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EDUCATIONAL POLICY AND CLASSROOM DISCOURSE PRACTICES: TENSIONS AND POSSIBILITIES

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> A central question for educators concerned with equity is: *What* forms of pedagogy might prepare *which* students to participate in [critical and transformative action]? (Morgan, this volume, p. 186)

What forms of discourse are valued? And by whom? Who gets to determine which forms of discourse are valued? Who gets to participate in the valued forms of discourse? And who controls participation? Can policy impact students' opportunities to participate in valued discourse practices? These questions focus attention on how students are positioned in classroom interactions, positioning that involves power relations, that potentially develops or stymies the formation of students' mathematical identities and that ultimately has implications for students' achievement and access to resources within and beyond school mathematics. We take the term 'policy' to refer to a wide range of governmental or administrative efforts to mandate or otherwise influence particular practices in school mathematics classes.

With respect to these questions, in this chapter we frame a dialogue between researchers and policymakers. We consider tensions among researchers and policymakers, particularly ones that relate to the scope and level of attention and to the proximity or otherwise to classroom interactions. Although policymakers are often concerned with mandating classroom practices at scale and from a distance, many mathematics education researchers, including some featured in this volume, focus on interactions within particular classrooms. These differences have an impact on how equity and discourse are framed in the various communities, with implications for the scale at which change is envisioned or evaluated. Given the resources available to policymakers, however, these

differences are not neutral with respect to students' opportunities to learn mathematics. Consequently, we explore the ways that researchers and policymakers might speak to each other, with the intent of highlighting possibilities for making policy more responsive to particular contexts and for making research more responsive to policy concerns.

We recognize that discourse and equity are inextricably intertwined. Moschkovich (2012), in this volume, questioned the tendency to separate discourse and equity, pointing out that doing so often marginalized the discourse practices and research activities situated in the classrooms of marginalized communities, as if discourse practices in these classrooms lacked legitimate mathematical forms of reasoning. She explains how the situated and hybridized nature of mathematical discourse practices binds together identity, power, access and achievement, which comprise Gutiérrez' (2012, this volume) four dimensions of equity. We explicitly build from these dimensions of equity to provide a frame of reference for situating the tensions within and between these two communities. Policy, for example, primarily addresses the tensions lying along what she called the *dominant* axis between access and achievement, especially with regard to addressing inequitable circumstances. Classroom-based researchers, on the other hand, have often focused on the tension between the dominant axis and what she called the *critical* axis, exploring the need to attend to identity and power (the two arms of the critical axis) as precursors to discussions of access and achievement. The nuances of such research findings, however, especially with regard to the role of context, seem to be evident rarely in policy.

As mathematics education researchers who have focused our work at the classroom level, we start with the view of 'equitable discourse practices' as being responsive to students' identities and intellectual resources as well as to the social, cultural, historical and political contexts in which students operate. We thus acknowledge our agreement with Gutiérrez that equity cannot simply be framed in terms of access and achievement, but must also include issues of identity and power.

In this chapter, we explore characteristics of policy and research that undergird these tensions. We place these voices in dialogue to underscore both tensions and possibilities. One set of voices is associated with the policy community and includes policymakers as well as policy scholars whom we interviewed for this chapter. In the interviews, we posed a series of questions, such as: Can policy alter classroom practices in ways that address long-standing inequities? Should policy focus on helping teachers gain a better understanding of and develop competency in new practices? We identified policymakers from a range of perspectives and international contexts. Because of our selection of experts, our examples are drawn from four countries: Canada and the USA (neighbouring countries in which we and some of our policy experts work), and Bhutan and China (neighbouring countries in which two of our policy experts work).

We note that attention to equity and to discourse in mathematics classrooms differs across countries. For example, recent PISA results identify large disparities in student mathematical achievement in the U.S.A. aligning with socioeconomic disparities (Education Trust, 2010). By contrast, neighbouring Canada has relatively little disparity

attributable to socioeconomic differences. Thus there is little surprise to us that equity has become a critical focus for scholars and policymakers in the U.S.A.

The second set of voices primarily includes the authors of the chapters in this volume. These chapters raise important issues about discourse and equity in mathematics classrooms in a range of international contexts, and we think it is important to connect their voices in dialogue with policymakers to consider what might *be done* to influence the nature of classroom discourse at a broader scale than what was reported in many of the individual chapters in this volume. We acknowledge Moschkovich's (2012) recommendations in Chapter 6 for how to think about and conduct research on mathematics discourse practices, yet make more explicit connections to the policy conversation at the heart of this one. Considering our developing sense of the centrality of discourse practices to equity and inequities, what might leaders in mathematics education do to affect the nature of classroom discourse practices? Although some chapters in this book provide examples of leaders working to support and/or structure discourse in particular contexts (e.g. Herbel-Eisenmann, 2012; Wagner and Lunney Borden, 2012; Setati, 2012), this chapter takes a broader look at the question.

1. FRAMING THE DIALOGUE

Dialogue entails that actors are positioned with respect to external criteria and in relation to each other. We use Gutiérrez' dimensions of equity to frame criteria to situate each community and then we see how the communities relate to each other. First, we note that studies relating to the *dominant* axis, more so than studies relating to the critical axis, address dimensions of equity that are objects of measurement, and thus are more likely to be subject to large-scale interventions (e.g. policy) crafted at a distance from the contexts in which they are to be implemented. Conceptions of achievement often involve standardized measurements, such as standardized test scores, while conceptions of access usually involve variables such as course-taking and teacher quality (see Harris and Anderson, 2012, in this volume) that can be measured with little contextual nuance.

