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CHAPTER ONE

The Learner's Perspective Study: Attending to Student Voice

INTRODUCTION

Learning environments are never identical. Research findings from the Learner's Perspective Study (LPS) affirm just how "culturally-situated are the practices of classrooms around the world and the extent to which students are collaborators with the teacher, complicit in the development and enactment of patterns of participation that reflect individual, societal and cultural priorities and associated value systems" (Clarke, Emanuelsson, Jablonka, & Mok, 2006, p. 1). In this book we attend closely to this collaboration with our focus on the voice of the student. Collectively the authors consider how the deliberate inclusion of student voice within the LPS project can be used to enhance our understandings of mathematics classrooms, of mathematics learning, and of mathematics outcomes for students in classrooms around the world.

As noted by the originators of the LPS project, the LPS design with the deliberate inclusion of the student voice, was initially conceived to address what was noted as a major limitation of international comparative studies at the turn of the century—an exclusive focus on the curriculum and the teacher. In reference to what was the major source of international comparative data at this time Thorsten (2000) notes:

> What is absent from nearly all the rhetoric and variables of TIMSS pointing to the future needs of the global economy is indeed this human side: the notion that students themselves are agents. TIMSS makes students from 41 countries into passive object of 41 bureaucratic gazes, all linked to the seduction of one global economic curriculum. (p. 71)

In contrast to the position taken by Thorsten at the beginning of this century, contemporary intercultural research, while still contestable in some forms (Wiseman, 2010) is characterised by a broadening of theoretical perspectives aligned to socio-cultural and political dimensions of mathematics education (see Shimizu & William, 2013). Contemporary educational research has increasingly drawn our attention to the importance of the social processes within the classroom. Quality mathematical experiences that enhance a range of student outcomes are premised on the understanding that knowledge is necessarily social (Bell & Pape, 2012; Wagner, 2007; Walshaw, 2011). Researchers draw on social learning theory to look at how competence is constructed and constituted within the unique activity

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system of a classroom (Gresalfi, Martin, Hand, & Greeno, 2009), and to explore the formation of learners' identities (Solomon, 2007), learners' dispositions (Hunter & Anthony, 2011), and learners' participatory and mathematical practices (Boaler, 2008). The socio-cultural influences on learning are well represented in the LPS project. In particular, the research design involving intensive video capture of micro and macro classroom events and post-lesson video-stimulated recall interviews gives primacy to the voice of the student.

Attending to student voice also serves to enhance our understanding of the ongoing relationship between the teacher and student as co-constructors of knowledge and practice within the classroom. No matter where the classroom is situated within the world stage, effective teachers—such as those selected as participants in the LPS project—are those that focus on enhancing student outcomes and achieve their purpose. That is to say, a pedagogical practice that is effective is linked to student outcomes. Achievement outcomes related to mathematical proficiency encompass conceptual understanding, procedural fluency, strategic competence, and adaptive reasoning (Nation Research Council, 2001). Added to those outcomes is another set that underwrites a quality mathematical experience. These are the social and cultural outcomes relating to affect, behaviour, communication, and participation (Anthony & Walshaw, 2007; Sullivan, 2011). Proposed in this way, Walshaw (2011) contends that effective pedagogy results in the development of mathematical proficiency and aptitude over time and is "characterised by an enhanced, integrated relationship between teachers' intentions and actions, on the one hand, and learners' dispositions towards mathematics learning and development on the other" (p. 94).

In attending to the relational and social nature of learning we also need to acknowledge that mathematics learning is embedded within both the cultural and political dimensions of mathematics education (Jablonka, Wagener, & Walshaw, 2013). Acknowledging the socio-political setting of the classroom learning environment, the design enables us to foreground the agency of the student, the nature of learner practice, and the cultural specificity of that agency and that practice (Gutierrez, 2013). Teachers, learners, (and researchers) bring to the teaching and learning encounter a history that is entwined with their experience of the social and political work. These approaches, underpinning chapters within this text, have been used to understand learning and development in a way that takes culture as a core concern. Locating social and cultural processes as mediators of human activity and thought highlights the importance of local activity settings (Nasir & de Royston, 2013).

