



Refusing mathematics: a discourse theory approach on the politics of identity work

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Abstract

Although many scholars in the field of mathematics education are aware that identity discourses are highly political, research in the field usually lacks a framework theoretically and methodologically to address the political dimension of identity research. Based on Laclau and Mouffe's discourse theory and the case of a female secondary school student at a German public school, the present paper analyses identity as a socio-political process of identity work articulated around the discourse of 'refusing school mathematics' in our contemporary times. Her refusal of mathematics is constituted around issues related to a series of noted classroom practices such as collective work, being together and having fun, relevance of mathematics in society and life, respect of one's own dignity instead of becoming humiliated, and bodily activity instead of seated work. We illustrate how discourse theory allows us to see the identity work of refusing mathematics as a contingent process in a discursive field of socio-political struggle. In this process the subject moves beyond an essentialist 'refusal' of mathematics learning towards articulating her refusal of a particular mathematics education socio-materiality that needs to become subverted and reworked into more affirmative terms.

Keywords Identity work · Discourse theory · Articulating meaning · Refusing mathematics · Laclau and Mouffe

1 Introduction

Over the last decades, mathematics education research has developed a growing interest in employing the construct of 'identity' as a matter of studying how learners and teachers narrate their knowing 'self' through lived experiences in mathematics education. Such an explosive interest has attracted the attention not only of researchers, but also of educators, curriculum designers and policymakers who rely on certain identity markers of the mathematical subject (e.g., the rational problem solver, the reasoning individual, the intuitive learner), or identity categories such as gender, race or talent, to produce claims for changing or

reforming curricular guidelines, materials, educational policies and learning practices. In a recent discussion of identity research, Chronaki (2017) argues that the turn to identity brings to the fore a concern not only for the 'quality' or 'equity' of mathematics practices for learners and educators, but, also, an impetus for an affective governing of schooling applied at the level of self. This becomes evident as identity research focuses more and more on learners, teachers and curricular materialisations in the pedagogic praxis.

The bulk of learner identity research denotes a concern in how learners relate to the subject of mathematics (Goldin et al. 2016; Kollosche 2017c), how teacher communities shape mathematical identities (Graven and Lerman 2014), how gender, class, race and ability determine the learning of mathematics or the pursuing of related career paths (Solomon 2007; Chronaki and Pechtelides 2012; Oppland-Cordell and; Martin 2014), how culturally diverse students become marginalised (Chronaki 2011; Norén 2015; Takeuchi 2018), how normative mathematical identities become construed or constrained via learning design, curricula reforms, and innovation (Cobb 2004), how learner-identity evolves as a matter of mathematical communication around experiences of struggle and failure (Sfard and Prusak 2005;

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Heyd-Metzuyanim 2015) or even how a radical encounter of hybrid identities pave entries to ‘dialogicality’ amongst bourgeois and subaltern subject locations (Chronaki 2009, 2011). However, in her review, Darragh (2016) denotes that although identity research in mathematics education draws from different theoretical approaches, there is not yet any thorough discussion that could help delineate the varied meanings, uses and political dimensions of the term ‘identity’. The fact that mathematical identity is entangled in socio-political issues of mathematics education leads to the need for a politically-sensitive approach to identity research—an approach that is discussed in this paper.

Despite some studies that discuss mathematical identity from post-structural or cultural theory perspectives (e.g., Mendick 2006; Chronaki 2011; Walshaw 2013; Brown and MacNamara 2011), identity research in mathematics education, by and large, rests upon a circuit of utilising certain approaches grounded in Wenger’s (1998) perspective, which discusses identity as a means to create ‘communities of practice’ as entrepreneurial systems, in the sociocultural approach of Sfard and Prusak (2005,) who outline narrative identity “as a set of reifying, significant, endurable stories about a person” (p. 14), or in the psycho-linguistic frame of Gee (2000), focussing on the discursive construction of identity categories. Whilst such approaches have been methodologically appealing as they tend to operationalise the concept of identity easily, they often reduce it to discrete individual or group identity categories (e.g., gender as male or female, race as black or white, learner as able or unable). This approach is entangled in a view of discursive identity formation that relies on a view of language-use (i.e., in the form of narratives, storytelling, classroom-based utterances etc.) acting as a mediating means for the construction of social phenomena. In these cases, identity configuration is often approached through a structuralist perspective of language, as a theory of meaning-making grounded in bipolar discursive positions that produce definite understandings of selfhood in the social field.

In contrast to this view, the poststructuralist critique on identity configuration, as adopted by Laclau and Mouffe (1985/2001), is that meaning cannot be seen as a fixed unambiguous statement and that a hegemonic discourse cannot be taken as an eternal ‘regime of truth’ but as a web of meanings based on a chain of significations that relate to the political struggles of specific historical times. Discourse theory claims that every object and subject is constituted in discourses whose genealogy can be unfolded and deconstructed (Foucault 1972). Such discourses are usually not reproduced consciously by the individual but emerge in a discursive field of practice-based interests influencing the ‘what’ and ‘how’ of communication interests at particular times and in different spaces. In this light, analysing identity configuration as part of language-use is a form of discourse analysis. The

necessity of a theory-informed political perspective on student discourses becomes apparent when examining studies closely related to the construction of mathematical identities around experiences of struggle and failure (Nardi and Steward 2003; Boaler et al. 2000; Heyd-Metzuyanim 2015). Most of these studies analyse student identity as it evolves in the realm of classroom or school discourse and focus on identity’s contribution to mathematical learning. However, they do not theorise identity construction as a socio-political project in ways that could explore how discursive truths come into existence, relate with identity categories, stand in conflict with each other or prevail over others and become hegemonic.