Conversely, identity is often explored interactionally at small grain sizes, due to the complex and contested nature of both the term and the ways people construe themselves in the world. Also, it is enacted locally. Similarly, power is not easily measured or studied at scale, as it operates relationally (Foucault, 1975) in formal and informal interactions among actors situated within and between layers of organizations. Consequently, issues of scale and proximity are central to the ways policy and classroom-focused research are constructed, with implications for the perspectives of people operating in each community and for the ways these perspectives engage with the various dimensions of equity.

2. TENSIONS BETWEEN ACCESS AND ACHIEVEMENT

We begin the discussion by introducing our selected policy informants and then describe how some of them have addressed the impact of policy on students' opportunity to learn. We point out how these experts described the constraints and affordances of policy

before turning to the perspectives outlined by the classroom-based researchers.

We chose to talk with policymakers and scholars from a broad array of policy perspectives and contexts, listed below:

- Doug Willms, Professor at the University of New Brunswick, Canada, who does large-scale quantitative analysis of education in relation to social policy, using international and Canadian databases of social demographics and of education achievement results and associated surveys;
- Karen King, Associate Professor at New York University, U.S.A., who has worked as a Program Director in the National Science Foundation, was on the RAND Mathematics Study Panel[1] and has served in leadership roles in the U.S. National Council of Teachers of Mathematics;
- Karma Yeshey, Director in the Curriculum Office in Bhutan's Ministry of Education, who leads mathematics curriculum reform in Bhutan, a country undergoing major national mathematics curriculum reform;
- Lynn Paine, Professor at Michigan State University, U.S.A., who has studied the Chinese educational system and mathematics teacher inductions systems, as well as new teacher induction forms, processes and policies in many countries;
- Walter Secada, Professor at the University of Miami, U.S.A., who has studied equity in mathematics education, particularly around how policies impact English language learners.

Two primary mechanisms by which policy impacts equitable opportunities to learn mathematics, were noted by the experts who addressed this issue. The first is the regulation of practice by means of creating incentives and penalties related to high-stakes standardized achievement measures, as is the case in the U.S. context. The second occurs through developing local capacity to enact the mandated curriculum, with an emphasis on supporting schools to help students learn challenging mathematics.

The distinction between these mechanisms is exemplified by the purposes for which educational authorities mandate curriculum. In China, the mandated curriculum has sometimes served as a focal point for developing teachers' capacity to understand relationships among curriculum, instruction and learning (Wang and Paine, 2003). Paine, for example, noted in her interview that a primary goal of local educational policy in China is to provide resources that help teachers develop the capacity to teach the mandated curriculum in ways that provide improved opportunities for students to learn mathematics:

> [The policy] was saying something is getting in the way of these kids learning and these teachers being able to support their learning, and let's figure out policies that might support the conditions that could or create the conditions that could support them [...] Now the goal is clearly equity,

[1] This committee's charge was to make recommendations to the U.S. Department of Education about future research funding in mathematics education.

> [...] concern that the larger portion of kids weren't achieving at the level that people might hope, but the problem wasn't the kids, and the problem wasn't even entirely the teachers, but it was a capacity issue where there needs to be learning, so there was a policy geared towards learning, which feels different from a policy geared towards measuring outcomes. What got produced was different [in many contexts], so in some cases it meant teachers were seconded from school A to school B to spend time teaching in a very different school [for a period of time ...] or a principal would be assigned to become the principal of two schools or to leave the school and work at another school and it worked out differently in different places in [Shanghai]. That seemed like a really novel approach [...] but the focus of the policy was very different from [the way we focus policy in the U.S.].

In her research, Paine describes how Chinese teachers form learning groups (similar to lesson study) around "learning how to think about an important topic and content and then try to understand what is hard for kids about this content, [which they do] by actually interviewing kids who have studied that topic in the past". They then use this information as data to improve the teaching of those topics. The overarching goal of these learning groups is to figure out how to best teach every child, particularly with respect to content areas in which many students struggle. Additionally, she explained how the teachers worked together to develop formative assessments that could be given at different points in time, drawing on this data to better understand what students were learning and using that information to inform their instruction. This kind of professional development, Paine argues, provides an interesting example of policy that supports issues of equity and discourse in mathematics education, but also points out that the process was labour intensive (see also Paine, Fang and Wilson, 2003). We note that in China, relative to the U.S., the corrective to inequities involves providing schools and teachers with greater autonomy to improve instruction for all students. Policy in China includes a structure that mandates that the voices of students and of teachers were valued and instrumental.

