Practice-based inservice teacher education: Generating local theory about the pedagogy of group work

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Developing local theories about what best works for Māori students is of critical importance to Aotearoa New Zealand. This discussion paper focuses on grouping as arranging for learning, by examining multiple ways in which grouping as pedagogy appears in practice settings and associated literature. We take the stance of interpretive bricoleurs to generate understandings of group work in light of a new moment in New Zealand's pedagogical history, that of practice-based teacher education. We explore three examples of local theory cogenerated in English-medium education settings with predominantly Māori learners. We identify the emergence of an expanded set of practices that illuminate multiple internal contradictions within government, school-based, and practice-based discourses about group work as arranging for learning.

Keywords learning environment · group work · arranging for learning · local theory · practice-based

Of particular urgency in Aotearoa New Zealand is promoting teacher change in pedagogical approaches in mathematics that are culturally responsive to Māori (indigenous) learners. Part of the New Zealand reform agenda is to address the challenge of those groups, such as Māori and Pasifika students, who continue to be underserved by the education system (Ministry of Education, 2013). Included in the Ministry of Education's (2011) cultural competencies for teachers is the notion of ako which encapsulates the reciprocity of learning and teaching and pertains particularly to teachers accepting responsibility for the learning of both their Māori students and themselves in terms of their practice within and beyond the classroom. Therefore, it is important to understand critical aspects of teacher practices that support Māori student learning by examining how classroom learning environments might be better structured to promote learning.

Bishop, Berryman, Tiakiwai, and Richardson (2003) challenged us to examine dominant teacher-centred "monocultural pedagogies developed in New Zealand on the basis of unchallenged metaphors" (p. 23). They suggested, "we need a pedagogy that is holistic, flexible and complex, which will allow children to present their multiplicities and complexities and their individual and collective diversities" (p. 13). A common response in practice settings to answer this challenge is to label pedagogies as culturally responsive; in this paper we prefer to use the term culturally adaptive. This positions the teacher as less of the lone hero fixing the

problem of underachievement through a mismatched pedagogy, to working with students to adapt pedagogy through the generation of local theory.

The term culture conveys a complexity of meaning and in this discussion paper in describing categories in social life (Sewell, 1999) it incorporates the category of ethnic groups. Notably here, that includes the practices and values of Māori in the interests of examining what it might mean to be culturally adaptive in a classroom. The predominant discourse is of cultural responsiveness however, and can be discussed at multiple levels. At the macro level, cultural responsiveness is taken to mean being responsive to Māori and Pasifika as broad ethnic categories of the New Zealand population underserved by the schooling system. Our discussion, however, will focus on Māori with illustrations drawn from these settings. In this sense, tikanga Māori (Māori customs, values, beliefs and attitudes) are commonly used to explain practices considered to be culturally responsive in that they reflect tikanga Māori values. Yet an increasingly common critique from Māori and non-Māori educators is that not all Māori are the same; the term culturally responsive can only describe pedagogical practices in broad terms. The label culturally responsive applied to instructional practices is imbued with assumptions of promoting the learning (and achievement) of Māori students. An example of a contradictory set of practices in relation to Māori students at a macro level is that based on the notion of learning styles (kinaesethic, aural etc.). Drawing on broad interpretations of cultural preferences that are assumed to be culturally responsive to students' learning preferences, one mode rather than multiple modes of instruction is selected thereby narrowing rather than expanding students' classroom learning opportunities (Dilworth & Brown, 2001). The mode most commonly associated with Māori learners often affords the least effective learning experiences (Alton-Lee, 2003) and as such perpetuates a deficit discourse about Māori students. That is, inappropriate assumptions about ethnically-based learner needs can maintain the least effective learning opportunities for these students.

At a macro level, claiming a pedagogy is culturally responsive therefore needs to incorporate nuanced views of what this might mean for promoting Māori student achievement. One largely unchallenged and enduring pedagogy is the notion of small group instruction, described as an arrangement for learning by Anthony and Walshaw (2007). However, such arrangements often retain traditional structures that position the teacher as instructor and constrain rather than afford students' active participation in discussion. We examine the pedagogy of group work using a case of local theory about arrangements for learning drawn from Māori English-medium settings in which the structures afforded students' individual as well as collective agency. We explore how an inservice teacher educator, teachers and a researcher created opportunities for student-initiated collective group work structures. We address the question: How can the generation of local theory make space for high-impact pedagogical practices to emerge when inservice teacher educators and researchers work with teachers in the practice setting?