While it is not intended that this collection of chapters provide a comprehensive inventory or a summary of all our separate learning about the form and role of student voice in LPS classrooms, collectively the chapters serve to highlight the varied ways that students' mathematical, social, and political voices are implicated in the social interactions and range of learning outcomes within the mathematics classroom. Not surprisingly, given the diversity of the classrooms and the theoretical perspectives of the authors, student voice is given 'voice' in a multiplicity of ways. In the following sections, we introduce the varied ways

student voice has been framed by the authors of the text based on their theoretical and local perspectives.

Mathematical Discourse in the Classroom

The nature of productive talk in the mathematics classroom has been the focus of considerable research. As highlighted in the two chapters by Clarke, Xu, and Wan, talk can occur in both public and private arenas and involve student and teacher, several students, or a self-conversation. Within much of the research originating in the West, the research focus has been on talk that occurs in group work and whole class discussions (Walshaw & Anthony, 2008; Wood & Kalinec, 2012). The focus of much of this research has been on participatory and communication practices associated with the development of mathematical argumentation discourse. Research has acknowledged that effective and equitable implementation of group and whole class discussion is challenging. With groups, in particular, many studies have found that students are rarely focused on mathematical content for the entire portion of their small group time (Wood & Kalinec, 2012) and some students are excluded from equitable participation (Esmonde & Langer-Osuna, 2013). In Chapter 2, Clarke, Xu, and Wan focus their attention on the adoption of the discursive practices of the academic mathematician— that is, the written and spoken language endorsed by the wider mathematics community. Specifically, they analyse the opportunities for students to hear and speak mathematical terms. Drawing on LPS classrooms from Melbourne, Hong Kong, Shanghai, Berlin, Tokyo, Singapore, Seoul and San Diego their analysis highlights considerable variance in the expectation and opportunities for students to engage in spoken articulation of mathematical terms as part of public classroom discourse. Importantly, their analysis reveals relative differences in the levels of public talk versus mathematical public talk, a feature in common with analysis of mathematical talk within small group situations. In Chapter 3, Clarke, Xu, and Wan's triangulation of the classroom video data with the student interview data leads the authors to suggest a link between classroom mathematical orality and student learning outcomes. They claim that "those classrooms that promote student spoken use of mathematical terms do develop in those students the capability to use mathematical terms to describe their mathematics classroom and their mathematics learning" (p. 50). This finding informs discourse practices associated with Western curricula that advocate expectations that secondary level students will communicate mathematical thinking orally, visually, and in writing, using mathematical vocabulary, and a variety of representations, and observing mathematical conventions (Barwell, 2012). However, given the disparity of pedagogical discourse practices—regarded as effective within their local settings—associated with the respective classrooms the question posed by the authors as to whether such fluency in spoken mathematics is associated with higher forms of mathematical understanding is timely and significant.

In Chapter 4, Cao, Guo, Ding, and Mok examine public student voice within a specific classroom episode termed "Students at the Front." "Students at the Front" activity is advocated as part of China's mathematics reforms. The goal of the activity is to encourage students to share their mathematical thinking about problems with peers. In light of an earlier comparative study (Jablonka, 2006) of classes drawn from Germany, Hong Kong, and the United States that highlighted the challenges involved in orchestrating and supporting productive public mathematics discourse, Cao and colleagues wanted to look closely at the form and frequency of student talk during this activity within a sample of six lessons from one class in Beijing. Lesson excerpts provide examples of students sharing their solution strategies, students providing assistance to other students, students building on other students' thinking and of active listening. Quantitative analysis of the classroom video suggests that time spent on explanation and discussion was significantly greater than time spent on procedural explanations. Another feature was the teacher evaluation and summary after each student presentation. The authors hypothesise that the integration of student voice in teaching orchestrated by the teacher is a characteristic of effective pedagogy linked to the development of student thinking.

