Mathematics Curricula: Issues of Access and Quality

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Abstract In the last forty years, it seems that discussions about inequality, power, access and identity have simultaneously become more prominent in mathematics education curricula, whilst also being subordinated to wider neo-liberal discourses of competition and accountability. In this paper, issues to do with access and quality are linked to the mechanism that determines what constitutes mathematics education for specific groups of children. Using Bernstein's pedagogical device, it is possible to see how the control of official knowledge affects who has access to what kind of mathematics learning opportunities. At the same time, contestation about what should be official knowledge also allows alternative possibilities to be raised. The challenge for those interested in providing higher quality mathematics education to all groups of students is how to make use of the possibility for "unthinkable" knowledge.

Keywords Curriculum · Equity · Neo-liberalism · Bernstein · Pedagogic device

1 Introduction

In recent times, educational policy-making in nation states, including the production of curricula,[1] is considered to be submerged into global trends (Atweh and Clarkson 2002a). Yet, perspectives of how mathematics should be taught and learnt, a regular feature of many curricula, have a long history of being affected by global discourses, that are then recontextualised into local settings (see for example, Meaney 2014; Wake and Burkhardt 2013). Following my previous work on the

[1]In this chapter, I use the definition of curriculum from Kamens and Benavot (1991), "Throughout this article the term "curriculum" refers to the official subject matter that has been transmitted by national educational administrators or system-level authorities to be taught in local schools" (p. 174).

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impact of global discourses on local educational practices, I explore how two recent discourses, one to do with equity in education and the other, a neo-liberal discourse, about the need for accountability through competition, interact in mathematics curricula decision making. These two discourses are investigated because of their potential impact on student and educator perceptions on how inequality, power, access and identify are integrated into mathematics education. A suggestion for the mechanism leading to convergence of curricula is put forward.

A global discourse can contribute both to describing as well as constituting a recognisable social event (Fairclough 2003) and through the use of this discourse establish membership of a trans-national group. According to Gee (1996), Discourse with a capital "D"

> is a socially accepted association among ways of using language, other symbolic expressions, and 'artifacts' of thinking, feeling, believing, valuing and acting that can be used to identify oneself as a member of a socially meaningful group or "social network," or to signal (that one is playing) a socially meaningful "role." (p. 131)

Although I choose not to capitalise discourse, the definition of global discourse that I use in this chapter is in alignment with Gee (1996). Discussions about mathematics education that use shared terms and expressions to describe, for example, how mathematics should be taught and learnt, also situate the speakers as belonging to the community of mathematics educators. When mathematics educators go elsewhere in the world and talk about events, then they not only use language to shape how those events come to be seen as mathematics education, but they also identify themselves as members of the mathematics education community.

The differences, between earlier cases of global discourses affecting mathematics education and the present day situation, is that the global discourses that currently affect mathematics education often arise outside of mathematics education or even general education. For example, at the beginning of the twentieth century, it was educationalists, such as Dewey (Tyler 1987) and Montessori (1912), who spread the notion that children's interests should form the basis of their learning. This was in direct contrast to previous views that children should dislike what they were learning in order to develop discipline while being educated (Tyler 1987). Arithmetic, alongside algebra and geometry was considered as needed for developing this discipline (Klein 2003). In contrast, Cuban (2007) illustrated how the No Child Left Behind policy of US president, George W. Bush, which resulted in significant changes to how mathematics, among other subjects, was valued in schools, was a result of agitation by businesses wanting "nimble college-educated workforce for early 21st century labor markets" (p. 7). The propagators of global discourses, who seek to change how mathematics education events can be described, may originate with groups such as politicians or economists who now dominate curricula discussion (see for example, Lange and Meaney 2017, this volume).

Atweh et al. (2003) stated that, in mathematics education, globalisation could be seen in "the convergence of school mathematics and mathematics education curricula around the world" (p. 188). Nevertheless, global discourses should not be considered homogenous or in alignment with each other (Atweh and Clarkson

2002b) and, thus, convergence of curriculum does not have to be the end result of the integration of different global discourses. As well, what may look like convergence could hide important differences when policies are implemented. For example, colonisation in the nineteenth century resulted in Western curriculum, with connections to mathematics, being used in geographical spaces, a long way from where the curricula originated (Kamens and Benavot 1991). The circumstances of the spaces where the imported curricula arrived affected its implementation. In a later example, Blakers (1978) discussed how overseas influences affected mathematics curriculum development in Australia in a haphazard way, in the 1950s–1970s, partly because of the particularly circumstances that surrounded school education there. Although curricula may look similar, other factors such as the number of hours students attend school will affect how the curricula is implemented (Kamens and Benavot 1991).

