# Remote Australian Primary School Parents' Attitudes Towards Their Children's Learning of Mathematics and the Role of Technology

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This qualitative study investigates remote Australian primary school parents' attitudes towards their children's learning of mathematics and the role of technology. Using semi-structured interviews and thematic analysis, results revealed that parents aimed to provide the best mathematics learning opportunities for their children, yet they felt obsolete and isolated from their children's learning. Additionally, they valued the role of technology, but did not think school was providing adequate digital literacy skills. Discussion about what changes to the educational community are suggested to support parents in their children's learning.

Research has highlighted that in Australia, three groups of students regularly perform at a lower level than their peers—Indigenous students, students from lower socioeconomic backgrounds and those living in remote or rural communities (Sullivan et al., 2013). Understanding these disparities requires consideration of numerous variables. Some previous studies have focused on students' attitudes towards mathematics (Bragg et al., 2020; Perry, 2011) and attitudes towards technology in education (Hughes & Read, 2018). Given that parents are involved at the personal, behavioural and cognitive-intellectual level of their children (Hill & Tyson, 2009), parents' roles in the education of their child cannot be understated. However, very few studies have focused on parent's attitudes towards mathematics and technology, and a scarcity of research has focused on remote parents' attitudes. This study addresses this gap and answers the research question:

- What are remote Australian primary school parents' attitudes towards their children's learning of mathematics and the role of technology?

## Literature Review

### *Attitudes Towards Mathematics*

Attitudes are an integral part of student's learning of mathematics as there are connections between attitudes and learning outcomes (Grootenboer & Marshman, 2016). Attitudes can be conceptualised as "a predisposition with an emotional charge that directs and/or influences behaviours" (Palacios et al., 2013, p. 68). Previous studies have focused on students' attitudes (Perry, 2011) and how to make sustainable changes in students' attitudes (Long, 2016). Others have investigated those of preservice teachers (e.g., Tran & Javed, 2017), but rarely have any studies focused on this aspect with in-service teachers (see Ingram et al., 2020). Diverse methods have been used to study attitudes including questionnaires (e.g., Tran & Javed, 2017), video-diaries (e.g., Larkin & Jorgensen, 2016). Di Martino and Zan (2015) argue that there has been a gradual movement towards the interpretive paradigm in mathematics education to understand phenomena, instead of the attempt to explain behaviour through measurements, which is applicable in studying attitudes. Previous studies have underscored that attitudes are important, but no reviewed studies have focused on parents, who also play crucial roles in student learning.

(2023). In B. Reid-O'Connor, E. Prieto-Rodriguez, K. Holmes, & A. Hughes (Eds.), *Weaving mathematics education research from all perspectives*. *Proceedings of the 45th annual conference of the Mathematics Education Research Group of Australasia* (pp. 299–306). Newcastle: MERGA.

### *Parents' Attitudes Towards Technology and Mathematics Learning*

Parents, whether part of nuclear, blended, single, extended, step or grandparent families, are embedded in and influence communities and larger social systems (Hoff & Laursen, 2019). Parents and caregivers provide the bedrock for their child's academic, emotional and cognitive life (Hannah, 2020). Hoff and Laursen (2019) report that a parent's socioeconomic status (SES) influences their estimation of the development trajectory and milestones their child will attain at a given time, with higher SES parents estimating earlier attainment than lower SES parents' estimations. Additionally, Blevins-Knabe (2016) highlighted differences between high and low SES households. High SES parents were more engaged and interested in mathematics, with lower SES parents providing fewer mathematics opportunities. Some parents may experience higher confidence engaging with informal mathematics activities such as card and board games (Ramani & Siegler, 2021), in contrast to feeling disheartened and isolated trying to navigate an unfamiliar mathematics teaching and learning terrain. For some parents, the potential to integrate technology into mathematics and education may create opportunities for a shared dialogue. However, as Hughes and Read (2018) reported this integration may prove challenging, as more students in their research reported mathematics as the subject where they never used technology for learning.

Government, the wider community and schools may operate on the assumption that parents will be proficient in the domains of "twenty-first century literacies" (Downes et al., 2020), while concurrently being sufficiently digitally literate (Jin et al., 2020). However, this expectation may not always be achievable. For example, Downes et al. (2020) reported that parent beliefs about access to technology devices and usage was influenced by factors such as SES, culture and employment. Furthermore, Davies (2011) suggests that low SES parents experience a level of anxiety when their children are using technology.

Consequently, if parents are expected to possess the necessary capabilities and competencies to integrate mathematics, technology and education, there is a clear absence of research, particularly in remote Australia, which is such a disadvantaged location. Therefore, undertaking research which investigates and reports on the complexities involved, particularly in a remote location in Australia would be highly relevant area for educational research.