Grouping as arranging for learning

We lay out our argument by first examining the multiple ways in which grouping as pedagogy appears in practice settings and associated literature. In accordance with Alton-Lee (2003), we use the term pedagogy to focus on "the range of ways in which quality teaching is accomplished [through the] skilled and cumulative pedagogical actions of a teacher in creating and optimising an effective learning environment" (p. 1). The term pedagogical approaches

> describes the elements of practice characterised not only by regularities but also the uncertainties of practice, both inside and beyond the centre or classroom … In addition to what the teacher knows and does, pedagogy, so defined, takes into account the ways of knowing and thinking, language, and discursive registers made available within the physical, social, cultural, historical, and economic community of practice in which the teaching is embedded. (Anthony & Walshaw, 2007, p. 6)

The notions of grouping and small group instruction are prevalent in New Zealand educational contexts. For instance, in research synthesised in the iteration of effective pedagogy in mathematics/pāngarau (Anthony & Walshaw, 2007), grouping is discussed in relation to task structure (group work), organisational tools (group teaching, group organisation), emotional environment (small supportive environment), make-up (mixed-ability group) and processes (small-group discussion). New Zealand's overarching curriculum statement suggests school curricula should be able to be flexibly interpreted by teachers as they respond to the diverse needs, interests and talents of the students they are working with (Ministry of Education, 2007). Terms including grouping for instruction, group work, whole class, instructional group, lesson group, group teaching, grouping (and regrouping), and cross-grouping are used in curriculum support materials such as those from the New Zealand Numeracy Development Project (e.g. Ministry of Education, 2008). In this discussion paper we use the term group for convenience, without any implication that we bring an unproblematic literal meaning to its use and take the notion of group at face value.

The prevalence of groups in New Zealand classrooms, particularly for mathematics and reading instruction, draws on the influence of a British child-centred approach as a means of catering for individual needs of students. These practices were institutionalised over many decades by educational visitors from Britain through schemes such as the Churchill Foundation and the British Council harking back to our colonial past and New Zealand's identity as a member of the British Commonwealth. During this period, the collective disinclination to consider alternative pedagogical structures, such as whole class teaching or cooperative grouping, was bolstered by the international acclaim for New Zealand primary education. This was particularly so for our reading programmes, although this was largely from Western English-speaking education systems. This international attention has been used as a marker for grouping being an effective means of instruction with these practices becoming unquestioned pedagogy, hegemonic in primary schools. However, we suggest that the notion of small group instruction as an enduring pedagogical practice is in need of greater scrutiny.

The extensive literature about group work commonly considers the efficacy of one type of group work over another (e.g. Blatchford, Kutnick, Baines & Galton, 2003; Cohen, 1994; Cohen & Lotan, 2014; Galton & Williamson, 1992), however, multiple theoretical frames underpin notions of group work including child-centred, cooperative learning and sociocultural approaches. While there is no shortage of discussion and literature about the different ways in which a teacher could arrange for mathematics learning in their class, there appear to be enduring tensions for teachers around lesson structure and the types of groups used. For instance, teachers' decisions about grouping, such as when to use stratified as opposed to heterogeneous grouping and whether to employ a cooperative group structure (Johnson & Johnson, 1975) and how to foster communities of learners (Hunter, 2007), are complex. There is no doubt that current research is instructive in regard to the ways in which grouping structures can foster or inhibit students' access to mathematical ideas alongside opportunities to develop mathematical understanding (see Anthony and Walshaw, 2007, pp. 61 to 69 for a wider discussion of grouping). However, the terms to describe approaches to grouping can be distracting, with ability also being referred to as needs-based or fixed and compared to mixed

ability or heterogeneous. The churn of terms appears problematic because the underlying assumptions and theoretical bases for the terms have disengaged from their use in the practice setting. Furthermore grouping practices and the labels used for groups have continued to create issues for those that the system has underserved, as has been noted by scholars over the last few decades (e.g., Alton-Lee, 2003; Boaler & Staples, 2008).