In other jurisdictions, there are aspects of such teacher autonomy that co-exist with forms of top-down control. For example, in Canada there are clearly defined curriculum outcomes that describe mostly the mathematical procedures that students should be able to perform. The province of New Brunswick's curriculum states: "By the end of grade 5, students will be expected to divide 2-, 3- and 4-digit numbers by single-digit divisors and investigate division by 2-digit divisors" (NBDOE, 2001, p. 30). This and the other outcomes are enforced in a way by external common assessments, though the results have less explicit implications on funding and programs than they do in the *No Child Left Behind* (NCLB) era of the U.S. Nevertheless, Canadian jurisdictions have legislation that guarantees teachers autonomy regarding ways of addressing mandated outcomes: "The duties of a teacher employed in a school include [...] identifying and implementing learning and evaluation strategies that foster a positive learning environment aimed at helping each pupil achieve prescribed learning outcomes" (Province of New Brunswick, 1997, para. 27.1) There is a tension between external control and externally-mandated authorization of the teacher's professional responsibility to make decisions. A similar

circumstance holds in France (see Pimm, Chazan and Paine, 2003), where the curriculum is nationally specified, but the means of instruction are equally firmly not.

In other contexts, such as within states in the U.S., the mandated curriculum is intended to regulate –with little attempt to support – teachers' practices through the mechanism of standardized testing, which is particularly evident in contexts that serve marginalized students (see Harris and Anderson, 2012, in this volume). Policy in the U.S. is insensitive to context, especially in terms of supporting the development of capacity in under-resourced contexts, which is particularly problematic since the U.S. has one the highest gaps in the world between the performance of low- and high-SES students (Education Trust, 2010).

2.1 Affordances and constraints of policy with respect to access and achievement

We now explore in more detail the affordances and constraints of policy in the U.S. context as an example of an environment that emphasizes external control. We explore in particular how policy attempts to address the inequitable distribution of access to high-quality curriculum and instruction, which we associate with an achievement gap that follows socioeconomic lines.

Even when the goal of policy is aimed at ameliorating inequitable circumstances, it is unclear exactly what policy may accomplish in this regard, especially if the policy does not articulate how schools and teachers can develop the capacity to enact challenging forms of curriculum and instruction for students. U.S. policy scholars Walter Secada and Karen King, for example, discussed some of the affordances and constraints of attempts in the U.S. to enact policies related to access and achievement. They both described policy as a 'blunt instrument', one that does not differentiate among local contexts or teachers. Policies in the U.S. context, such as the *No Child Left Behind* (NCLB) legislation, mandate progress toward specific levels of achievement, which typically involve the use of standardized assessments and prescribed curriculum content to measure that achievement. The downside to such prescription without accompanying support mechanisms has been well-documented with regard to narrowing the kinds of curriculum and instruction to which students have access, especially in schools in which there are high percentages of minority students and high poverty rates (see Harris and Anderson, 2012, in this volume). Yet, as Moschkovich (2012) highlights in her chapter, there are important alternative forms of assessment that might be better suited to contexts in which students are learning English, in addition to mathematics. These alternatives are rarely considered in policy contexts.

Secada suggested that the 'bluntness' of policy is the result of attempting quickly and radically to change people's behaviour. However, the blunt nature of policy is endemic to the nature of educational systems in the U.S., in part due to how government is organized. In the U.S., for example, governance structures are ultimately local, which leads to considerable variation between districts and schools in terms of how state and federal policies are interpreted (Cohen, 1995). By contrast, in Canada jurisdictions are

larger – they are provincial – and in Bhutan and China, the system is national.[2] As policy gets pushed closer to classrooms in the U.S., what gets transmitted is typically at best an awareness of reform doctrine, with little emphasis on how to support teachers in developing new practices around the doctrine (Cohen, 1995). Consequently, there is likely to be little coherence *in practice* at the level of the classroom. Spillane (1998) goes further, noting the segmentation *within* schools and districts that causes variation within those organizations with respect to policy implementation, making it less likely that there will be coherent messages or well-designed support systems for teachers as they enact new policy. Although local governance in the U.S. has the potential to be responsive to local contexts, so far we and our policy discussants see that it has not successfully addressed equity in a coherent and centralized way.

Also in the context of the U.S., King described policy as being unresponsive to conditions in local contexts. She pointed out, for example, that policies might be made to mandate aspects of classroom discourse as they relate to specific groups of children who historically have been marginalized by schools and that these policies could lead to "essentializing children, making all children of type X [the same], assuming there is some essential feature of them that they can build on". She argued that, instead, a more appropriate approach to classroom discourse should involve "having genuine conversations with children" and families in the community. King's points echo the recommendations made by Moschkovich (2012) in Chapter 6.

King similarly described the undifferentiating aspect of professional development in the U.S. that is not responsive to the local demands of teachers. She claimed that the collective set of teachers' professional development experiences are haphazard and unorganized, rather than building toward a common goal of expertise in an area of practice:

> [It is] not surprising that policy finds that people plateau in five to seven years because they get the same stuff they've always been getting. There's no catalyst to do something different. [...] A policy regime that would help with differentiated professional development for different expertise would make more sense than the ones that are typically in place. Particularly, the ways in which we would expect beginning teachers to attend to discourse and equity would be different from more experienced teachers who have the freedom of mind to think about broader issues, like who is participating, the level of discourse happening. The system doesn't make it easy to help an experienced teacher to advance. They have to seek these experiences out.