Education policies, including curricula, may combine, but not necessarily integrate, contradictory discourses leaving mismatches and contradictions to be worked through and implemented by practioners (Otterstad and Braathe 2016; Apple 1995). As Angus (2004) stated "educational change is concerned with the negotiation and contestation of educational meaning and educational politics" (p. 26). The differences in philosophies expressed by prominent global discourses may negate some perspectives, not just at the practioner level, but also at the societal level. I explore these disjunctions in the section on Bernstein's pedagogic device.

Using examples from mathematics curricula from around the world, I explore how two global discourses, an equity discourse and a neo-liberal discourse, are combined, using Bernstein's (2000) pedagogic device. The pedagogic device provides ways to investigate the negotiation and contestation of knowledge transformation at different levels. Before discussing how the pedagogic device works, I consider mathematics curriculum development.

2 Mathematics Curricula and Their Relationship to Discourses

Mathematics curricula can be considered barometers, which reflect societal views about the role of mathematics in education (see for example, Smith and Morgan 2016; Wake and Burkhardt 2013). When different aspects of mathematics become valued as a result of changes in discourse, curricula are adapted to match these new values (Romberg 1993). The need for education to meet labour force requirements has re-emerged as a global discourse across the world. In relationship to mathematics education, this global discourse is often reflected into policies, as a need for more students to take up science, technology, engineering and mathematics (STEM) careers. For example, Wake and Burkhardt (2013) investigated the European Union's (EU) initiatives to introduce inquiry-based learning (IBL) in mathematics and science curricula. These initiatives were directly linked to

ensuring that more students gained the necessary knowledge and skills for STEM careers. The EU's decision combined the global discourses about the need for more STEM graduates for the economic well-being of society, from outside the education field, and IBL as an appropriate method for teaching mathematics and science, from inside the education field. Although the EU's policies situate these global discourses as being in alignment, unless other aspects of the schooling system, such as assessment, also support the use of IBL, it is unlikely that IBL will retain its position of importance in school curricula of EU nation-states (Wake and Burkhardt 2013). In contrast, the global discourse about the need for more students to take up STEM careers is unlikely to be challenge because of implementation issues, as it forms an aim for curricula, that stands outside of attempts to achieve it.

Arguing for the need for a sociology of education, Bernstein (1971) stated "curriculum defines what counts as valid knowledge, pedagogy defines what counts as valid transmission of knowledge and evaluation defines what counts as valid realization of this knowledge on the part of the taught" (p. 47). As such, curricula are seen as the guiding documents for teachers to plan from, in that they contain "educational philosophy statements and general goals and, to varying degrees, the specific objectives, learning activities, teaching strategies, and assessment procedures" (Sirotnik 1988 p. 56). However, the transmission of knowledge through pedagogies, such as IBL, and assessment, such as rigorous testing regimes, affect, as well as being affected by, curricula (Cuban 2007). As well as noted by Cuban (2007), although curricula, pedagogy and assessment may change, historical (global) discourses remain in evidence, often resulting in hybrid policies and classroom practices.

Although the importance of curricula has been recognised as connected to "the distribution of power and principles of social control" (Bernstein 1971, p. 47), curriculum development is rarely the focus of mathematics education research, particular research with a sociopolitical focus (McMurchy-Pilkington et al. 2013). Curriculum development is acknowledged as a political activity, because of the ideologies held by the planners (Walker 1971), regardless of whether or not those involved in the planning are aware of them. In contrast, Walker's acknowledgement of the political aspect of curriculum development is incorporated into the first stage of his naturalistic model of curriculum:

> The system of beliefs and values that the curriculum developer brings to his task and that guide the development of the curriculum is what I call the curriculum's platform. The word "platform" is meant to suggest both a political platform and something to stand on. (Walker 1971, p. 52)

In the second stage, the *deliberation* stage, the developers interact and in so doing "defend their own platform statements and push "spur of the moment" ideas" (Print 1993, p. 76). The final stage is that of the design which links the product, the curriculum, to the decisions made in its production, whether they were implicit or explicit. An example of how the beliefs and values of the curriculum developers affect their decisions is that of how the teacher is situated in a curriculum. Autio (2014) stated:

> Bluntly put, is the teacher implicitly or consciously defined as a passive agent in the system (what s/he never is in reality!); an assumed conduit for external administrative, political and scientific ideas disciplines and mandates like in "implementation" policies; or an academically educated intellectual whose most significant work is trusted, supported or encouraged by surrounding culture and society? (p. 19)

Those who have the possibility to constitute what is valued in society use curriculum planning to determine the kinds of mathematics education social events that should be provided. Distributing different kinds of mathematics to different groups of children will affect the possibilities for developing thinking and, therefore, reinforce social control (Kollosche 2014) and the acceptance of global discourses.

The global discourse about the need for schooling to meet labour force requirements has a long history, which to some extent explains why it gained so much currency at the turn of the century. This global discourse reinforces the view that different types of children should receive different types of education, including mathematics education, to meet their anticipated differentiated, labour force requirements. For example, in England, in the nineteenth century "elementary schools were designed to produce a labour force" (Lawton 1984, p. 1) that would predominantly be used in factory work and for children to come "to be obedient and to have respect for the property of their betters" (Lawton 1984, p. 2), also necessary for factory work. Primary schools were funded by factory owners or other affluent people who controlled what was taught. In comparison, grammar and public schools provided an education in leadership which was done through "character training" and provided students with "the kind of knowledge which would be an obvious mark of their exclusive rank" (Lawton 1984, p. 1). Public schools were funded by wealthy parents, while grammar schools were funded by the government. The government employed their graduates as civil servants. The mathematics required for work in bureaucracy is also based on discipline and an acceptance of rules but includes a requirement to think logically (Kollosche 2014).

The mathematics available in each of these kinds of schools reflected the knowledge that society anticipated that these particular sets of students needed. As mass education was instigated across the world, arithmetic was at the vanguard of what young people were considered to need to learn at school (Kamens and Benavot 1991). Only some students received instruction in other topics of mathematics as there were far fewer jobs which required logical discipline, it was supposed to provide.

These distinctions continued into the twentieth century, but were accompanied by different sets of reasoning, through changes in discourses. Goodson (1989, p. 19) stated that the differentiated curricula in Britain suggested by the Norwood Report in 1949 were based on assessments of mental capabilities. Klein (2003) provided evidence of similar discussions in USA from the same period. A global discourse had developed around mental aptitude as delineating students' capacities to learn. This discourse replaced the discourse about the need to fulfil labour force requirements and became the new reason for providing groups of students with

different curricula, even though the end result was that these groups were still channelled into different work futures.

However, at least from the 1970s, this differentiating of students at school by their performance in mathematics was resisted and attempts made to change curricula, see for example the work done by Freudenthal on this (Gravemeijer and Terwel 2000). In recent years, this resistance along with other realisations of how mathematics education contributed to inequitable outcomes for different groups of students has led to sustained calls for equity and access in mathematics education.

2.1 The Incorporation of Global Discourse About Equity and Access into Curricula

Discussions about equity in mathematics education have a long history (Secada 1989). For example, Secada (1989) referred to US legal cases about school segregation in the 1950s as highlighting concerns about access to educational opportunities provided by achievement in mathematics education. These concerns focused on low achievement and high rates of early drop-outs from school. These concerns formed the basis for the first version of the global discourse about equity, which was evident also in other parts of the world (see Román et al. 2015). At this time, Secada (1989) considered equity issues to be "about whether or not a given state of affairs is just" (p. 642).

In the 1990s, the global discourse about equity gained strength, although it was still predominantly used by mathematics education researchers who researched social justice issues (Meaney 2000). At this time, the concerns about the marginalisation of some groups from possibilities to gain good results in mathematics led to calls for curricula reform. The global discourse about problems with differentiating learning opportunities based on student results was combined with another global discourse, the need for quality mathematics education in schools. For example, Schoenfeld (2002) considered high quality curriculum as one of four conditions for ensuring that all students received high quality mathematics instruction. The need for "all" students to succeed in mathematics became a refrain connected to this global discourse (Pais 2014).

