

Gendered Positions and Participation in Whole Class Discussions in the Mathematics Classroom



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Abstract This chapter examines how gendered and classed positions are co-constructed and accessed through participation in whole class discussions in the primary mathematics classroom. Using Holland and Bourdieu, we highlight how forms of participation mark out gendered and classed positions in education and how this is mediated through the exchange of capital which takes place locally in whole class discussions. We present evidence regarding the experiences of two girls, Sian and Erica, who appear to take up/enact the contrasting positions of ‘domestique’ and ‘in need of help’, which we argue, are mediated by their perceived ability and gender. Our aim is to highlight the concept of ‘position’ as a means to understand how local participation (classroom level) is structurally mediated by the educational field – thus giving more or less access to the symbolic capital that success in mathematics affords.

Keywords Position · Gender · Ability · Classroom discourse

1 Complex Relations: Gender and Mathematics Education

The relationship between gender and mathematics has been the focus of extensive research for at least the last 50 years, historically documenting how women were underperforming in the subject in comparison with men (e.g., Maccoby and Jacklin 1974; Hyde et al. 1990; Willingham and Cole 1997). From the 1990s onwards, and in light of wider concern regarding the underachievement of boys in all subjects, we see a shift in focus, with numerous studies reporting small or nonexistent gender

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differences in mathematics attainment (Hyde and Linn 2006) and in some countries at least, the evidence suggests that girls are outperforming boys (e.g., DfE 2015). This indicates that the role gender plays in mediating students learning outcomes and access to mathematics is complex and even paradoxical. For example, in England, whilst girls make greater progress and achieve higher in mathematics at GCSE (DfE 2015), they are less likely to enrol in mathematics or STEM subjects in post compulsory education (WISE 2015). Furthermore, such low participation becomes compounded when we factor in other cultural categories such as social class, ethnicity (Noyes 2009).

One way to explain this complexity has been to focus on students' affective relationships with mathematics. A body of research has highlighted how girls in particular have lower self efficacy beliefs in relation to mathematics than boys (Bourdieu and Johnson 1993, OECD 2015), lower dispositions to study further mathematics (Buschor et al. 2014; Nagy et al. 2006), lack confidence (Ross and Bruce 2012), show higher levels of anxiety and lower levels of enjoyment when doing mathematics (Frenzel et al. 2007) and display self-attribution of failure, but not success (Stipek and Gralinski 1991). This is despite the fact that girls are more likely to attain higher grades. However, one criticism often made of such research is its tendency to utilise constructs which are viewed as internal to the individual (e.g. self-efficacy, anxiety) and therefore, separate from the environment in which they are produced. By contrast, and in response to the social turn in mathematics (Lerman 2000), constructs like 'identity' and 'positioning' have been used to establish students beliefs about mathematics as situated and produced through engagement in social, cultural and institutional practices which mediate the ideas we construct about ourselves (Solomon 2008; Black et al. 2008). This is built on the rationale that who we become (in relation to mathematics or otherwise) is intricately connected to what we do in the moment (our being), and that what we do is socially negotiated and defined.

Thus, this approach to studying students' affective relationships with school mathematics looks at how an 'identity in practice' (Holland et al. 1998) is co-constructed through participation in particular forms of pedagogic and institutional practices - practices which are mediated by gender, class and ethnicity. For example, Boaler and Greeno (2000) highlighted how two different advanced placement algebra classrooms – one which involved a transmissionist pedagogy and one in which collaborative discussion was used more frequently – enabled students to co-construct different identities as passive receivers of knowledge and as active learners respectively. More recently, Eisenhart and Allen (2016) have indicated how neo-liberal institutional practices promote 'hollowed out' mathematical identities, focused on performance rather than the use value of mathematics. Their study investigated two 'failing' schools in the US, both of which had implemented initiatives to dramatically increase performance in mathematics tests and college enrolment in STEM subjects for students from 'poor' backgrounds. Their evidence indicates how a strong focus on test performance both in and across classrooms encourages students to focus on 'getting good grades' with little recognition of the value mathe-

matics might have outside of this context. Furthermore, even inside the same classroom we know that students have varied opportunities to identify with different positions of confidence/competence which, can then be connected to different forms of mathematical identity (e.g., Radovic et al. 2017; Renold and Allan 2006). Such positions are built through ‘moment-by-moment’ interaction, both with the teacher (Black 2004a, b; Heyd-Metzuyanim 2013) and with other students/peers in the classroom (Bishop 2012; Turner et al. 2013). Studies that have explored how these interactions unfold in time have documented repetitive patterns that can restrict students possible forms of participation, thus reiterating their positions and over time, developing varied forms of mathematical identity (Black 2004a, Empson 2003, Turner et al. 2013).

In this chapter, we investigate how students co-construct (with their teacher and other students) particular positions in a given mathematics classroom through their participation in one particular practice - whole class discussions. In doing so, we conceptualise such positions as indicating ‘potential’ in terms of future mathematical identities which may eventually manifest in later phases of schooling (see our theoretical framework below). Our focus on students’ participation in the exchanges which comprise whole class discussions stems from our argument that this practice is an important site for the production of positions which engender more or less privilege in accessing school mathematics. We know that participation in classroom discourse is not a socially neutral act, with gender (Howe 1997; Beaman et al. 2006), social class (Zevenbergen 2000) and ethnicity (Biggs and Edwards 1994) seen as influential on who gets to say what and when. Therefore, we argue that investigating students’ participation in whole class discussions offers a lens to explore how gender is relevant to their experience of learning mathematics.

