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Mapping a collaborative cartography of the encounters between the neurosciences and early childhood education practices

Lena Aronsson and Hillevi Lenz Taguchi

Department of Child and Youth Studies, Stockholm University, Stockholm, Sweden

ABSTRACT

This paper takes its starting point in a shared problem of concern, formulated in terms of what might be produced – or not – as effects of encounters between neuroscientific research and preschool practices. The aim is to show what emerged in collaborative encounters, in what is theorized and practised as Deleuzo-Guattarian-inspired cartography mapping exercises. During regularly scheduled staff ‘reflection meetings’, an invited doctoral student enacted, participated, and documented these encounters with preschool staff at three preschools in the same area outside Stockholm, Sweden. Two major lines of articulation, converging around a core problem, were collaboratively constructed and put on this ‘map’. These were then actively put to play to be disrupted and deterritorialized, making ways for new diverging lines and potential reconfigured forms of literacy practices.

KEYWORDS

Educational neuroscience; Gilles Deleuze and Felix Guattari; cartography; deterritorialization; collaboration; matter of concern; praxiographical fieldwork; early childhood education

Background and the problem from which this study emerged

To know more about our brain–body-in-culture (Schmitz, 2016, p. 143) seems to be an increasing contemporary desire in a number of fields, whether with an inside-out neuro-biological determinism’s perspective, or with an entangled co-constituting nature–culture approach (Lenz Taguchi, 2016a; Schmitz, 2016). The neuro- prefix is, however, most often and regretfully used simply to ‘designate a novel explanatory framework’ (Rose & Abi-Rached, 2013, p. 6) to already established disciplinary interests, rather than creatively reconfiguring them in the encounter (cf. Lenz Taguchi, 2017). Since the OECD dedicated the first decade of the twenty-first century to The Learning Sciences and Brain Research (OECD, 2007), education has become a vital part of this still emergent desire, primarily linked to the contemporary inclination for evidence-based learning practices. In Sweden, however, applying and designing teaching practices based on neuroscientific evidence (Ingvar & Eldh, 2014; Klingberg, 2013; Olvestam & Ott, 2010), have until quite recently been more or less resisted and barely considered legitimate. This is specifically evident in early childhood preschool practices, which in Sweden encompass 83% of all 1–5 year olds in up to full-time municipality subsidized EduCare system, defined as the first stage of the education system (SNAE, 2016).
A most probable reason for this scepticism is that preschool practices in Sweden, for almost two decades, have been immensely influenced by critical psychology (Burman, 1994/2016; Dahlberg, Moss, & Pence, 1999/2007; Henriques, Hollway, Urwin, Venn, & Walderdine, 1984/1998). This critical stance was taken as a reaction to earlier views of the child as vulnerable, dependent on an interpersonal child–adult attachment, and developing in predetermined stages based on scientific observations presented as normal distributions. Accordingly, the preschool’s task was primarily to care for the children and for adults to enhance a development in accordance with such scientific knowledge. This conflicted with the then emerging idea of children as competent co-constructors of their development and learning in an active relation to their surrounding world (Dahlberg et al., 1999/2007). A central component of this critique was the stance taken against determining and predictive normalizing accounts and psychological explanations which were seen to objectify the child. In contrast, a social constructionist focus on social relations and the force of discursive (de)constructions was understood to enable an independent and competent subject and enhance non-determinate or previously unthought potentialities (Dahlberg et al., 1999/2007; Lenz Taguchi, 2000, 2007, 2008; Lenz Taguchi & Munkhammar, 2003). Since the mid-1990s, there has thus been a steadily growing resistance in the Swedish preschool culture to what has been conceptualized as normalizing psychology-based theories and what has been understood as individualizing strategies based on child observations to determine the child’s normal development. The subsequent and emerging neuroscientific research on children’s development and learning has primarily been taking place in cognitive psychology and has thus been discarded on the same grounds. During the last 20 years, preschools have, sometimes in close collaboration with local research environments, engaged in actively developing social constructivist, socio-cultural, as well as critical-emancipatory and post-structurally informed learning practices (Dahlberg et al., 1999/2007; Lenz Taguchi, 2000, 2007, 2008, 2010; Pramling & Pramling Samuelsson, 2013). This gradual but persuasive trend, whether in the practices, in research, or in subsequently revised curriculum texts, aims to find ways to think beyond the individual child’s development and skill acquisition as effects of the socio-cultural and material learning environment. Not only is ‘the individual’ displaced from the actual child towards contextual constructions, but it also includes a discourse of children’s influence as consisting of individuals in a cohesive, albeit diverse collective. Consequently, the pedagogical focus has almost exclusively been geared at children’s cooperative learning in shared and distributed group learning activities, and the material environment as an active teaching agent (Lenz Taguchi, 2007, 2008, 2010).