Based on previous work (Chronaki 2013; Chronaki and Matos 2013; Chronaki and Pechtelides 2012), we aim in this paper to discuss how the discourse theory of Laclau and Mouffe (1985/2001) can substantiate the study of mathematical identity, not as a fixed but as a contingent meaning-making process that unfolds the political struggles of mathematics education in our contemporary times. To that end, we present their discourse theory from a theoretical and methodological perspective before we illustrate how it might work through an interview study of a female student who articulates her opt towards the discourse of refusing school mathematics.

2 Identity as identity work and discourse theory

As Jørgensen and Phillips (2002) argue, varied approaches of discourse analysis understand discourse as “a particular way of talking about and understanding the world” (p. 1). They adhere to the premise that our world is constituted through socio-historical practices, grounded in language-use, and their position is anti-essentialist in discarding the idea that there is a true understanding of our world. Instead, in the tradition of Foucault (1972), discourse is understood as necessarily interest-driven and political. In this vein, discourse analysis becomes a critical endeavour that sets out to deconstruct discourses as established ‘regimes of truth’. Explicitly incorporating discourse analysis into the study of mathematical identity can be understood as an attempt to accentuate its political grounding in social studies of mathematics education.

Within the field of discourse analysis, the discourse theory of Laclau and Mouffe (1985/2001) takes a radical position in assuming discourse to be the central space of meaning-making as an unending struggle in which every sign’s meaning remains contingent. Thus, the aim is to unfold this very process of ‘struggle’ and identify how the meaning of signs becomes temporarily fixed, conventional or natural. In agreement with Foucault, they consider the subject as

both ‘decentred’ and inseparably interwoven in a social field where discourses can hold antagonistic or hegemonic status. Further, they dislocate from a Marxist view of having a fixed social class identity and argue that people’s identities become situated in the context of discursive struggles where “politics has primacy” (Laclau 1990, p. 33). They argue for the inherent socio-materiality of discourse, which determines how the assemblage of acts and thought creates society. As such, politics in discourse theory is not narrowly understood as party politics, but as “the manner in which we constantly constitute the social in ways that exclude other ways” (Jørgensen and Phillips 2002, p. 36).

Discourse theory rejects a Western understanding of an individual core identity and, instead, argues for a social relational organisation of identity formation as a continuous process of accepting, resisting and reconfiguring notions of self and other in the context of discursive political praxis. For Laclau and Mouffe (1985/2001), the subject remains split, fragmented and decentred and never becomes ‘itself’. Its identity is changeable and, always, has the potential to identify differently in relation to the web of discursive meanings it has access to. Consequently, we regard discourse theory as providing a promising ground for relating identity research and socio-political studies in mathematics education.

2.1 Basic concepts of Laclau and Mouffe’s discourse theory

In the discourse theory of Laclau and Mouffe (1985/2001), identity formation is a core part of understanding discourses. Discourses are continuously reconstituted in language-use around unfixed or partially fixed words or phrases, which are called *nodes*. Discourses differ in the connections they establish between different nodes, and nodes receive conceptual meaning through their interrelations within the field of discursivity. For example, the word ‘education’ is meaningless as a node until it receives meaning in interrelation with other nodes such as school, learning, training or childhood. These nodes are already-existing signs that are rearticulated into new meanings. As such, ‘education’ could be constructed with a different meaning in competing discourses. For example, education may signify different meanings when it refers to the context and process of becoming a productive workforce or an emancipated and responsible citizen.

The practice of *articulation* connects different nodes and establishes a relationship around signs, whereupon connected nodes are called *moments* of a discourse. For example, stating that ‘education is about emancipation’ constitutes an articulation that connects two nodes and turns them into moments of the discourse. In contrast to that, a discourse might also isolate certain nodes, which are then called *elements*, by not including them in any articulation. The potential possibilities of meaning that a particular

discourse can build upon constitutes a “surplus of meaning” and is called *the field of discursivity* (Laclau and Mouffe 1985/2001, p. 111). Discourse is defined as ‘the structured totality resulting from the articulatory practice’ (p. 105). Through articulation, a discourse establishes a closure, a temporary halt to the fluctuations of meanings of nodes. Nodes that have had their meaning fixed by a discourse are called moments. This closure is, however, never permanent: “the transition from the ‘elements’ to the ‘moments’ is never entirely fulfilled” (p. 110). A few moments may occupy central positions in a discourse in that they link varied nodes and produce a centre of meaning-creation. These moments are called *nodal points* and illustrate the major ideas around which a discourse is constructed. For example, ‘emancipation’ might be a nodal point around which a certain discourse on education is organised.

Nodes which remain particularly open to different ascriptions of meaning are called *floating signifiers*. Nodal points can be thought of as floating signifiers, but whereas the term *nodal point* refers to a point of crystallisation within a specific discourse, the term *floating signifier* belongs to the ongoing struggle between different discourses to fix the meaning of signs. Nodal points are floating signifiers in that they have hardly any materiality but receive their meaning through the articulations in the discourse. According to Žižek (1989) a nodal point is “not simply the ‘richest word’, but the word that ‘quilts’ the field with meaning.” It is “the word which, *as a word*, on the level of the signifier itself, unifies a given field, constitutes its identity” (p. 95). Considering our example, the discourse on education might develop our understanding of emancipation in the first place, whilst emancipation might be a widely meaningless concept when separated from that discourse on education. The flexibility of floating signifiers is essential for its function as a connective bridge between a wide range of discursive moments. Thus, floating signifiers facilitate a process of discourse *closure* and contribute “to the ongoing struggle between different discourses to fix the meaning of important signs” (Jørgensen and Phillips 2002, p. 28). A discourse closure is understood as a struggle that aims to remove ambiguities by turning its elements into moments in an attempt to stabilise a fixed meaning.