Historically, the literature on gender and participation in classroom discourse has presented girls as participating on the periphery of classroom discourse, with teachers initiating more interactions with boys than girls (Jones and Dindia 2004) and giving less attention to girls (Younger et al. 1999; Swinson and Harrop 2009). These studies conceptualise participation mainly as a way of accessing resources in the mathematics classroom and focus on differences between the way groups of students (male versus female) participate with the teacher who is presented as the dominant force, responsible for regulating access to mathematical knowledge. By contrast, we argue that participation in classroom discourse (as a social practice) is a way of enacting a mode of being in the classroom - a position which then affords status (e.g. as ‘high ability’ or ‘low ability’) which mediates our access to resources. This views gender not as a fixed attribute attached to individuals who can be grouped in particular ways (male vs female) but as performed through such enacted positions. Only by recognising this can we establish how gender comes to be manifest ‘in practice’, how it translates into social status in a given practice and consequently, how gender mediates one’s access to certain resources.

We present case study data of the whole class discussions which took place in one primary Year 5 mathematics classroom (aged 9 to 10 years) located in England. Our analysis of this discourse illustrates:

- (i) patterns of participation which constitute the dynamics of whole class discussions in this classroom and the socio-normative rules regarding who can say what and when.
- (ii) the different positions offered to and taken up by two girls, Sian and Erica, through their participation in whole class discussions.
- (iii) how such positions are mediated by and provide access to artefacts and capital which enables the production of gendered (and classed) divisions in wider society.

Our aim, therefore, is to offer synthesis between a theoretical perspective on positions and positioning (outlined below) and a methodological framing of individual students' participation as situated in the dynamics and normative patterns of a particular classroom's whole class discussions.

2 Theoretical Framework

2.1 *Identifying Patterns of Participation in Whole Class Discussions*

We begin with Vygotsky's theory (see Vygotsky and Rieber 1988) which outlines the importance of the communicative speech act as a unit of analysis which presents the student as situated in activity with others (teachers, students etc). Vygotsky argued that it is through the communicative speech act that the student comes to make 'sense' of the cultural forms and meanings which the adult already has access to. Thus, a Vygotskian perspective sees the learning process as not one of acquisition whereby the child merely absorbs pre-determined cultural meanings transmitted by the adult, but it is a process of semiotic mediation whereby the child, through dialogue with others, gives personal sense to such meanings, making them their own (Wells 1999; Edwards and Mercer 1987; Barnes 1976). Eventually, the child begins to internalise the cultural forms and meanings, initially sensed in dialogue with others, so that they become part of their inner speech (Vygotsky and Rieber 1997).

From this perspective, the doing of classroom discourse in the mathematics classroom is a particular form of activity which can involve the student giving personal sense to concepts (mathematical), tools (e.g. operations, symbols) and artefacts (e.g. calculators but also pedagogic artefacts such as the Initiation-Response-Feedback exchange where the teacher asks a question, expects an answer and then provides feedback or an evaluation) and sometimes, this 'sense' is recognised as doing school mathematics by others (e.g. teachers). Gradually, over time, such activities can enable learners (and teachers) to adopt the goals, belief systems, ground rules and cultural norms of formal mathematics and schooling (Wenger 1998). Therefore, classroom discourse is viewed as a mediating tool which allows teachers and pupils to give sense to the various signs (e.g. words, phrases,

objects) and symbols which represent the concepts and methods associated with school mathematics (Mercer 1995, 2000).

However, as Mercer and Dawes (2014) note, four decades of research on classroom discourse has highlighted how power relations enacted between teachers and students affects students' ownership of the meanings negotiated in classroom discourse. The classic Initiation-Response-Feedback (IRF) exchange between teacher and student initially identified by Sinclair and Coulthard (1975) and Mehan (1979) is a case in point. This has received much attention (see for example the series of TIMSS video studies, Stigler et al. 1999) with some stating it is an important strategy which enables students to follow a series of steps in a mathematical argument established by the teacher as the arbiter of the curriculum (see Bauersfeld 1980 on funnelling) i.e. by answering questions to which the teacher already knows the answer to, students have the opportunity to test whether their understanding aligns with that of the teachers - and receive feedback on this. By contrast, it is also well recognised that too much use of the IRF exchange can (see for instance, Edwards and Mercer 1987) result in a kind of guessing game where the student tries to guess what's in the mind of the teacher through monosyllabic utterances. One consequence of this is that it limits the teachers' opportunity to engage in more extended dialogue where the student can give sense to the ideas and concepts raised in the teachers' question move (e.g. open questioning has been widely recognised to offer potential in this respect - see for instance, the findings of the National Oracy Project in Norman 1992).

However, as noted previously, participation in classroom discourse in the classroom is not merely about accessing knowledge, but it is also an act of being. It is a site for the transformation of students into what we may culturally recognise as a 'successful' learner of mathematics (Boaler and Greeno 2000; Lerman 2000). Likewise, it may also involve experiencing and/or enacting marginalisation and resistance towards expected forms of participation and we know that the label of the 'successful mathematics learner' is not always accessible or even available to all students (Black 2004a, b, 2007; Radovic et al. 2017).