Moving to Singapore, Kaur, in Chapter 5, also provides an analysis of students' engagement in public talk. In this chapter, however, the analysis occurs across a series of 10 lessons each for two teachers. Characterised according to levels of discourse complexity, with Level 0 involving students giving short answers to the teacher's questions, and Level 3 involving students initiating clarifying questions and building on peers' thinking and explanations, Kaur's analysis of lessons within these two classrooms offer limited evidence of student engagement in content-learning discourse in the classrooms studied. While exhibiting individual patterns of discourse, Kaur concludes that both classes were dominated by teacher talk and student listening. Student-teacher interactions, for the most part, were related to the teacher's assessment of students' progress in understanding the demonstrated problem solution methods, and this was classified as calculational orientation. Kaur hypothesises that the almost total lack of student-initiated public talk was expected, given the instructional organisation of teacher demonstration, seatwork and whole class review of written work by the teacher. Without activities such as "Students at the Front" as described in Chapter 4, student-initiated public talk was not likely to occur in a classroom that privileges individual attainment via practice during seatwork. Kaur hypothesises that the effectiveness of the teachers' pedagogies is related to the close attention to monitoring and attending to students' progress against very specific instructional objectives.

Students' Participatory Practices within the Classroom

Within our classrooms, students must learn to engage in classroom discourse and practices that serve both social and cognitive functions. A research focus on the social nature of learning activity must include the co-construction of classroom norms, participation structures, and collaboration (Nasir & de Royston, 2012).

These social activities, "where teacher and students improvise their interactions within the constraints and affordances of cultural, societal and institutional norms" (Clarke et al., 2006, p. 8) involve "reciprocity and a pedagogical attention that moves students towards independence" (Walshaw, 2011, p. 94). Students are implicated in the classroom practices that both constitute and are constituted by the norms and interactions of the classroom on a daily basis. A focus on the student gives voice to these practices from the inside (while still subject to the researcher's interpretation).

Chapter 6 by Gallos Cronberg and Emanuelsson, featuring the student Martina's voice within a sequence of ten lessons from a Swedish classroom, provides a unique insight into cultural variation concerning student independence. Martina learns mathematics in a classroom environment in which students are required to plan and work on their own on different tasks, independent of other students and to a large extent independent of the teacher. Prompted by concerns raised by Hansson (2010) that question the extent to which such an environment and associated pedagogical practices can support students to develop appropriate levels of mathematical proficiency, the authors examine how Martina negotiates her learning environment. In particular, how she exhibits agency and how she interact with others in her community are considered in relation to learning outcomes associated with mathematical practices and reasoning. Using Martina's voice, the authors examine how Martina was able to contribute to the sociomathematical norms in the class, engaging in public mathematical discourse that involved explanation, justification, and argumentation. However, the authors note that opportunities to learn were mediated by access to mathematical tasks and by Martina's interpretation of the didactical contract (Brousseau, 1997). In contrast to many of the learning environments featured in this text, Martina regarded the textbook as the main source of support, and as a consequence, learning outcomes were dependent somewhat on the suitability of the instructional text to assist movement to the next zone of learning development (cf. Vygotsky, 1986).

In looking at participatory practices within the lesson, Nyman and Emanuelsson in Chapter 7 have chosen to focus their analysis on the enactment of the mathematical task using the construct of task-related attention. As noted by Sullivan, Clarke and O'Shea (2010), effective learning is not solely dependent on the quality of the tasks, "but also on the ways the teacher implements the task, and whether the students are able to take advantage of the opportunities that working on the task might offer them" (p. 531). Situated within the social interactions of one Swedish mathematics lesson, Nyman and Emanuelsson give voice to students' task-related attention through the categories of relevance, solution methods, and validation of tasks. Again the learning outcomes are a focus. In this chapter, the outcome that takes centre stage is that of student interest and its relationship to participation in mathematics learning practices. For example, they illustrate how interest constructed during a student generated discussion on task relevance acts as a segue for the student to both solve the task and see the meaning of the task. Linking the documented practice to effective pedagogies, the authors hypothesise that the teacher's efforts to clarify the relevance of the task was instrumental in

developing student interest and consequent engagement with the intended content matter. The authors contend that task-related attention can be enhanced by specific teacher-student interactions that support and acknowledge student interest.