In the last quarter of a century, the global discourses about equity, problems with differentiating learning opportunities and the need for high quality learning opportunities, has contributed to many countries including rhetoric about access and quality in their curricula. An example can be seen in the National Council of Teachers of Mathematics' (2000) *Standards*:

> Creating, supporting, and sustaining a culture of access and equity require being responsive to students' backgrounds, experiences, cultural perspectives, traditions, and knowledge when designing and implementing a mathematics program and assessing its effectiveness. Acknowledging and addressing factors that contribute to differential outcomes among groups of students are critical to ensuring that all students routinely have opportunities to experience high-quality mathematics instruction, learn challenging mathematics content,

> and receive the support necessary to be successful. Addressing equity and access includes both ensuring that all students attain mathematics proficiency and increasing the numbers of students from all racial, ethnic, linguistic, gender, and socioeconomic groups who attain the highest levels of mathematics achievement.
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> (http://www.nctm.org/Standards-and-Positions/Position-Statements/Access-and-Equity-in-Mathematics-Education/)

Although the NCTM standards are not endorsed by US state governments, they do provide inspiration for much mathematics teaching both in USA and elsewhere. As such, the standards (NCTM 2000) draw on global discourses but also reinforce these discourses and, thus, reinforce the necessity to use these global discourses to be part of the community of mathematics educators. This is evident in the number of articles that refer to this document when highlighting equity issues in mathematics education research, but also would include the informal discussions between mathematics teachers. For example, in critiquing calls for there to be more mathematics in mathematics education research, Martin et al. (2010) asked instead whether there should be more focus on equity in mathematics education research given that it was the first principle of the NCTM's standards.

In some curricula, the recognition of the need to provide more equitable access to mathematics learning experiences is implicit and situated in a general overview rather than in relationship to mathematics learning. This is the case in the Swedish curricula (Helenius 2015, personal communication). At other times, aspects of the equity discourse appear explicitly in curricula. For example, in the draft mathematics curriculum of Nepal, much of which was incorporated into the present curriculum (Bilbeck 2017, personal communication), there is a specific section on equity and inclusion in the key principles for reform:

> The principle of equity and inclusion puts emphasis on a) making powerful mathematical ideas accessible to all children; and b) promoting appropriate pedagogical approaches to involve children in all possible mathematical learning endeavours. The notion of inclusion refers to increasing the participation of all learners in mathematics, thus reducing the possibility of their exclusion from classroom activities. Present educational practices seem to have been guided by the equality principal where learners are taken as having the same type of learning ability or similar learning styles. All the blame for low achievement goes to the learner's lack of aptitude. Impact of social background, suppression from the teachers, parents and curriculum and oppression of privileged group of people in society is not taken into account. So a democratic mechanism that promotes self respect of learners and encouragement for learning is to be developed. (Shrestha et al. 2012, p. 33)

This call for equity is closely related to School Sector Development Plan (Government of Nepal 2016) which has equity as the first of its five dimensions, driving societal improvement through education.

It could be expected that with clearly stated goals for equity and increased access through curricula more equitable outcomes for different groups of students could be achieved. Certainly Schoenfeld (2002) suggested that there were signs that the gap between different groups of students' mathematics achievement was flattening out as a consequence of US states aligning their curricula with the NCTM standards. However, particularly in the last ten years it would seem that high quality

mathematics learning opportunities have not become more accessible. The Organisation of Economic Development (OECD) (2013) stated that the 2012 mathematical literacy of 15 year old students compared to 2003 had improved only slightly in regard to how much socio-economic status could predict achievement (down from 17 to 15%). Only in three countries, Turkey, Mexico and Germany, did mathematics achievement improve alongside a reduction in the prediction value of disadvantage. The OECD indicated that this showed that improvement in a country's mathematics achievement does not have to be at the cost of equity. However their comparison of results across 10 years does not indicate that this kind of improvement was particularly simple to achieve if only 3 countries were able to produce it. It may be that the inclusion of contradictory discourses results in relevant research evidence on improving access and quality of mathematical learning opportunities being ignored:

> Even as policy texts express concern about the risk of social exclusion, there is continued reliance on restricted forms of evidence, on performance measurement and management, and on superficial and contradictory acknowledgements of difference and diversity. As a consequence there is a failure to take full account of social science research-based evidence that is relevant to meeting the challenges posed by such risky, complex and unjust contexts. (Ozga and Jones 2006, p. 3)

Ozga and Jones (2006) indicate that even when calls for improvements in equity are made, through curricula, then these improvements may be counter-balanced by being judged through inappropriate measures, such as the OECD's testing regime, and by using descriptions of diversity, such as socio-economic status that are fraught with problems (see Valero and Meaney 2014). Pais (2014) went further in his critique by stating that "mathematics for all" can never be achieved because of the system's reliance on some students failing, in order to fulfil capitalist requirement that education systems provide the necessary credits to only some students, to gain high-paying jobs.

