nordisk barnehageforskning nordic early childhood educational research

Peer-reviewed article | Vol. 20, No. 4, 2023, pp. 25-42 | ISSN: 1890-9167

An Ecology of Practices – The Hydrosocial Cycle as a Matter of Concern In Preschool **Children's Explorations**

Teresa Elkin Postila

Stockholm University, Sweden

Contact corresponding author: Teresa Elkin Postila, e-mail: teresa.elkin.postila@buv.su.se

Abstract

The aim of this article is to investigate the local ecology of practices in joint engagements with the hydrosocial cycle by preschool children, water specialists and a researcher in a Swedish urbanised coastal area. In particular, the article considers the potential of Isabelle Stengers' plea for creative meetings, knowledge exchanges and collaborations to produce novel relational practices between different parts of society, practices and disciplines. This local ecology of practices was investigated in a posthumanist onto-epistemological intervention research project, theoretically and methodologically informed by Isabelle Stengers, Donna Haraway and Anna L. Tsing. In three stories constructed by the preschool children's and the researcher's collectively produced data - digital films and photographs, notes and drawings - attention is drawn to the hydrosocial cycle through the concepts of tracing, hierarchies and values in the locally situated ecology of practices. The stories emphasise the significant contemporary topic of water and wastewater in everyday preschool practices and activities and the processes through which water and society make and remake each other. In conclusion, the article suggests that creating relational practices and collaborations between different parts of society could make other questions possible and alternative methods conceivable, for example changed approaches to collaborations between young children, researchers and other professions.

Keywords: ecology of practices; early childhood education; hydrosocial cycle

Subject editor: Johanna Birkeland

©2023 Teresa Elkin Postila. This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (https://creativecommons.org/licenses/BY/4.0/).

Citation: Postila, T. E. (2023). An Ecology of Practices - The Hydrosocial Cycle as a Matter of Concern In Preschool Children's Explorations, 20(4), 25-42. https://doi.org/10.23865/nbf.v20.262

Introduction

In the current time of human-induced climate change, water is under threat now and will also be in the future (Bates et al., 2008). A paradox may occur as water is essential for all life and there is no substitute for it (Wilfong & Pavao-Zuckerman, 2020). This situation implies that everyday Swedish preschool practices and activities that are taken for granted, such as exploring volume and density through water and flushing the toilet, are threatened or have to be reformulated. Tangible abstract threats, such as climate change, tend to be a concern young children learn about (Taylor, 2013), but what may occur when children learn with the 'watery' questions that concern them? For example, where do water, poo, pee and/or toilet paper go when I flush the toilet? However trivial and mundane this question appears, it embodies intimate physical, cultural and historical experiences, as well as (re) connecting us with water's natural and social circulation. In contemporary Sweden, the water and wastewater infrastructures are well developed. This has not always been the case; for example, the first water treatment plant in Stockholm opened in 1861 (Stockholm vatten och avfall, 2015). Moreover, this taken-for-granted commodity is, in the contemporary time, challenged by altered access to fresh water (Swedish Meteorological and Hydrological Institute, 2015) and sanitation due to climate change (UNICEF, 2017).

This article partakes in the ongoing scholarly philosophical and existential discussion formulated by Donna Haraway (2016), Isabelle Stengers (2015, 2018), and Anna L. Tsing (2015, 2021). They argue that we (humans) in the contemporary age, the Anthropocene, need new ways of thinking and doing. In 2000, Paul J. Crutzen and Eugene F. Stoermer suggested that the Anthropocene was a new geological epoch, distinguished by the impact of human beings on biogeo-systems. Yet the concept as such has been questioned due to its political and epistemological underpinnings (Stengers, 2015; Haraway, 2016), and concepts such as Capitalocene (Moore, 2016) and Chthulucene (Haraway, 2016) have been suggested. Common, and regardless of which concept used to capture contemporary time, is as Stengers (2015, p. 27) argues - to acknowledge that the Anthropocene offers the "power to make us think, feel, imagine, and act." This potentiality of thinking, feeling, imaging and acting differently in precarious times, has been investigated theoretically by Haraway (2016) and empirically by Tsing (2015), as well as by educational scholars such as Peter Kraftl, Affrica Taylor and Veronica Pacini-Ketchebaw (2020). This article aligns with the above in its aim to investigate other and new ways of thinking and doing in early childhood (environmental) education (henceforth ECE) as well as investigating how the youngest members of society may be perceived as societal actors in environmental inquiries.