2.2 Discursive struggle and hegemony

Discourses serve to explain parts of our world. They vary according to what concepts they place in central positions and in how they include, connect, marginalise or exclude other concepts. For example, a nexus of nodes associated with the concept of ‘democracy’ throughout history and across political philosophies might draw rather diverging links by differently locating such nodes as slavery, women’s rights, private property, freedom of speech, or political

parties. In the same vein, conceptions on mathematics education feature different nodes as nodal points and might connect very differently to nodes such as creativity, rigor, drill, application, exploration, or assessment.

Laclau and Mouffe (1985/2001) understand *hegemony* as the discursive “organisation of consent” so that “subordinated forms of consciousness are being constructed without recourse to violence or coercion” (Barrett 1991, p. 54). Laclau and Mouffe (1985/2001) argue that there are no objective laws that divide society into certain fixed and eternal categories, but that instead individuals and groups are always in a process of formation and deformation in political discourses. As such, the aim of discourse analysis is not to discover an ‘objective reality’ but to unfold how power relations are created as ‘normal’ through discursive productions of meaning in specific times and places.

Conflicting discourses engage in *discursive struggle* for their share in meaning-making. Such struggle might be explicitly formulated or appear in very subtle forms. Indeed, Laclau and Mouffe (1985/2001) argue that some discourses obtain a *hegemonic* status, which means that they, by and large, have succeeded in suppressing alternative discourses and in presenting themselves without alternatives via obtaining ‘consent’ or positioning themselves as ‘common sense’. For instance, the economic crises of the late nineteenth and early twentieth century allowed for the hegemony of a discourse which assumed the imminent end of capitalism, leading to political identities of workers cooperating to seize power. At that time, it seemed indisputable that a worker had to fight for his rights. However, hegemony is always temporary and subject to new discursive struggles. When, in the second half of the twentieth century, the economy in Western countries had altered dramatically, this discourse lost its hegemonic status and could no longer serve as a basis for socialist activism. In philosophy, the work of Nietzsche, Foucault, Butler, Deleuze and others can be understood as attempts to bring hegemonic discourses back into the field of discursive struggle in order to trouble and open them up for reconfiguration through a different articulation process. Examples from mathematics education research might be how the belief that the main purpose of mathematics education is about ‘learning mathematics’ has been critiqued as a ‘learnification’ of mathematics education (Biesta 2009).

2.3 Discourse theory and identity work

In contrast to the “standard Western understanding of the subject as an autonomous and sovereign entity” (Jørgensen and Phillips 2002, p. 15), already Foucault (1972) considered the subject as “decentred” and inseparably interwoven in the discourses surrounding her: neither can the subject understand the world around her, define who she is, or

assume positions in discursive struggles without recourse to the discourses around her, nor can discourses exist without subjects developing, reproducing or changing them. In Laclau and Mouffe’s (1985/2001) theory, the subject is considered necessarily ‘overdetermined’ in the sense that she is exposed to conflicting discourses in and across discursive fields, none of which have the power to totally explain the world. In mathematics education, a student might, for example, reconfigure her identity between the conflicting discourses of mathematics as an intellectual challenge on the one hand, and, as an esoteric formalism on the other.

Identity work, as a process of a discursive encounter of the self, becomes, therefore, a struggle towards creating a closure where different narratives integrate different concepts in certain arrangements that strive for hegemony. Such struggle can indeed take place between how an individual sees herself and how others see her, as conceived in Sfard and Prusak’s (2005) differentiation between actual and designated identities. However, Laclau and Mouffe (1985/2001) would argue that even ‘actual’ identities are constituted by internal struggle, just as a learner of mathematics might negotiate her identity work of incongruous discourses that position her as a diligent learner, as a rationally capable being, as somebody who prefers open-ended creative activity over rule-bound tasks or as someone who wants to be perceived as cool rather than as a nerd. Identity, thus, is taken as a process of identity work where the subject becomes ‘self’ in the realm of the discursive field of the articulatory practice struggling to deal with hegemony (Mouffe 1979).

In this realm, student narratives concerning their relations to mathematics, self and other in the school classroom or community become sites of such ongoing struggles and potential reconfigurations. Identity work in the context of agonistic, antagonistic and hegemonic discourses tends to assume sameness and otherness, which Laclau and Mouffe (1985/2001) termed the *logic of equivalence* and the *logic of difference*. For instance, these processes become evident when students with diverging interests unite as ‘the students of the class’ to pursue common interests in conflict with ‘different’ others such as teachers or parents—a union that might easily fall apart when ‘other’ interests are at stake such as race, gender, social class etc. In general terms, the logic of equivalence is a strategic move to create sameness in the discursive field, but this sameness might collapse just as easily as it was articulated. Consequently, when discussing student narratives, articulations of sameness and difference can be interpreted as strategies driven by interest in the context of their engagement in a political project that either embraces or resists hegemony.