Group learning is supported by the preschool curriculum that explicitly emphasizes integration and that ‘children who occasionally or on a more permanent basis need more support and stimulation than others should receive such support in relation to their needs and circumstances’ (Lpfö 98/2010, p. 5). Hence, children with special needs or disabilities should not only be organizationally integrated but also pedagogically. Training and special support are given by specialist teachers, but within the large group of children and in ordinary activities if possible. According to the School Act, all children from 1 year of age are offered preschool if the parents work or study, and from an assessment of the child’s needs for support and stimulation if necessary (SFS, 2010:800). Children with special needs are to be prioritized in admission. Thus, the educational orientation towards group-pedagogical practices also includes working actively with the curriculum’s
values that concern solidarity and diversity (Lpfö 98/2010, p. 3). This is expressed as empathy and understanding of vulnerability and different living conditions, but also as diversity as valuable and an asset for the group. The curriculum’s fundamental values aim to develop openness and respect for variations in gender, ethnicity, religion or other faiths, social or cultural backgrounds, as well as function impairments. It is explicitly stated that ‘mobility across national borders creates cultural diversity in the preschool, which provides children with the opportunity to show respect and consideration for each individual irrespective of background’ (Lpfö 98/2010, p. 4). In line with these values, it is emphasized that bilingual children and children with other cultural heritage than Swedish should have the possibility to develop a multicultural identity and have support in developing both their mother tongue and the Swedish language (Lpfö 98/2010, pp. 5–6).

These, historically, fairly recent dominating collective enunciations, to speak with Deleuze and Guattari (1987, p. 7), converge with previous articulating lines in the Swedish preschool tradition. For instance, and more precisely, there have been lines of articulation based on Freirean dialogue pedagogy during the 1970s, and on Deweyan pragmatism, dating back almost a century to the early Volk-Kindergarten movement of the 1930s (Lenz Taguchi & Munkhammar, 2003). Moreover, preschool pedagogy in Sweden is most often described in terms of its fundamental difference as compared to school practices, proclaiming its holistic integration of care and education (Lenz Taguchi & Munkhammar, 2003). This phenomenon is internationally sometimes referred to as the Scandinavian EduCare model. In relation to the above, one can assume that the encounter between the neurosciences and early childhood practices in Sweden might take on different contours compared with other national preschool and school contexts, based on partly different dominating collective enunciations and their connected pedagogical practices (e.g. Ferrari, 2011; Rose & Abi-Rached, 2013).

**Introducing the study and the aim of this paper**

The study emerged out of curiosity, spurred by popular media, among preschool teachers and staff in a municipality outside Stockholm, for what the neurosciences might have to offer their practices of literacy education. The concept of literacy in Swedish early education is often referred to as extended (e.g. Kress, 2010). Literacy thus comprises not only linguistic competence and communication but also creative expression, multimodal processes, and developing a personal identity and the ability to listen, reflect, and express own views and understand the perspectives of others (Kress, 2010; Lpfö 98/2010). Notably, the personal and individual aspects here should be understood together with the preschool’s task of developing ‘the children’s ability to function both individually and in a group’, and an ‘educational approach, where care, socialization and learning together form a coherent whole’ (Lpfö 98/2010, p. 9). Consequently, the ways in which literacy practices are approached can differ extensively, focusing more on one or two aspects of literacy rather than others, which was the case with the three preschools selected for this study. The staff agreed to actively engage in what we will theorize below in terms of a study of collaborative encounters and cartography mapping, inspired by Lenz Taguchi’s (2000, 2007, 2008, 2010) feminist deconstructive work with practitioners, as well as by
her adaptations of Deleuze and Guattari’s philosophy and methodology of cartography mapping (Lenz Taguchi, 2016a, 2016b, 2017).

Taking the strong feminism in this previous work into account, the present project was correspondingly designed together with the staff based on a *shared* agreement on a joint *matter of concern* (Stengers, 2008, p. 58; in Lenz Taguchi, 2017). The agreement was to explore what the encounter with neuroscientific knowledge might do (or not do) to everyday practices, and what possible beneficial effects this might have on the teachers’ and staff members’ ways of thinking. Interestingly, the driving force of the teachers’ desire to collaborate was *both* the didactic problems related to children’s literacy development and *also* the attraction – and hesitation – around what they called ‘brain research’, meaning neuroscience in a broad sense. This can be understood as an attempt to claim access to knowledge that has not previously been part of the preschool theoretical frame. In that sense, the teachers’ scientific curiosity challenged existing contextual norms in the preschool field. Aronsson, as a researcher, planned and negotiated a set of practices to put this shared matter of concern to work. After some negotiation, the staff of three units gave their informed consent and thereby agreed to collaboratively engage in and investigate the encounter between contemporary neuroscientific knowledge and their daily literacy practices during a period of 9 months.2