In the New Zealand context it is common practice for students in a class to be grouped together, usually by the teacher, for a particular purpose including those which are academic and social. In New Zealand primary classrooms most conceptualisations of instructional groups gather students together with similar perceived learning needs so that the teacher can target the learning to individual students as a means of addressing individual learning needs (Alton-Lee, 2003). In a recent Organisation for Economic Cooperation and Development (OECD) report detailing mathematics achievement in 65 countries, New Zealand schools were identified as having a much higher than average prevalence of ability grouping across and within classes in mathematics (May, Cowles, & Lamy, 2013). A particular example is the term strategy group in which students that are assigned the same strategy stage, denoting "a structural type of reasoning in number that students use" (Ministry of Education, 2008, p. 9), are grouped together for instruction. A more recent variation, perhaps associated with the implementation of national standards in 2010 (Ministry of Education, 2009), is the term target group for those at risk of not achieving the standard. Such groupings are based on the assumption that more homogenised groups facilitate focused teaching (Ministry of Education, 2008) and can be seen as arrangements for teaching which are aimed at better targeting students' specific needs and making teaching easier for teachers (Lamy & May, 2014). A predominance of such grouping practices, however, can constrain both the development of positive attitudes, and opportunities to engage in productively challenging learning experiences in mathematics for students assigned to lower ability groups (Anthony & Walshaw, 2007) and can serve to "replicate existing social and economic inequalities" (OECD, 2013, p. 76).

Changing demographics, such as the increasing proportions of Māori and Pasifika students in the New Zealand school population, has resulted in a focus by politicians and educators on their overrepresentation in under-achieving groups. Also with critiques of child-centred education (see Cook-Sather, 2002; Walkerdine, 1984) and of the hegemony of pedagogical practices from New Zealand's colonial past (see Bishop et al., 2003; McKinley, Stewart & Richards, 2004), there is a growing collective realisation that grouping practices are privileging particular groups of students, particularly those from dominant social groups. There will, of course, be many reasons in addition to those related to instruction in groups, such as a mismatch between expectations within and beyond the school system, for students who are not deemed to be making progress as defined by the expectations of their year level in schooling (Ministry of Education, 2009). Nevertheless, for the increasing numbers of students from marginalised groups outside of the dominant student group, prevalent grouping practices, including those aimed at responding to perceived cultural needs, may be counterproductive.

One commonly agreed aspect of culturally responsive practice relates to group work. At the classroom level examining the meso level structures of a teacher-led group enables a nuanced view of how learning together can be considered as culturally responsive. Recently, the terms communities of learners and discourse communities have been promoted to teachers by scholars—for instance through work drawing on Hunter's (2007) PhD study. This work includes research-led professional development and an exemplar of high-impact pedagogies published as part of the Ministry of Education's iterative best evidence synthesis programme (Alton-Lee, Hunter, Sinnema, & Pulegatoa-Diggins, 2012). Group work structured to provide

opportunities for multiple explanations of mathematical concepts assumes that providing a learner with different explanations of mathematical concepts will benefit the development of student understanding, both collectively and individually for group members. As a group member there are opportunities to both explain and listen to others' explanations. Highlighted within the communities of practice work are specific pedagogies such as using talk moves for orchestrating discussions (Chapin, O'Connor, & Anderson, 2009) aimed at promoting students' mathematical reasoning.

A focus on pedagogical practices in teacher education aligns with what McDonald, Kazemi, and Kavanagh (2013) describe as "a major shift—a turn away from a predominant focus on specifying the necessary knowledge for teaching toward specifying teaching practices that entail knowledge and doing" (p. 378), that is a practice-based approach. Such a turn, it is argued by Grossman and McDonald (2008), might address the need for teachers to learn about, and find ways to build on, the cultural knowledge of their students as a foundation for their teaching. In accordance with this view, McDonald and colleagues (2014) use the term ambitious mathematics teaching in their work to "develop a pedagogy of practice" aimed at promoting children's thinking and engagement in robust, meaningful mathematics "and disrupt[ing] longstanding assumptions about who can and cannot do math" (p. 502).