King stated that although NCLB mandates the narrowing of the achievement gap, it ignores what happens in urban settings and consequently reduces students' opportunity to learn by constraining the forms of curriculum and instruction. The lack of flexibility in

[2] The population of Bhutan is similar to that of a small province and smaller than many cities in the U.S. and Canada, but the connections between authorities and schools are more distant, both organizationally and geographically, due to challenging mountain terrain.

the law reduces teachers' ability to react to the specific needs and resources of their students, removing the potential or even possibility for teachers to exercise professional judgment.

Secada, however, noted that such policy is sometimes a necessary evil, because it directs attention to important issues:

> And so policy, which is a blunt instrument – and it's a horrible instrument from the standpoint of forcing things to happen – is, in fact, an instrument that opens up spaces [...] and makes possible asking those questions and having people say, 'Yes this is an important question'.

He described an example of educators needing to attend to the challenges experienced by mathematics students who are also learning to speak English, which has clear equity implications:

> Before *No Child Left Behind*, I had to beg people to come to anything I did about teaching math to English language learners. I would go to major urban districts that were under court order to desegregate along the lines of language and I would go there to do anything on teaching math to English language learners. The people in the math departments would tell me, 'That's the business of the bilingual people.' The people in the bilingual department and ESL department would tell me, 'That's the job of the math people.' If I was lucky I might get maybe 20 to 30 people... Now I do six sessions with 50 to 100 teachers in each session about how to do things involving the teaching of math to English language learners.

Attention to equity in the U.S. is also prevalent in research. Some of that attention may be attributable to gaps identified by policy instruments, such as the disparity we mentioned above. However, researchers who have close associations with teachers who face the disparities every day are responding to more than published results exposing inequities. They are responding to the realities they see among students and teachers. Nevertheless, others who may not notice these disparities may be directing their attention to the research on equity because of the identified achievement disparities. Public resources would also be directed more to research that addresses these disparities.

2.2 Classroom-based researchers' perspectives on access and achievement

In this sub-section, we discuss the perspectives of mathematics education researchers who explore equity and discourse in mathematics classrooms. These researchers criticize the nature of policy with regard to access and achievement, for reasons that have both dissonance and resonance with those of policymakers.

The classroom-based researchers in this volume expressed a variety of perspectives about policy and how it gets interpreted, particularly with respect to the ways policy frames access to conventional forms of mathematical content and terminology. These

perspectives lay bare the tensions within the dominant axis – namely, that access to particular forms of mathematics somehow leads to achievement – as well as the tensions between the two axes, explored more fully in the following section. In short, the perspectives expressed by mathematics education researchers concerning access point to the perils of ignoring political and cultural dimensions of policy (also discussed in more detail in the subsequent section), as well as the perils of ignoring access to dominant forms of mathematics.

In Chapter 9, Barwell (2012) criticizes the notion of 'access' as a basis for formulating policy, particularly around classroom discourse for students in the U.K. who are learning English. He states that policy that does not take into account the broader cultural and linguistic milieux in which students learn mathematics is narrow and potentially harmful. He states that policy needs to move away from deficit- or access-based notions of language with respect to mathematical learning. In order to understand fully the mathematics learning of Learners of English as an Additional Language (the U.K. term), for example, Barwell states that policymakers need to consider language demands besides vocabulary, to look at the demands of learning to use registers or genres (also see the chapters from Moschkovich (2012) and Schleppegrell (2012)).

Barwell describes *discursive demands* as "broader discursive aspects of bilingual, multilingual or second language mathematics classrooms, including the use of multiple languages; the role of students' everyday language; the interpretation of graphs, tables and diagrams; the construction of students' relationships with each other; and political tensions surrounding language use" (p.151-152). Barwell criticizes policy in England as too focused on access, with potentially damaging impact on students for whom English is not their first language. In part, his disagreement arises because notions of access construct language use in simplistic terms and ignore the more complex and situated features of language use that have been shown to be useful, if not imperative, to the learning of mathematical concepts.

Setati (2012), in Chapter 8, describes how teachers in South Africa interpreted policy that was ostensibly intended to incorporate students' home languages in multilingual contexts. Her research shows the limitations of policy that do not take into account the political aspects of access and achievement. She details the tensions for teachers between providing access to dominant forms of language and responding to policies that emphasized the use of multiple home languages. Setati notes that, although the "South African Language in Education Policy (LiEP) recognizes eleven official languages and encourages multilingualism as well as language practices such as code-switching as resources for learning and teaching in multilingual classrooms" (p. 128), there was little evidence of these practices in classrooms. The reason for the disjuncture between policy and practice, she explains, is that the policy assumes "that mathematics teachers and learners in multilingual classrooms together with their parents are somehow free of economic, political and ideological constraints and pressures when they apparently freely opt for English as the LoLT (Language of Learning and Teaching)" (p. 131). Setati observed the prevalence of English use in multilingual classrooms and cited the teachers' ideological and pragmatic reasons for preferring to teach in English, rather than in

students' home languages. Consequently, the teachers' preferred language practices contravened what research indicates is helpful to the learning of mathematics. She explains:

> There seem to be a tension between the desire to gain access to English and the important but not always recognised and acknowledged need to gain access to mathematical knowledge. (p. 132)

