses indicating that parents are teaching their children different strategies than those being taught within the school. Teachers perceived that mathematics homework and basic facts drills are the main way parents support their children at home; this aligns with the fact that sending homework is the main action that the school and teachers implement to engage parents.

Parent focus group interviews

This section presents examples of the main tensions that were identified across the five focus groups. The participants were clear about the difficulties they have with the current mathematics curriculum.

I don't like how it's taught today. I have no idea what my kids are on about! And how they use the tens, ones, tens, thousands. (Awhina, Māori focus group interview)

... but I've noticed in schools today they're quite different. Like instead of saying $5 - 2$ they use 5 is the same as $3 + 2$, which is quite 'you know' to get your head around. And also, when you're adding and you've got 52 , and you add 52 plus 6 they're using the - [makes a horizontal action with hands] back in the days we used to go the long way [makes vertical action with hands] which is much easier. Yeah, so you hear from the teachers you know, you don't teach the children like that. (Kahurangi, Māori focus group interview)

Parents in the Samoan focus group similarly spoke about the confusion and frustration that occurs when they have different mathematics methods to their child.

...the strategies that we used in high school. It was, for me it was easier – but now, like in school now... you know even having my children come home and they try and work out something, a maths problem and they do it differently – the strategy. And I'm thinking, you know, what I did back then is a lot longer process of getting the answer. But now I still find it confusing, like is that right? Even the new strategies now that the kids have picked up now, it's very hard. So yep, I find it hard that they come home with new

strategies and I can't help: because I still have this old way of working it out! (Leilani, Samoan focus group interview)

It is clear that parents were taught certain strategies when they were at school, which they find easy to understand. In contrast, their children are bringing homework that requires different ways of solving problems. Having different sets of mathematical knowledge means that Leilani struggles to effectively support her children during homework time.

Sione (Tongan focus group) had a clear idea of how he would like the school mathematics curriculum communicated regarding his son's learning.

I think the better way is to give them the, the syllabus of every person's class and then show them what's the, the exactly math that you want them to use. Like me: I can use a different kind of methods. But when he came to do school he say "no that's wrong". I remember this. So I can't change his mind, once he says "no! My teacher is right! But you're wrong". [...] It doesn't matter if we, we get the same answer. He, he really needs the teacher's way. Oh, that's why if they give any homework or something... and the should... I think they should uh ... tell us what kind of math they use (Sione, Tongan focus group interview).

This dialogue shows Sione would like a copy of the teacher's mathematics syllabus, along with explanations of how to complete the different strategies. Sione's methods of mathematics are different from what his son is learning at school, and his son views the teacher's methods as correct. It can be reasonably assumed that in Sione's case, he is wanting to align his practices with the school, creating a "school-like family" (Epstein, 2009).

Some parents, in contrast, spoke of the need to remedy the situation at home:

I think their homework is little, so only a few months ago I joined them to Kumon classes, have you heard of Kumon? So, my kids go to Kumon extra classes and they have [homework] for every day: they do their homework, school homework...once it's done they have lots of Kumon class. I think it's a matter of practice, everyone has booklets and the kids practicing it every day. (Mathura, Indian focus group interview)

Mathura believed the mathematics homework was not sufficient, and had enrolled her children in after-school tutoring. She explained later in the conversation about how she and her husband had chosen to sacrifice things for themselves, in order to give their children this opportunity. Through Mathura's description, it appears the Kumon service was meeting her needs, by providing ample homework and practice opportunities for her children.

In general, the results demonstrated that parents are interested in their children's mathematical learning and want them to succeed. They are aware of the issues they face when supporting their children with mathematics at home, and have ideas about how these issues could be remedied. Moreover, they want to receive timely and in-depth information about the school's mathematics curriculum so they can best support their children at home. It is also evident that there are differences between the mathematics knowledge that parents hold, and what is being taught in the school. Two dominant themes emerge from the focus group data. First, that there are many areas of tension within existing home-school partnership practices (especially regarding communication of mathematics in homework, reporting, and student-led conferences). Second, that parents demonstrate a high level of agency and aspire for their children to succeed in mathematics. The next section will discuss the theme related to tensions between school and home mathematics practices