In Chapter 8, Novotná and Hospešová consider how students can develop their problem solving competence within the social milieu of the classroom. They utilise student and teacher voice within classroom discourse episodes to understand how the teacher provides space for students to access and build on informal and acquired knowledge. Drawing on the theory of Brousseau (1997), they analyse a-didactical situations looking closely at teacher and student perceptions of situations where the teacher intentionally provided activities linked to students' real life experiences or prior knowledge. The authors conclude that to be effective the teacher needs to attend to students' voice in all its possible forms. They provide evidence of the complexity of occasioning student learning, arguing that the effective teacher needs not only to be able to "work with students' suggestions on how to solve a given problem," but also the teacher needs to be able to react "without hesitation to the unforeseen situations arising in consequence to other influences than mathematics" (p. 141). Meeting this challenge, Novotná and Hospešová argue, requires that the teacher has a deep knowledge of the students as individuals.

Bergem and Pepin, in Chapter 9, examine the development of democratic agency within the mathematics lesson. Like Walshaw (2011), they argue that effective pedagogy that involves students' participation in classroom discussions has both a cognitive and social dimension. Using data from Norwegian classes, they provide exemplars of teacher student interactions that either afford or constrain opportunities for students to challenge and question the teacher's and other students' thinking. Student voice, as expressed in challenges to the teacher, was used to explore engagement levels with tasks and to examine issues of democratic participation. A feature of the Norwegian classes in the LPS project was that opportunities were provided for everyone to contribute to and participate in ongoing discussion. However, unlike the Shanghai classrooms described by Huang and Barlow in Chapter 10, this opportunity extended to a choice to agree or refuse to come to the board when asked by the teacher. Effective pedagogy, these authors conclude, occasions opportunities for students to participate and engage themselves as members of a group. They suggest that the diversity of ideas expressed within the group has the potential to promote deeper mathematical understanding.

Much of the current research work on understanding how students participate in the social and mathematical practices of the classroom is driven by the need to address systemic levels of underachievement and disengagement among disadvantaged groups of learners in our classrooms (Gutierrez, 2013). An important role of intercultural studies is that they enable us to question taken-for-granted practices within one's own culture and society that may serve to perpetuate inequities. For example, Anthony in Chapter 12, while focused on the notion of students' perception of the 'good' teacher, contrasts the learning opportunities afforded students in a top and a low set class in terms of co-constructed norms of

participation. In each of these classes, students accessed significantly different activities and associated mathematical practices that variously afforded or constrained student opportunities to develop mathematical proficiency.

Students' Perceptions of the Classroom and Teacher

One of the arguments for inclusion of student voice relates not to the role of student voice within the lesson itself, but rather to student voice about the learning experience after the fact. Until relatively recently, most efforts to improve education have been based on adults' notions of how education should be conceptualised and practised and the views and opinions of young people have been traditionally discounted as having less legitimacy than the views of adults. Research seeking students' perceptions began with the premise that for teachers and researchers to be able to understand and improve learning and teaching, we need to canvas students' needs and viewpoints. Brown (2002) argued that student views of learning reflect their experiences with the activities that teachers provide and the values teachers convey as being important. That is, students construe learning in ways that they have been socialised to do, through their perceptions of what their teachers' value. These student voices can be particularly useful for informing local contexts. For example, examining the messages within the narratives of young Maori students in New Zealand, Bishop (2003) identified conditions necessary for supporting the engagement of Maori youth in school-based learning. Central to the findings was that young Maori students valued teachers who would enable them to bring their cultural experiences to the learning conversation.

Motivated by a strong belief that the characterisation of the practices of mathematics classrooms must attend to the learners' practice with at least the same priority as that accorded to the teacher's practice, several chapters in this text collate both student and teacher perspective data generated by the LPS research design. Within the video-stimulated recall interview situation both students and teachers were asked comment on aspects of the lesson that were significant to them, and invited to make more general comments about the overall experience of the teaching/teacher and the learning environment. Taking the view suggested by McGregor (2005) of treating students as 'experts' in schooling, the design assumes that students will have knowledge of the class which adults might not have. In this sense, students could hold different views regarding what are important moments within their lesson from those of the teacher. Prompted by a scarcity of research about how Chinese students perceive their classroom learning, Huang and Barlow, in Chapter 10, explore the relationship between student and teacher perceptions of important events across a set of 15 consecutive lessons in a Shanghai classroom. They describe the students' perspective as aligned to 'learner-trained learning' where students are well aware of the expected procedures and react promptly to teacher cues (Cortazzi & Jin, 2001). Thus, not surprisingly the authors noted a strong match between teachers' and students' perceptions of important events within each lesson. Again, we see how student voice can inform our understanding

of effective pedagogy and learning outcomes. This match, Huang and Barlow argue, affirms the effectiveness of the particular pedagogical approach in promoting valued learning outcomes, claiming that "the students are more likely to engage in the mathematical tasks at the cognitive level the teacher intends" (p. 184).