Barwell (2012), Setati (2012) and Moschkovich (2012) each emphasize the importance of using multiple languages and genres to learn mathematics: that is, although the ways policy was articulated or interpreted was intended to provide access to dominant forms of mathematics, these efforts had the unintended effect of restricting access to forms of language use that actually facilitate mathematics learning. However, there are risks to allowing learners to rely on non-dominant languages and genres to learn mathematics. Morgan (2012), in her chapter for example, states that it is clear "that achieving success in school mathematics necessarily involves learning to recognise, respond appropriately to and produce mathematical texts" (p. 189). However, if students are allowed to make choices in how they produce mathematical texts, especially with regard to high-value languages and particular registers, there are consequences:

> The choices students make will still serve to differentiate those who become able to produce legitimate texts in both domains (legitimate both mathematically and linguistically) from those who, for example, engage mathematically through the medium of their home language but consequently do not develop their competence in English and hence are unable to achieve political power. (p. 187)

Morgan (2012) explains in Chapter 7 that these choices may result in different trajectories and differences in how those trajectories are distributed across groups of students, with potential consequences for who ultimately develops the forms of discourse most highly valued by those who have access to resources.

Tensions similar to those in the multilingual environments studied by Setati (2012) and by Barwell (2012) exist in relatively unilingual environments as well. In Chapter 7, Schleppegrell (2012) explains how attention to peculiarities and specificities of mathematics discourse is worth the while of mathematics teachers. Herbel-Eisenmann (2012) has worked with teachers to explore their discourse and reports in Chapter 10 on aspects of that experience. From our experiences, we know that mathematics teachers are not at first inclined to attend to their discourse, but that attention to inequities related to their discourse practices piques their interest. Nevertheless, there are significant challenges in raising and supporting such attention.

A final critique of the access perspective is provided by Martin (2009), who states that a focus on access ignores the racialized nature of society and the work place, a perspective that could be expanded beyond race to consider other ways of framing students' identities that are associated with marginalized statuses. He claims that even when students of

colour in the U.S. develop competency in high-valued practices, they are often denied the same opportunity to jobs and other resources as similarly qualified White students. Consequently, Martin argues, if educational policy ignores the ways race is constructed inside and outside of educational settings, these policies are likely to have little impact on whether or not outcomes are equitable.

3. TENSIONS BETWEEN THE DOMINANT AND CRITICAL AXES

The discussion of the tension along the two dimensions of the dominant axis was previewed above in the ways the classroom-based researchers described the importance of attending to students' linguistic, cultural and political contexts and the resources that derive from those contexts. This tension exemplifies the orthogonal relationship between the dominant and critical axes. Concerns for access and achievement (the dominant axis) frame equity in terms of privileging access to high-value knowledge. Concerns for student identity and power (the critical axis) frame equity in terms of privileging access to culturally based ways of thinking and acting.

The identity and power perspective is conceived in terms of designing discourse practices around students' linguistic and cultural resources both from the perspective of the culture they bring to the classroom, which Vithal and Skovsomose (1997) refer to as students' *background*, and the perspective of looking forward to the cultures they would want to engage with in the future, which they label as the students' *foreground*. In her chapter, Gutiérrez (2012) similarly states that, in order for students to understand dominant mathematics, they should not have to divorce themselves from their current ways of being in the world. In the following subsections, we focus more explicitly on the role of these resources in providing opportunities for students to learn mathematics. We explore the tensions between culturally-based and dominant forms of discourse in mathematics classrooms, integrating the perspectives of the classroom-based researchers and policy experts who spoke to this tension. We then explore the power dimension of policy as discussed by our policy experts.

3.1 Tensions between the culturally-based and dominant forms of discourse

Questions raised by the classroom-based researchers surrounding the tension between culturally or linguistically based forms and dominant forms include whether these discourse forms are mutually exclusive, whether each can be developed in service of the other, whether teachers can develop the capacity to understand multiple forms of discourse and how teachers attend to issues of power and politics around classroom discourse.

Moschkovich (2012) warns that there is a potentially dangerous dichotomy in this tension:

> In terms of theory, if the study of learning and teaching for learners from non- dominant groups is relegated to being only about that group, the study of learning and teaching (writ large) will continue to assume that

> there is a norm (regular folks, meaning those from dominant groups) and to reflect only the experiences of learners from dominant communities. [...] In terms of practice, this perception assumes that learners from non-dominant communities are the problem because they learn in fundamentally different ways than regular folks, that teaching them requires special pedagogical tricks, and that we cannot learn much about how regular folks learn (or how we should teach) from our work with learners from non-dominant communities. (p. 91)

As noted above, Setati and other researchers whose work is based in multilingual mathematics classrooms (e.g. Moschkovich, 2002) show how learners develop an understanding of mathematical concepts while working in their first language and use English formally to communicate their results. These students engage in *code-switching*, an important practice for meaning-making, not only between languages, but also between registers within the same language to negotiate meaning. This research suggests that culturally-based discursive forms *help* learners develop mathematical understanding and, ultimately, to participate in conventional disciplinary forms such as argumentation, a phenomenon that Setati labels *cognitive access*, in contrast to the *social access* emphasized by the teachers she interviewed.