## Methodology

We adopted the semi-structured interview approach as it's flexible, versatile, able to adapt to the purpose of the study. Additionally, through the development of a structured interview guide, informative insights would be captured, as participants respond to, and elaborate on a series of open-ended, yet thoughtfully ordered and predetermined questions. The study utilised a culturally appropriate (Kariippanon & Senior, 2017) and socio-culturally sensitive design to ensure all participants experienced a safe and supportive interview environment. The interviews were conducted by a member of the research team who had been part of the remote community for a number of years. Therefore, the researcher was a sufficiently trusted member of the community, yet not so close as to potentially distort or introduce bias into the analysis. This placed the researcher as neither an insider nor an outside, but able to operate in the "space between" (Kerstetter, 2012).

### *Participants*

Participants for the study were drawn from an area in remote Australia, which is categorised as a *most disadvantaged* area of the nation (Australian Bureau of Statistics, 2016). Potential participants were contacted through Parents and Citizens' Associations and the local Aboriginal Education Consultative Group. Four participants agreed to participate in this project. Susan, is a female. She is married with two children, and one is attending Year 6. Bernadette was also female. She is currently living with her parents, and four of her children; two currently attend primary school. Tori, was female. She is currently married with four children. Two of the children are of pre-school

age. The other two children currently attend primary school. Finally, Claire is also female. She is married with four children with one in Year 6.

### *Interview Protocol*

A comprehensive, questioning protocol was developed by the research team. The interview comprised of three interrelated and overlapping sections. The first section focused on establishing each parents' access to, and attitudes towards technology within the home, for themselves and their child. Parents were encouraged to discuss technology use, perceived level of competency and confidence, plus perceived capacity to support their eldest primary child in their learning and technology use. Next, insights were sought on their attitudes towards mathematics and the current use of technology in schools. Parents were encouraged to elaborate on their personal mathematics experiences, and whether these accord or not with their child's experience. Finally, attitudes towards informal and formal mathematics in the home was investigated, together with any recommendations about mathematics, technology or education. All participants selected an area open to the public, such as a café for the interview. To ensure appropriate cultural sensitivities, participants were invited to ask a trusted friend to join them for the interview. No participants brought a friend to the interview. The audio from the interviews were recorded by the researcher on two digital devices. Interviews lasted between 50 and 60 minutes.

### *Analysis*

Participant interviews were transcribed verbatim. These transcripts, with associated field notes were imported into NVivo for analysis. The researcher used the constant comparative approach (Glaser & Strauss, 1977), forensically analysing each interview transcript to establish the possibility of themes present in more than one transcript (Goulding & Lee, 2005). This approach enabled the codes to emerge from the data, with constant reference to all transcripts. Through an iterative approach, codes were renamed and revised taking into account the emerging understanding of participant responses. Following the emergent phase, axial coding aimed to identify and create "connections between a category and its subcategories" (Charmaz, 2000, p. 706). Through this process, preliminary connections were identified, with the data coalescing around four broad themes. These themes were evident by the breath of the data as they showed the highest frequency in NVivo.

## Results

### *Feelings of Being Obsolete and Isolated from Their Child's Mathematics Learning*

Parents generally felt obsolete and isolated from their child's mathematics learning expressing a sense of being undervalued and overlooked. This feeling was aligned with recognising an absence of a shared mathematics language or learning experience. For example, Bernadette, said,

> I find that in maths when I am trying to help the kids, and they will say to me, 'how do you do this?' And I do it one way, even like multiplication, and they go 'ooorrrr, we don't know how to do it that way!' Like I have learnt it one way and they are learning it another and I don't know how to meet in the middle and help them.

This feeling of being unable to "meet in the middle and help them" indicated a feeling of disconnection, resulting in them feeling old-school and unhelpful. This feeling was accompanied by an acute awareness that a boundary existed between the teaching approaches experienced by the parent and the child. As Bernadette further expressed, "You have to sort of stand back and trust that the way that Maria (teacher) taught him is the right way, and that he understands it, because I can't help him." Moreover, as Claire elaborated,

> I remember saying to Doris, 'you gotta carry the one'. And she goes, what do you mean carry the one? Do you mean lend or borrow? And I'm like, 'what are you talking?' She is like, 'you put the one over here, you put the one over here!'And I am like, 'umm I am so confused now.

Responses from parents expressed a practical inability to support their child with their mathematics, coupled with feelings of isolation, obsolescence and confusion around how to best support them. To counter these feelings, parents responded by questioning the current approach to teaching mathematics. For example, Claire, said,

> When one of her teachers actually said to me…'but we don't care if she gets the wrong answer or the right answer it's the strategy that she uses to get there'. And I thought, but she still needs to know how to get the right answer.