This article elaborates on what emerged in organised meetings between 46 3–5-yearold preschool children, water, three water specialists and one researcher, myself, by drawing attention to water as an actor, highlighting the intertwined and inseparable relations among water, nature, humans, non-humans and society. The term "water specialist" includes these two different occupational categories: water engineers and water technicians. This article connects with water and water technologies as ecology and society entwine (Boelens et al., 2017, p. 26) in and with preschool children's everyday lives, practices and activities. In these natural-societal relational processes, henceforth *the hydrosocial cycle*, 'water and society make and remake each other over space and time' (Linton & Budds, 2014, p. 170). The hydrosocial cycle thus broadens the understanding of the hydrological cycle in that it includes societal aspects that affect the natural flow of water (Linton & Budds, 2014).

Theoretically, this article draws on Stengers' (2010, 2011, 2015, 2018) theorising on the possibilities that emerge in researchers' collaborations with the public. In this article, the preschool children partake as connoisseurs, to use Stengers' (2018) expression, as representatives of the public. I understand Stengers' (2018) concept connoisseur as meaning a knower of who has knowledge about a specific question, problem and phenomenon. Although, as a philosopher of science, Stengers may not have had children in mind, her theorising resonates with the core of the nine-month-long ECE research project this article draws from and opens up for creative methodological approaches - making meetings between the preschools, ECE research, the geosciences, water engineering and hydrology possible. It could be understood as 'a form of ethical experimentation' (Stengers, 2010, pp. vii-viii). Consequently, this article is an attempt to think and do otherwise in its aims to draw attention to the possibilities that emerge in meetings and collaborations between different forms of knowledge and practices (Stengers, 2010, 2011, 2015, 2018), brought together by a common concern - the hydrosocial cycle (Linton & Budds, 2014) - rather than existing and working in parallel and seldom meeting through the common matter of concern, as Stengers (2010) writes. In Stengers' theorising (2010, 2011), the focus is on the practices' relations or the network of practices' relations that emerge, hence the metaphor ecology.

This emergent ecology of practices of relational connections was investigated in two preschools and their urbanised localities in a municipality bordering the Baltic Sea. This highly populated region of Sweden is perforated by water and wastewater infrastructures that seek to protect drinking water, bodies of freshwater and the Baltic Sea from further over-fertilisation. In this article, water infrastructure is used to mean "mediated by governance structure and human interventions that entwine the biophysical, the technological, the social and the political" (Boelens et al., 2017, p. 25). It is worth noting that the Baltic Sea is one of the world's most polluted stretches of water (Stockholm International Water Institute, 2018). Accordingly, these localities, or hydrosocial territories, are historical outcomes of a continued reconstruction of human imagination, social practices and related knowledge systems (Boelens et al., 2017).

Furthermore, this ecology of practices' engagement with the hydrosocial cycle is presented in three stories focusing on the concepts of *tracing*, *hierarchies* and *values*.

The approach of story-telling as a method draws its inspiration from Haraway (2016) and Tsing (2015). Tsing (2015) writes that story-telling as method is a method which is done and at the same time different participants, or messmates as Haraway (2016) writes, make themselves comprehensible to each other. Participants or messmates in this study were different types of data, water, scientific knowledge, theories, planning, engineering, the hydrological cycle, roads, storm water ponds, amphibians and other organisms, and so forth. This article encompasses listening to the preschool children, the water specialists and my own local, hands-on experimental meetings with water, wastewater and water technologies (Elkin Postila, 2021). These stories connect with the movement and circulation of water in and through nature and society, as well as with different practices, forms of knowledge and understanding of water.

The outline of the article is as follows: it begins by unfolding the theoretical and methodological engagements. After that, it follows the circumstances surrounding the meetings between the preschool children, the water specialists, myself and water. The next section presents three hydrosocial stories drawing on the concepts of *tracing*, *hierarchies* and *values*. The article is summarised in a concluding discussion.