Against this background, the aim of this paper is to lay out the collaboratively constructed ‘map’ of the various encounters produced during this endeavour. Importantly, the ‘map’ does not constitute a representation of the events taking place. Instead, it is constructed to perform the doubled movement of, on the one hand, identifying emerging lines of articulations and problems that might evolve as an effect of these encounters and, on the other hand, engaging in creative rupturing and deterritorializations of diverging lines (Deleuze & Guattari, 1987; in Lenz Taguchi, 2016a, 2016b, 2017). Such diverging lines would – if ever so subtly – come to initiate thinking on how to potentially transform aspects of daily preschool ways of thinking and doing literacy, as this paper will show. A Deleuzo–Guattarian mapping exercise thus entails what we might previously have conceptualized in terms of a self-critical deconstructive movement of reflection on your own practices as preschool teacher together with a researcher (Lenz Taguchi, 2000, 2007, 2008, 2010). Equally important is, however, the reconstructive aspect of experimental thinking that might lead to concrete transformations of practices with children, which are closely connected to the strong feminist collaborative agenda of this methodology (Lenz Taguchi, 2000, 2007, 2008, 2010).

### The methodology of collaborative encounters and cartography mapping

This study is situated within the realm of a feminist relational materialist paradigm (e.g. Barad, 2007; Braidotti, 2013; Haraway, 2008), and inspired by a praxiographic methodology (e.g. Bueger, 2014; Mol, 2002). Praxiography is a term deployed within actor–network-theory to displace ethnographic methods towards focusing particularly on practices rather than discourse (Mol, 2002). A relational materialist stance is underpinned by an onto-epistemological assumption; i.e. knowing and being, and discourse and matter, are seen as interwoven. It is feminist in its rejection of an asymmetrical binary thinking, whereby a ‘different from’ also implies ‘less than’, and positioning women, children, animals, as well as nature, contrary to culture, as incomplete contradictions to the
Masculine and Hu(Man) norm (Braidotti, 2013, pp. 24–25). A feminist ‘turn to matter’ (Pitts-Taylor, 2016b, p. 16) can ‘help to elucidate its specificity and particularity, and to reveal the stakes of doing so’ (Pitts-Taylor, 2016b). This theoretical and methodological framing implies that the research and the researcher are relationally intertwined and mutually constituted by, and constitutive of, everything from data, analysis, to the site of research itself (Barad, 2007; Mol, 2002). The researcher’s interest is thus directed towards what constitutes the site as co-constituted material-discursively enacted practices and how they emerge as effects of relations. Researchers, as other human actors, are understood to mutually self-differentiate (Lenz Taguchi, 2017) in these co-constitutive encounters: that is, encounters with other humans, but also – in this case – with neuroscientific texts, as well as other material or more more-than-human actors involved in the research apparatus that was set up for this project (Barad, 2007). Research realities, as other realities, are seen as produced in multiple versions, depending on which relations are focused on as involved and productive (Aronsson, 2017; Lenz Taguchi, 2017; Mol, 2002).

The research apparatus was set up to encompass 9 months of collaborative ‘fieldwork’ performed by Aronsson. This ‘fieldwork’ was organized in 3-week periods of alternately participating in everyday preschool practices, alternately in weekly staff ‘reflection meetings’, and then pausing 3 weeks from that particular unit to go to the next, and so forth. The ‘reflection meetings’ were ordinarily a mix of planning, evaluating and reflecting on everyday activities with the children. A main activity was discussing the teachers’ observations of children’s activities, most often materializing as written notes, but sometimes as photos or film clips. Typically, one of the first meetings, of each unit, started with the researcher offering to ‘intervene’ with an excerpt from neuroscientific literacy research (e.g. Dehaene, 2010; Kegel, Bus, & van IJzendoorn, 2011; Klingberg, 2013). These were chosen based on what the teachers had expressed as urgent pedagogical issues for them to discuss. The idea was to collaboratively unfold what lines of dominating articulations might underpin this particular excerpt, and how these might connect – or not – to staff’s experiences of their own literacy practices. At the next or a later meeting, the conversation would relate back to any of these neuroscientific excerpts: putting it in relation to any of the new documented sequences of the pedagogical practices performed during the last 2 weeks by the teachers and which they wanted to discuss further. Now, the concern was in what ways the lines of articulation in the research might connect – or not – to the lines of articulation inherent in that specific event of literacy practice performed with the children.

Every meeting was preceded by a joint agreement on what question or event the teachers found most urgent or wished to focus on. The conversations in these meetings were documented in written notes by the researcher during meetings and directly after. These notes were most often distributed to the teachers ahead of the next meeting, as preparation but also for the teachers to discuss the researcher’s notes and make corrections, and thus constructing a new set of response data (Lenz Taguchi, 2000). These notes also served as an ongoing evaluation of staff literacy practices. These had important empowering effects, as the teachers were now better equipped to theoretically underpin and ‘explain’ their practices to their superiors and parents.