Discussion

Many areas of tension appear to exist within the current mathematics home-school partnership in the study context. These tensions comprise of practices, homework, student-led conference, reporting, mathematics strategies, vocabulary and workshops. The tension is also evident in the misalignment between the perception and reported practices of teachers when compared to data from parent focus groups. In this paper we will focus on one of these areas of tension - mathematics practices used at home and school

Tension is evident in the contrasting mathematical computational strategies that parents use, and those that teachers use in the classroom. The main tension lies in the fact parents were typically taught using vertical long multiplication/ division methods (such as described by Kahurangi), yet, the current mathematics practices at the school focus more on knowing and understanding different types of strategies to solve problems, with attention to meaning making as opposed to memorisation. Mathematics computational problems are presented horizontally, so that the traditional algorithm is not promoted.

Data from the focus groups show that some parents found the ‘new’ strategies baffling because of the presentation and method required. Some parents described withdrawing their help in fear of teaching the wrong method, and other parents reported their child telling them that the teacher was right and they were wrong. Additionally, two parents described how their children were “told off” by the teacher when they used a strategy they had taught them. These problems are commonly reported by other international studies (De Abreu & Cline, 2005; Li, 2006; Mistretta, 2013; Takeuchi, 2018) and are especially apparent for immigrant parents, and in countries that have undergone significant curriculum changes.

When asked about what mathematics activities parents do with their children at home, three teachers reported they believe parents teach algorithms to their children. This finding shows that some teachers have an awareness that parents may hold different mathematical strategies than the school. It could also be interpreted that these particular teachers do not agree with parents teaching algorithms at home, when linked to the descriptions mentioned above about children being “told off” or believing their teacher was right. It was also interesting that one teacher stated parents should be better informed about how mathematics was taught at school, as well as what was covered in the curriculum (however, did not give a suggestion of who exactly should be the one to inform parents). It is likely that teachers are unaware that responding negatively to home mathematics strategies can impact the child and family (De Abreu & Cline, 2005; Takeuchi, 2018).

This tension indicates insufficient communication about significant curriculum changes within the past decade. When parents hold one set of knowledge that does not align with the set of knowledge accepted by schools, then it comes as no surprise that tension occurs. This explains why many parents (such as Sione) said they wanted an example of strategies written at the top of homework sheets (so they can teach the same method as the school). The *Ua aoina le manogi o le lolo* (Amituanai-Toloa et al., 2009) also reported Samoan parents wanted examples of how to complete homework so they could follow the methods correctly. When considering this information, it is clear that many parents (and especially Sione) want to create a ‘school-like family’ (Epstein, 2009) by aligning practices at home with that of the school.

Implications and Conclusions

The study identified a number of implications relevant to the specific school context that may additionally be valuable to teachers, researchers and policymakers more broadly. Parents were very aware of what they need to better support their children’s learning of

mathematics, and schools need to realise the value in listening to these parents' needs. In particular, the school mathematics curriculum should be made more available to parents. Teachers need to be mindful about how they respond to mathematics strategies that students bring into the classroom from home (especially algorithms). They also need to find ways to give clearer communication to parents about the mathematics curriculum in their class, especially concerning instructions about how to complete homework where strategy work is involved.

This study has shown that teachers that welcome parents' questions and are open to them visiting the classroom help enable parents to understand their child's mathematics learning. Schools should find ways to support parents to further develop this agency to visit and question. The study identified a number of tensions present within common mathematical home-school partnership practices. Gathering data from parents in other schools in New Zealand would be useful in identifying if these tensions are commonplace. At a policy level, there appears a need to begin building understanding about the expectations and practices of cultural and linguistic populations that are on the rise in New Zealand, such as those from Indian descent.