Theoretical and methodological engagements

The article derives from a posthumanist onto-epistemological intervention research project in ECE to investigate forms and methods of collaboration with preschool children and engaging with them in societal and environmental issues concerning various aspects of water (Elkin Postila, 2019, 2021, 2022). The research project was carried out in accordance with the ethical legal framework and guidelines regulating research involving humans in Sweden (European Parliament and Council, 2016; SFS 2003:460; Swedish Research Council, 2017). All of the personal names in the article are pseudonyms. The notion of onto-epistemology draws on Karen Barad's theorising (1998, 1999, 2007), which suggests that being, learning and ethics are intimately intertwined. Consequent knowledge production, knowing, ethics, being, methods and practices are understood as emergent, in constant change in the preschool children's, my own and the water specialists' engagement with and in water (Elkin Postila, 2021). Furthermore, the research project was theoretically and methodologically inspired by Haraway's (1988, 2016), Stengers' (2010, 2011, 2015, 2018) and Tsing's (2015) extensive scholarship on human and non-human beings within/on our planet. Thus, central to the article is the assumed entanglement of ethics, ontology and epistemology, highlighting human and non-human relational entanglement(s).

In addition to the research project's Stengerian inspiration to involve the public in research and focus on what emerges in meetings between different disciplines, forms of knowledge and methods, inspiration is drawn from previous feminist research. In particular,

feminist research in which the researcher has installed themselves in existing and ongoing practices. By intervening, practices temporarily (and sometimes fundamentally) alter and/ or shift. At the same time, the researcher's own research practices are intervened by the ongoing practices (see, e.g., Alaimo, 1994, 2010; Lenz Taguchi, 2000, 2012). Within ECE, this approach to research displays an epistemological variation, with a common interest in multi-epistemologically investigating what emerges when different forms of knowledge and practices meet. These projects have, for example, investigated preschool documentation by involving researchers and preschool educators (Lenz Taguchi, 2000) and how meetings between the practices and activities of the youngest children at preschool with the societal practices in public spaces produce possibilities for children to create space and be a part of public spaces (Eriksson, 2020). In Sweden, children can attend preschool from the age of one (SFS 2010:800). This methodological approach has inspired and encouraged me to install myself as a researcher trained in the geosciences and ECE in the ongoing practices of two preschools to investigate water together with preschool children (Elkin Postila, 2021). At the same time, the practices of the preschool children and the preschools intervened and became part of my research practices (Elkin Postila, 2021). Water also intervened in our practices and methods during the project (Elkin Postila, 2019, 2021, 2022). Thus, the concept of intervention is challenged and altered compared to the more common use in randomised control research designs (see, for example, Gerholm et al., 2019).

Epistemologically, the article draws inspiration from previous posthumanist ECE research that acknowledges today's climate change and uncertain ecological future carried out in preschool and playschool settings. Such inspiration is found in focusing on the complexities emerging in human-animal relations when drawing attention to the ethics, affects and effects of learning-with, rather than learning-about, insects (Nxumalo & Pacini-Ketchabaw, 2017); in rethinking the place of humans in the world by focusing on the entangled vulnerability and mortality in human and non-human encounters (Taylor & Pacini-Ketchabaw, 2015); and engaging with environmental vulnerability in locally situated educator-child-creek encounters (Nxumalo & Villanueva, 2019). However, it should be pointed out that the epistemological inspiration lies within investigating and unfolding relations with the more-than-human rather than following the methodological approach of these research projects.

Situating this article's local ecology of practices

The preschool children who were part of the research project were divided into groups of five to seven children, and educators assisted each group during the collaborative explorations. The educators mentioned in this article include the two different occupational categories common in Swedish preschools: nursery staff with upper secondary school training and preschool teachers with three-and-a-half years of higher education. Three water specialists were invited to the project three months after it started. This was due to their expertise in water infrastructure, given that the questions, actions and things that the children encountered had initiated reasoning concerning wastewater. Contact with the water specialists was established via an email briefly describing the research project which was sent to a mailbox function at the municipality where the water project was carried out. After being redirected to different divisions and departments in the municipality, the email ended up in a water engineer's inbox at the company in charge of the water and wastewater infrastructure. The water engineer, in turn, involved a second water engineer and a water technician. The water specialists met the children and myself on several occasions over a four-month period. The meetings took place through and during explorative activities as part of the preschools' everyday practices. During the meetings with the preschool children, the water specialists and I met, disrupted and intervened in each other's practices, creating what Stengers (2010) calls an ecology of practices. Questions and findings were multi-epistemologically and multi-ontologically explored through different individual and group-based practices and methods. We combined ways of thinking and learning with listening and relating to each other's areas of knowledge about water and wastewater.