Consequently, calls for equity may be ineffectual, particularly when this global discourse is in conflict with other global discourses. This affects how the social events of mathematics education can be described—only in terms of success in tests—so that members of the mathematics education community are unable to have shared perspectives about how the aims for equity can be integrated in meaningful ways into those social events (Meaney 2000).

2.2 *Neo-liberal Discourses and Their Effect on Mathematics Education*

A global discourse that has a direct effect on the inclusion of equity into mathematics education social events, is that of neo-liberalism. Originating in economics, the neo-liberal global discourse affects education because "technologies of institutional control and accountability are identified as the key mechanisms which now

increasingly subordinate education to the economic imperatives of the latest phase of globalised, 'post-industrial' capitalism" (Beck 1999, p. 227). Lingard (2010) suggested that the neo-liberal discourse manifests itself in common sense discussions about competition between schools, coupled with parental pressure and the need for parents to choose schools for their children. Competition, as determined by test results, is considered as naturally leading to improved education (Llewellyn 2017). As such, neo-liberal discourses are detrimental to instigating access to high quality mathematics learning opportunities for all students, regardless of class or ethnicity. If all students had access to high quality learning opportunities, then there would be no need for competition to drive improvement.

For example, Sweden's results in international testing declined over a decade, with the proportion of students at the lowest levels of performance increasing (OECD 2015). Although the latest report suggests that mathematics results have begun to improve, the difference between students living in high socio-economic areas and those in low socio-economic areas continues to increase (OECD 2016). In Sweden, it would seem that for the equitable outcomes outlined in the curricula cannot be achieved when school choice is in operation (Östh et al. 2013). As Östh et al. (2013) found:

> With expanding school choice, the differences between schools have increased and, at the same time, Sweden's comparative performance has declined (OECD 2010). Thus, as has been the case with other neoliberal ideas, school choice—when tested— has not been able to deliver the results promised by theoretical speculation. (p. 422)

In Australia, the gap in achievement between those attending schools in high socio-economic areas and those attending schools in low-socioeconomic areas has also increased, particularly in Year 9 numeracy results (Bonnor and Shepherd 2014). Similar suggestions to those made in Sweden about the causes of the problem, parental school choice, have been raised (McConney and Perry 2010).

As well as parental school choice, high-stakes assessments are recognised as having a significant impact on what is taught within education systems (Lange and Meaney 2012). The deep learning of mathematics advocated in equity statements is often replaced by a focus on test content, particular for students in schools where test results have wider implications for teachers' jobs (Lange and Meaney 2012). For example, an evaluation of mathematics teaching in Nepal suggested that "no matter how the syllabus and its objectives are genuine and child-centred, it would be a tough challenge for teachers to change their teaching under the current examination system" (Nakawa 2013, p. 131).

Lingard (2010) described the likely impact of the introduction on high-stakes national testing in Australia as "what we will most likely see is test-focused schooling, with a consequent narrowing of curricula and pedagogies, with this having its most egregious effects in low SES schools" (p. 131). Children attending schools in low socio-economic areas were likely to have learning focused on passing the numeracy and literacy tests and a reduction in learning opportunities in other subject areas (Taylor et al. 2003).

Although Lingard (2010) suggested that educational accountability can be achieved in other ways that better recognise research evidence and specific community needs, it is unlikely that this is a realistic option. This is because, although it originated outside of education, the neo-liberal discourse connects more strongly with historical views of the role of mathematics education in schools. It has therefore been able to adapt existing discourses about the necessity to distribute different kinds of knowledge to different groups of students. In the next section, I use Bernstein's (2000) pedagogic device to suggest how the operation of neo-liberal discourse at the different levels of the pedagogic device overtakes and disrupts equity discourses. This results, not in a hybrid of the two discourses (Cuban 2007), but a parasitic invasion of one discourse by the other.