Theorising group work

Classrooms are places where culture is enacted (Tobin, 2005) and Sewell's (1999) perspective on culture highlights the making of meaning where learning new practices within an "institutionally defined sphere" such as a classroom is seen as cultural production (p. 41). The notion of culture, Sewell argued, is a dialectic of system and practice. By this he means that while culture is constituted by a set of constantly evolving practices, these practices are loosely bounded within a system or, in Bourdieu's (1977) terms, a field. Sewell's (1992) work on theorising structure and agency in a dialectic relationship is useful for examining the transformation of classroom practice. The structures of the classroom, according to Sewell's definition, are composed of "sets of mutually sustaining schemas and resources that empower and constrain social action and that tend to be reproduced by that social action" (p. 19). Agency, here, is taken to mean the power to act (Roth & Tobin, 2005). The dialectic, structure|agency, means that any change in structure brings about change to agency and vice versa. The classroom structure that is the focus of this discussion paper is the notion of a group and taking a phenomenological approach we are interested in what happens and why, when group structures are changed.

Generating local theory, defined as "the collective generation of a discourse about classroom events" (Roth & Tobin, 2005, p. 8), is a way of addressing Alton-Lee's (2003) challenge to make explicit the processes by which, and precisely what, students are learning. In contrast to applying theories developed by others, discourse is used as a sociocultural theoretical tool to explain how commentary on classroom events can be communicated in the form of local theory which supports communication and engenders social and cultural identity within the context of community (Roth & Tobin, 2002). The generation of the theory is central to the development of community so incorporates social change as part of the collaboration. An example of a local theory is Hunter's (2010) sociocultural analysis of a teacher's journey in learning and using mathematical practices in a community of mathematical inquiry that details the challenges for teachers in shifting to an inquiry approach. She found that through applying a model of communication and participation patterns, diverse students enhanced their

participation in proficient mathematical practices, teachers gained insights into their practice, and the researcher enriched her understanding of classroom processes.

Practice-based inservice teacher education offers possibilities for developing local theories. This discussion paper explores the use of co-teaching and associated reflective sessions to create opportunities for teachers, inservice teacher educators, and researchers to change themselves and promote the learning of mathematics. Elmore's (1996) suggestion of addressing teacher change through focusing on what happens in classrooms is salient to the issue addressed in this paper. Of interest is how inservice teacher educators can work with teachers to generate shared practices within the affordances and constraints of the classroom context while at the same time promoting teacher change in mathematics teaching and teacher education practices that promote learning for Māori students.

The notion of local theory aligns with that of discourse to enable the communication of ideas by subsuming "ways of saying, writing, doing, being, valuing, and believing" (Roth & Tobin, 2002, p. 179). Our aim here is to challenge master narratives about group work through sharing stories of practice. In this instance of developing local theory the collective generation took place in multiple ways: an inservice teacher educator and teachers co-teaching mathematics lessons; the researcher working alongside the teachers in peer-focused group work; and reflective discussion between the researcher, the inservice teacher educator, the teachers, and the students. We see the collective generation as emergent and contingent; that is emerging in multiple situations, with multiple players bringing multiple meaning (Tobin & Ritchie, 2012); the evolving local theory contingent on preceding events. In other words including the voices of participants reflects our commitment to polyphonia (multiple voices) and polysemia (multiple meanings). We use these as a means of illuminating the complexities including contradictions or differences in arranging for classroom learning in mathematics. The theory of difference (Tobin, 2012) is important because rather than seeing difference as a deficit to be managed we are seeing it as an asset in our quest to make nuanced claims based on thin rather than thick coherence about group work practices.