In these practices, as collaborators from different disciplines and practices, we met and were offered the possibility of presenting ourselves in what Stengers (2010, p. 73) calls "a here that resonates with the elsewhere of other practices." A local ecology of practices has the potential to produce other meanings, values and modes of evaluation (Stengers, 2010), for example, when the preschool children challenge the water specialists' practices by add-ing their own, as shown in the upcoming stories.

In the interest of intervening, interrupting, disrupting and unsettling dominant mindsets and creating opportunities to think and act, this study has its starting point in the questions that emerged through the preschool children's encounters with water. According to Stengers (2018) and Stengers et al. (2014), these questions are investigative questions that matter to the individuals involved in the research. Rather than me introducing water as threatened in contemporary times or interrogating and/or observing the children's notions of environmental issues concerning water, I aimed to take the children's questions and the things they encountered seriously (Rautio, 2013b). This was done by allowing them to formulate their questions in relation to the hydrosocial problem of "Where do water, poo, pee and/or toilet paper go when I flush the toilet?" This methodological approach touches on explorative working methods that are common in Swedish preschools, where children's doings, questions and interests are guided and supported by educators (Åberg & Lenz Taguchi, 2018). At the same time, my aim of creating knowledge about preschool children's opportunities for engagement and collaboration in and with societal and environmental issues concerning water, wastewater and water run-off was approached multi-epistemologically. This result is in line with Stengers' (2010) argument that exploring different kinds of knowledge is also about experimenting with ethics. The methodological approach requires the researcher to think-with, as in getting involved-in, other beings in terms of "*becoming with them* and (starting) from them" (Despret, 2013, p. 36; italics in the original). In this study, thinking-with not only affects how the preschool children were approached but also water, water infrastructure, places, documentation and data.

The meetings between the preschool children, myself and the three water specialists were incorporated into the everyday preschool practice of walks in the preschools' neighbourhoods, thereby acknowledging the "pedagogical potential of the mundane and ordinary" (Taylor et al., 2013, p. 49, following Haraway, 2008) and the ways in which we already are in nature (Rautio, 2013a, 2013b). Our meetings included three pre-planned activities based on the hydrosocial question "Where do water, poo, pee and/or toilet paper go when I flush the toilet?" The three activities unfolded from the question which correlated with the preschool children's and my findings and questions about manhole covers, metal rods with metal plates in various colours, letters and numbers, and a stormwater pond. These planned activities were: opening manhole covers, investigating the correlation between manhole maps and the preschools' physical surroundings and experimenting with different sedimentation rates.

Here-and-now data

During the meetings, the children and I documented what we considered important in digital still and video images on a shared digital tablet, memos and drawings in a shared project diary, personal project diaries and image presentations. All of the documenters were entangled in and with the explorations and data (Lenz Taguchi, 2010). As the documentation was emerging/growing during the project and situated here and now in the preschools (Rautio, 2013b), I called the data produced by the preschool children and myself *here-and-now data*. This documentation constitutes the article's primary empirical data.

The documentation was always present in that the shared digital tablet and the project diary became our constant companions and could be easily accessed by the preschool children and myself during the explorations to revisit and reframe. After each explorative meeting, we – the children and myself – compiled the data in image narratives that described what mattered to us during the meetings and indicated the possible paths for the forthcoming meetings. In this article, the here-and-now data and the image narratives have been re-constructed and reframed as stories, thus theoretically entangling them with Stengers (2010, 2015, 2018), the water project and my own background in the geosciences and ECE to produce material-discursive spatiotemporal sequences of events (Millei & Rautio, 2017).

The three stories – tracing, hierarchies and values

Different practices meet and collaborate in the ecology of practices to explore the matter of concern – the hydrosocial cycle. The concepts of *tracing, hierarchies* and *values* highlight the hydrosocial cycle in the preschool children's, my own and the water specialists' collaborations – the local ecology of practices which emerged in the interface between society, science and nature. In the following, three material-discursive spatiotemporal stories are presented.