References

- Amituanai-Tolosa, M., McNaughton, S., Lai, M., & Airini. (2009). *Ua Aoina le Manogi o le Lolo: Pasifika Schooling Improvement Research - summary report*. Ministry of Education, New Zealand.
- Bakker, M., Van Den Heuvel-Panhuizen, M., & Robitzsch, A. (2015). Effects of playing mathematics computer games on primary school students' multiplicative reasoning ability. *Contemporary Educational Psychology, 40*, 55–71.
- Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper (Ed.), *APA handbook of research methods in psychology (Volume 2): Research designs*. American Psychological Association.
- Bull, A., Brooking, K., & Campbell, R. (2008). *Successful home-school partnerships*. Ministry of Education, New Zealand.
- Civil, M., Bratton, J., & Quintos, B. (2005). Parents and mathematics education in a Latino community: redefining parental Participation. *Multicultural Education, 13*(2), 60–64.
- De Abreu, G., & Cline, T. (2005). Parents' representations of their children's mathematics learning in multiethnic primary schools. *British Educational Research Journal, 31*(6), 697–722.
- Epstein, J. (2009). *School, family, and community partnerships: Your handbook for action* (3rd ed.). Thousand Oaks, CA.: Corwin Press.
- Epstein, J., & Dauber, S. (1991). School programs and teacher practices of parent involvement in inner-city elementary and middle Schools. *The Elementary School Journal, 91*(3), 289-305.
- Fan, W., & Williams, C. (2010). The effects of parental involvement on students' academic self-efficacy, engagement and intrinsic motivation. *Educational Psychology, 30*(1), 53– 74.
- Fisher, J., & Neill, A. (2006). *Exploratory study of home-school partnership: Numeracy*. Retrieved from http://dev.nzmaths.co.nz/sites/default/files/Numeracy/References/Comp06/comp06_fishe_r_neill.pdf
- Gonzalez-Dehass, A., Willems, P., & Holbein, M.F.D. (2005). Examining the relationship between parental involvement and student motivation. *Educational Psychology Review, 17*(2), 99– 123.
- Hunter, J., Hunter, R., Bills, T., Cheung, I., Hannant, B., Kritesh, K., & Lachaiya, R. (2016). Developing equity for Pāsifika learners within a New Zealand context: Attending to culture and values. *New Zealand Journal of Educational Studies, 51*(2), 197–209.
- Hunter, R. (2010). Changing roles and identities in the construction of a community of mathematical inquiry. *Journal of Mathematics Teacher Education, 13*(5), 397–409.
- Li, G. (2006). What do parents think? Middle-class Chinese immigrant parents' perspectives on literacy learning, homework, and school-home communication. *School Community Journal, 16*(2), 27–46.
- Maher, M. (2007). Home-school partnership within mathematics intervention. *Australian Journal of Early Childhood, 32*(3), 48-58.
- Maxwell, J. (2010). Using numbers in qualitative research. *Qualitative Inquiry, 16*(6), 475– 482.
- Meaney, T., Trinick, T., & Fairhall, U. (2013). One size does NOT fit all: Achieving equity in Maori mathematics classrooms. *Journal for Research in Mathematics Education, 44*(1), 235–263.
- Mistretta, R. (2013). “We do care”, say parents. *Teaching Children Mathematics, 19*(9), 572–580.
- Nakhid, C. (2003). “Intercultural” perceptions, academic achievement, and the identifying process of

- pacific islands students in New Zealand schools. *The Journal of Negro Education*, 72(3), 297–317.
- Olsen, G., & Fuller, M. (2008). *Home-school relations: Working successfully with parents and families*. Boston: Pearson/Allyn and Bacon.
- Patrikakou, E., & Weissberg, R. (2000). Parents' perceptions of teacher outreach and parent involvement in children's education. *Journal of Prevention & Intervention in the Community*, 20(1–2), 103–119.
- Sheldon, S., Epstein, J., & Galindo, C. (2010). Not just numbers: Creating a partnership climate to improve math proficiency in Schools. *Leadership and Policy in Schools*, 9(1), 27–48.
- Takeuchi, M. (2018). Power and identity in immigrant parents' involvement in early years mathematics learning. *Educational Studies in Mathematics*, 97(1), 39–53.
- Theodorou, E. (2008). Just how involved is 'involved'? Re-thinking parental involvement through exploring teachers' perceptions of immigrant families' school involvement in Cyprus. *Ethnography and Education*, 3(3), 253–269.
- Weininger, E., & Lareau, A. (2003). Translating Bourdieu into the American context: The question of social class and family-school relations. *Poetics*, 31(5–6), 375–402.
- Young-Loveridge, J., Taylor, M., Sharma, S., & Hawera, N. (2006). Students' perspectives on the nature of mathematics. In *Identities, cultures and learning spaces (Volume 2). 29th Annual Conference of the Mathematics Education Research Group of Australasia.*, (pp. 583– 590).