2.2 *Positions*

In this chapter, we want to consider how students access to positions in classroom discourse are gendered, on the basis that the repeated enactment of such positions may eventually become internalised as mathematical identities later in the school career (see below). Drawing on Bourdieu, Holland et al. (1998) argue that engagement in practice involves enacting a particular position in a given field or figured world (e.g. the able learner in a particular mathematical classroom) which affords one more or less power. Such positions are established through day to day encounters which involve the building of capital which index status through symbolic means (e.g. appearing bright through articulate responses to the teacher's questions). Crucially, the nature, accessibility and salience of these positions are

mediated by both the actions of others, particularly those who have power or dominance in the field (such as the teacher) and the acts of the individual themselves. In this sense, participation in classroom discourse involves students positioning themselves and being positioned by others as entitled or constrained to enact this participation. This is illustrated by Bishop (2012) whose study of two girls engaged in collaborative work during mathematics lessons, highlighted how each girl enacted different positions that were relational to one another: while one girl enacted a position of ‘smart’, the other took on a position of a ‘dumb’, positions that were reproduced in talk and interaction over time.

In Bourdieu’s theory, positions are central to a given field and they delineate its structure in terms of relations of power or dominance (Bourdieu and Johnson 1993) (e.g. clever versus less able student). But this is also a dynamic process, involving the struggle to appropriate forms of capital (i.e. symbolic artefacts which are valued by a given field) which afford a given position. Therefore, participation also involves enacting the exchange of capital (Bourdieu 1986), use of artefacts (Holland et al. 1998) or cultural models (Holland and Skinner 1987), which produces and/or maintains one’s position in the field (the educational field). For instance, in the mathematics classroom capital may reside in the construct of ‘ability’ (Choudry et al. 2017), ‘being naturally gifted’ and/or ‘getting it quickly’ (Mendick 2005a). Or to put it in another way, students may identify with the cultural model of what is means to be ‘naturally able’ and use this label as capital to negotiate power in the classroom. But crucially for Bourdieu, the act of capital exchange is not merely produced locally but is also produced by and for the field of power which (re)produces broader class positions (Bourdieu 1977). Thus, appearing as ‘gifted at mathematics’ (as a form of capital) is associated with particular types of individuals who have more legitimate claim to them over others, such as middle class white men (Mendick 2005b) or British Chinese male students (Archer and Francis 2005). Note here that class position is about relations of dominance and dominated rather than a fixed background measure or categorisation such as socio-economic status or deprivation index. Furthermore, in *Masculine Domination*, Bourdieu identifies gender as part of the broader class positionings enacted by the social order, and notes that the education system is particularly effective in the reproduction of the principles of division and oppositions which naturalise and reproduce such positions (Bourdieu 2001).

Therefore, to summarise, the concept of ‘position’ we use here can be defined as: (i) co-constructed as students (and teachers) engage in the local practice of doing whole class discussions over time and as such, can be identified by who typically gets to do what and (ii) is indexical of broader class positions which delineate relations of dominance and dominated in the social structure, which are manifest in the practice of whole class discussions through students access to and exchange of capital. Thus, we see ‘position’ as a powerful and dynamic concept in that it captures the mediation of the social structure through local practice and in doing so, explains how such practices may contribute to patterns of engagement/disengagement with mathematics seen later in the school career. Through repeated acts of positioning over time, we learn to recognise such positions as referencing access to resources and reflecting social status in a given figured world (e.g. being clever) (Holland

et al. 1998). Thus, positions enacted and taken up through practice may eventually be reflected on and internalised as positional identities, which inform our sense of who we are in relation to the practices we engage in. Whilst positional identities are clearly beyond the scope of this chapter, we argue that an analysis of how differential positions are enacted within whole class discussions may offer some insight into how gendered mathematical identities (observed elsewhere in the literature) are formed.

3 The Study

This paper draws on data from a previous research project one of us was involved in, which set out to explore the nature of students' participation in whole class discussions in mathematics lessons through a case study of one primary classroom (Year 5, aged 9–10 years) (Black 2004a, b, 2007, 2011; Solomon 2008). Classroom observations of whole class discussions during mathematics lessons were conducted and were also recorded using a video camera and radio microphones over a period of five months. Interviews were also conducted with the teacher and some pupils during which they were shown videos of recorded lessons and asked to comment on what was happening. This not only used their insider knowledge regarding interpretations of classroom talk, but also gave them a voice in the analysis process.

24 lessons were recorded and transcribed and were initially analysed using a form of discourse analysis informed by neo-Vygotskian theory (Mercer 1995, Edwards and Mercer 1987) and Wenger's (1998) theory on participation in Communities of Practice (see Black 2004a, b). However, given the purpose of this chapter, we were not satisfied with this framework mainly because Wenger's theory is a meso-level toolkit and does not adequately capture the institutional context in which classroom discourse is situated, and how this may be mediated by broader structural categories such as gender. Therefore, whilst we have kept the original discourse analysis (steps i and ii below) which identifies the quality of teacher-student exchange experienced by students, we have re-visited the data in order to apply our framework on positions described above. This builds on the analysis of Solomon (2008) who also analysed our data with a focus on gender. The analysis took place as follows:

- (i) Separation of all episodes of whole class discussions into individual extracts of teacher-student dialogue. This largely involved the identification of IRF exchanges between the teacher and one or more students, but occasionally involved more extended episodes of dialogue with one student or multiple students. Essentially what marked any given teacher-student exchange from another was the content i.e. when the conversation moved to the next task, problem, or textbook question. We recognise that carving the exchanges up in this way detaches each exchange from the overall discussion, but it was necessary in order to investigate the participation patterns of individual students.