3 The Pedagogic Device

Bernstein (2000) used the notion of the pedagogic device to explain the "social grammar" that reproduces and transforms knowledge within education systems, often invisibly to the detriment of those from low socio-economic backgrounds. The pedagogic device has been used by Kanes et al. (2014) to describe how those who instigate OECD's testing regime have come to regulate how students relate to mathematics. Bernstein stated "those who own the device own the means of perpetuating their power through discursive means and establishing, or attempting to establish, their own ideological representations" (p. 114). Knowledge is transformed through a hierarchical set of rules:

> *Distributive rules*: These rules distributed forms of knowledge to different social groups. In this way, distributed rules distributed different forms of consciousness to different groups. Distributive rules distributed access to the 'unthinkable', that is, the possibility of new knowledge, and access to the 'thinkable', that is, to official knowledge.
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> *Recontextualising rules*: These rules constructed the 'thinkable', official knowledge. They constructed pedagogic discourse: The 'what' and the 'how' of that discourse.
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> *Evaluative rules*: These rules constructed pedagogic practice by providing the criteria to be transmitted and acquired. (Bernstein 2000, p. 114)

At each point of transformation, there is contestation of what knowledge becomes acceptable. As different groups come to value different knowledge, through the adoption and adaption of global discourses, then what is contested will change as will the knowledge, which comes to be considered acceptable.

By focusing on the knowledge which is distributed, recontextualised and evaluated into mathematics curricular, I illustrate how it is regulated by global discourses, including those about equity and neo-liberalism. These discourses both determine what is valuable and then enshrine this valuation by reinforcing through curricula the need for all members of the mathematics education community to discuss mathematics education in this way. This approach is in alignment with Loughland and Sriprakash (2016) who used "Bernstein's ideas of

recontextualisation to show how discourses of competition, standardisation and commensurability become 'inside' discourses of current Australian education policy ambitions relating to social and educational equity" (p. 234). Their analysis focused on the adaptation of neo-liberalism as a discourse about economic markets to one about education, so that existing structural inequalities in the Australian education system were ignored and the equity discourse became shaped into one about the need for assessment and parental choice, based on reports about school performance. Although such adaptations are also present in the specific case of mathematics education, the historical precedence of mathematics curricula being differentiated for specific groups of students and of testing to be used to determine this differentiation provide additional information about how Bernstein's pedagogic device operates. The analysis of the mechanism of how knowledge is valued and transformed at different levels of the pedagogic device illustrates how the ascendancy of the neo-liberal discourses and the disregarding of the discourse about more accessible, high-quality mathematics learning opportunities has been achieved.

3.1 Distribution Rules

The distribution rules of the pedagogic device allow for alternative scenarios to become possible, for example within curricula, because of the discursive gap resulting from differences between perceptions of what is considered valuable (Au 2008). This gap provided an opportunity for the insertion of the equity discourse into mathematics curricula, through the recognition of such things as deep learning being important for all students. Nevertheless, those who control the distribution rules are the ones who decide what should be included. As Au (2008) stated, "the distributive rules also seek to regulate not only what is thought of as possible or impossible, but also who has the right or power to set the limits of possibility" (p. 642).

Although Bernstein (2000) conceded that new knowledge could be determined outside of traditional fields, it is generally up to the proponents of the field to recognise and incorporate knowledge as valuable into the field. For example, both Jahnke (2012) and McMurchy-Pilkington et al. (2013) describe curriculum development processes which included consultations with teachers and teacher educators, but where the final version of curricula had to be sanctioned by the Ministry of Educations in their respective countries, Sweden and New Zealand. In Romania, Singer (2008) described the case of curriculum developers ignoring information from international tests showing Romania's general poor performance, while maintaining their belief in their students being high achievers due to their performance in mathematics Olympiads. This contributed to the failure of curriculum reform, initiated by the World Bank. Thus, those in charge of curriculum development control the distribution of knowledge into curricula and their adoption of specific discourses support their decision making about what is the valuable knowledge to be included.

