

Children's Views of their Teacher's Role in Helping them Learn Mathematics

Merilyn Taylor
University of Waikato
<meta@waikato.ac.nz>

Ngarewa Hawera
University of Waikato
<ngarewa@waikato.ac.nz>

Jenny Young-Loveridge
University of Waikato
<educ2233@waikato.ac.nz>

This paper reports on data from 183 nine-to eleven-year old children attending six Waikato schools. An analysis is provided of children's responses to a question about their teacher's role in helping them learn mathematics. Four major roles were identified, including mentor, classroom manager, transmitter of information, and arbiter of decisions. The implications for students' mathematics learning of viewing their teacher in each of these roles are then discussed. The importance for teachers of recognising the ways they are perceived by their students is also considered.

Children's voices are considered important for understanding their schooling experiences (Forman & Ansell, 2001; Harlen, 2002; McCallum, Hargreaves & Gipps, 2000; Nieto, 1994; Rudduck & Flutter, 2000). Children can hold strong views about all manner of things, and often have an awareness of the social and organisational matters that can affect their learning (Civil & Planas, 2004; Swan, Bell, Phillips & Shannon, 2000). Perceptions about the role of their teachers and how they might contribute to their learning begin to be formed once they start school (Daniels & Perry, 2003; Diaz-Obando, Plascencia-Cruz & Solano-Alvarado, 2003; Lumsden, 1994).

As children gain experience in a school setting, they become more aware of how notions of power and control influence their experiences of a particular subject (Alerby, 2003). Some children believe that a safe learning environment is where their teachers can clarify content (Phelan, Davidsen & Cao, 1992). Others just appreciate the opportunity to talk to their teacher alone (McCallum, Hargreaves & Gipps, 2000).

A teaching context can influence children's learning in complex ways. Children have identified a variety of teaching strategies that are effective for their learning (Devereux, 2001). Studies indicate that there are children who understand the teaching process as a way of helping them learn and develop higher order thinking, whilst others tend to think that the teacher has a focus on the transmission and reproduction of information (Campbell, Smith, Boulton-Lewis, Brownlee, Burnett, Carrington & Purdie, 2001). Research has also found that students can articulate ways that both the physical and cognitive aspects of an environment provided by a teacher can support their learning (Campbell et al, 2001).

Any strategy that children use in a given situation is the result of interactions between their beliefs about knowledge and learning, and their perceptions of the learning process required in a particular educational context (Campbell et al, 2001). Some children are able to discern what a teacher's assistance represents for them (Daniels & Perry, 2003). As they work within their class settings, children construct a sense of self in relation to their school mathematics experiences (Zevenbergen, 2003). This includes expectations of their teacher (Kinchin, 2004) and the ideas they hold about her/his role in a classroom. Talking with and

listening to children discuss what they consider the role of their teacher to be for their mathematics learning is one way to uncover the voices and perspectives of children.

This paper presents data from part of a larger project that set out to explore students' perceptions and dispositions towards learning mathematics. This paper focuses on one aspect of the larger study; namely, students' ideas about a teacher's role in helping them learn mathematics.

Method

Participants

The participants in this study consisted of 183 year 5 and 6 students (9 to 11 year olds) at six schools. Table 1 shows the composition of the sample. More than half of the students were Maori (the indigenous people of New Zealand), over a third were European, a tenth were of Pacific Islands ancestry, and the remainder were Asian or another ethnic group. Four of the schools (those marked with an asterisk) had participated in New Zealand's Numeracy Projects and were from a large urban centre. The two schools that had not yet participated in the Numeracy Projects were from a small neighbouring town.

Table 1

*Composition of the sample in terms of gender, ethnicity, and SES
(Eur = European, Ma = Maori, Pas = Pasifika, As = Asian)*

School	SES	Boys	Girls	Eur	Ma	Pas	As	Other	Total
Arch*	low	21	17	9	20	5	2	2	38
Bank*	low	8	15	1	17	5			23
City*	medium	16	14	21	3	1	5		27
Dale*	low	15	15	11	11	3	4	1	30
Edge	low	19	11	2	28				30
Farm	low	17	15	9	22	1			32
<i>Total</i>		<i>96</i>	<i>87</i>	<i>53</i>	<i>101</i>	<i>15</i>	<i>11</i>	<i>3</i>	<i>183</i>

Procedure

Schools were asked to nominate about 30 year 5 and 6 students from across a range of mathematics levels. Students were interviewed individually in a quiet place away from the classroom. Students were told that the interviewer was interested in finding out more about "how kids learn maths and how their teachers can help them" and "what kids themselves think about learning maths". The question that is the focus of this paper was:

How do you think your teacher helps you learn maths?