However, during the analysis we were mindful to consider the overarching whole discussion in our interpretation of each exchange.

- (ii) In our original analysis (see Black 2004a, 2007), we used the labels ‘productive’ and ‘nonproductive’ talk to identify whether each exchange provided access to the co-construction of knowledge and meanings in the classroom. In this chapter, we have re-labelled these exchanges using Scott’s (2008) terms of dialogic and authoritative talk, since we feel better describes how each exchange constructs the teacher and student’s position in relation to the knowledge under discussion. Scott (2008) defines dialogic talk as exchanges where the teacher asks students for their point of view and he aligns this with Barnes’ (2008) notion of exploratory talk where students get to ‘try out ideas’. This form of exchange, we suggest, provides students with the opportunity to assert their stake in or take ownership of ‘school mathematics’. By contrast, authoritative exchanges are where the teacher focuses on their own view point only, which is presented as factual and thereby, non-negotiable (Scott 2008). In our analysis, we have used authoritative talk to refer particularly to heavily controlled IRF sequences (e.g. funnelling Bauersfeld 1980), which we suggest, signals a student’s more limited claim to authority over school mathematics when compared to dialogic talk.
- (iii) The next step involved calculating the number of each type of exchange experienced by each student over time revealing patterns or norms of participation in class 5 W. In this step, we also re-read the data to see how the student’s utterance appeared (to us) to say something about their position and their access to appropriate forms of capital in the classroom.
- (iv) Finally, we also coded the exchanges for explicit reference to particular forms of capital associated with the education field (e.g. student ability, cultural capital, gender expectations – Bourdieu and Passeron 1990) which appeared to inform the teacher or students’ behaviour (see Black 2007; Solomon 2008). Such codes were developed from thematic analysis of the teacher and students’ interviews and were then applied to the teacher-student exchanges. For instance, the teacher’s interview data included statements regarding parental interest in education (cultural capital) and we then looked for explicit recognition of home/parental input in the whole class discussions (e.g. ‘Simon has practiced this at home’). We viewed these explicit references as exchanging and reproducing the legitimacy of certain forms of capital, which further strengthen position in the education field (cultural context).

4 The Classroom Context

Class 5 W was located in a school situated in a large town in the North West of England and was one of two in the area which had a diverse intake according to class and ethnicity due to its locality and reputation for gaining grammar school entry. The class consisted of 12 girls and 17 boys. Their highly experienced

teacher – Mrs. Williams – was from the local area and had been teaching for 30 years. Mrs. Williams' pedagogic approach was typically transmissionist and highly controlled, with much of her communication corresponding to the aforementioned IRF exchange (Sinclair and Coulthard 1975). Most lessons centred around pre-set tasks following a textbook with the occasional practical activity used when relevant to the topic. This meant that lesson content was very much controlled by both the teacher and the textbook. Whole class discussions typically took place at the beginning of each lesson, and in organising and controlling these discussions the teacher had several purposes “to give them confidence... to go over the language... to introduce the idea to them” [teacher interview]. Occasionally, lessons also contained a plenary type discussion focused on what had been learnt, but this was relatively rare. On some occasions, the teacher addressed the class a whole in the middle of the lesson if a particular error or misunderstanding became apparent in her one to one interactions with students.

5 Findings

In Black (2004b), we highlighted a group of 8 boys (Group A) who experienced more dialogic exchanges in the classroom than the other students and we argued that this gave them the opportunity to state their point of view in relation to the mathematical knowledge under discussion. We also noted that these boys were seen as high ability by the teacher and other students, and in Black (2007) we showed how pupil ability was a key factor in shaping the teacher's behaviour in this classroom. We also identified a group of 4 boys and 1 girl (Erica, see below) (Group B) who experienced more authoritative than dialogic exchanges, a group of 8 girls and a boy who showed low participation during the entire period of observation (less than 10 exchanges, Group C) and a group of 3 girls and 3 boys (including Sian, see below) who experienced a similar numbers of both dialogic and authoritative exchanges (Group D). All of the students in these three groups appeared to take on positions with less agency when compared with the boys of Group A. These students participated in exchanges that provided limited responses to the teacher's question in an IRF exchange (Group B), conformed to the stereotypical image of the quiet girl (Group C) and showed mixed patterns of participation (Group D). We do not wish to repeat this analysis here, and refer the reader to the above papers and also Solomon (2008) if they require more detail regarding the quality of exchanges each student experienced in the class. But we do wish to point out that the patterns of exchange we observed in the whole class discussions of this classroom indicated a hierarchical ordering of students, with Group A boys being occupying a higher status when compared with other students, which gave them certain communicative rights (some of which we exemplify below).

To explore more in detail how gender was relevant to students' experience of learning mathematics we now turn to the analysis of two girls, Sian and Erica, who did not conform to the normative gendered position of the silent observer (referred

to above) but rather took on other gendered positions. An analysis of these two students' experiences in class 5W was briefly discussed in Solomon (2008), here we extend this analysis to consider the function of gendered positions from a Bourdeusian perspective.