2.4 Methodological procedure

Our methodological procedure of applying discourse theory to empirical data focused on the process of discourse articulation in the realm of the qualitative research paradigm (Lincoln and Guba 1985). Specifically, our analysis of how a female student articulates the discourse of ‘refusing mathematics’ is based on her interview data and starts with searching the contingency of nodal points, moments and elements in her discourse. This first step illuminates which nodes have a temporal privileged status in her narrative and their relations to other nodes. In a second step, we explored how cluster connections between different nodes in the interview text can be mapped and reveal nodes that assume central positions as nodal points. For example, an articulation such as “I just find maths difficult, I do not understand it that quickly” connects mathematics with such nodes as difficulty, understanding and the pace of learning mathematics. The notion of difficulty might further become a nodal point around which other nodes become organised. In a final step, we contrasted this discursive architecture with alternative discourses as they are presented in the interview or discussed in mathematics education research. This contrast is utilised to explore how articulations of varied discourses are being reproduced, transformed or challenged. Considering that this analysis lies in the qualitative paradigm, we sought to minimise bias and maximise trustworthiness by first engaging with the data individually, and then reflecting together on ambiguities that arose.

Discourse theory analysis might take different directions. For example, given a set of interviews, it is possible to track the discursive functions that a single node such as ‘logic/logical’ might play for identity work in relation to mathematics across interviews and this process might encourage us to ask questions such as the following: where, when, for whom and why does a specific node become a nodal point around which the articulation of meaning is organised? When does it merely constitute a moment around a different nodal point? When does it become isolated or excluded as an element of the discourse? In our case, we want to begin the analysis on a more basic level by opening up in depth what might be the nodal points in the discourse of only one student, and explore how the discourse of refusing mathematics unfolds. We believe that this single-case approach is beneficial both to illustrate the analytic potential of discourse theory and to widen our understanding of acts of refusal in mathematics education.

Table 1 Main questions in the interview study

Interview questions
What is your favourite subject in school?
How does your favourite subject differ from mathematics?
Describe for me what a maths lesson typically looks like in your class!
What do you usually do during mathematics lessons?
Do you believe that mathematics will be necessary for your future life?
What would have to happen so that you would be better in maths?
If you could create your own timetable, would mathematics be a part of it?

3 The case of Anja: on refusing mathematics

3.1 Data collection and analysis

Anja¹ is a female student in her ninth year of schooling at a public school of a non-academic track in Berlin. Anja was 15 years old when she participated in an interview study on her relation to mathematics. The study, conducted in 2015 by student teachers in a Master’s programme at the University of Potsdam, targeted students of lower secondary schools of different tracks in and around Berlin, Germany. The study included individual interviews of 15–30 min using open-ended questions which allowed for a variety of responses on how students relate to school mathematics. Some of the basic questions asked in the interview are shown in Table 1 below. The interviews were recorded and transcribed. We chose the case of Anja for further analysis both because she expressed a refusal of mathematics, which is only seldom discussed in research, and because the analysis of her case allows for illustration of a discourse theory approach to identity work. Our analysis rests solely on the data obtained from the interview.

Anja’s favourite school subject is sports. She regards mathematics as not only ‘difficult’ but associated with ‘danger’.² Anja considers assessment in mathematics as especially strict as ‘there is only right and wrong’ and students are ‘put so much pressure on, also concerning marks’. The teaching style that she experiences in her mathematics classroom is described as teacher-centred:

Well, most commonly, for a start, we go through the topic of the day or week before. Talk about it again, what was important there and so on. And then we go through a new topic, go through exercises and, well,

¹ Name changed.

² All translations of the originally German interview statements provided by D. K.

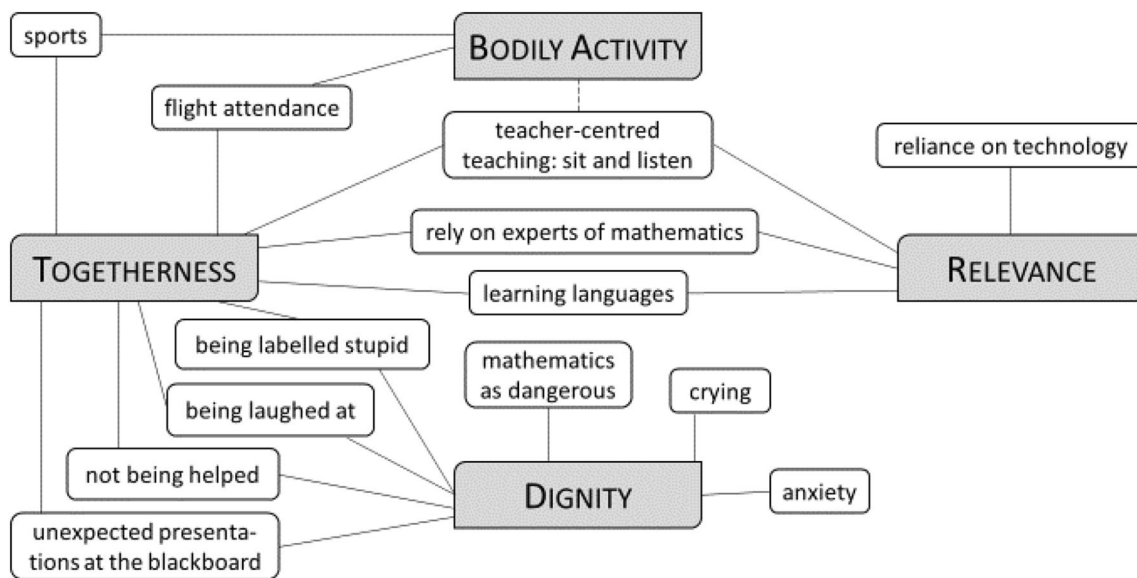


Fig. 1 Anja's articulation practice: nodal points (grey) and moments (white) as temporary fixations of meaning

probably we then get homework, with which we are supposed to practice at home.