The tension is particularly relevant in contexts in which learners are from marginalised backgrounds, because there is a cost to ignoring culturally based forms of discourse, a cost that Jorgensen (2012, this volume) describes as *symbolic violence*. Three chapters in this volume – by Setati (2012), by Jorgensen (2012), and by Wagner and Lunney Borden (2012) – address the experiences of students from such marginalized backgrounds, by connecting mathematics experiences to their cultural identities. Even within such approaches, we note power implications. These power implications are particularly significant in mathematics classrooms because of the high value society ascribes to mathematics as a discipline. Wagner and Lunney Borden (2012) point out in their chapter that there are differences between teachers and other authorities identifying cultural connections on the one hand and students themselves identifying them on the other. Nevertheless, even if students identify the connections it is important that their teachers and community leaders support the students in making these connections.

Secada also described for us the consequences of ignoring the cultural perspectives implicit in disciplinary-based forms of reasoning advocated by mathematics educators: "The kind of argumentation that math educators promote are very culturally laden things, that makes sense only for particular kids from middle class backgrounds". He explained the implications of advocating such practices in classrooms without regard for students' cultural perspectives:

> To say that the value of an idea is based on its ability to compel someone to agree to it on the basis of its intellectual coherence and the quality of the argument, flies in the face of people and children who are socialized into saying that the value of an idea is based on who said it... Kids who are raised in traditional ways – that the parents say things and that there are no

> questions asked, you just obey – to place them into the settings, either makes it seem like, 'Why are you playing games with me when you [the adult] know the answer,' [...] or if you succeed in socializing them and then they transfer that way of looking at the world at home, [it might lead to tensions in the home].

Though discourse practices associated with the discipline of mathematics are based on argumentation (Forman, 2003) and rely on the authority of evidence or logic to support claims, they may stand in contrast to cultural perspectives. Teachers who ignore such differences place the burden on students to understand the situated nature of such discourses and the potential risks to thinking of them as appropriate for settings outside the classroom.

4. DISTRIBUTION OF POWER WITHIN EDUCATIONAL SYSTEMS

We have not yet explored the specific structure of power in educational systems, which was a topic raised for us by some of the policy experts. In this section, we explore how power relations are evident in educational systems and connect power relations to the structure of educational systems. Doug Willms used the term "loosely coupled system" to describe the nature of policy in mathematics education. This characterization of the structure of the system describes how educational systems often do not function as formal hierarchies, despite the existence of hierarchical structures.

In his ground-breaking depiction of education structures, Weick (1976) introduced the idea of loosely coupled systems and described them as resilient to change because so many people at so many levels are active agents in the system. Most are not limited by terms of office, thus their beliefs and practices endure, surviving regime change. Weick also described how such distribution of power makes a loosely coupled system sensitive to local issues. He called this a system that perceives well.

With people in power at all levels of the system, it is possible to respond to local differences in culture, for example. Weick's analysis, and most of the comments made by the policy experts with whom we had conversations, seemed to focus on the sometimes explicit and sometimes implicit contract between mathematics teachers and jurisdictional leaders. However, from our perspective as researchers in classrooms, we notice more agents in the system. In particular, students are agents, not mere products of the system. Furthermore, the jurisdictional leaders are not the zenith in the system. We ask where their ideas and mandate come from. They too are responsive agents. The question is this: *To whom or to what are they responding?*

Regarding the 'top' end of the system, our conversation with Willms was instructive. Because he has worked extensively with high-level administrators from numerous countries, we asked him what prompts education policymakers to address particular issues relating to mathematics education and what prompts them to address issues in particular ways. In particular, we were interested in his views on the way policy draws on research. He answered with an account of a recent experience he had had. When leading

an international consultation of policymakers, he "had this policy group to try to get the group to formulate their policy questions, and they're actually not very good at it. [...] They don't even know what they want to know".

Willms said that the policymakers seemed unsure what change was necessary in their milieux. It was important for them to initiate positive changes, but they were not sure how to go about this. Willms said that policy often ignores clear research. Often one idea from research somehow engages an important policy leader who then pushes reform that connects with this one idea. It is unclear how researchers could promote their work to be instrumental in this way for policy.

Willms' approach has been to simplify results to catch the attention of policymakers at all levels: "I've had good success when I can just get one kind of clear idea and hammer it to death." For example, he has promoted the "shift from learning to read to reading to learn" – the idea that early literacy is necessary for achievement in all disciplines later on. He even promoted this idea in our conversation, saying that the most important way to promote equity in mathematics classrooms is to focus attention on developing reading skills in general in the first years of schooling: when students are unable to participate in discourse, which requires reading, inequities abound. Willms' use of the metaphor of the hammer in the quote above invokes the image of policy being a blunt instrument.

4.1 Reciprocity in classroom positioning

On the 'bottom' end of the loosely coupled system, we know that relationships within any system are reciprocal. If educators try to position students in a certain way, students may comply or resist that positioning (Wagner and Herbel-Eisenmann, 2009). Thus students have significant power over the discourse forms that take shape in any classroom. Collectively, the response of students in numerous classrooms combines to shape teachers' views about how to position themselves. This is true whether or not policy takes students' views seriously; it is true whether or not policies set up forums for students to inform the development of curriculum (as in the case described by Paine and mentioned in section 2 of this chapter).

In addition to shaping the discourse, students have the power to opt in or out of the particular discourse that presents itself to them in mathematics class. In the chapters by Jorgensen (2012) and by Wagner and Lunney Borden (2012), they confront milieux in which mainstream mathematics education does not engage the children. Both chapters aim to redress that disparity. Children not engaging with mathematics in the classroom may be the strongest form of resistance. The success of the system is affected by students engaging or disengaging with the particular discourse of mathematics they face in classrooms.