In relation to the above, the collaborative ‘fieldwork’ can perhaps better be described in terms of an active intervening into practices, both neuroscientific excerpts and the
presence and participation of the researcher herself. Fitzgerald and Callard (2015, p. 4) use the term intervening as they call for ‘entangled experimentations’ in the intersections between the neurosciences and social sciences/humanities, referring to the classical Science concept of experiment in terms of ‘a space of intervention’ (p. 4). The crucial component in that ‘space of intervention’ is performative rather than the production of facts and answers. However, the actions taken, and the contributions made, are deliberately enacted to affect the relations between human, material, and discursive actors involved in the experiment, set up to enact the research apparatus, as Barad (2007, p. 142) theorizes.

In the case of the present study, this corresponds to performative relations between teachers, their beliefs, the discussed neuroscientific excerpts from articles and books, and, of course, the preschool practices, involving the children, materials, planning, structures, as well as the enacted literacy activities.

The participative praxiographic observations, performed by the researcher during recurring periods, produced important documentations to fuel the discussions in the staff ‘reflection meetings’. Typically, the researcher visited the schools from 8 am to 2 pm, 2–3 days a week, to participate, watch, listen, observe, but interact only on the margins of the literacy practices, which were organized and performed by the staff. In terms of praxiographic observations, the written notes, in line with the above theoretical positioning, addressed relations between human, material, and discursive actors, and how these co-constitute each other, and thus make each of the actors and their respective practice self-differentiate (Lenz Taguchi, 2017; Mol, 2002). Thus, the field notes describe not only what the teachers and children did and said but also what activities, what material, and what pedagogical intentions were staged. The researcher gaze was also directed towards what emerged in the encounter between, for example, teachers and a reading activity, in terms of an ongoing distinction between the teacher and the activity respectively – that is, how the teacher and the reading activity produce themselves in new versions through the encounter.

When enacting the collaborative mapping exercises during staff ‘reflection meetings’, documentations and excerpts were simply put on the ‘map’ (the table) between participants. The choice of which texts and what research to use was determined by the questions posed by the teachers, related to the literacy practices and the documentations made by them, but sometimes also made by the researcher. This process can literary be understood in terms of constructing together a ‘map’ as a space of creative play (Lenz Taguchi, 2016a, p. 39), between multiple present actors, to conduct creative experiments on (Fitzgerald & Callard, 2015). The guiding question was what dominating lines of articulations seemed to inform and thus speak the particular relations evolving in an event of practice, or between two or more events of practice, or alternatively, between such an event and an excerpt of research. In other words, why is it that this or that particular relation is formed rather than another? What does this connection produce in the next instance, and why is it this new relation is subsequently produced, rather than another, and so on. The excerpts from neuroscientific literacy research (e.g. Castro-Caldas, Petersson, Reis, Stone-Elander, & Ingvar, 1998; Coldren, 2013; Dehaene, 2010) were sometimes used to contrast documentations from practices, but more than often the dominating lines of articulations of the research seemed to connect in curious ways to similar or corresponding lines of articulation in the documented preschool practices, as we are about to show.
Mapping a collaborative cartography

A Deleuzo–Guattarian-inspired cartographic mapping exercise is not about representing, but it is all about constructing a map as a field of play to experiment on (Lenz Taguchi, 2016a). There is no given starting point and ‘[t]he map is open and connectable in all of its dimensions; it is detachable, reversible, susceptible to constant modification’ (Deleuze & Guattari, 1987, p. 12), that is, a moving construction of converging and diverging articulations and the practices connected to them. Two forceful and recurring lines of articulation, which can be understood to inform and ‘speak’ the events of all three preschools’ literacy practices, could be identified to emerge on the constructed maps. The first we call: Group learning: the group as an organism in itself. The second: Individualization without the individual: majority decisions as directives. These two iterative lines of articulation swirl, as Deleuze and Guattari (1987, p. 11) express it, together to form a strong circle of convergence around a key problem inherent to the three preschool units’ literacy practices. This problem concerns the didactic conflicts between enhancing learning processes in the group and individual children, respectively. We will refer to this problem as the problem of group learning vs. individualized learning, with a realization of a general neglect of and/or disbelief in individualized learning practices as a consequence of the identification of these dominating lines of articulation, which the encounter with neuroscientific research evoked. Subsequently, the mapping of this problem would incite reconfigured and innovative ways of thinking about group learning and individual literacy practices.