Anja unfolds her refusal of mathematics as she states that she 'never' wants to attend mathematics in her classroom. She does anyway, which might be explained by her legal obligation to do so, but her rejection might not have severe effects only on her learning of mathematics and her educational emancipation, it also causes Anja to suffer in mathematics classes as will be illuminated in the following discussions.

We interpret Anja's narrative as not merely an expression of a fixed mathematical identity, but rather a testimony of her struggles with her everyday social experiences of her school mathematics reality. Anja's interview provides a rich narrative that touches upon various topics of school mathematics, making it impossible to reproduce the totality of her story here. Instead, our analysis focusses on identifying moments, elements, nodal points and their relations to each other in order to explore how Anja, in the process of her identity work, strives to articulate partially fixed meanings in her field of discursivity. Thus, we found four inter-related nodal points: *togetherness*, *dignity*, *relevance* and *bodily activity*. As nodal points are not necessarily termed explicitly in a discourse but addressed with varying vocabulary, metaphors and stories instead, we found it necessary to name them by considering Anja's words and connecting them to concepts that are familiar in mathematics education research. While Fig. 1 gives a visual impression of how these nodal points assemble with specific moments of her articulation practice, the following more detailed discussions illuminate how Anja unfolds

these nodal points in her articulated practice to configure her refusing of mathematics.

In addition to a focus on the case of Anja, the present analysis attempts to put forth a broader discussion on mathematics education that might problematise the prevailing ways of seeing identity in mathematics education research. Just as discourse theory assumes that no particular discourse is 'truer' than another and that 'truth' is merely the arrogation of a discourse that has obtained a hegemonic status as a political project, we argue that we as scholars in mathematics education do not entirely 'know' or 'seek to know' the 'truth' of mathematics education in students' lives. Instead, we turn to analysing not whether Anja 'speaks the truth' but how Anja articulates her own experiences of school mathematics. In this her articulatory practice is a political project of identity work configured in direct relation not only to what is taken as the hegemonic mathematics discourses in her schooling context, but to their potential alternatives. Thus, our report on Anja's case may provide essential insights into our understanding of mathematics education.

3.2 Findings

3.2.1 Togetherness: being together and having fun

The nodal point of togetherness becomes introduced by Anja early in her interview, constitutes an integral part of her overall identity work and, crucially, configures her relation to mathematics. Already when she compares mathematics to her favourite subject, sports, she explains her preference for sports in the following terms: 'you can simply have fun together with your friends'. In contrast to that, Anja explains

that in mathematics it is ‘commonplace’ to have ‘teacher-centred teaching, where the teacher stands in front and we must listen’. Students ‘must not talk with each other’: ‘We have to do all our problems alone and if we have a question, we can raise a finger’ to invite the teacher for help. According to Anja, this is how her teacher legitimises this lesson organisation:

She says that she explains it in a way that we all must understand. And, then, we must also handle the exercises somehow. And that we have enough time at home to look at the things once more. And that in written tests we cannot work together with our fellow students either.

Anja critiques how she is not allowed to talk with her fellow students, a practice that she deems ‘would be good’ for her learning. She argues ‘if I could talk about it with the others earlier, then I would possibly understand it better, and then I would also be able to do it in the written test’. When asked what she would ‘like to change the most in mathematics education’, Anja mentions ‘group work, that you can exchange ideas a little and maybe calculate together’.

Anja’s observation that her teacher ‘doesn’t manage’ to deal with each student’s question in one lesson, and her proposal to allow cooperation to solve this problem, are genuine didactical considerations. Yet, Anja’s desire for togetherness is more than an attempt to render the learning of mathematics more efficient. In her identity work attempting to build up a relation to mathematics education, Anja seeks, but fails to connect mathematics and togetherness. Anja recites a discourse which presents herself as somebody who is seeking to work in cooperation and in a joyful atmosphere. In contrast to that, she is faced with the hegemonic discourse in her classroom that positions mathematics education as solitary work. Consequently, this hegemonic discourse on learning mathematics stands in conflict with Anja’s self-narrative. It is in this realm that she articulates her refusal of mathematics and her opting towards collective activities such as sports. Thus, at this moment, mathematics becomes a symptom for the impossibility of achieving enduring togetherness. However, to resolve this conflict, Anja articulates an alternative discourse as a mere possibility, one where mathematics can be learned joyfully as a collective praxis. While this counter discourse can be understood as an attempt to reconfigure her relation to school mathematics, at the same time, it adds another moment around the nodal points of togetherness, thus articulating new meaning along the logic of equivalence: Anja acts as if togetherness can only become realised in physical education or in other subject areas but not mathematics. In this, Anja articulates school mathematics as a lonely endeavour, thereby shaping solitary activity as a floating signifier that permits her to argue for her refusal of mathematics. This organisation of the discourse allows Anja

to reach a closure, as her refusal of mathematics is now well explained and no longer a matter of discursive negotiation.