With our interest in equitable discourse, we see the benefits of a loosely coupled education system. We suggest that these benefits would best be realized if the distribution of agency were recognized at all levels of the system. As in the examples in China given by Paine (see section 2), not only were teachers and students agents in the system, but the

system was set up to recognize their agency as people who knew what they needed to improve teaching and learning and to adapt to their voices. Indeed, the recommendations made by Moschkovich (2012) in Chapter 6 would require the attention of agents in all levels of the system.

Not only do students interact with teachers and thus shape the discourse within the loosely coupled mathematics education system, but students also interact with each other and thus open or close space for each other within the system. Esmonde's (2012) chapter describes some of this power dynamic. So students, who are the majority agents in the system, exercise power over teacher–student discourse, over the success of the system and over each other.

4.2 Educational systems as a web of relations

The loosely coupled system of mathematics schooling is coupled in yet further ways beyond the contract between policy and mathematics teachers. Though Weick focused on the hierarchy comprising administrators, teachers and students, he also noted that "under conditions of loose coupling one should see considerable effort devoted to constructing social reality, a great amount of face work and linguistic work, numerous myths" (p. 13). This advice aligns with Wagner and Herbel-Eisenmann's (2009) call for the remythologizing of mathematics education, as they drew attention to the way people are positioned within mathematics classrooms as an alternative to envisioning students as merely respondent to a hierarchical discipline coming from outside their classroom walls.

Weick's recognition of the significance of social reality points to the connections among mathematics policy, mathematics classroom events and other cultural phenomena, which connects in various ways to mathematics and school. Weick described how loosely coupled systems are resilient because change requires changes in beliefs and values among all the agents at play in the system (which we are seeing as far-reaching). For example, change might require contending with issues of privilege and oppression throughout society. These kinds of far-reaching connections are likely to require attention, in order, for example, for the disparities in mathematics achievement along socioeconomic lines in the U.S.

The case of Bhutan's reforms in mathematics education shed light on this kind of dynamic at work in systemic reform. Starting from 2006, Bhutan's government implemented a gradual change in the curriculum. The most significant recommendation involved classroom discourse structure. Karma Yeshey described the upshot of the change in this way:

> Perhaps one of the most important aspects of the new curriculum is the requirement to explain and communicate ideas and understandings; to provide justification and reasoning for the solutions consistently. The teacher will need to be all-supportive in this. Over time then, the students will, hopefully ask the teachers too to give reason and justification for his/hers own answers. We earnestly need to promote this in our teachers

> and students in Bhutan, for in Bhutan we have somehow the culture of not questioning teachers and elders. This will improve the powers of our rational and critical minds!

Yeshey recognized the need for both teachers and students to recognize the need for altered discourse forms in mathematics class. Our claim that other social phenomena connect with the mathematics education system is quite clearly pertinent in the case of Bhutan, for the country is simultaneously undergoing massive reform in government, moving from a monarchy to a democracy. It is already described as a democracy but leadership recognizes that this is a slow process.

The reform of mathematics is intentionally connected to the development of democracy. Yeshey said, "I think Democracy will thrive only if we have a questioning and reasoning people and an explaining and reasoning government." Because the system of mathematics education is loosely coupled itself and coupled, albeit loosely, to other social forces in the surrounding culture, democracy depends on mathematics education as much as discourse in mathematics education depends on students' conceptions of appropriate ways of interacting with teachers and elders.

The concurrent reform of mathematics education and political structure draw attention to the need for policy change in mathematics education to be responsive to cultures at work in the communities in which schools are situated. Relatively global cultural phenomena (as in the national reforms in Bhutan) and relatively local phenomena are already connected to what happens in the mathematics classroom. Thus it is important for policymakers at all levels to take this connection seriously.

At the relatively global level, policy might prescribe changes that align with parallel cultural changes (as in Bhutan). The relatively local-level connection between mathematics classroom experience and students' cultural milieux is central to Gutiérrez' identification of identity as an aspect of equity in mathematics education. As Weick noted, the loosely coupled nature of education makes it possible for teachers to be responsive to local particularities. We note that large-scale policy can recognize the need for teachers to be responsive to local culture, and can structure systems that support connections between mathematics classrooms and community experiences. Wagner and Lunney Borden's (2012) chapter describes one instance of a structure that promotes such local interaction.

5. DILEMMAS OF MOVING FORWARD

The policy experts and researchers described dilemmas related to policy that aims to provide access to dominant forms of mathematics. These communities described the difficulty of being sensitive to local contexts while at the same time providing opportunities for students to understand and master dominant mathematical forms of language and reasoning. On the one hand, the policy experts described the limited reach of policy that strictly mandates particular practices without providing the autonomy and resources to develop the capacity to locally enact challenging forms of curriculum and

instruction. On the other, the researchers described the perils of ignoring the kinds of local linguistic forms (e.g. the use of multiple languages and informal genres) that provide cognitive access to mathematics, while at the same time warning of the risks of highlighting these linguistic forms in terms of maintaining the marginalized status of those most likely to use multiple languages and informal genres.

