Strength Based Grouping: A Call for Change

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In this paper, I report on one teacher's journey of change in grouping her students for mathematics learning. In addition, I describe and illustrate the design and implementation of a smart tool used for planning for effective grouping in collaborative mathematics problem-solving. The findings illustrate that when explicit teacher support is provided, shifts in teacher beliefs and practices in grouping students by notions of perceived ability are possible.

Researchers, policy-makers, and classroom practitioners increasingly acknowledge the importance of engaging students as active participants in the learning process (Ing, Webb, Franke, Turrou, Wong, Shin, & Fernandez, 2015). Central to student engagement is their participation in collective mathematics activity. For students to effectively engage in collective mathematical sense-making, the teacher must explicitly position the students to be able to do so (Hunter, 2007; Kosko, Rougee, & Herbst, 2014). Teachers also need to believe that all of their students are capable of successfully learning mathematics if they are to actively engage in collaborative sense-making. However, we know that often such beliefs may conflict with their beliefs about which students are able to learn mathematics. As a result, deficit theorising, low expectations and an inability to see all student capabilities as strengths are evident (Spiller, 2012). Some researchers (Anthony & Hunter, 2016; Askew, 2012; Zevenbergen, 2003) suggest that such deficit views held by teachers and students themselves can be attributed to the ways in which students are grouped by ability in mathematics classrooms. However, what happens to teacher beliefs when they shift from grouping according to ability towards grouping according to capability within a strength-based approach? The aim of this paper is to examine one teacher's journey of change as she drew on and used a smart tool designed to support teachers in identifying individual students' strengths as criteria for grouping students for collaborative sense-making. The specific research question explored in this paper is: How can teachers form and manage student groups to provide opportunities for all students to engage in mathematics learning and understanding?

Literature Review

Grouping by ability is a common institutionalised practice in many mathematics classrooms internationally and within New Zealand (Anthony & Hunter, 2016; Askew, 2012; Crespo & Featherstone, 2012; Marks, 2012). However, ability grouping in mathematics classrooms is a practice that has quite conflicting views proffered about its appropriateness. While some view this practice as a means to manage student diversity in classrooms, others caution that only gifted and talented students benefit from this practice (Kulik & Kulik, 1992). Others (e.g., Boaler & Wiliam, 2001, Braddock & Slavin, 1995; Hunter & Hunter, in press) describe the damaging effects of ability grouping and evidence that it neither provides for all students nor raises achievement. Also, Zevenbergen (2003) described how students from dominant cultural groups often occupy the upper ability groups while students from marginalised groups (for example, low socio-economic, immigrant and culturally diverse) are most often relegated to the lower ability groups. The results of which Anthony and Hunter (2016) and Askew (2012) describe as deleterious. They show that how students are positioned to participate in collective activity affects not only what they learn,

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but how they come to view themselves as learners, and determines how they participate in educational activity and settings.

Zevenbergen (2003) states that discourse on why some students are more likely to succeed in or fail school mathematics despite similar learning opportunities, frequently ascribes the root cause as originating in inborn dispositions, such as ability or intelligence. As a result, it allows teachers and schools to lay the blame for low achievement elsewhere (Crespo & Featherstone, 2012) and limits some students' opportunities to learn. Mathematics as a "gate-keeper" is commonly upheld when the belief is maintained that some people are *mathematics people* and others are not (Moses & Cobb, 2001). If teachers view differences in mathematical skill as evidence that some students have an inherited ability to learn mathematics while others do not, they are less likely to believe that all of their students are capable of understanding mathematics. At the same time, they are less likely to reflect on their own practice when students show little evidence of accessing their teaching of mathematics.

Zevenbergen (2003) states that a substantial body of sociological research tests such fundamental assumptions. She contends that success or failure is not random, but rather closely connected to the background (gender, social class, language, or culture) of the students. For example, reflecting societal categories rather than innate categories, middle class students often occupy the higher group or stream. A tenet is fashioned whereby the dominance of the ability mythology in school mathematics permeates the practices of mathematics education, creating a specific and universal style of learning opportunities and classroom organizational strategies. Furthermore, Zevenbergen (2003) argues that streaming students into specific ability groups generates learning environments that influence how students view themselves as learners of mathematics, that is, they create a mathematics identity that can have consequences for future learning. How different learning environments are structured can provide very different opportunities for individual students and impacts on students' status and their ensuing positioning within these learning environments.