5.1 Sian

Sian was identified by the teacher as high ability. This is evident in the following quote from a lesson on 'Money' where the teacher directly identifies Sian as 'the best of us'.

Extract 1 Sian is viewed as high ability T: can you just remind yourselves when you come to multiplication that you don't do what Sian's been doing. **So it just shows even the best of us can make mistakes.** She's started with the tens and she's said two sixes are twelve and the six nines are fifty four and adding it and starting with the tens when you don't do you? You always start with the units. Six nines are fifty four pennies and the five will go into the ten pences. So make sure you aren't making that mistake.

However, despite being seen as high ability, the quality of input Sian regularly made to teacher-student exchanges was fairly limited. Unlike the girls in Group C (the girl group involved in very few exchanges), Sian did participate regularly, but her input was largely restricted to providing correct responses to the teacher's questions in an IRF type exchange. The following extract provides an example of one such exchange which allows us to illustrate Sian's position in the classroom in comparison to the typical position adopted and afforded by Group A boys (in this case Tim).

Extract 2 Sian's role in whole class discussions This extract is taken from a lesson on Shape in which pupils were working on a textbook task which involved matching a series of labels (shape names) to differently shaped gift boxes. The question under discussion here involved labelling a square prism. The second part of this task involved identifying what 3D shape could be made from its 2D 'net' which was laid out in the textbook.

1	T	Which one do you think they're meaning? Why are they calling it a
2		squared prism do you think, not a rectangular prism? (Phillip, Tim,
3		Sean and Erica put hands up)
4	Tim	The mint creams.
5	T	Pardon?
6	Tim	The mint creams because they've got a erm square on the ...
7	T	On the base and the top of it? I think they're referring to the
8		Smartie box now...Cos it's got a square base and a square top...Cos

9		it's got a square base and a square top whereas a rectangular prism.
10		Has got rectangular sides all the way around it. Out of those two, the
11		mint creams box is a rectangle and the Smartie box is the square
12		So I actually think that's what they're after. I think they're
13		after the smarties for that one. Now I don't want you to draw the
14		net. I don't think you need to draw the net. All you need to do is tell
15		me what it is. (pause, Daniel puts hand up) What is it? Can anyone
16		tell me what that's gonna become?
17	Daniel	That? (pointing to yellow net) (Tim puts hand up)
18	T	No the green one. What kind of shape is that one? Sian? (Ben puts
19		hand up)
20	Sian	A rectangular prism.
21	T	A rectangular prism. That's all you need to write for that. So for
22		number seven just write rectangular prism.

Although, it is not our intention to analyse the position Tim (Group A) enacts in this classroom's whole class discussions, it is worth discussing his input first as it provides a useful contrast to Sian's role and therefore, highlights how her positioning compares to the boys in Group A. The teacher initiates the interaction by asking two questions. The first (line 1) directly refers to the question in the textbook: which gift box should be labelled a squared prism? The second question (lines 1–2) opens up the discussion to encourage students to think about the definition of a squared prism and how it differs from a rectangular prism (perhaps the teacher was aware that the distinction between these two shapes is often problematic for students?). Tim instantly puts his hand up and provides an answer to the first question (the mint creams box is a squared prism - line 4). But this appears to cause some confusion perhaps because the teacher had anticipated an answer to her second question (hence her response of 'pardon?' in line 5). Despite this confusion, Tim continues with the exchange by justifying his response, suggesting the mint creams box must be the answer as it has a square face (line 6). It is the teacher's next feedback move which appears most indicative to us of Tim's position in this classroom - rather than simply stating he is incorrect, the teacher responds by referring to her answer as an opinion (marked with the phrase 'I think they're referring to....' in line 7) rather than a fact that the student must accept. This is then followed by a justification that it must be the smartie box 'cos it has a square bottom and a square top' (line 8). It is the teacher's use of 'I think..' here which led us to code this exchange as dialogic talk since it presents her contribution as an alternative point of view to that which has been offered by Tim. Thus, it appears that both Tim and the teacher are engaging in the kind of conflict and justification which "represents the more 'visible' pursuit of rational consensus through conversation" (Mercer 1995, p. 105) which, we argue, this kind of dialogue gives access to. So although the teacher's response emerges as the accepted response to the question, it is the fact that she has to justify this as her opinion (rather than an unquestionable truth) which leads us to suggest this is a

dialogic exchange which positions Tim as someone who can potentially contribute to the knowledge under discussion in this classroom.

However, our interpretation of Tim's input contrasts markedly with that of Sian who participates a little later on in Extract 2. At this point, the teacher has moved the discussion on to looking at the nets provided in the textbook and she asks the students to give her the name of the shape one particular net refers to (lines 15/16). The exchange starts in a similar way to that with Tim i.e. with a question that requires a particular answer (compare line 1 and line 15/16), but how Sian responds is different. She provides the correct answer (line 17) but unlike Tim above, her answer is not accompanied by a justification (Tim states in line 6 'because they've got a square on ...'). The teacher's feedback move (line 21/22) is also different – she repeats Sian's answer, presenting it as a statement of fact (right or wrong) and then closes the exchange by giving a direct instruction to the rest of the class ("So for number seven just write rectangular prism"). Thus, the teacher asks the other students in the class to mimick Sian's correct answer without discussion. It seems to us that the knowledge presented in this exchange is viewed as unquestionable and the authority over how such knowledge should be defined lies entirely in the hands of the teacher, through both the question she poses and her response to Sian's input. For this reason, we have identified this exchange as authoritative talk.