Interviews were transcribed for later analysis. Once the interviews were complete, schools were asked to identify each student's current stage on the number framework, or, if at a non-Numeracy Project school, whether the student was "average", "above average" or "below average" in mathematics. This information was used to categorise students as *high* (above average or at stage 6 Advanced Additive Part-Whole, or above), *medium* (average

or at stage 5 Early Additive Part-Whole), or *low* (below average or at stage 4 Advanced Counting or below).

Results and Discussion

The data from the transcripts indicate that most of the children viewed the role of the teacher in their mathematics programme in one of four ways. This was irrespective of whether they were assessed to be of a high, medium or low level in mathematics, or their teachers had been involved with the New Zealand Numeracy Projects. A fifth group of children did not express a view about the role of the teacher at all. Each category is discussed in turn.

Teacher as Transmitter of Information

Quite a large group of children (~45%) indicated that they saw the teacher's role as a "transmitter of knowledge." Like the previous group, they also tended to adopt a passive role in their learning, and placed much of the responsibility for their mathematics learning on the teacher. Their view was that when their teacher told them what to do, their responsibility was to comply. It seemed that not only did the teacher ask all the questions, but also had all the strategies and pathways towards the solutions. Students seemed to believe that if they listened carefully, these would be imparted or transmitted to them by the teacher (Campbell et al, 2001). As a consequence, children who were experiencing difficulty (eg, those who were struggling with division) said things like "I just don't get it. She doesn't make it clear." They did not appear to consider the possibility that they might take some personal responsibility for their own learning. They seemed unaware that they might have a role to play in the learning process that was separate from, yet connected to their teacher's role. They expected the teacher to "give" the mathematics to them in the "right" way.

Some children explained it like this:

She tells us to, she puts these counters down and she tells us to write many numbers that equal 6 or 12 or 24. (B5, girl, medium)

Oh, just telling me what to do and how to do it. (E12, boy, average)

Teacher as Mentor

One group of children (~16%) saw the role of the teacher primarily as that of a mentor or helper. This group appeared to know when they needed assistance and sought help as appropriate. Their comments indicate that they adopted an active role in their own learning, and took responsibility for it. For them, the role of the teacher was to "give clues" when asked, and to help them to solve mathematics problems, but they needed to reach the solutions themselves. They were appreciative of these opportunities to engage in mathematical thinking. These children viewed themselves as learners who could get help if needed. They could also choose to withdraw from a situation when they decided they were ready to cope on their own.

She helps us, like she gives us clues and if we get something wrong, she doesn't really mind. (B20, girl, high)

Teachers help us. They encourage us and tell us what's right, but not just like that. (A27, boy medium)

She helps us by, like fractions, she'll do like one of a quarter, or something like that and she'll just help us instead of telling us the answer. (F24, girl, medium)

He shows us how to do it and then he sees if anyone understands it, and if someone says no, then he helps, or he does one altogether, so we all do one together and then we might do about five and then he will set us off to do the worksheet and if some still don't understand they'll stay with him. (B8, boy, medium)

Like sometimes she will pull us, like she'll just take one person and talk to them about how they are learning maths and so it's really good because, it's like sometimes when she calls me out because I'm having problems with maths, she like helps me, she gives me other like ways to answer them so they will be easier for me. (C1, girl, medium)

Teacher as Classroom Manager

A sizeable group (~13%) considered the role of a teacher to be one of a classroom manager. The teacher was perceived as a person who managed their (the children's) time and space; that is, someone who focused on their organisation. They appeared to interpret this management role as the highest priority for the teacher, that is, higher than their own learning of mathematics. These children seemed to assume that power and status structures were in place to determine their classroom involvement and thought they were expected to act and react by following directions and behaving in particular ways (Civil & Planas, 2004). These children positioned themselves as passive and unable to make a contribution to the generation of mathematics in their environment. To them, the teacher's role was about ensuring the management of their mathematics lessons. Typical of the children's responses were:

The teacher actually tells us what to do, and we just do what the teacher says (A31, girl, low)

She tells us to concentrate, be quiet. (A22, girl, medium)

She just tells us stuff. She just gives us some sums and then we've got to work them out. (B3, boy, high)

By just keeping us going on with maths hard core. (F22, girl, high)

Teacher as Arbiter of Decisions

This relatively small group of children (~2%) perceived the teacher to be an administrative authority. They saw the teacher's role as that of an information gatherer who made decisions about whether they could move "up to a higher level." For these children, such movement suggested to them that they were making progress in their mathematics learning. They were aware that there were consequences associated with the assessment used by the teacher for making decisions about their "progress". These children seemed to see the main purpose for the mathematics programme as being about assessment for "progress".