Group learning: the group as an organism in itself

Much discussion arose in the three groups of staff in relation to issues of how to prioritize and choose to direct the pedagogical gaze when supervising children engaged in literacy activities. This happened as utterances like ‘the children said or did, this or that’, when describing what had happened in a sequence of documentations, were put in relation to a sequence of neuroscientific literacy research, saying something along the lines that ‘individual children connect individually to different aspects of a story read to them: for instance, one child might connect to own memories whereas another will connect to the story in itself’ (cf. Dehaene, 2010; Kegel et al., 2011). During such events of encounter, members of staff would, for instance, burst out laughing, and/or state something along the following lines: ‘We actually don’t document at all, in order to know how each of our children connect differently to the stories we work with, do we?’ or ‘How do we know how to support each of the children’s ways of making meaning in their own specific ways from those stories we use?’

Encounters like the above made it possible for the three groups of staff, in their respective collaborations with the researcher, to formulate examples of dominant lines of articulations informing their literacy practices. What dominated these articulations was that the respective practices all seemed to focus on ‘the children’ as a learning group, and even as an organism in itself, rather than a number of individual children who might differ from each other in the ways that they would take on and relate to a specific learning activity. In the emerging discussions, it was possible to connect this line of articulation informing and speaking the events of a dominating part of the three schools’ literacy practices to
social constructivist and socio-cultural Vygotskijan (Nilsson & Ferholt, 2014) ideas about the social construction of language in play, learning from peers, and meaning making as mediated within the group.

This socio-cultural line also converges with dominating ideas in the Swedish preschool culture, described in the above background, declaring an ideological preference for group-based learning, with reference to the subjugating and normalizing risks involved when preschool children’s accomplishments are measured in relation to predetermined goals or developmental theories (Burman, 1994/2016). In the first preschool curriculum launched in 1998, this articulated line of thinking was expressed as a necessary shift from understanding the child as a separate entity with particular cognitive assets, to a child, socially constructed by others and the environment (Lpfö, 98/2010). This shift also implied a different role of the pedagogue vis-à-vis the individual child as merely a part of a group-learning organism, unit or corps of learning, in which the individual would automatically benefit in terms of learning as a group member (e.g. Elfström, 2013). Following this articulating line of thinking and practising, group learning and the enhancement of individual development and learning are still seen as inherently and theoretically contradictory, and deemed as virtually incompatible in terms of being part of the same preschool practice (cf. Dahlberg et al., 1999/2007; Lenz Taguchi, 2008).

Another example of a matter of intense discussion was ‘how to ask good questions’ during literacy activities. According to the staff, the normative didactic method was to ask children meta-questions about aims, thoughts, and associations connected to the activity. Elfström (2013) describes this as ‘the practitioners’ wish to “plug in” to children’s thinking’ (p. 167), to know more about how they perceive and understand the world around them. These discussions featured two diverging lines of articulation: one which intertwined and converged with those lines that affirmed the idea of the group of children as a learning organism, and the other diverging into another direction, and connecting to another territory, supported by a neuroscientific thinking. Interestingly, these diverging lines seemed to connect to the relative age of staff’s preschool teacher education, which will be discussed below.

When discussing ‘how to ask children good questions’, other inquiring into aspects of power production were also evoked, such as: ‘Who’s in charge of asking?’ ‘Who’s entitled to formulate the questions, and who can answer and interpret the answers?’ ‘Is asking questions something that teachers do to increase their own knowledge of children’s thinking, or is it aimed to support children’s exploring in a more direct way?’ Although, some of the teachers made the reflection that the questions they asked ultimately were aimed to ‘encourage children’s own ability to pose questions’, the overarching discussion was whether adults ultimately asked such questions urged rather by their own interest in how ‘children’ generally think about the world around them. Do you ask questions to enhance individual children to ask more, and more challenging, questions in order for each of them to develop their own learning, and thus the group’s learning at the same time; or, do you ask questions merely out of your own curiosity and urge to learn as adult? In summary, the diverging lines of articulation here concerned what was foregrounded in the fashion, and ultimately why, questions were asked. Was it the learning group as an organism to be documented in terms like: ‘the children saw, said, learned … ’, or individual children’s learning documented in terms like: ‘X said, saw, said and learned’, as part of an
encouraging – but nevertheless – group process as supporting backdrop, constituting the conditions and milieu of individual children’s learning?

In the discussions, teachers educated during the last 15 years tended to foreground the group as an organic whole, a learning unit. In the encounter with a more individualizing neuro-educational line of thinking, they expressed conflicts in relation to the practice of identifying individual children’s learning processes. ‘In preschool, we don’t assess children’s achievements. Focusing on the individual child’s performance as individual competence and as part of the group competence would be to judge or evaluate in a way that is more like school, not preschool’ explained one of the teachers. They either did not want to identify the individual learning processes, based on theoretical reasons, like connecting it to a ‘school-like assessment’, or they expressed their lack of knowledge about the individual child’s skills and competences. The latter became especially apparent when parents inquired about their own child during parental meetings, since staff’s focus was rather on ‘the children’ and a collective story of what the group had learned.