As noted earlier, often historical understandings about what is valuable knowledge is merely adapted to suit the emphases of new global discourses. In documenting the dissatisfaction with the "New Math" movement of the late 1950s–1960s, Fey (1978) claimed that there was a call for more practical mathematics, which had been the basis of many mathematics courses taught previously. The mathematics courses, which replaced the "New Math", were not the same as had been provided earlier. Nevertheless, the established ways of describing mathematics education allowed for an acceptable replacement to be instigated. Fey also stated "much of the challenge to make school programs more practical and accountable for their effectiveness seems to reflect anxiety about personal economic pressures much more than philosophical disagreement about educational policy" (p. 352). Thus, historically accepted ways of discussing mathematics education are adapted to suit local and particular circumstances.

The discourse around equity and access has not had an established role in the field of mathematics curriculum development, whereas discussions about assessment that can be linked to neo-liberal discourse have always been part of this field. For example, Howson (1978) documented the case on a school inspector in 1859 who asked 1344 children two questions, one of which was on arithmetic. On the basis of the answers, this inspector categorised 53 schools as good, fair or inferior. I contend that this historical backdrop to mathematics curriculum development has contributed to the discussion of equity being transformed into one about raising standards and the need for skills for work, which are in alignment with neo-liberal discourses about the priority of economic interests (Lingard 2010). By focusing on economic needs, the inherent inequities within the schooling system are disregarded and the need for improving educational outcomes becomes the responsibility of individual learners.

3.2 Recontextualising Rules

The recontextualising rules take the knowledge identified as valuable by the distribution rules and places it within a pedagogic discourse (Au 2008). The resulting pedagogic discourse provides information not just on the content that should be taught but also on how it should be taught. As Au (2008) stated "the recontextualization of knowledge into pedagogic discourse is ultimately connected to external socio-economic relations that grant teachers, schools, districts, and governing bodies the power to make decisions regarding the content and form of knowledge" (p. 642). In making these decisions, these organisations will draw on global discourses to situate themselves as appropriate members of the groups who can make such decisions.

Morgan and Xu (2011) outlined a number of influences on how the recontextualising rules operate in China and UK in relationship to the pedagogic discourse around mathematics education. Bernstein (2000) identified two components of the recontextualising field, the official recontextualising field controlled by the state,

and the pedagogical recontextualising field, influenced by textbook writers and teacher educators, outside of the direct control of the state. Morgan and Xu (2011) described these sub-fields as being more integrated in China as the state controlled textbook writing and teacher education, in more overt ways than in the UK.

In contrast to the situation described by Morgan and Xu (2011), I contend that the instigation of surveillance mechanisms to make teacher education and schools accountable, reduce the independence of the pedagogical recontextualising field, available to teachers and teacher educators. In the first half of the twentieth century, teacher educators in teacher education colleges took over much of the responsibility for determining mathematics curricula (see as a description of the US situation Klein 2003). This control has been reduced over time and rather than being seen as leaders in the field, they are also situated as needing to be regulated. Alongside schools in many countries being regularly inspected (see for example, Jahnke 2012), teacher education institutions are also regulated through the need for them to gain accreditation. In Europe, there has been a recent increase in accreditation to meet European Union requirements for mutual recognition of tertiary qualifications (Tatto et al. 2012). Although accreditation is set up to ensure the quality of new teachers, it is also likely to reduce the possibilities for instilling equity aspects into mathematics teacher education. This is because mathematics teacher education often focuses on the mathematical knowledge (see for example, Meaney and Lange 2012). Tests of preservice teachers' mathematical pedagogical content knowledge rarely include explicit questions connected to dealing with equity issues in mathematics classrooms. For example, no such questions appear in Tatto et al. (2012).

It is likely that the newness of the equity global discourse in discussions about mathematics education means that it is under-recognised by those making decisions about how to recontextualise curricula as pedagogic discourse. In USA, Sleeter (2008) described how universities had only a limited period in the 1990s to incorporate equity issues across teacher education programmes before neo-liberal discourses began to take precedence. Consequently, it can be said that the recontexualising of the neo-liberal discourses emphasised amongst other things, content knowledge above professional knowledge. So, although curricula may indicate the need to consider issues of access and quality, teacher education programmes have limited opportunities to provide preservice teachers with understandings of how to do this.

3.3 Evaluative Rules

The evaluative rules determine what knowledge is reproduced by teachers to students in classrooms (Bernstein 2000). Classroom practices are enacted by teachers based on curricula recommendations. Even when curricula include a focus on equity, the enactment of it in classroom practices can be whittled down to an almost unrecognisable version. Loughland and Sriprakash (2016) showed how the evaluative rules complete the narrowing of understandings about equity to be "something

that is achieved through market notions of competition and commensurability" (p. 240). Teachers may speak the discourse of equity, but enact it in alignment with notions from the neo-liberal global discourse. As a consequence, social events of mathematics education cannot lead to an overcoming of injustice.