Cohen (1986) suggests that it is differences in status that influence students' sense of belief in their own and others' mathematics capability which, in turn, affects their participation in the classroom. Status is established and embedded through the way students are grouped in mathematics classrooms. Marks (2012) explores how ability in primary mathematics classrooms is understood and the effects these understandings and ability-grouping practices have on students' engagement with learning mathematics. Marks (2012) concludes that in spite of diverse experiences of grouping, students in both the top-and-bottom ability groups experienced similar restrictions on their learning. Likewise, Boaler's (2006) study highlights that limitations arising as a result of group placement, and teachers' beliefs in what was achievable for the students in their groups led to students' disillusionment and underachievement in mathematics. Furthermore, Marks (2012) concludes that the effects of grouping by perceived ability in mathematics classrooms are far-reaching, may not yet be fully understood, and may have significant impacts on learning and engagement.

Askew (2012) argues for the creation of classroom communities that provide opportunities for the diverse range of students to work successfully together. This requires teachers to reflect on their views about different students' capabilities to learn and understand mathematics. Askew (2012) suggests that accepting without question practices such as ability grouping for mathematics implies an implicit agreement with the perspective that different children have different mathematical capabilities. Askew (2012) advocates the idea that effective communities embrace diversity and draw on individuals' strengths. Building such communities requires restructuring and utilising the mathematics strengths students bring to the classroom as opposed to focusing on what students cannot do and attempting to fill the gaps.

Methodology

This study was grounded in a sociocultural perspective and drew upon a qualitative interpretive research framework, specifically a design-based research paradigm. During this study, I worked alongside a team of primary school teachers investigating ways for teachers to provide and enhance opportunities for all students to learn mathematics. During each phase of the design-cycle, the teachers and I designed, implemented and evaluated several frameworks aimed at supporting teachers to construct effective social structures to enhance opportunities for mathematical learning.

The data presented in this paper reports on one classroom at an urban primary school in New Zealand. The student participants were aged 9-10 years old and came from low-middle socio-economic home environments. Multiple ethnicities were represented. The teacher (Josie) had eight years of teaching experience.

The data presented in this paper are drawn from phases of the design-cycle that focused on social functioning within the mathematics classroom and in particular, how the teacher was supported to form effective groups for collaborative problem-solving. Data were generated through voice-recordings and artefacts of planning discussions, video recordings of lessons, teacher planning and grouping artefacts, and teacher and student interviews. Findings were developed by coding of relational episodes, in particular, the social structures constructed to support student access to opportunities for learning mathematics. These episodes were examined and categorised as follows: setting the emotional tone, grouping, small-group interactions, and mathematical communication (e.g., explaining, listening, questioning, justifying, and generalising).

Within this study, emphasis was placed on the importance of students learning mathematics through participation in collaborative sense-making. During mathematics lessons, the class was grouped into two groups. The teacher would work with one group, while the other group engaged in purposeful mathematics tasks. The format for each of the mathematics lessons was as follows: The lessons were 50-60 minutes in length. The teacher began each lesson with the presentation of a contextually relevant mathematical problem. The students were then divided into smaller peer groups of four participants. The groups worked collaboratively to solve the problem for approximately 15-20 minutes. As the students engaged with the mathematical task, the teacher monitored the mathematical activity and facilitated group discussions where required. This was followed by a large group sharing and a teacher-facilitated discussion of mathematical thinking.

Findings and Discussion

Initial Phase

At the beginning of the study, the teacher's (Josie) existing understanding and beliefs about the importance of social dynamics in the mathematics classroom were explored. Aspects of the social constructs this teacher believed supported students to access mathematical opportunities to learn were identified. In particular, Josie's beliefs and practices in grouping her students in mathematics were examined. The following extract from a written questionnaire at the start of the study outlines how Josie grouped her students for mathematics learning:

Q: How do you group your students for learning mathematics?

Josie: Completely mixed abilities. I look at their school testing results from the end of the previous school year and then split my class into two completely mixed groups of low, middle and top ability students- half in each group.

Q: What do you understand by the term ability?

Josie: What the students are capable of achieving in maths.

Q: How is ability measured?

Josie: By test results.