In contrast, for those teachers and staff educated before the turn of the last century, in an era when Piaget’s, Ericsson’s, and Vygotskij’s constructivist learning focusing on individual children’s learning were still taught, the encounter with neuroscientific lines of thinking reawakened resisted forms of thinking. One of the teachers said: ‘I’ve always tried to have knowledge of each individual child in order to offer them the opportunity to work together in different constellations. And when arranging the groups, it’s important that the individual is not subordinate to the group’. Hence, the encounter with the neuroscientific excerpts of research would rupture some of the dominant lines of thinking and doing, but in different ways for different staff members.

**Individualization without the individual: majority decisions as directives**

The second dominant line of articulation we have named is individualization without the individual: majority decisions as directives. It summarizes what emerged in the mapping exercises in the three groups, featuring encounters such as the following. When discussing the plasticity of the brain (Klingberg, 2013; Neville et al., 2013) and connecting that to ‘how to divide the children into smaller groups’, the teachers identified taken-for-granted norms and ideas. They made reflections like: ‘Children’s interests must be taken into account’ ‘Subdivisions by age is almost never questioned, but to talk about maturity … impossible’ ‘We never seem to talk about individuality as individual brains, only as individual [social and family] background’.

The line of thinking in the example above, on the ability of the brain to change due to experiences (Klingberg, 2013; Neville et al., 2013) and the pedagogical task of subdividing the group, clearly converges with the type of thinking about individualization specific to the Swedish national curriculum (Lpfö 98/2010). Here, individualizing has nothing to do with individual learning-trajectories but is instead primarily referred to in terms of ‘giving children – as a group – influence’ over their daily life in the preschool and learning-contents. Correspondingly, as the above example shows, the encounter with a neuroscientific line of thinking revealed that the kind of individualization that is practised is based on children’s majority decisions – the idea of the collective – rather than taking the individual child’s wishes or interests into account. The majority interests tend to be regarded
as everybody’s interest, as Elfström (2013, p. 232) concludes. Individualization is performed in practices of a collective group enunciation, merely consisting of individual voices as part of a democratic vote. Or, as we have chosen to summarize this based on the playful disruptive input by one of the staff members: ‘Individualization but without the individual child’.

This second dominant line of articulation thus converges with and supports the former. Children are being given ‘voice’ as members of a group, and are taught and trained as part of a collective. Hence, the core concept of ‘the competent child’ (Dahlberg et al., 1999/2007), that has been in the spotlight now for almost two decades, constitutes an image of the child that does not develop according to predefined stages, but is instead regarded as competent, curious and capable of interacting independently with the world. However, this is an image which in practice constitutes a representative of a collective, for the grown-up world to listen to and learn from (Dahlberg et al., 1999/2007). What emerges in the encounter between Swedish preschool practices and neuroscientific lines of thinking is thus the re-emerging of an individual child that should not merely be treated as part of a collective will, voice, or learning process. Rather, as what evolved as a new diverging line of thinking in the mapping exercise, this individual child can instead be understood as different; both from other individuals and foremost differentiating in relation to itself – self-differentiating – while developing and learning in its own unique way (cf. Lenz Taguchi, 2017). This reconfiguration of the individual entails a reinterpretation of the relationship between the group and the individual. Rather than understood as incompatible, a group and its individuals, in Deleuzian terms, are different bodies in relations of ongoing differentiation: as processes that depend on those relations (Deleuze, 1994). In preschool practice, this means that group learning can be practised as teachers are also and simultaneously concerned with enhancing individual children’s learning, as vital agents in a learning group, but in a process of self-differentiating individual learning.

**Mapping, rupturing, and the construction of new diverging lines**

In Deleuze and Guattari’s (1987) writing on mapping, they describe the process in terms of following the root threads, or what we here refer to as the lines of articulation, of a rhizome (cf. Lenz Taguchi, 2016a, 2016b). These swirl and come together to form ‘circles of convergences around successive singularities’ (Deleuze & Guattari, 1987, p. 11). In this study, the practitioners and researcher collaboratively referred to one such major circle of convergence in terms of forming a conjunction around a particular problem. All major and minor lines identified as emerging in these encounters during the staff ‘reflection meetings’ seemed to be connected to and intertwined in some way to this problem. This problem concerned the didactic conflicts arising between enhancing learning processes vis-à-vis the group as an organism and/or individual children, respectively.