As noted earlier, national tests can determine how mathematics learning should be realised and in so doing set out for teachers, students and the rest of the community what constitutes mathematics. In an analysis of PISA test items, Kanes et al. (2014) showed that although students seemed to be provided with an opportunity to show deep learning on the mathematics to do with climate change, a topic with real-world implications, this was illusionary. Instead contradictory information was provided about how the student should situate themselves in regard to answering the question. Kanes et al. (2014) suggested that this was likely to result in students, who had the skills for manoeuvring through the contradictions, becoming self-governing, rather than critical thinkers.

Lange and Meaney's (2014) research on public discourse about national tests in Australia showed a general acceptance that what was in the numeracy tests was the important mathematics that students needed to know. These views by the general public, politicians and others, are likely to have been built on historical understandings that while all children should learn arithmetic, only some can learn mathematics (Howson 1974). Similarly, Morgan and Xu (2011) identified such views in interviews with Chinese teachers. Wake and Burkhardt (2013) concluded in regard to teachers' resistance to changing practices to meet curricula expectations, "it is often the well- and long-established expectations of the community that provide obstacles to policy intentions being realized" (p. 853). Curricula that include requirements to consider access and quality issues in mathematics teaching are unlikely to be implemented in a broad and meaningful way, when mathematics is what is needed for labour force requirements, but differentiated so that students' work careers are determined by what they cannot achieve in mathematics tests.

4 Implications

In this paper, I argue that although equity issues as a global discourse have become included within mathematics curricula across the world, the neo-liberal discourse has controlled how this equity discourse came to be realised in classroom practices. This is in alignment with Angus (2004), who in a micro-political, ethnographic study, showed how actors within educational systems come to be complicit in accepting neo-liberal norms.

In regard to mathematics education, neo-liberal discourse has the ability to tap into historical discourses amongst other things, mathematics and assessment and mathematics and students' ability. This is reinforced by government surveillance, both of schools and teacher education institutions, which emphasise content learning over professional knowledge. Through the neo-liberal global discourse, students are situated, by educators, parents and the wider society, as responsible for

their own learning. Consequently equity discourses about access and quality, so that educational outcomes are more just, are reduced to mere considerations about the mathematics students need to pass in order to fulfil particular work requirements or to access further study. Accountability through regular assessment becomes the only way of judging whether students have gained access to quality mathematics education. Their results, rather than being seen as judgements on how the system is providing equitable opportunities, become about students being self-regulated learners. When students do not achieve, they become the owners of their own failure.

As can be seen in many of the contributions to this volume, mathematics education researchers who are interested in how inequality, power, access and identify are integrated into mathematics education tend to focus either at the classroom level or at the societal level. Yet it is essential to see these two levels are seen as knitted together, where each level both draws on and reinforces the other. Curricula investigations provide the necessary opportunities for exploring how discourses integrated into societal understandings about mathematics education become classroom episodes that limit students' possibilities to receive high-quality learning opportunities. In this chapter, I have begun a discussion of how curricula investigation can illustrate how the well-intentioned calls for the inclusion of equity understandings be included into curricula become subsumed into neo-liberal discourses. However, much more research is needed if the complex interplay between classroom interactions and global discourses are to be understood.

Although Bernstein (1990) indicated that the pedagogic device maintains class distinctions through education, he also identified that as knowledge is selected through the operation of the different rules of the device, a gap between abstract meanings and immediate contexts can appear. As Au (2008) discussed, this gap contradicts the regulation of thought, which restricts what knowledge is considered valuable, by enabling people to become aware of the 'unthinkable'. As global discourses of neo-liberalism and social equity are distributed, recontextualised and evaluated through curricula into local mathematics education social events, previous unthinkable possibilities can be made available. The challenge is to use these possibilities so that the equity discourse is given more than cursory attention when mathematics curricula are implemented and not reduced merely to discussion of performance indicators. However, opportunities to make use of these possibilities will close if not acted upon. It may be that the possibility offered by the equity global discourse can act as a mirror through which a willingness to conform to changes in alignment with the neo-liberal discourse can be challenged.

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