In her study of gendered preferences among school students in mathematics education in Germany, Jahnke-Klein (2001) showed that the question of approaching mathematics either collaboratively or in solitary competition is highly gendered, with only boys opting for solitary competition and most girls demanding collaboration. Mendick (2006) stresses that the masculine position of mathematics being an activity best performed in solitude constitutes a prevailing discourse despite these divergent positions. Indeed, Anja’s teacher reflects this masculine mathematical identity although she is female. Anja at least theoretically breaks through this hegemony when she proposes to introduce group work and collaboration in the learning of mathematics. Yet, she seems to feel unable to turn this fantasy into a reality. From a more general perspective, togetherness and solitude are closely connected to the hegemonic discourse of mathematics being an objective subject. Epistemologically, the objectivity of mathematics lies in the fact that different people, applying the same mathematical theory to the same problem, are expected to obtain the same results. Some mathematicians invest a lot in order to realise this expectation, such as refraining from embracing the contingency and ambiguity of a social or physical reality, talking only about well-defined objects and accepting only proven statements (Kollosche 2014). From the perspective of this hegemonic discourse, Anja’s connection with school mathematics as a lack of togetherness appears consistent, and her pursuit of a collective learning of school mathematics all the more hypothetical.

3.2.2 Dignity: humiliation at the blackboard

Anja describes that, in her classroom routines, lessons are organised in a way so that ‘one of us is called to the blackboard and he then has to present either the homework or other problems on the blackboard and might even be marked for that’. Thereby, the teacher ‘just chooses somebody’ for presentation, ‘also those who do not want to’. Anja adds that ‘the teacher expects that you can do it, because you should be concerned with it at home’. If you cannot solve the problem at the blackboard anyway, ‘she repeatedly tells that we should be able to do it’. In such a situation, ‘one girl even cried’. The teacher’s practice of calling any student to the blackboard and marking his or her performance in solving a problem in front of the class is discussed in the first half of the interview as a humiliating practice. Anja explains:

If, then, you cannot do it, then I also feel humiliated, right, in front of the class, when she then repeatedly tells that we should be able to do it, right? But often, I learn at home and try to understand it but I just don’t

and then I have to come to the front, she doesn't help me, and I sometimes even get a bad mark. There, she could indeed help me a little and not leave me alone like that.

Asked how Anja feels when she is called to the blackboard and cannot solve a problem, she replies:

Not good. Sometimes I am sad, because again I have not understood it. Also, I am a little anxious that the others will laugh at me because it was easy for them. Usually, that does not happen often, but still you have that anxiety... that the others think that you are stupid.

Later, Anja adds that 'at the beginning of the lesson, I am always afraid that I have to go to the blackboard when I have not understood'. In the interview, this experience of humiliation shines up as the only explanation as to why Anja might associate mathematics with 'danger'. Indeed, when asked whether she thinks 'that if you had more support and understood the contents better, that you would like to attend mathematics education?', she agrees 'totally' and adds that 'then, I would not have to be afraid'.

This experience of humiliation is a nodal point that binds together large parts of Anja's discourse. We decided to name the nodal point more generally as 'dignity' because we interpret Anja's concerns with humiliation as a lack of dignity in her classroom interactions. Interestingly, this nodal point seems to be embedded in two discourses that seem to be competing when analysed closer. Both discourses connect the humiliating experience to the before-mentioned nodal point of togetherness. On the one hand, the teacher's practice of calling somebody to the blackboard seems to be illegitimate, for it denies the togetherness that Anja seeks. Anja's statement that 'she [her teacher] could indeed help me a little and not leave me alone like that' illustrates that all too well. On the other hand, the teacher's practice is taken to be accepted as legitimate, not necessarily so by Anja, but by her classmates who otherwise would have no reason to 'think that you are stupid' if you fail in this situation, a label that Anja herself takes very seriously. Both discourses, the hegemonic discourse, in which the blackboard practice can determine who is 'stupid' and who is not, as well as Anja's alternative discourse, in which the blackboard practice creates an illegitimate situation, exist simultaneously in Anja's discourse and struggle to assume a central position. Thereby, it seems ironic, although not completely coincidental, that both discourses add together to an extreme experience of anti-togetherness which might explain the humiliation in the first place: not only is the student at the blackboard denied the togetherness desired in a situation of helplessness, but this very denial is then shared in a voyeuristically perverted togetherness when the classmates have to witness passively how the student fails.

While Anja has further reasons to reject mathematics and not every student will report so traumatic an experience, humiliating experiences in mathematics education can well lead to self-exclusion or even mathematics anxiety (Kollosche 2017a). But, also, in less dramatic situations, very subtle experiences of disaffection and denial might lead students and student-teachers systematically to connect mathematics with fearful feelings. For example, Dowling (1998) describes the articulation that connects the learning of mathematics to predominantly solitary engagement with problems as the 'myth of construction' and argues that it places pressure upon students by discursively associating failure in learning not with unsuitable learning situations but with individual deficits. However, even if Anja rejects mathematics education for its humiliating lack of togetherness, she does not question the hegemonic discourse that provides the blackboard practice with the power to label students as 'stupid'. Apparently, the denial of togetherness in the blackboard assessment has lost the fixed position it holds in the hegemonic discourse of the classroom, while other moments such as the labelling of students through the blackboard assessment, have remained fixed, even in Anja's rejection of the practice itself.

3.2.3 Relevance: pointless mathematics

Anja explains that she 'never' wants to attend mathematics lessons. Aside from her contestation that 'it is no fun' and that she fears humiliation, Anja introduces a felt lack of relevance as another nodal point of her discourse:

I also don't know what we always have to do that for. I won't need it for my life. I mean I got my mobile, I can look everything up in there if I want to, I can check calculations. And, therefore, I do not understand why I must have all that in my head.