It is important to explain to M (the teacher), so he can mark how good we are (D29, girl, low)

Because then we could go up another level. (A8, boy, medium)

Because she could put us in another level, like spheres or hexagons, which is the highest group in our class. (C15, boy, low)

Don't Know

A substantial group of children (~21%) responded that they "did not know" how the teacher helped them learn mathematics, or they were not prepared to comment on this

issue. They ventured no opinions at all about their teacher's role, and many seemed quite puzzled by the question. Although it may not be easy for some children to articulate their ideas (Pollard, Thiessen & Filer, 1997), we were somewhat surprised at this finding, considering how much time they spend in a classroom.

Not sure how the teacher helps learning. (A23, girl, medium)

Not sure. (B2, boy, medium)

General Discussion

Reforms in mathematics education in recent years have been about encouraging children to view learning as a social activity in which they interact and learn from peers, teachers and their wider community (Hiebert et al., 1997; Lampert & Cobb, 2003; Lave & Wenger, 1991). The findings of this research raise some issues that need to be considered by teachers. While mathematics education practices in recent times have expected communication to be a major focus, many of the children we spoke to did not seem to be aware that their mathematics learning could offer them these possibilities. If meaningful interchanges are not valued by children, then they may be prevented from using their own voices to help them develop deeper mathematical understanding (Lyle, 2000). Campbell et al, (2001) suggest that for such exchanges to be effective for learning mathematics, communication skills need to be explicitly taught.

It makes sense that the role children assign to their teacher influences their perceptions of mathematics and their ideas about how it is learned. Children are aware of social and organisational structures that exist (Civil & Planas, 2004) and the ways that these might affect their participation in mathematical activities. If, for example, they consider that the teacher's role is to manage their learning, then they are likely to respond by being passive and accepting in their mathematics class. However for children to begin to perceive that the teacher's role is that of a co-constructor of their mathematics is another matter. It may require that support is offered to them so they feel comfortable with the idea that they have a right for their voices to be heard, and they have a responsibility to ensure that this happens.

If children have concluded from the patterns of participation they have experienced that mathematics is a subject where meaning cannot be negotiated with their teacher (Civil & Planas, 2004), then their beliefs about their roles as learners may also be viewed as non-negotiable and unchangeable. This may create difficulties for implementing changes in the learning of mathematics. When such patterns of participation change, the roles that the children assign to the teacher and the learner may become more reciprocal and thereby more in line with current reforms.

To view a teacher as a "classroom manager" raises questions about the nature of the mathematics that children are experiencing. If children think the teacher's role is to "make them do work" and "keep on with maths hard core," this suggests they have a rather superficial approach to learning and will focus on features they think will facilitate the transmission and reproduction of information (Campbell et al, 2001). Consequently, when children's perception of success in mathematics is to be compliant with the teacher's behavioural expectations, we wonder if this construction of the teacher's role prevents them from exploring mathematical ideas.

The issue of power relations in classrooms is important. As Cullingford (1995) has pointed out, "the difficulty for children is that schools automatically put all the power into the hands of teachers" (p. 2). Consequently, students may become passive receivers of

information, waiting to be given instructions and explanations from their teacher rather than actively thinking and participating in their mathematics learning. Most teachers' experiences as students are likely to have been in situations that were closely controlled by others (Weissglass, Mumme & Cronin, 1990). It may be a challenge for them to consider how children can be empowered to take greater responsibility for their mathematics learning.

For many of the children we interviewed, it appeared that learning mathematics was highly dependent on their perceptions of the roles that they assigned to their teacher. We have found that many children have quite strong views about their teacher's role and their own roles as pupils, and these are not necessarily aligned with the intention of current reforms about how mathematics learning occurs.

In this study, the children have provided us with important insights into their experiences that warrant further investigation. We did not talk to the teachers about the ideas we were exploring with their students. However, a fruitful area of research might be to consider the views of both students and their teachers, in order to understand better how the multiple perspectives of classroom participants contribute to the learning processes taking place.