Claire was passionate at this point, as she was concerned about procedural aspects of mathematics, the importance of solutions and getting the "right answer", in contrast to her daughter Doris who was demonstrating strategic, conceptual mathematical understanding. This may indicate the presence of both a knowledge and understanding gap of the current mathematics pedagogy and may highlight that Claire has not been afforded with an opportunity to develop a deeper understanding of the current mathematics pedagogy.

### *Aiming to Provide the Best Mathematics Learning Environment*

Although aware of their knowledge and capacity gaps, parents expressed a determination to do their best to support their child's mathematics learning. They were actively creating and seeking opportunities to establish the best foundation, particularly around informal learning opportunities. For example, as Tori said, "from day one with the kids, when we have been using the microwave, we count down from ten or count up to ten. Yep, there are plenty of opportunities for counting". Claire reinforced this sentiment, saying,

> At the moment, Doris is counting down the days to Christmas. So, she needs to know that. She needs to know that today is the 5th and Christmas Day is the 25th. How many days is it to Christmas? She needs to know how to do that in her head.

Bernadette further added, "the children are heavily into UNO and monopoly and card games and even their grandfather teaches them to play crib. Well, that is counting." By consciously integrating informal mathematics into the everyday experiences of their children, the parents are striving to enrich their child's mathematical experience, and therefore provide the best environment possible.

This attitude was further reinforced when considering the role of technology and support networks for teaching and learning. For Claire, when it came to schoolwork, only the best would do, "My laptop is better than hers, so she uses my laptop for any school stuff." Attitudes expressing the desire to provide the best access to technology reached into the extended family, with Tori saying, "if he needs them (better technology) he has got things that he can access, and if he needs something that has a little bit more on it, we can always go to nan and pops, nan's got her computer." Parents are therefore, striving to source and secure the best resources possible. For Susan, in contrast to reaching out a family member, she sought to tackle the task herself, saying,

> if he was unsure of something I would probably have a go at doing it (solving the mathematics problem) without him seeing it. And see if I get it right, to then go, OK well this is, now I can now explain to you what you need to do.

Parents are clearly expressing, that to support their child, they will seek out whatever resources available. For Tori, a community network was instrumental, as she said,

> We had a thing called, and it was actually for the Aboriginal kids…called the Homework Centre. It wasn't necessarily for homework, but it was there to help and provide for these kids that don't necessarily have the help at home.

As highlighted by Tori, this merging of community, parent and student in a supportive learning environment, non-judgmentally accepted that, at times, parents may be willing, but due to circumstance, unable.

### *Technology Affords Individualised and Accelerated Mathematics Learning Opportunities*

Parents largely felt that technology was a powerful educational companion supporting learning in general and mathematics in particular. As explained by Susan,

> I think it's beneficial. I think like Prodigy can be used where the student just goes off and just uses it, or the teacher can set tasks in it and have like, so may set a particular period of time where kids are only exposed to a certain subject areas and can kind of guide it.

Here, Susan is highlighting the independence and autonomy that her child experiences when using technology for mathematics. The ability to "just go off and just uses it" captures a sense of trust and confidence that she feels when her son is using technology for mathematics. Importantly for parents, they expressed an opinion that the various technological tools available, could meet the child's needs depending on the specific learning activity. As Bernadette explained "I don't think he loves the laptop. He just doesn't seem to use it as much as the iPad. He'll jump on the iPad, he'll google things straight up, it's, he just takes it wherever he goes with him." Bernadette perceived that her son Mark valued both the portability and ease of accessibility of the iPad in comparison with a laptop. The capacity of technology to meet children's learning needs was also recognised by Susan. However, she expressed a salient educational caveat, saying, "I think it (technology) is good for revision, but, again I d on't think that it replaces the teaching that they get in the first place". Susan here expresses an attitude towards the timing, suitability and utility of technology use, which is conditional on its purpose. This point was further reiterated by Claire who said,

> If Doris were more, I suppose, more confident with maths I think that she would enjoy using some of those, the maths apps. But because she does not feel confident (with maths), she tends to stay away. And the more I try to encourage, the angrier she gets.

Consequently, parents expressly recognised technology's potential to support individualised and accelerated learning opportunities, but recognised the limitations.

The potential for technology to support accelerated learning was also highlighted in discussions about games and learning through playing. Tori was clear about her thoughts, saying, "My kids have always had them (maths apps) on their (iPad). Because if they are going to be playing a game, they may as well be playing something a little bit educational at least." Recognising the complementary opportunities for learning and enjoyment that co-exist in learning by playing was also important for Susan, who said, "I guess that Mathletics may be more game-based, but if the game-based app gets kids using it, they think that they are playing a game and the by-product is they are learning maths".