Tracing

In the preschool context – taps with clean water, flushing toilets, preschool children and their activities, practices and bodily experiences of water and wastewater – are disconnected from water's "natural" cycle, the subterrestrial water and wastewater infrastructure. In the preschools' outdoor surroundings, water reveals itself through rainfall, evaporation and streams, while the subterrestrial water is out of sight and wastewater infrastructure is only indicated by manhole covers and metal rods with metal plates in different colours. However, preschool children's everyday practices, activities, bodily experiences and the manhole covers are part of the complex hydrosocial cycle – connecting social, natural and political relations involving human practices, such as drinking water and flushing toilets, water momentum, and the engineering of water flows in, for example, hydraulic technologies (Boelens et al., 2017). These abstract relations materialised when the water specialists opened the manhole covers and reconnected everyone and everything involved in our hydrosocial cycle.

During a meeting with a group of seven children and myself, one of the water specialists opened a manhole cover with a metre-long key with a handle. While peeking through the metre-wide opening, lying on our stomachs or kneeling, we saw a smooth, beige-grey, wide, cement tunnel with slow-flowing, rippling wastewater. While the specialist continued down the slightly sloping road to open another cover, the second specialist explained that the beige-grey tunnel transported wastewater from the terrace houses on the hillside above us. When they poured drops of grass-green tracing colour into an open manhole, they told us that it traced the water's flow. I made the following memo: *We use this colour to trace wastewater leakages or detect places where the flow is blocked, the colour then ends up where you least expect it, or it gets stuck somewhere.* Through our reconnection with water and the infrastructure of water, and connecting the water specialists' practice of using tracing-colour with the abstract pictograms from the preschools' bathrooms showing what not to flush down the toilet, concrete-hard conglomerates in Swedish wastewater tunnels (see, for example, Sveriges radio, 2017) and an understanding of the problem with clogged tunnels emerged.

Lilly, one of the children, made us aware of a piece of toilet paper stuck to the tunnel floor in the slowly flowing water. We discussed where the toilet paper and the slowly flowing water came from that occasionally moved faster. We talked about what the water could be and what it brought with it. Another child, Isak, who lived in one of the houses on the hillside, explained the following while I took notes: *There is no water in the tunnel because no one is at home, me and Noah are at preschool and Mum and Dad are working.* When the tracing colour dissolved in the wastewater, the preschool children and I ran to the other open manhole to see what would happen. While we ran, the water followed its man-made tunnel beneath us and turned up as grass-green water in the second opening. The wastewater infrastructure beneath us was revealed as deeply entangled and a preserver of our contemporary urban life as recipients, with its wide wastewater tunnels, transporting wastewater, downpours and run-off from houses, roads and walkways in the neighbourhood.

Whilst lying on our stomachs or kneeling, we discussed and listened to the different sounds of the water and what our voices sounded like in the tunnel. The listening, singing and talking through the manholes, pipes and tunnels with the gushing, running or drizzling water emerged during the study as a practice – a method. This method made the water specialists reconnect and pay attention to the different sounds of water when opening the manhole covers. The different diameters of the tunnels and pipes and the different volumes and types of water passing through them produced different sounds that enabled us to predict what we would see when opening the covers. When we listened, sang and talked through the manhole during the dry spring and summer of 2018 (Swedish Meteorological and Hydrological Institute, 2018), the sounds diffracting back to us were not the same as those we heard later in the autumn of that same year. In the dry spring and summer, we could hear whether someone along the tunnel had flushed their toilet and produced intense fluctuating sounds or turned on a tap and produced drizzling sounds, thus connecting us with the everyday practices of water use. When we talked and sang through and with the tunnels, our voices echoed back to us, connecting us with the tunnels' smooth emptiness and the absence of downfall during spring and summer 2018 (Sjökvist et al., 2019) coexisted with the wastewater from households. The different practices of opening, singing and listening through the manhole covers carried information about the tunnels, the pipes and the different waters flowing beneath us.

Hierarchies

It could be argued that this section, which deals with a stormwater pond, is about the superior status of science and technology in relation to nature, a "tale of a conquest of nature by human labour" (Stengers, 2015, p. 58). The stormwater pond could also be regarded as a technical solution – a quick fix – to the problem of dirty water run-off from busy roads and urban areas in terms of water as "an object of management, governance, and commodification" (Wilfong & Pavao-Zuckerman, 2020, p. 1273). In an ecology of practices, the

stormwater pond emerges as reconnecting and producing other relations in contemporary human life, and as troubling hierarchies, between society, science, nature, and child and adult, as static.