This extract outlining Josie's practice of grouping her students in mathematics into groups of mixed ability reflected a school-wide practice of normed testing as the sole means of measuring student ability for learning mathematics. This grouping practice mirrors grouping practices across New Zealand (Anthony & Hunter, 2016; Hunter & Hunter, in press) The following excerpt highlights Josie's rationale for her grouping:

Q: Why do you group your students in mixed ability groups?

Josie: So that there is always someone who knows how to do the math and that person can help the others, especially the low ones, they can show them what to do.

Josie's response highlighted a belief she held that some students are better at learning mathematics than others. This was emphasised further by Josie's response in the following extract from the initial teacher questionnaire:

Q: In your mathematics class, who holds status and why?

Josie: The teacher has the most status. The students who have more confidence in their mathematical ability seem to have more status over other students with less ability.

The teacher's response reflected her belief in the innate ability of some students to learn mathematics better than others. This belief reflects the findings of other research (e.g., Anthony & Hunter, 2012; Askew, 2012; Crespo & Featherstone, 2012; Moses & Cobb, 2001) which claims that, in spite of students being provided with similar learning opportunities, how students are viewed as learners of mathematics, and how they view themselves as learners of mathematics can influence their success or failure in school mathematics.

Middle Phase

The beliefs and practices expressed and enacted by Josie formed the basis for the next stage of the design-cycle. During this phase of the study, I worked closely alongside Josie while she taught mathematics. My role during these lessons was to support her with *in-the-moment-noticing-and-responding* to the dynamics of the collective participation of the students. This included attending to how the explicit grouping of students provided opportunities for student learning. In addition to being mentored in the classroom, Josie also participated in study-group sessions aimed at designing and evaluating innovations to support enhanced learning opportunities for all students. In one of the study-group sessions, a smart tool was designed to support the construction of effective groups for learning. Specifically, this tool was designed to shift teacher focus from notions of perceived ability to a focus on identifying students' individual strengths. The following table illustrates the smart tool and how Josie utilised it to focus on her students' strengths as central to her deliberate grouping:

Table 1
Smart-Tool: Strength-Based Grouping

Teacher Task: Identify the individual strengths of all of the students in your class Select four students who, based on their individual strengths, you would group together to solve a mathematics problem		
Student name	Student strengths	Other comments (i.e. current status, language, behaviour needs/special needs etc)
Zion	Shares clearly, can explain what he is thinking.	Patient with others and asks positive questions
Ocean	Good sharer	English is a second language. Doubts herself
Tyrell	Art	Doesn't usually speak up or engage with others. Cannot read very well
Summer	Can share others' thinking clearly.	Avoids struggle. Does not see her own capability

Josie's immediate reflection upon completing this activity is outlined in the following extract:

> Josie: This was extremely difficult to complete. I had to dig deep to think beyond my students' maths test results and their reluctance to participate in math lessons. I also had to put aside thinking poorly of any of my students. This brought to my attention to how often I think of what my students cannot do in maths as opposed to what they can do. Using the template based on students' strengths, forced me to think about each student in my class and to think about their different strengths and status to think about who could work well together as opposed to thinking about who was going to be able to do the maths and help others to do it.

Josie had identified how perceived notions of ability influenced her prior grouping decisions. She also highlighted how embedded her teacher belief and practices in grouping were, and the difficulties teachers may face in having to change these beliefs. Josie also recognised how differences in status can influence students' sense of belief in their own and others' mathematics capability. In addition, as reported in other research, (e.g., Anthony & Hunter, 2016; Boaler, 2006; Cohen, 1989; Marks, 2012) Josie accepted how students' beliefs in their ability to learn mathematics, or lack thereof, affects their participation in groups. Furthermore, Josie's willingness to focus on her students' individual strengths supports Askew's (2012) ideas that utilising individuals' strengths plays an important role in building an effective community with the aim of improving mathematics learning.

To observe how Josie's new grouping strategy influenced the ways in which her students engaged in collective mathematical activity, she deliberately constructed a mathematics problem to draw on the collective strength of the group. The following excerpt highlights the ways in which the changed grouping affected one student in particular:

> Josie: I specifically planned a problem to draw out a particular strength of an individual student who had a low status during mathematics learning. My aim was to allow him to feel success and build beliefs in his own strengths in mathematics. The student I had in mind was Tyrell. Tyrell never engaged in group discussion, could barely read the problems. When a problem was written in the context of art, a huge shift was seen in him. He was involving himself in group discussion, asking questions, taking the pen, and sharing his strategy. He also shared his group's ideas back with the class. He then also asked questions of other groups during the sharing process.