Rounding off the parent feelings that technology is ubiquitous, and that engaging their child in learning is paramount, Bernadette neatly captured the importance of using technology to unite teaching and learning, by saying,

> We are in a technological world, it's everywhere, and I think that drawing the kids in to having something whether it be an app, a computer programme, or something that ties in with their schoolwork, but it's a game. You've gotta catch them, you've gotta get their interests.

### *Current Technological Skills Taught at School are not Preparing Their Children for the Future*

Responses from parents broadly recognise technology's important role in the lives of their children, plus its value as an educative tool, particularly with its potential to support and accelerate learning. However, dissatisfaction was expressed regarding the level of preparation being provided in schools. For example, Susan expressed feelings of dissatisfaction, saying,

> I just think sometimes the focus becomes on doing elaborate things with technology like coding or using a variety of programs. But sometimes the basic skills are missed, and it's those basic skills that kids actually need to use to go in their day-to-day life using technology—like a kid might be used to texting on a phone, that is not going to help them on a keyboard.

Susan is expressing a level of frustration that basic competency skills are being overlooked, in favour of more "elaborate" skills, skills which she considers should be taught once the basics have been taught. Susan adds further,

> Like lots of kids do not know how to use a mouse and to be able to use a mouse to click on things is quite a different skill in terms of their development instead of just touching a screen.

When discussing this absence of foundational learning in technology, Susan became quite passionate and animated, clearly feeling that advanced technology, such as robotics or coding would not help her child succeed if they were deficient in basic computer skills.

> I think there is bit of an assumption that these kids are from a technological age and that they are all over that, but I think using a keyboard to type even a physical keyboard versus an on-screen keyboard and using one finger typing versus typing are quite different things.

Susan's level of disappointment was echoed by Tori. Tori felt that access to technology and the teaching of it needed to be more targeted, saying,

> You need to be able to research the stuff that you need off the internet, and you need to be able to type it up in Word, and you need to be able to use Excel, and you need to be able to use PowerPoint. I mean they probably need more (technology teaching) rather than less.

Parents clearly feel that schools are not preparing their children for a future they envisage awaits them, neither in basic operational skills nor software. Consequently, feelings of their children being left behind or abandoned by the system become relevant. For Bernadette, feelings of differential and unfair treatment are salient, as she said, "I think kids in the city, kids in more populated areas, they do have more access to things to learn in different ways and to learn more. Our kids are sort of shoved out here and forgotten about".

## Discussion

This qualitative study reports on the preliminary findings investigating remote Australian primary school parents' attitudes towards their children's learning of mathematics and the role of technology. Parents reported feeling isolated and disconnected from their child's mathematics learning journey, highlighting the absence of shared mathematical language, knowledge and understanding. This created a learning chasm between the parent and child. One suggestion to account for this gap could be the increased focus on the conceptual understanding of mathematics which followed the shift away from the *traditional curriculum* (Klein, 2007) of which many parents were unfamiliar. Additionally, as reported by McFeetors et al. (2020), parents were not seriously considered when reforms and changes to the mathematics curriculum were instituted. Consequently, barriers may have been created which prevent parents from engaging in their child's conceptual mathematics education. In disadvantaged, low SES areas, these barriers may be more pronounced. Therefore, as was identified in these preliminary results, parents tend to immerse themselves in informal mathematics activities. To close this gap, Biag and Castrechini (2016) reported on the contributions afforded by comprehensive community-based learning partnerships and environments. They reported that an extended learning program provided by the school bridged learning gaps. Additionally, Maier et al. (2017) reports on the benefits of community-orientated parent education programs and the improvement in student mathematics achievement. These community-based frameworks could be considered within the Australian remote locations to assist and upskill parents with their conceptual mathematical understanding, thereby providing additional support to their children.

Additionally, the potential role of technology in the both the mathematics education and teaching and learning was well understood by parents. Parents strived to provide their children with the best devices possible for learning, with the best chance to be successful. Parents too recognised that their children needed access to digital skills. As noted by Burns and Gottschalk (2019), being

technologically aware and competent is required for full participation in the 21st century. However, while recognising the potential of robotics and coding, parents want their children have access to the basic skills first. This preliminary finding may support research by Harris et al. (2017) who reported a 'digital divide' between high and low SES areas, such that, low SES use home devices more for chat rooms and multimedia, whereas high SES use home devices to extend learning and promote academic skills. Consequently, children in high SES areas may be learning the basic computer skills in the home environment, therefore, making robotics and coding a natural extension. Whereas low SES students may not be developing the basic technology skills at home, so need these included in the curriculum. Therefore, schools may need to recognise that technology usage in the home of low SES families may not be providing students with the basic skills. Consequently, the teaching curriculum may require adjustments.

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