We contend that our understanding of formal learning environments can be enhanced through examining student-initiated collective group work structures for learning mathematics. Grouping as a mathematics education pedagogy needs to be challenged as part of the socio-political justice agenda because it is the predominant "structure that sorts and labels children" in terms of their capacity to learn (McDonald et al., 2013, p. 381). Furthermore, the notion of group is powerful as both a macro structure that permeates social life (Fellner, 2014) at the same time as being a meso classroom structure. With challenges such as the need for more complex, holistic and flexible pedagogies, investigations of high-leverage practices for teaching primary mathematics are increasingly urgent. A key question is how learning environments are arranged to facilitate learning from each other?

Local theory in context: Weaving multiple threads

In light of the turn towards practice-based teacher education, this discussion paper brings a renewed perspective to findings from a study investigating the New Zealand Numeracy Development Project (see Higgins, 2005) in order to illuminate contradictions and affordances in group work. We examine grouping practices in mathematics classrooms and illustrate our argument about the enduring challenge of theorising group work. We specifically address the claim that inservice teacher educators, teachers and researchers all have opportunities to learn through expanding classroom practices. We focus on the social change that is possible "through

the agency of participants, who can collectively alter structures and produce new culture, thereby disrupting cycles of reproduction" (Roth & Tobin, 2005, p. 3). In doing so, we take the stance of interpretive bricoleurs, picking up Denzin and Lincoln's (2011) metaphor of researcher as quiltmaker piecing together varied and interconnected representations to produce a complex whole. As such, we understand research to be interactive and influenced by the personal characteristics and histories of researchers and others in the research setting and what we are aiming to produce is an "interpretive structure [which] is like a quilt … a sequence of representations connecting the parts to the whole" (p. 6). In taking such a stance, a notion that resonates is that of crystallisation which draws on the metaphor of a crystal reflecting light in many different directions at once. The metaphor rests on the idea that where multiple lenses are applied to data interpretation the resulting multiple tellings of an event each give a different perspective and so add to the understanding of the event (Denzin & Lincoln). In this discussion paper, the multiplicity of the tellings arises both through the application of multiple theoretical and interpretive tools and by developing understandings of historical events from within a new temporal context. That is, we are returning to past events from within a new moment in New Zealand's pedagogical history, that of practice-based teacher education.

The discussion that follows draws on the re-examination of events in a mathematics classroom during New Zealand Numeracy Development Project's practice-based inservice with the aim of illuminating the generation of grouping practices in this setting. The New Zealand Numeracy Development Project followed a situative approach to teacher professional development in recognising the importance of the context of teacher's work. It was informed by Putnam and Borko's (2000) perspective on cognition as situated, social and distributed. An important component of the project was an inservice teacher educator's modelling of pedagogical approaches in individual teachers' classrooms, while the teacher observed. Later the teacher taught while the inservice teacher educator observed and provided feedback. In this case, a theoretically grounded approach was taken to explore key issues that emerged when an inservice teacher educator worked alongside a teacher rather than modelling for the teacher, thereby disrupting the cycle of reproducing teacher education practice. The aim in this discussion paper is to examine the development of local theories about classroom approaches that foster learning in mathematics in ways that are adaptive to Māori learners. Research participants including the inservice teacher educator, the teachers and the researcher, all contributed through a process of sharing their insights on the evolving local theory. The notion of sharing draws from the stance of transformative activism in which contribution rather than participation is emphasised (Murphy & Carlisle, 2008; Stetsenko, 2008). Building on the original work of Tobin and Roth (2006) and later interpretations by Murphy and Carlisle, this paper examines shared contribution as a means of transforming practice in mathematics classrooms with Māori learners, using co-teaching approaches.

This case draws on an inservice teacher educator's work in five classrooms across two schools, each with a high proportion of Māori students aged between eight and 12 years old. He taught alongside the teachers over a five week period in a co-teaching arrangement with the researcher. The inservice teacher educator and the teacher participated in shared reflective sessions at the conclusion of each co-teaching session. These sessions were important in gaining a phenomenological perspective on classroom social structures in which no individual acts independently of social structures that afford and constrain actions. Actions contributing to the ongoing generation of knowledge were theorised as knowledge at hand (Tobin & Roth, 2006). The methodology of both the co-teaching sessions, followed by the reflection, was critical to ongoing co-generation of knowledge about how to best support Māori learners in mathematics.