In one sense, the teacher's different responses to these two students is not that surprising since each appears motivated by a different purpose - the first response is to demonstrate a conceptual distinction between a squared and rectangular prism whilst the second response serves to close the whole class discussion so that students can begin their independent work with the textbook. However, our analysis indicated that Tim regularly experienced the kind of dialogue we have highlighted above during the observation period, which suggests (to us) that he was recognised in this classroom as someone who had the legitimate right to make such contributions to the negotiation and shared construction of school mathematical knowledge in this classroom. This interpretation was validated by the teacher who, in response to our question about how different students contributed to whole class discussions, described Tim as 'professorish' because of the 'content', 'seriousness' and 'maturity' of his input. Similarly, Extract 2 highlights the kind of input Sian regularly provided (i.e. she often provided minimal correct answers which simultaneously performed her status as high ability but also enabled the teacher to round up the discussion and move on or help others having difficulty). As such, we suggest her position in the whole class discussions of this classroom was as a *domestique* – a term we have borrowed from the world of professional cycling where team members work to support one rider (usually the team leader) with the aim of placing them in an advantageous position in the race (Solomon 2008). In other words, we argue that it is because of Sian's compliance with the teacher's agenda (providing correct answers and moving the discussion on), that the Group A boys, such as Tim, were able to engage in more dialogic talk (than others) which involved being seen to provide a 'serious' input to the knowledge under discussion (as team leaders). We view this as a form of capital exchange (see below) since it involves using the right kind of input (or response from the teacher) to signal and be recognised as 'high

ability'. Mroz et al. (2000) note that enabling students to participate in extended exchanges in whole class discussions is costly in terms of time, as teachers negotiate the 'hurry along curriculum'. In this classroom, we suggest that Sian's position supported the teacher in managing this time pressure, which then enabled Group A boys to take up more time in the discussion where they were then able to exchange capital.

Arguably, Sian's symbolic status as a high achieving pupil is central to her positioning as domestique in Class 5 W. It seems that the teacher could rely on Sian to perform a certain function in the classroom's whole class discussions because she had confidence in her capacity to provide correct answers and keep with her agenda. Nevertheless, the distinction we observed between Sian's position and that of the high achieving boys (as outlined in Extract 2) suggests that something additional to ability status (as a cultural model) was informing the dynamics of this classroom. As such, whilst the boys in Group A were also called on to provide limited correct responses at times (see Extract 3 below), their opportunity to participate in a different form of exchange (and thereby exchange capital) meant they could identify with higher status positions in this classroom.

However, it is important to recognise the multiple and diverse positions available to girls in this classroom in order to unpack how such positions are produced and defined by this specific cultural context and the relations of capital exchange within it (e.g. Sian's position is defined as much by what she does not do (Group A behaviour) as what she does). For this reason, we provide a contrasting case, Erica, in order to highlight such diversity.

5.2 *Erica*

Like Sian, Erica also did not conform to the stereotype of 'silent observer' (Stanworth 1983) since she was involved in 23 exchanges during the observation period. However, she was regularly involved in interactions which were coded as authoritative using our framework (see Black 2004b). Extract 3 below displays one example.

Extract 3 Erica's participation in whole class discussions This extract is taken from a lesson on 'money'. Here the pupils were required to divide some sums of money which were set out in the textbook. The sum the teacher had drawn on the board was £1.68 divided by 3. The pupils were quite familiar with this kind of task as they had discussed similar problems in several lessons prior to this one.

1	T	Eleven, twelve, thirteen, fourteen, fifteen are all sharing sums.
2		How would we do those? (Pause) Erica? How do we do this?
3		(writes a sum on the board) can you tell me how we do that one?
4	Erica	How many threes are in one.

5	T	How many threes are in one? None and put your point. Then you say..
6	Erica	How many threes are in six?
7	T	In sixteen. Well done cos we haven't shared it, so how many
8		threes are in sixteen? (pause) Chris help her out.
9	Chris	Five..
10	T	Five
11	Chris	Remainder..
12	T	Remainder
13	Chris	One
14	T	Which goes in front of the eight to make eighteen. Now we say
15		how many threes in? (pointing to 18 on the blackboard)
16	Erica	Eighteen
17	T	Eighteen and the answer is fifty six. So have a little bash at that.

In Extract 3, the teacher uses the IRF exchange to elicit solutions to monetary ‘sharing sums’ using the well recognised ‘bus stop’ method [drawn on the board] whereby division of larger values (above 10) is broken down into a series of steps. The teacher adopts a cued elicitation strategy (Edwards and Mercer 1987) whereby authority over the knowledge (method) under discussion is firmly in the teacher’s hands (controlled by her closed questioning of students) who then elicits ‘correct responses’ from students. Edwards and Mercer (1987) liken cued elicitation to a guessing game, where the student is encouraged to guess the answer the teacher has in mind - a form of authoritative talk which demands compliance with the teacher’s definition of what counts as appropriate mathematical knowledge and the socio-mathematical norms of the school curriculum.