Even when the interviewer tries to provoke Anja with a story of an imaginary price reduction for clothes she would like to buy, Anja insists that mathematics 'isn't necessary' for her future life and that she could instead depend on technology or experts such as 'the shop clerk' to provide her with mathematical information. Furthermore, she positions languages in opposition to mathematics when she explains that 'other subjects such as English or German are needed in everyday life', for example, for travelling or communicating. Here, the discursive articulation reveals that Anja's experience of a lack of relevance of the mathematics she is offered is closely connected to the lack of togetherness in her mathematics classroom. Andersson et al. (2015) present a case study of a student who is equally troubled with teacher-centred mathematics education but becomes seriously engaged with mathematics when she is involved in cooperative project work on societal applications of mathematics. Although

Anja does not address this issue explicitly, it seems fair to assume that Anja would also see more relevance in school mathematics if it was used as a means to solve more complex problems in collaboration with others and not in solitude.

Anja does not only reject the hegemonic discourse of the relevance of mathematics, she presents a solidified discourse about the uselessness of learning mathematics. However, it is noteworthy that Anja's counter-discourse is still closely linked to the hegemonic discourse she critiques: while the hegemonic discourse connects the nodal point of the relevance of mathematics to its applicability, thus articulating applicability as a moment in that discourse, Anja's counter-discourse denies that connection and positions the applicability of mathematics as an element in her discursive articulation, isolated from the idea of the relevance of mathematics. What is left in Anja's discourse is not a set of further articulations that introduce new moments to the idea of the relevance of mathematics. Her discourse on the relevance of mathematics rather stages a deconstructive attempt characterised by negativity as it denies any relevance of mathematics education. Elsewhere, analysis of the other cases in the interview study revealed that students regularly reduce the relevance of mathematics education to the question of the applicability of mathematics (Kollosche 2017b). In this case, the applicability of mathematics assumes a central position in the students' discourses without necessarily having any materiality in the form of lived experiences, thus becoming a floating signifier of the discourse, whose only function is to discursively link mathematics education to ideas of its relevance. Consequently, it can be argued that the lack of resource to richer discourses concerning the relevance of mathematics constitutes a central barrier for students to imagine, construct and thus identify with counter-discourses of school mathematics.

This also means that Anja's rejection of mathematics is directed against the idea that the mathematics she experiences would be needed to master her future life and leaves the possibility that Anja's identity work is able to embrace a positive relationship to mathematics on the basis of an alternative discourse of its relevance. Considering that, for her, mathematics is being presented with concepts and procedures that apply to repetitive right-and-wrong problems in solitude, Anja is rejecting a kind of mathematics that is performed in her classroom as a specific form of identity. Skovsmose (2005) proposes that such experiences from the mathematics classroom can be understood "as an efficient social apparatus for selection", which identifies students who are proficient at activities which "have some similarities with those routine tasks, which are found everywhere in production and administration" (p. 11). Especially the administrative character of sitting still and doing concentrated work in silence resembles the ideal type of the bureaucrat who acts without compassion as a mechanical mind-worker (Weber

1921/2008). The teaching-to-the-test philosophy explicitly orchestrated by Anja's mathematics teacher might prove functional to that end, excluding Anja from a bureaucratic career, which she might eventually dislike and resist (Kollosche 2014). However, it also inhibits all possibilities of further articulating areas of relevance of school mathematics such as reasoning, tackling a theoretical problem collectively, learning to organise working processes, or enduring chaotic frustrations.

3.2.4 Bodily activity: remain still and listen

Already at the beginning of the interview, when Anja compares the subjects of mathematics and sports, she explains her preference to sports on the basis that 'you are free to move', whereas in mathematics, 'the teacher stands in front and we must listen'. The classroom organisation she experiences demands that the students sit still and listen, concentrate, and do their exercises in silence. The most expressive form of bodily action described by Anja is to 'raise a finger' to get the teachers attention, whereas engaging with other students or going *to* the teacher are forbidden. Obviously, this lack of bodily activity troubles Anja deeply. Both her interest in sports and her aim to become a flight attendant indicate that Anja seeks activities that she can experience with her body. Furthermore, Anja's discourse features a classroom practice which lays a negative connotation on the body. The most prominent bodily experience in her experiences with school mathematics is the presentation of problems at the blackboard—an experience in which the body often becomes entangled with humiliating experiences. Rather than offering various opportunities for involving the body in learning mathematics, Anja's mathematics classroom motivates students to hide their physicality and experience a kind of body-absence.