Deleuze and Guattari (1987) write about cartography mapping in terms of ‘see[ing] whether inside that line new circles of convergence establish themselves with new points located outside the limits and in other directions’ (p. 11). In practice, this meant actively rupturing or displacing the meaning of the dominant lines of articulation, making it possible to cast possible new lines of thinking towards another territory on the map. One such diverging line concerned what emerged in the encounter between neuroscience and the dominant ways of how to understand psychology. Even though
the terms used was ‘neuroscience’, ‘neuroscientific research’, or ‘brain research’, it was mainly texts and research within the cognitive neuroscience field that were used, as the teacher’s interest was in learning, memory, attention, language, and other cognitive functions (Fischer, 2011; Klingberg, 2013).

The encounters between a handful of neuroscientific research excerpts and documented preschool literacy practice aroused lively discussions about how and why the Swedish preschool field has come to reject all forms of psychology. Encountering neuroscientific findings (Fischer, 2011), children’s recurring cycles of learning and development can, however, be observed to jump and drop in complex and unpredictable patterns. Such findings conclude that neurocognitive development should not be conceived as a ladder of successive stages, but as a complex network of interactions, nested cycles, and clusters of discontinuities: ‘a web of many strands’ (Fischer, 2011, p. 131). Hence, the encounter with cognitive neuroscience does not reclaim psychology in a simplified way. Rather, apart from disrupting the two dominating lines of articulation outlined above, the straw man image of a normalizing psychology was also ruptured and subsequently reconfigured.

As staff talked about how the encounter with cognitive neuroscience had brought back a new and reconfigured focus on the individual child, this also meant a reconfiguring of that classic and troubling nature–nurture binary. In the Swedish preschool, as in other social institutions, nature and culture can be understood as two different starting points that determine children’s development and learning in different ways during different socio-historical periods. Whereas nature during the major part of the twentieth century was seen as a determining baseline, which culture could only do its utmost best to compensate or complement, the turn to social construction in the 1990s instead took its starting point in culture and overemphasized the constitutive powers of discourse to the point of actively neglecting biology and the body altogether (Lenz Taguchi, 2010; Mol, 2002).

The issues of nature–nurture seemed to intrigue some of the members of the staff in empowering ways. The weary question about the extent to which genetic disposition, or the nurturing social circumstances, plays the more significant role than the other could eventually be replaced with discussing how nature–nurture might rather be intrinsically entangled and co-constituted (Castro-Caldas et al., 1998; Fischer, 2011; Immordino-Yang, 2011; Schmitz, 2016). In this new articulating line of thinking, the child’s development and learning is understood in terms of a naturculture ‘coactive emergence’ (Mascolo & Fischer, 2015). As noted above, development, in this perspective, does not proceed in a linear stage like progression, but is nonetheless structured or directional, as it exhibits both order and variability. However, what is perceived as order and systematic development is nevertheless always an emergent product of social and environmental interactions that can never be fully foretold. As Mascolo and Fischer (2015) write: ‘Novel developmental circumstances may foster the coactive production of novel and unanticipated forms. This principle applies both to individual developments as the process of evolution’ (p. 153).

From a didactic perspective, the question could now instead be put in terms of how ‘nature gets nurtured’ in preschool practices, but also correspondingly how ‘nurture might – eventually – alter nature’ (cf. Schmitz, 2016). The past ‘forbidden thinking’, in terms of development as predetermined stages, was now to be replaced by complex
reflecting on how to make practices achieve ‘situated and individuated nurturing’ in relation to individual children. Hence, the old and taken-for-granted ways in which psychology and genetics have traditionally been understood as biologically determining children’s development were gradually and playfully replaced by discussing the natureculture interplay (Pitts-Taylor, 2016a, p. 8). Connecting this to the feminist relational materialist stance taken in this paper, we align ourselves with Barad’s (2007) performative understanding of how matter and discourse, and nature and culture, co-produce and co-constitute realities. The teachers shifted their discussion from whether genes or environments have the greatest impact to talk about situated nurturing, and thus shifted from a binary thinking to focus on what is produced in an intra-active and mutually transformative relation.

Experimenting on the ‘map’ with the dominating lines of articulation that had surfaced during earlier discussions, a new diverging line of thinking about the collective emerged. The notion of ‘children as a collective’ was instead reconfigured in terms of an ‘entangled fellowship of multiple learning individuals’, as well as ‘individual children’s multifaceted and embodied multiplicities of learning’, when thinking along the lines of nature-culture entanglement, and the interplay of brain–bodies-in-culture (Schmitz, 2016), as shown above. In this new territory of the ‘map’, it was possible to reconnect to some of the staff’s reactivated knowledge of the Vygotskijan (Nilsson & Ferholt, 2014) learning concept. This concept contains the practice of trying out imaginary roles and contexts, making children’s play and language crucial tools for learning. Children’s play focuses on what is ‘to be’ something or someone, by experimenting with an ‘as if’ in a future-oriented direction of successively new becomings. In the encounter with a neurocognitive concept of learning, which is oriented towards how to retrieve and use what is already learnt to reconsolidate that learning, learning can now be understood in different terms: as consolidating and retrieving (in an imaginative and experimental play) with already embodied and ‘coded’ memories in the body’s brain (Pitts-Taylor, 2016a), to be reconfigured in a relearning process. This means that learning, from the perspective of an individual child, is not about every child learning the same thing, which the dominant line of articulation of the learning group as an organism in itself implies. Individual children’s learning can instead be understood in terms of an ongoing process of ‘a multifaceted self-differentiation’ (cf. Lenz Taguchi, 2017). Hence, children will individuate, and become continually new versions of themselves, within a community of others, as well as other non-human, or more-than-human, matter (Lenz Taguchi, 2017).