There is, however, some potential convergence in the two communities, particularly around the notion of building capacity to enact challenging forms of curriculum and instruction across a broad array of contexts. One possible site of convergence stems from Paine's example of the role of policy in China to provide support to schools that are struggling to help their students learn mathematics. She described for us the ways that local schools are provided both autonomy and support to meet the demands of teaching challenging concepts to a broad range of students. King would add that such locally oriented policies should align the perspectives of educators with those of the local community. The classroom-based researchers might contribute to this idea by inquiring into the kinds of practices in which teachers should develop capacity, with the idea of highlighting how access to particular practices leads to achievement through first providing cognitive or linguistic access. Current policies, they argue, are misguided in their fundamental understanding of how language use is associated with learning and should promote the effective use of multilingual resources and informal genres.

The prescriptive policy focused on measuring student learning described above addresses the dominant axis, because it measures success of the policy in terms of large- scale measures such as access and achievement. By contrast, policy that structures support for teachers as agents can address explicitly the need for them to be responsive to the identities of students and to foster the power of students and the community in classroom dynamics. Identity and power comprise the critical axis in Gutiérrez' account. However, because education systems are by nature loosely coupled, the reality is that teachers are free to be locally responsive.

Nevertheless, they may not be inclined or equipped to be responsive. Furthermore, even when policies go beyond prescription to capacity building, the question remains 'Building capacity to do what exactly?' If it is about building capacity to increase achievement and access, such policy in effect does not speak to the critical axis in any meaningful way. This, perhaps, reflects the politically risky dimension of this axis and the difficulties of taking context and culture into consideration when crafting and implementing policy at a large scale. One way for research on equity and discourse to make the critical axis more relevant in mathematics classrooms is to illustrate how issues of identity and power impact the learning of mathematics achievement, for example, by taking Moschkovich's recommendations for research seriously. However, this imperative must be mitigated by modifications of the system that privileges certain cultures.

The tension between access and identity in educational policy and practice is not easily managed, much less resolved. Three issues emerge. First, is it possible to mandate the use of non-dominant or non-disciplinary-based discourse forms? Martin (2009) is sceptical on this point, observing that "top-down, externally generated solutions that are not

responsive to the needs and conditions of the context in question are unlikely to have a meaningful and lasting effect" (p. 304). We argue, however, that change is possible if teachers understand connections between suggested new discourse forms and their own views of social needs or social justice.
Second, even if teachers began to encourage the use of such linguistic moves as code-switching, would they be able to understand and navigate the political implications of these moves. Given the often-reactionary backlash to progressive reforms (Tyack and Cuban, 1995), teachers may lack the political will or cultural capital to withstand criticism of such practices, as noted by Setati. Third, from a strictly pedagogic perspective, how can teachers help students to understand the relationships between culturally-based forms of discourse and those 'high-value' forms that offer access to resources in the dominant society? Herbel-Eisenmann's (2012) work with teachers described in Chapter 10 shows that, even as teachers engage seriously with issues related to taking up new classroom discourse practices, this might only scratch the surface of coming to understand the discourse practices of all of the other communities in which students participate in order to consider how to negotiate the hybridity of these practices.

Policy as blunt force can at best mandate a change in the official discourse; the translation to practice is questionable. *How can policy be sensitive to local conditions in ways that spur change in practices? How can policy impact the way race and language use are construed?*

Two themes emerged from our analysis relative to possibilities. The first is that a teacher-centred focus has possibilities, especially if teachers engage in inquiry about their students' cognitive, linguistic, cultural and political resources. In this vein, Setati (2012) argues in Chapter 8 that teachers need to take a holistic view of learners:

> Multilingual learners have a unique and specific language configuration and therefore they should not be considered as the sum of two or more complete or incomplete monolinguals. The solution to the problem explored in this paper is informed by this holistic view of multilingual learners. (p. 133)

Barwell similarly argues that policy needs to move away from deficit notions of students that place the problems with participation on students' lack of understanding of terminology or register. Instead, he suggests, policy should at least recognize the complexities involved in asking students to engage in mathematical discourse in classrooms, especially when they are simultaneously learning the language of instruction.

We have also become more aware of macro-cultural differences in dealing with and implementing change. Ironically, China is often portrayed as a relatively authoritarian culture and the U.S.A. as relatively democratic; yet, the nature of policy in education seems to be the opposite of what we would expect. Clearly, the relationship between culture and policy is complex.

The case of Bhutan's mathematics curriculum change provides further insight into the

role of macro-culture. As quoted above, Yeshey characterized the Bhutanese view of authority in terms of policy in this way: "In Bhutan, we have somehow the culture of not questioning teachers and elders". This quotation demonstrates his awareness that policy change initiatives are in fact attempts to change culture (and power dynamics), even while guided by culture. Later in the interview, he referred to the culture as evolving. Seeing culture as dynamic and power-laden is important in the consideration of change.

We offer these suggestions in attempting to address Morgan's question posed at the start of this chapter: "*What* forms of pedagogy might prepare *which* students to participate in [critical and transformative action]?" The discussion in this chapter suggests that policy cannot prescribe practices, especially in technical terms, but should recognize the complexities involved in engaging students in mathematical discourse and should support teachers in inquiring into their students' practices and ways of reasoning.

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