Despite recent studies on mathematics and the body, where the importance of movement, motion, gestures and body-language are stressed, the majority of mathematics classrooms still opt for seated work on worksheets or textbooks (de Freitas and Sinclair 2014; Arzarello and Robutti 2004; Nemirovsky and Ferrara 2009). It is notorious how school mathematics continuously remains the curriculum subject area where students spend most of their time still in their desks focusing more on thinking in silence instead of talking, collaborating, moving. And yet, lately, the subject of mathematics has been revisited as a discipline that has evolved epistemologically as a corporeal activity that always demands our direct involvement with the physical environment (Chatelet 2000; Rotman 2009; Roth 2015). With the birth of rationalism, the mind and the body have been constructed as antagonistic entities, with the body hosting the emotional, anarchic, sinful and female characteristics of the body, and the mind its rational, rule-bound, virtuous

and masculine qualities. While such an antagonistic characterisation of body and mind, together with the location of mathematics in the mind, has been critiqued (de Freitas and Sinclair 2014), the classroom practice that Anja experiences still seems to live this spirit. The denial of the body is reminiscent of Weber's (1921/2008) conceptualisation of bureaucratic administration, which demands "formalistic impersonality" and work "without hatred or passion", "without affection or enthusiasm", in short, without any "personal considerations". Although it is unclear whether school mathematics is merely mirroring the bureaucratic organisation of school here, or if it can be understood as an institution for preparing and selecting adolescents for work in administration (Kollosche 2014), it becomes clear that Anja's classroom requires a certain kind of identity, one which values a certain disciplining of the body for mental work.

Interestingly, while Anja acknowledges the discursive struggle between the disembodied understanding of mathematical activity and the discourse about her bodily active self, she cannot present an alternative discourse that would allow her to unite mathematics with her interest. Different from Anja's thoughts about togetherness, where she proposed alternatives towards a collaborative mathematics education, but similar to her discussion on the relevance of mathematics, where she did not present an alternative discourse that would negotiate between her interests and school mathematics, Anja here reaches a dead end in her identity work: eventually, the antagonistic points of Anja's discursive articulation on her relation to mathematics appear irreconcilable.

4 Conclusion

This paper set out to explore discourse theory as a way to study identity as identity work in mathematics education from a socio-political perspective. Discourse theory provided us with a framework of thinking about identity work in the context of discourse as an ongoing configuration of self and other. Thus, we were able to approach Anja's discursive articulation practice as a struggle in-between antagonistic discourses related to student and teacher and to discuss how far this practice resembles contemporary concerns in mathematics education research and praxis. Anja's identity work, understood as her attempt to pave a path between mutually conflicting discourses, can also be understood as producing sad affects which have led to her refusing mathematics as her discourse closure. In this realm, Anja's identity work remains contingent on the socio-materiality of her school mathematics experience but, at the same time, strives to remain open for alternative discursive articulations of mathematics classroom culture and activity.

From a theoretical perspective, we think that discourse theory proved to be a helpful approach towards unfolding student identity work as a political project in the mathematics classroom. Specifically, discourse theory allowed us to appreciate Anja's struggle to discursively articulate her relation to mathematics around the nodal points of dignity, togetherness, relevance and bodily activity. By emphasizing the lack of such qualities in her classroom, she arrives at a partial fixity of her identity work as a refusal of mathematics. Refusing mathematics has been articulated by her as a discourse closure that resorts to elements also found in the wider literature addressing students' alienation of the subject of school mathematics. Nevertheless, Anja's discursive articulation of mathematics needs to be appreciated, with Laclau and Mouffe's discourse theory, as a contingent and temporal assemblage of discursive and non-discursive elements from her socio-material reality that features very specific moments in the central position of nodal points, and it has to be expected that hers or other students' experiences might result in different articulations at different spaces and times. Consequently, discourse theory allows researchers to trace connections in how the subject experiences specific events within the societal dimensions of local settings but, nevertheless, is related through the logic of equivalence and difference with global discourses on what is counted as proper mathematics. In the case of Anja, her relation with mathematics can be understood as a struggle with how this 'proper mathematics' becomes materialised in her classroom and retains a temporal hegemony—a hegemony that, nevertheless, is discursively reconstructed and has the potential to become subverted. In this, the hegemonic discourse of the learner of mathematics is figured as a disembodied, rule-following and solitary mind-worker on textbook materials whilst Anja's identity work identifies her as a bodily active and collaborative individual ready to espouse an alternative discursive materiality.

The illumination of the ongoing struggle between Anja and her classroom experiences through discourse theory prevents us from taking sides too easily: not only would it be inappropriate to defend the status quo of Anja's classroom reality and ask her to adjust, it would also be undue simply to reject the practice of Anja's teacher and to reshape mathematics education according to Anja's needs. Indeed, a deficit ideology lurks in the above interpretations where blame is put on either teacher or learner. In mathematics education, it is necessary to pay attention to the quality of teaching and learning practices. But, at the same time, we need to consider the need for appropriate shifts beyond an easy turn towards blaming individual students, their families or teachers (who are also trapped in such conflictual discourses). Instead, we need to pause and interrogate both the effects of certain educational policies on people's school lives, and the effects of encountering perspectives that, instead

of emancipating people, enslave them into practices that produce sad affects. As we saw here, this can easily happen despite the ‘good intentions’ of teachers in following strictly what might be school policy, the curriculum or the textbook. Here, discourse theory allows us to avoid blaming either the students or the teacher by locating the divergent discourses from both sides in the wider discursive field.

Thus, the discourse analysis of Anja’s interview has entered a space in which classroom practice can be negotiated between all participants. A fruitful discussion would have to include the academic and popular discourses that frame the reality of mathematical experiences in and out of the classroom, influence how students experience mathematics, and direct how mathematics education could be reorganised. This discussion could illustrate how participants, who, as we could see in Anja’s case, often lack experiences to connect to within their personal discourses, could pursue their identity work through the articulation of their positions within the widening discursive field. Here, we might need to ask, how could we move forward without blaming the teacher but still recognising the potential of emancipatory relations that do not suffocate each student with an ideal ‘identity’ construct. Although such a configuration might be facilitated with research, it will eventually have to take place within the mathematics classroom.

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