In this respect, the ‘bus stop’ method under elicitation here requires that students have some understanding of place value in that they have to remember to carry any remaining tens over into the next step of the process. Crucially, in her second response in line 6 Erica appears not to have remembered or understood this, instead stating ‘how many threes are in six?’ rather than the correct answer of sixteen. Thus, she provides an incorrect answer which the teacher mishears responding with ‘well done. Cos we haven’t shared it.’ The teacher’s incorrect reformulation of her response (line 7 ‘In sixteen.’) which does not address the initial incorrect answer Erica offers (six) appears to cause some confusion. This seems apparent in Erica’s lack of response to the next question of ‘so how many threes are in sixteen?’ (line 8 to 9). However, rather than offering Erica the opportunity to explain her perspective on the method being used, the teacher simply asks another pupil, Chris (group A) to ‘help her out’. So although the teacher brings Erica back into the conversation by asking her about the final part of solving the sum (lines 14 and 15) the question is laced with very strong clues which simply require her to chime in the number already drawn on the blackboard. The teacher does not actually ask Erica to solve the sum but simply tells her the answer (line 17).

As with Extract 2, we see again here how Erica’s position in the exchange is mediated and defined by the position that Chris (Group A) is offered and takes up.

The teacher's request that he 'help her out' coupled with her surprise at Erica's apparent 'correct' answer ('Well done' in line 7) serves to position Erica as someone who 'needs' help as a lower ability student. As noted above, authoritative exchanges such as this were highly controlled and offered students little space to position themselves differently. Given Erica's involvement in such exchanges, we suggest her role in this classroom's whole class discussions was fairly restricted. Unlike Sian, Erica's input did not serve a legitimate function in terms of supporting the teacher's agenda but merely highlighted her 'apparent' pedagogic needs.

5.3 *Positions and Capital*

As mentioned previously, Bourdieu (1977) argues that any given position is not only realised locally but reflects wider relations of domination/dominated which are rooted in an institutional field (the education system) and the field of power (broad structures of society). Thus, in reflecting on the positions Sian, Erica and the Group A boys were able to enact, we must consider their connection to the educational field and broader class positions. Recall that our use of class position in this chapter refers to Bourdieu's understanding of the term, as being a position in relations of power with associated capital which may connect to social class, but also to gender, ethnicity etc. Therefore, we can use the notion of class position as a lens to understand how status is manifested in/through practice, whereby individuals occupy different locations in a hierarchical structure stratified on the basis of class and gender. In this sense, we argue that the forms of participation discussed above reveal embodied competencies which act as forms of capital (in that they are recognised as 'high' or 'low' ability, appropriate/inappropriate, right/wrong) which serves to maintain this hierarchical ordering of positions.

Applying this idea to our analysis leads us to question why it was ONLY boys (Group A) who accessed dialogic exchanges where they could take up more agentic positions in the discourse and be positioned as contributors to mathematical knowledge in Class 5 W. The distinction between the positions offered to these boys (as high ability students) and Sian's position (also high ability) suggests that the findings reported here cannot solely be explained by a local definition of ability. Why was Sian not offered opportunities to make a contribution to the knowledge under negotiation, despite public recognition of her high ability? So far we have surmised that Sian's position was marked by her willingness to comply with the teacher's agenda and her apparent reliability which assisted the teacher as she negotiated time pressure. Both characteristics are identified in the research literature as stereotypically performed by girls in the classroom (Younger et al. 1999) and Mrs. Williams herself stated that she believed girls to be 'more mature' and conscientious. As such, it seems possible that both Sian and the teacher's behaviour maintained and was informed by a cultural model regarding girls' stereotypical behaviour, and it is this cultural model which served to mark her position as *domestique* as gendered.

As Bourdieu notes (2001), gender is part of class positioning constituted through relations of dominance and dominated in a given field. Indeed, gender and its forms of capital in a given field, are arguably central to the reproduction of such class relations because of the way such forms are often embodied (or worn on the body) which makes it more difficult ‘to masquerade as the authentic, idealised other’ (Holland et al. 1998). In the cultural context of Class 5 W, our analysis indicates that being male (embodied capital) and high ability was associated with a particular form of competence (contributing to knowledge). This indexed a symbolic claim to a position of privilege over other students in the class which was manifest in their normative mode of participation in classroom discourse. Sian did not appear to exchange such embodied capital, despite being seen as high ability, and her role is sanctioned to that of domestique. Recall also the (mostly) girls in Group C who participated very little during our observation period and were largely invisible (or perhaps resistant) to the teacher’s agenda. Although we have not analysed their participation here, we can hypothesize that by not having access to and/or being predisposed to exchange the kinds of capital valued in this classroom (i.e. not being involved in dialogic or even authoritative exchanges), served to produce/reproduce their marginal positioning in this classroom and perhaps in relation to mathematics in general.