As teaching and learning is framed as a social act, the backgrounds of the teachers, the inservice teacher educator and the researchers are relevant to the development of this local theory. For instance, in discussing ways to promote learning for Māori students, the teachers and the inservice teacher educator drew on their knowledge of successful ways of working with Māori students based on many years of experience while the researchers built on their knowledge of group work derived from the literature, other research studies and their experience as classroom teachers and facilitators of professional learning. The inservice teacher educator's experience, noted by one of the principals, focused on his ability to contribute to "how we best go about meeting the needs of Māori" is particularly salient to the research. "

> In a way, I think T's history in himself … in his knowledge of things Māori … enables his delivery to be applicable to Māori kids … even when T is demonstrating in the classroom his interaction with kids is almost exactly the same sort of style and reflects the kinds of values and tikanga we have in the school.

The other principal commented that "T, I think, has what we would say an empathy, an affinity with Māori … and has the expectation that they can achieve". In the sections that follow we tell the stories of the emergent and contingent practices that unfolded and examine structures that support participation through different ways in which all participants in the study became resources for teaching and learning.

Co-generating local theory about groups: Three stories

We argue that there is a need for more nuanced understandings of grouping as arranging for learning. A key component of such nuances is the problematizing of culturally responsive practices as a system and practice-based response to underachievement of minority groups in the New Zealand education system. Creating space in teacher education settings for local theories about practices to emerge can be a useful approach to take, with related space in parallel spheres of influence of the teacher educator, the teacher, the students and the researchers who all have the possibility of engaging in the activity of developing local theory.

One of the issues that emerged for teachers in this case was that small instructional groups bounded the mathematical thinking available for appropriation by the teacher or by group members to the group with whom they were working at the time. This collective realisation about the impact of group structure on student learning was a catalyst for changing the teachers', inservice teacher educator's, and researcher's thinking about how groups might be set up so that all students could become a resource for the teacher and other students. We use illustrations of three different elements in the conceptualisation of group to interrogate what each of these arrangements afforded and constrained in terms of participation or who had access to whose thinking.

Well, who do you learn maths from?

In the first example we see the reconceptualisation of group as a tool for instruction. In a reflective feedback session between the researcher, the inservice teacher educator, and the teacher the conversation turned to groups of students during whole class mathematics sessions on the mat. The teacher reflected:

> I haven't gone into groups as much as I thought I would because the lower kids are listening and watching what the more capable ones are doing and I think that's where they are learning the most.

She explained how the inservice teacher educator's observation in her classroom led her to notice the ways in which students were listening to each other. In responding to the researcher's question about when she first started noticing how the students were listening to select students, she explained:

> not until [the inservice teacher educator] came in [to co-teach] actually and he watched … Right…and then when you commented on it and then it came back in the feedback session.

She then explained her reason for working with the whole class was because dividing students into smaller groups meant that she experienced fewer opportunities to appropriate student explanations in her teaching.

> I've done a whole lot more whole class work than I planned to do because when I was going back into the smaller group the brighter ones were flying ahead but the other ones weren't because they had no role model to be listening to apart from me.

She reflected that "without my little helpers … it was actually really hard work and I felt that these kids were actually co-teaching in a way". Through co-teaching with the inservice teacher educator as part of his work in her classroom the teacher was able to identify who was watching whom in the mathematics instructional sessions. The inservice teacher educator added to her story to explain to the researcher that:

> [The teacher] just made the comment that she's really aware now having talked with you about [the students] how she went back and she said to William, "William who do you learn from in maths?" and William said, "I learn from Chris" and then she said to another kid, "Who did you learn from?"…I think the kid was Evan or something…and Evan said that he learnt from William…and of course she said William got such a huge grin and then she started saying to the kids, "Well, ok who do you learn maths from?" And she actually made a little map on the board about who were the learners and so she was nearly into socio-graphs and when we start thinking about that and we start thinking about putting kids together who provide a good model and they feel that they can learn from them … then that's a different kind of grouping structure in the classroom. …I mean the discussion flipped around as the principal came in and said, "Well maybe next year we have got to start looking at who do our kids learn maths best with in terms of grouping".