During our walks with the water specialists in one of the preschool's neighbourhoods, we came across something that we described as a pool at first glance. The pool was positioned between a busy road and a flatland lake. Beside the pool was an information board notifying that this was a stormwater pond. The water specialists explained that if the road's dirty run-off was not cleaned before entering the freshwater lake, it would affect the living conditions of water organisms, humans and other organisms swimming in it and the recreation area surrounding the lake. In connection to the stormwater pond, the water specialists mixed water and gravel, sand and soil in transparent glass containers to visualise the mechanical cleaning of wastewater in stormwater ponds and water treatment plants. However, as mixing water with sand and soil was part of the preschool children's everyday practices in the sandpit and yard, the explanation and experimentation did not attract the children's attention. Instead, the preschool children made a fuss – as Stengers et al. (2014) might put it – by noting statements and questions:

"Why do you put sand in clean water? Now it's dirty! Is that sand? It does not look like the sand we have in the preschool sandpit. Why don't you use the small yellow spade – instead of that big green one? It is easier to handle." The children shared their practices and knowledge of water mixtures by relating the water specialists' practices to their own experimentation with sand, soil and water. Whilst talking about, looking at, touching and smelling the sand, attention was drawn to sand as material – different to a water specialist and a preschool child. The water engineer talked about sand as particles between 0.06–2.00 mm (Geological Survey of Sweden, 1994) in size, whereas the preschool children talked about sand from their situated knowledge of the preschool sandpit's washed, natural, rounded particles ranging from 0.06–4.00 mm in size. Paying attention to sand as multiple entities highlighted that it mattered who produced the knowledge and how it was produced (Stengers, 2010; Stengers et al., 2014).

When the water engineers reasoned about the purpose of the stormwater pond, the children became interested in the pond, the lake and the surrounding area. Thus, the former pool emerged as something else. When the children explored the water specialists' knowledge about dirty water run-off and its consequences, it awakened ethical considerations and thoughts. By engaging with the purpose of the stormwater pond, the children connected their situated knowledge of their neighbourhood, their experiences of the lake's recreation area, the organisms living in the lake and the surroundings. The children had previously spent time in the area with their preschool in addition to our explorative meetings. Many also had personal experiences of the area, such as swimming in the lake, seeing fish, ducks and water insects, walking or cycling around the lake, having picnics, celebrating Walpurgis Night with bonfires, singing in the spring and on Midsummer's Eve, and

dancing around the midsummer pole. The lake and its surroundings altered through and with the preschool children's, my own and the water specialists' relations with the stormwater pond. Troubling water and nature "as submissive, manipulable, assimilable to some 'raw material' on which we would be free to impose whatever organisation we choose" (Stengers, 2010, p. 34).

Values

As Stengers (2010) and Stengers et al. (2014) argue, it matters who produces knowledge and how it is produced. This story draws attention to the relations and values produced, in that the preschool children, three water specialists, myself and the water disrupted and intervened in each other's practices. During my daily walks with the preschool children, manhole covers of different sizes with specific capital letters, patterns, grids and emblems became our constant companions. The manhole covers turned into the markers for distances and boundaries when running, preventing us from passing a specific point while saying or shouting, "*Stop at the A-cover, just before the car park*," or asking each other "*Should I stop at the K-cover before the tunnel*?" We counted the covers, stepped on them, took photographs, and looked through their grids and small holes to peek at the pipes, tunnels and contents. The water specialists brought maps of the preschools' neighbourhoods, displaying the wastewater infrastructure and indicating manholes, roads, walkways and buildings.

These different practices mattered there-and-then for the children and I because they were what Rautio (2013b) describes as autotelic practices – practices that are important in themselves. An example was Sophie's repetitive running ahead of the rest of the group to the A-cover just before the car park, while the rest of us shouted, "*Stop at the A-cover!*" In other groups, we all ran to the A-cover, shouting in agreement, "*We will stop at the A-cover!*" The covers thus became common reference points when navigating the neighbourhoods. However, when our practices met the water specialists' practice of mapping, the preschool children's and my practice turned into one of surveying. In the exchange of knowledge and practices, the constant companions, the manhole covers and the practices attached to them, like running, the autotelic practice emerged as valuable.