This episode highlights how, through deliberate structuring of student groups, Josie provided an opportunity for a previously marginalised, low-status student to engage with the learning. In addition, this student was able to access the mathematics through a strength in a different curriculum area. The student's status shifted from low-to-high as a direct result of the explicit action of the teacher to focus on utilising this student's strengths as means to accessing the mathematics learning. This explicit action has provided the student with the means to develop belief in his capacity to learn mathematics. This aligns with Cohen's (1986) findings that differences in status effect students' sense of belief in their capacity to learn mathematics. In addition, the deliberate action taken by the teacher to support a student is backed by research (e.g., Hunter, 2007; Kosko et al., 2014) calling for deliberate teacher action to do so.

End Phase

At the end of the study, Josie reflected on the changes she had made to her approach to teaching mathematics, and in particular, how she grouped her students for learning mathematics. The following excerpt outlines the changes Josie made:

> Josie: I now understand how effective grouping can ensure the best outcome of learning through problem solving. I now create effective grouping based on strengths which has helped create a positive and supportive learning environment. We have developed the mindset and belief that we can all be mathematicians; we are all on our own learning journey with different strengths that we use to be competent mathematicians. Using the grouping template tool broke down all these hidden barriers that I wasn't aware are there that influence students' understanding of their mathematical competence and status.

Josie's reflection is supported by research (e.g., Anthony & Hunter, 2016; Askew, 2012; Moses & Cobb, 2001; Spiller, 2012; Zevenbergen, 2003) that reports on grouping practices playing a pivotal role in students' access to mathematics learning. The teacher's focus on strengths as opposed to deficit views of perceived ability demonstrated a shift in teacher awareness of the importance of student grouping in opportunities to learn. This awareness is further emphasised in the following excerpt from Josie's final interview:

> Q: How do you group your students now?
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> Josie: Using the teacher tool based on students' strengths or status. I look at different strengths and personality types to see who will work well together. My students are open to change and give working in any group a go.

> Q: How is this different to how you grouped students before participating in the study and what has supported you in making changes?
>
> Josie: I did not think about status and strength; it was based on test results and ability. Changing my thinking, and explicitly planning my grouping allowed this change to happen and led to much higher student engagement.

The teacher has identified the use of the smart tool as supporting her to structure effective strength-based groups in mathematics lessons. Josie's acknowledgement of her responsibility for providing opportunities for all students to succeed in mathematics is significant, as several studies (e.g., Crespo & Featherstone, 2012; Moses & Cobb, 2001; Zevenbergen, 2003) show that blame for failure in mathematics is frequently attributed to the students themselves.

Conclusions

This paper has reported on the changes one teacher made to her approach to teaching mathematics. In particular, this paper focused on the changes Josie made to her grouping practices in mathematics. Through the design, implementation and evaluation of a smart tool aimed at identifying students' individual strengths, Josie demonstrated significant shifts in her beliefs and views of grouping students for mathematics learning. Prior to participating in the study, Josie viewed mathematical ability as a phenomenon measured by normative testing. The term *ability* proved a stumbling block for her; whether it was used alone or in the context of mixed-ability or multi-ability. The aim of the smart tool was to remove the stigma attached to notions of perceived ability and shift the focus to strength-based grouping. The effect this had on the teacher was significant. She reported feeling compelled to shift her thinking around her students from deficit views to what strengths they each bring. In doing so, students were provided with opportunities to shift their beliefs about their capabilities to learn mathematics also. Rather than mathematics being a "gate-keeper", the individual strengths students were bringing to the learning process provided gateways to accessing the mathematics itself. This study highlighted that producing teacher change requires explicit support for teachers. For change to occur, teachers must be able to firstly recognise and acknowledge the pedagogical actions they currently take to support students in learning. In addition, teachers need to be supported to identify the facets of their pedagogy that support student learning and those facets that may hinder student learning. Without access to evidenced-based research, teacher change is difficult to implement. The teacher in this study acknowledged that without explicit support for continuous and rigorous reflection on specific aspects of her teaching practice, she would not have effected any change to her practice. Using the smart tool supported Josie in breaking down her practice into observable points she could focus on explicitly. The role that effective grouping practices can play in providing opportunities for all students, and in particular, traditionally marginalised students to learn mathematics effectively is far-reaching.

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