Drawing on student interview data from one Singapore class (SG1) and one Hong Kong class (HK1), Mok, Kaur, Zhu, and Yan (see Chapter 11) compare Singapore and Hong Kong student perspectives of their respective lessons. Following on from earlier independent analysis (see Kaur (2008, 2009) from Singapore and Mok (2009) from Hong Kong) noting that both cohorts of students were very positive about their learning, the authors examine those pedagogical routines and practices that were important to the students within the exposition, seatwork and review phases that characterise lessons within these two countries. Based on student reports of significant moments in lessons, students in Singapore and Hong Kong provided closely matched responses. Both cohorts valued clear teacher explanations and demonstration of procedures, followed by individual seatwork for practice, with Singapore students also reporting appreciation of opportunities for group work as an additional source of practice. Whole class report back sessions were also valued by both cohorts, largely as a way of checking the answers and (re)learning via corrective feedback. The authors characterised the students' expectations as 'seeking a virtuoso to follow.' While the characterisation of pedagogy is different to that provided by Huang and Barlow, the harmonious match between teachers' instructional practices and students' expectations re their learning needs is offered as a potential reason for students' high performance levels.

Chapter 12 by Anthony also uses students' voice from interviews to explore the notion of a 'good' teacher, but in this chapter students' perceptions of their teacher are linked to their perception of themselves as a learner. Using the conceptual tools proposed by Cobb, Gresalfi, and Hodge (2009), Anthony looks at the interplay between social practices and the processes of self-form that are at work within two contrasting New Zealand mathematics classrooms—grouped distinctly as high achieving and low achieving students. Analysis of the alignment between what students valued in their teacher and expectations of how students should behave within the mathematics classroom, expressed as normative identity, were consistent within each class, but notably different between classes. In any mathematics classroom, mathematics knowledge is "created in the spaces and activities that the classroom community shares within a web of economic, social and cultural difference" (Walshaw, 2011, p. 95). In this chapter, exploration of these spaces by means of students' voices illustrates how the development of mathematical proficiency cannot be separated from the axes of social and material advantage or deprivation that operate to define students both within the school system and community. While both classes reported positive feelings about their mathematical learning experience, Anthony questions whether these positive feelings equated to equitable learning opportunities.

CONCLUSION

In these chapters we see how effective pedagogy—in all its various forms—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 practices in which the teaching and learning is embedded (Anthony & Walshaw, 2007). The authors have used student voice to demonstrate how aspects of engagement in mathematics lessons, such as approaching unfamiliar problems, persisting in the face of challenge, and interacting with others are crucial determinants of what students come to know and do (Boaler, 1997). These behaviours all constitute aspects of disposition—an important strand of mathematical proficiency (Gresalfi, 2009).

In some chapters, the role of social, emotive, and motivational factors are shown not simply to act as influences on learning but are seen as central drivers to the learning process. Issues of identity and power bring suggestions of socio-political framing paying heed to the power and affective dimensions of the classroom in their exploration of the "relationality of the teaching/learning encounter" (Appelbaum & Allen, 2008, p. 52). For example, Anthony (see Chapter 12), Bergem and Pepin (see Chapter 9), and Gallos Cronberg and Emanuelsson (see Chapter 6) consider how individuals can act to resist classroom social and socio-mathematical norms.

Collectively, these chapters serve to affirm the underpinning assumption of the Learner's Perspective Study that the characterisation of the systems of social practice within the mathematics classrooms must attend to the learners' practice with at least the same priority as that accorded to the teachers' practice. In focusing on student voice within this partnership, as enacted in many different guises across different cultures and socio-political learning environments, we hope that we will be better informed to understand the relationship between pedagogy and learning mathematics, and between pedagogy and the empowerment of diverse learners.

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