What, then, does this mean for didactic strategies in literacy practices? One of the recurring discussions in the staff ‘reflection meetings’ concerned different ways of observing and documenting each child’s self-differentiated learning processes – now in terms of effects of brain–bodies-in-culture (Schmitz, 2016) intra-actions (Barad, 2007). This new way of thinking, as many of the staff members would say by the end of the 9 months, forces practitioners to think closely about how the learning group enhances individual children’s learning, as well as how the individual child, not to forget, mutually enhances the group’s collaborative learning. This implies doing things differently: plan literacy practices differently, ask questions differently, and document your practices differently, i.e. new sets of practices that have just merely begun.
Conclusion

The collaborative cartography mapping performed in this study shows that it is possible to reconfigure dominant lines of thinking in new productive and empowering ways together with groups of preschool staff. In this case, it was neuroscience and education that was subject to the mapping. However, as a methodology of tracing converging and diverging lines of thinking, it may well be used for any kind of epistemological encounter. Basically, this methodology is about materializing theories of science and learning in a way that is situated and closely connected to the practices and the practitioners. In the cartography mapping reported on in this paper, knowledge of the human brain, even as it is put into the context of brain–bodies-in-culture (Schmitz, 2016), puts a renewed focus on the individual child. In the context of Swedish preschool education, this generally causes both resistance and suspicion among predominantly staff educated more recently, as well as researchers, who are firmly convinced of the risks involved with any theory connected to psychology (Moss et al., 2016). However, and as this collaborative endeavour has shown, the encounter between the neurosciences and preschool practices does not necessarily have to cast practices back into the 1990s’ critically formulated choice between either enhancing learning by ways of the social constructionist environment of the learning group or enhancing the individual child as a separate mind and entity as two incompatible choices. If carefully enacted, and informed by the multiple takes on educational neuroscience as well as the new developmental sciences that flourish today (e.g. Ferrari, 2011; Immordino-Yang, 2011; Klingberg, 2013; Mascolo & Fischer, 2015; Rose & Abi-Rached, 2013), we believe there are at least as many productive possibilities for practices and children, as there are – of course – always risks involved, as in any power/knowledge nexus.

Moreover, to set up epistemological encounters with the explicit aim to trace and map the lines of thinking also makes possible a practice of extending the didactic repertoire, contrary to having to choose the ‘better’ epistemology and method for teaching. This is essentially a shift from orthodoxy to multiplicity, from ‘rejecting-and-replacing’ to ‘adding-on’ and self-differentiating in the process. This, in turn, puts ethical issues to the fore – not only the ethics of what theories and texts to be included in the encounter but also the clarifications of values that is required when dichotomies, comparisons, and dismissals are no longer a taken-for-granted part of the exercise, but rather something to be actively avoided.

To conclude, we pose an overarching question to the field of education: who is to be engaged in mapping out those risks and possibilities in the interconnections between the neurosciences and educational practices? As researchers progressing from critical and post-structural research to feminist new materialist posthumanisms (Aronsson, 2017; Lenz Taguchi, 2017), we find it our ethical call to engage in this crucial matter of concern and in close collaboration with those agents who these issues affect and involve, that is, teachers and practitioners, children, and their families.

Notes

1. As a response to a mutual request of exchange, a bi-monthly network was created in 2015 organized by Stockholm University in collaboration with the municipality preschools. The idea was to exchange experiences, knowing, and perhaps to develop new ways of thinking and doing, at the interface between the neurosciences and early education. http://www.buv.su.se/om-oss/evenemang/förskedidaktiska-rum
2. Informed consent was received from all 23 staff working in the preschools, as well as from all guardians of the 85 children in the subdivisions. Typically, the staff of a subdivision in a preschool consists of 1–2 educated preschool teachers (3.5 years of higher education), and 1–2 staff that might have training from high school as nursery staff. Staff work in non-hierarchical ‘flat’ teams where everyone performs the same tasks and have the same working hours. Educated teachers have the responsibility to plan and evaluate the practices.

Disclosure statement

No potential conflict of interest was reported by the authors.

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