What is interesting here is how the students without the teacher's knowledge created for themselves a hierarchy of explainers which we suggest is an example of a student-initiated adaptation. A day after the revelation of this phenomenon in the reflective session the researcher went to the classroom to ask the students about whether or not this was what they did and they confirmed it was, giving a similar explanation to the inservice teacher educator's description above.

Hitch-hiking and Mirroring

The second illustration of local theory was using groups as a source of emotional support for students. It provides examples in which the inservice teacher educator and one of the teachers used the Māori notions of whānau (extended family structure), waka (canoe), and tuakana/teina (older sibling/younger sibling) to develop the collective responsibility aspect of the local theory. In employing the notion of whānau, the inservice teacher educator emphasised

the idea of collective responsibility for learning by all class members. The notion of collective responsibility included discussion about structuring the classroom to facilitate ways in which students can help other students by explaining mathematical concepts.

One of the teachers explained groups as a frame for collective responsibility using the metaphor of waka where it is important that all paddlers on the waka work together. "It's regarding everybody … yeah. I mean the waka is the focus of its own". She explained how she saw the class in mathematics sessions "as being all on the same waka, but they don't have the same skills". She talked about how she uses the analogy of waka to explain this to the students by saying "some of them are not paddlers and they can see that it brings them all together and we all help each other to get to the end". Some of her consistent messages to the class were, "just letting everyone in on the secret of where everyone is going", and "remember, we're all responsible for everyone else's learning". The key point is that this teacher was not just thinking of the expert as an individual but the expert as being a collective – the group as a whole. "I could have one group … helping out another group, so you can expand it … not just a one-on-one". She conceptualised emotional support using a growth metaphor of plants needing protection to flourish:

> In the Māori sense I sort of see it as this little koru growing … part of a whole tree, some are further ahead and shelter the winds … but they are part of the whole.

For her it was important to provide support to learners when they needed it, using the notion of tuakana/teina,

> so there'll always be a group where you have a teina, … you'll always have an individual that is quite out of their depth ... It is emotional support ... Definitely and that's aroha [or love] ... Sort of whānau thing definitely.

She explained that whānau means there is collective responsibility for all members – in this case all members of the class:

> it's never you people are doing this and you guys just go away … everyone knows what everyone else is doing, that's … you know … that's a whānau thing.

To illustrate the emotional support she commented that "even though they accumulate knowledge for themselves it's never 'I learnt this', it's 'we learnt this', 'we had a good day at maths'". The inservice teacher educator similarly explained,

> teachers are telling me that they still need the whole class for a lot of the strategy learning, because it's only the top kids that can do it and then the others hitchhike and mirror with them and this is very much so in Māori dominated classrooms.

The notion of "hitchhike and mirror with them" pertains to the notion of tuakana/teina used previously by one of the teachers. His comment illustrates an expectation that the collective understanding matters more than individual understanding in these Māori dominated classrooms.

Becoming reliable experts

The third example of local theory is about the generation of a collective of interconnected groups operating at multiple levels of the classroom. In this example, one teacher working alongside the inservice teacher educator and one of the researchers generated a local theory of her classroom groups as a collective of interconnected groups, rather than seeing and managing them as separate entities. This served to expand the range of available mathematical

explanations without teaching the whole class. She explained how she realised that potentially students were a useful instructional tool for her as the teacher, and also for the other students:

> Very much a tool that I have is the kids themselves. … Some kids help others emerge better than I would, although I create the environment for that to happen.

Building on the discussion about some students working at a more advanced stage than others, she employed the Māori concept of tuakana/teina as a way of describing those who are at more advanced stages of understanding mathematically helping those at less advanced stages. She explained this as "it does the tuakana/teina thing ... build up the lead group". Later she talks about building up "a tuakana group ... you set them up as a reliable expert". Building up the lead group became a starting point of the co-generation of understanding that is that knowing and understanding of learning can be passed on to all members of the class.

Through reconceptualising group work, the teacher was able to change her practice in ways that promoted learning for the Māori students she taught. In reflecting on how she had changed her teaching, she relayed how in a previous class, "they were not allowed to share, they had to do it in their books, so it reduced it down to an individual". She said:

> the one key strategy that I've learnt … is building up that lead group. That is the key to it … because they set the model for thinking … they become the leaders.