Acknowledgements. Sincere thanks are extended to the students, teachers, and principals of the six schools involved in the study. The study was funded by the University of Waikato School of Education Research Committee and the New Zealand Ministry of Education. The views expressed in this paper do not necessarily represent the views of the New Zealand Ministry of Education.

References

- Alerby, E. (2003). 'During the break we have fun': A study concerning pupils' experience of school. *Educational Research*, 45(1), 17-28.
- Campbell, J., Smith, D., Boulton-Lewis, G., Brownlee, J., Burnett, P.C., Carrington, S., & Purdie, N. (2001). Students' perceptions of teaching and learning: The influence of students' approaches to learning and teachers' approaches to teaching. *Teachers and Teaching: Theory and practice*, 7(2), 173-187.
- Civil, M., & Planas, N. (2004). Participation in the mathematics classroom: Does every student have a voice? *For the Learning of Mathematics*, 24(1), 7-12.
- Cullingford, C. (1995). Children's responses to teachers. *Set: Research information for teachers*, (2), Item 10.
- Daniels, D. & Perry, K. E. (2003). "Learner centred" according to children. *Theory into Practice*, 42(2), 102-108.
- Devereux, J. (2001). Pupils' voices: Discerning views on teacher effectiveness. In F. Banks & A. Mayes (Eds.), *Early professional development for teachers* (pp. 247-259). Milton Keynes: Open University.
- Diaz-Obando, E., Plasencia-Cruz, I., & Solandro-Alvarado, A. (2003). The impact of beliefs in student's learning: An investigation with students of two different contexts. *International Journal of Mathematical Education in Science and Technology*, 34(2), 161-173.
- Forman, E., & Ansell, E. (2001). The mathematical voices of a mathematics classroom community. *Educational Studies in Mathematics*, 46, 115-142.
- Harlen, W. (2002). Taking children's ideas seriously - influences and trends. *New Zealand Science Teacher*, 101, 15-18.
- Hiebert, J., Carpenter, T. P., Fennema, E., Fuson, K. C., Wearne, D., Murray, H., Olivier, A., & Human, P. (1997). *Making Sense: Teaching and learning mathematics with understanding*. Portsmouth, NH: Heineman.
- Kinchin, I. M. (2004) Investigating students' beliefs about their preferred role as learners. *Educational Research*, 46(3), 301 - 312.
- Lampert, M., & Cobb, P. (2003). Communication and language. In J. Kilpatrick, W. G. Martin & D. Schifter (Eds.), *A research companion to Principles and Standards for School Mathematics* (pp. 237- 249). Reston, Va: National Council of Teachers of Mathematics.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

- Lumsden, L. (1994). Student motivation to learn. *Eric Digest* 92. Retrieved from <http://eric.uoregon.edu/publications/digests/digest092.html> 25-02-05.
- Lyle, S. (2000). Narrative understanding: Developing a theoretical context for understanding how children make meaning in classroom settings. *Journal of Curriculum Studies*, 32(1), 45-63.
- McCallum, B., Hargreaves, E., & Gipps, C. (2000). Learning: The pupil's voice. *Cambridge Journal of Education*, 30(2), 275-289.
- Nieto, S. (1994). Lessons from students on creating a chance to dream. *Harvard Educational Review*, 64 (4), 392-426.
- Phelan, P., Davidson, A. L., & Cao, H. T. (1992). Speaking up: Students' perspectives on school. *Phi Delta Kappan*, 73(9), 695-704.
- Pollard, A., Thiessen, D., & Filer, A. (1997). Introduction: new challenges in taking children's curricular perspectives seriously. In A. Pollard, D. Thiessen & A. Filer (Eds.), *Children and their curriculum: The perspectives of primary and elementary school children* (pp. 1-12). London: The Falmer Press.
- Rudduck, J., & Flutter, J. (2000). Pupil participation and pupil perspective: 'Carving a new order of experience'. *Cambridge Journal of Education*, 30(1), 81-89.
- Swan, M., Bell, A., Phillips, R., & Shannon, A. (2000). The purposes of mathematical activities and pupils' perceptions of them. *Research in Education*, 63, 11-20.
- Weissglass, J., Mumme, J., & Cronin, B. (1990). Fostering mathematical communication: Helping teachers help students. In L. P. Steffe & T. Wood (Eds.), *Transforming children's mathematics education: International perspectives* (pp. 272-281). Hillsdale, NJ: Lawrence Erlbaum.
- Zevenbergen, R. (2003). Grouping by ability. A self fulfilling prophecy? *Australian Mathematics Teacher*, 59(4), 2-7.