Moreover, the case of Erica indicates that the positions enacted in this classroom’s whole class discussions were not binary in terms of gender (i.e. girl or boy) but were more complex and intersected with other aspects of class positioning. Erica’s involvement in authoritative exchanges was similar to the experiences of the low ability boys in this classroom. Thus, whilst she did not or was not able to enact the position of domestique (like Sian), she still participated on a regular basis. Clearly, the construct of ability IS relevant here - whilst shared perceptions of a student’s ability did not solely explain the positions enacted in the whole class discussions of this classroom, it did seem to matter in terms of differentiating Group A from the other students in the class. Using Bourdieu, we view the role of ability in differentiating positions in this classroom as referencing the doxa of the education system i.e. a common belief or presupposition that is unexamined (Bourdieu 1990). This doxa is that students can be ordered and organised based on perceived ‘ability’ which naturalises the forms of capital associated with the dominant classes as aligned with the field (education system). Bourdieu and Passeron (1990) note how teachers, parents and students are complicit in this - maintaining the doxa - even when it does not serve their best interests. As mentioned above, Sian was viewed to be of high ability being labelled as one of ‘the best of us’ by the teacher, but there was also evidence that she and her family engaged in broader forms of behaviour likely to be valued by the teacher and thus imbued with capital relevant to the educational field (Bourdieu and Passeron 1990). For example, on one occasion it was publicly noted by the teacher that her mum had been in to collect work for her during an absence due to illness. Erica’s mum had not done so in a similar situation. This suggests that the teacher perceived Sian’s parents’ interest in her education as significant and worth publicly commenting on to the other pupils– i.e. she recognised their symbolic capital ascertaining to knowledge about the significance of

education and its purpose. Similarly, the boys in Group A also spoke of experiences which could be viewed as capital played ‘like trumps in a game of cards’ (Bourdieu 1990, p. 230) in the context of whole class discussions. For example, Simon described the importance of his attendance at the Grammar School (selective entry secondary school) for his future educational success and told me of how his parents had set about obtaining a mock entry exam paper in order that he prepare.

What these findings appear to demonstrate, therefore, is how whole class discussions in this classroom operated as a localised site for the exchange of capital and subsequent capital growth in the mathematics classroom. Sian, who was seen to have access to capital in her family/home, behaved in ways which were compliant with the expectations of the teacher and was consequently able to use such capital to increase her ‘ability’ status in the eyes of others. Thus Sian was able to exchange symbolic capital for a label of high ability, which when coupled with her embodied capital as female, constituted the position of *domestique* in this classroom. By contrast Erica, who did not appear to exchange such capital, occupied positions which inferred less power in the classroom (e.g. as low ability), thus maintaining the reproduction of low capital in this classroom and the wider field. In sum, we argue that the exchanges we observed in the whole class discussions of this classroom are intricately connected to the display and exchange of forms of capital and suggest relations to dominant positions in the field of education.

6 Conclusion

To conclude, in this chapter we set out to analyse how student participation in the whole class discussions of a primary mathematics classroom might give access to different positions which signify one’s status and legitimacy as mathematical learner. Using Holland et al. (1998) and Bourdieu, we have argued that such positions are also marked by gender and class, mediated through symbolic cultural capital, cultural models of ability and gendered forms of behaviour. So whilst Sian, as a high achieving girl with access to symbolic capital, plays a gendered position of *domestique*, Erica experiences whole class discussions differently - she is offered and takes up a position of ‘needing help’ which is provided by her ‘more able’ peers (who can display an appropriate/valued form of capital). Similarly, the positions enacted by the boys in this classroom are varied, with Group A enacting a legitimate right to discuss the mathematical knowledge introduced by the teacher. In this sense, along with Zevenbergen (2000) we have argued that participating in classroom discourse is an important side for the (re)production of broader patterns of inequality in relation to mathematics.

Furthermore, in so far as the gendered positions we have observed are both local (to Class 5 W) and structural (indicative of positions in the educational field), we can argue that this analysis is helpful in explaining the gender paradox we referred to at the beginning of this chapter. Sian’s position as *domestique*, in particular, offers some insights into why apparently high achieving girls either drop mathemat-

ics at the end of compulsory schooling or struggle to form positive mathematical identities in post compulsory education. As noted previously, Holland et al. (1998) state that the social work we do in our daily lives can be identified as acts of inclusion or exclusion which serve to maintain positions and the capital that indexes their status. Thus, consistently enacting a position of ‘less than’ in relation to ‘high achieving’ boys (like those in Group A, ‘carrying’ the valued form of capital), may lead Sian to gradually internalise this position into a more fragile mathematical identity later on, which is well documented in research on adolescent girls (Radovic et al. 2017). As Solomon (2012) notes, such positional identities are often observed in high achieving girls and women who then question their legitimate claim to be a mathematical person. Thus, we suggest that understanding the positions students adopt in classroom discourse is a useful addition to existing research literature which seeks to explain why girls/women come to feel disenfranchised with mathematics and mathematically related subjects in adolescence and at university (Mendick 2005b; Solomon 2012).

Of course, our argument for the significance of classroom discourse as a site for inequality, depends largely on the assumption that this is a common practice across many mathematics classrooms, which is certainly the case in England. But it should also be noted that the particular way whole class discussions were conducted in this classroom and the positions enacted therein are not meant to be representational of other classrooms or generalizable. In fact, we are keen to point out that the positions enacted and their relations with each other are in part local to the particular cultural context of Class 5 W. In this sense, we recognise that the teacher’s dominance over the content and direction of the exchanges which took place was quite visible and so too, her frequent use of the IRF exchange. Such heavily controlled discourse may not be so apparent in other mathematics classroom, resulting in different kinds of teacher-student exchanges and different positions. Indeed, this is supported by Boaler and Greeno (2000) and others who highlight the influence of different pedagogic practices on learner identities. However, our purpose here is to present the concept of position as an analytic generalisation - i.e. as a tool to understand how students’ experience of a given pedagogic practice are both locally produced and structurally determined at the same time. We argue this is a necessary step if we are to establish the link between participation in mathematical teaching and learning practices and broader patterns of inequality in relation to mathematics.

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