She also realised that it was important to ensure that the students understood her strategy by being explicit about their role,

> I'll have them all in different groups, but I'll make sure that the group that knows less than the others … [say] "You guys listen because this is where you're going to."

The change to her practice expanded not only her agency, but also that of the students. In thinking about all the groups simultaneously rather than focusing exclusively on the group with which she happened to be working at that time, she could exercise greater agency by drawing on more advanced mathematical explanations from students in the other groups. Students had expanded agency because by not being constrained by what she described as "the procedural way of doing it doesn't ask them to think about what they know", they were able to show the teacher that "they do actually know a lot more than they think". This gave the teacher an opportunity to affirm and advance their understanding.

Theory in the practice space: Adaptations of pedagogy

Promoting teacher change so that those working with Māori learners have opportunities to develop local theories about what works best for Māori is of critical importance to Aotearoa New Zealand. The intention of the discussion paper is to provide an account of the development of local theory about group work in response to Bishop et al.'s (2003) suggestion of more complex, holistic and flexible pedagogies. The examples of local theory that emerged were collectively shaped adaptations of pedagogy that contrast with a teacher-led response to working with Māori learners. Conversely, when students were organised into separate groups the class was structured as a collection of smaller self-contained learning environments with limited opportunities for students in other groups to support each other in learning. The three examples of local theory illustrate how the teachers and the inservice teacher educator realised that all the students in a class are important resources for all other class members, as for instance, the students' hierarchy of explainers.

Central to the restructuring of the learning environment through reconceptualising groups was the relationship between individual and collective in which individuals were positioned as part of the collective rather than as individuals within a group. Examining the individual|collective dialectic within the classroom culture is at the heart of our analysis. The development of the local theory about groups was based on the collective or whanau—a Māori concept broadly denoting family but with many contextually defined meanings (Metge, 1995). Its use as a structure in a classroom context incorporates reciprocal roles and obligations (Smith, 1995). Three different elements in the conceptualisation of a group enabled the learning environment to be restructured in ways that appeared to expand agency for Māori students and their teacher. These included using a group as a tool of instruction, a source of emotional support, and as a frame for collective responsibility.

Situating the local theory in the practice setting highlighted the importance of using Māori constructs of whanau and tuakana/teina to extend the notion of group. The co-teaching process and associated reflective sessions provided opportunities for participants to draw on shared experiences in the classroom, such as the students' hierarchy of explainers. For the inservice teacher educator there were opportunities to reflect on the possibilities afforded by enacting facilitation taking a culturally adaptive approach. He was able to reflect on how co-teaching provided expanded agency for himself and the teachers with both contributing to the development of local theory. For the researcher there were opportunities, through examining classroom events with the inservice teacher educator and the teacher in the reflective sessions, to gain insights into the development of local theories as they unfolded. The challenge was for all the participants in this study to make the learning processes and understandings of students transparent as suggested by Alton-Lee (2003), but also those of teachers and teacher educators as a means of transforming practice in mathematics classrooms with Māori learners.

We suggest the generation of local theory enables the emergence of an expanded set of practices for group work. Using a theory of difference we argue that the multiple internal contradictions within government, school-based, and practice-based discourses around group work as an arrangement for learning illuminate the question of whether grouping is a structure for learning as well as a process of learning. Through local theory the co-generation of a discourse about classrooms (Roth and Tobin, 2005) has suggested different possibilities for participants. Our purpose here has been to take a broader consideration of possibilities of arranging for learning to address underlying hegemonic assumptions and theoretical underpinnings by expanding what those participating in the group can do.

Grouping as a mathematics education pedagogy needs to be challenged as part of the socio-political justice agenda because it is the predominant "structure that sorts and labels children" in terms of their capacity to learn (McDonald et al., 2013, p. 381). With challenges such as the need for more complex, holistic, and flexible pedagogies, investigations of high leverage practices for teaching primary mathematics have increasing urgency. Our understanding of formal learning environments can be enhanced through examining student-initiated collective group work structures for learning mathematics.

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