When correlating our surveyed reality with the maps provided by the water specialists, it was difficult due to the abstract symbols on the map which differed to the grids, letters and emblems we used to navigate our surroundings, since the maps did not indicate the different types, shapes and sizes of manhole covers. However, common practices emerged through listening to each other's different practices. Hence, children, water specialists and myself together paid attention to covers that were out of position, elevated in relation to the surrounding area, and produced deep, jumpable puddles of water when it rained in the autumn. We noticed that some of the gridded covers were clogged with leaves from

last autumn or with sand and gravel used during last winter to make the snow and ice less slippery. The detailed surveying that was valuable and important to the preschool children and I turned in to something valuable, important and extraordinary to the mapmakers, the water specialists. Thus, making them question and noticing their own practices, as one of them pointed out, the manhole covers were not under surveillance regularly but were only attended to if they caused flooding or obstructed contemporary human life.

In the forest close to one of the preschools, the preschool children and I had come across metal rods with metal plates in different colours and with different capital letters and numbers on them. We asked ourselves and the water specialists what the purpose of the metal rods was. In response to our question, the specialists explained that the letters indicated what the tunnels or pipes contained and that the numbers indicated the distance, *x-axis*, from the rod and the depth, *y-axis*, of the water pipes and wastewater tunnels. We were also told that the metal rods had been replaced by three-dimensional maps that made virtual reality navigation possible.

In response to the water specialists' matter-of-fact explanation, two children started discussing a new 3D TV game and 3D goggles. The previous abstract and subterrestrial out-of-sight network of differently dimensioned pipes and tunnels, waterways for fresh-water and dirty water turned into a potential video game. Thus, our attention to the metal rods and their plates, bearing what was for us abstract information, turned into a matter of concern for the preschool children and myself when in contact with the water specialists' knowledge and practices.

The various relations, meanings and practices mattered differently to our part of the meeting, and the values of the practices differed according to their spatiotemporal and material-discursive relations. Accordingly, in this local ecology of practices, different practices and forms of knowledge emerged as valuable (Stengers, 2011), challenging knowledge hierarchies such as adult water specialists and young preschool children. At the same time, the different practices emerged as valuable, in that we responded to and answered them, consequently aligning with Haraway's (2016) response-ability.

Concluding discussion

This onto-epistemological study has investigated what emerged in those different areas of knowledge, disciplines, methods and practices encountered through a common matter of concern – the hydrosocial cycle. In meetings between preschool children, a researcher and water specialists, a local ecology of practices emerged in which the different areas of knowledge met and intervened with each other. In meeting and intervening in other questions and practices, other understanding emerges. In her argument, Stengers (2015, 2018) shows the importance and potential of different scientific disciplines meeting and the importance

of including the public in research in the Anthropocene, in order to think, feel, imagine, act and do differently. This article shows that the meetings of preschoolers, three water specialists and one researcher, investigating a common matter of concern, are about going beyond disciplinary and methodological boundaries and the preconceived notions of an explorative working process. For example, did the ways the children listened to water through the manholes make the water specialists reflected on their own established method of listening to water to obtain information about the water in tunnels and pipes. This article recognises Stengers' (2010, 2011, 2015, 2018) call by suggesting an ecology of practices as a way of producing other values, modes of evaluation and meaning when different societal actors, disciplines and methods disrupt and intervene in each other's practices. Thus, exchanging knowledge between the different disciplines, as Stengers (2010, 2011, 2015, 2018) argues, makes us think and learn – potentially in other ways and new ways. The idea of an ecology of practices is both scientific and political and at the same time it affirms the relations of all living and material things. It recognises the relationships with other practices in which unexpected collaborations might occur. Consequently, the article displays the potential and the importance of involving young children in collaboration on common matters of concern with different parts of society.

Moreover, this study dissolves and expands the boundaries of the concept of experts or, as Stengers calls them, "connoisseurs" (Stengers, 2018, pp. 8–9), for example, in that the water specialists introduced facts that were verified by scientific consensus on different sedimentation rates and the preschool children shared their expertise regarding water and sand mixtures. While the water specialists are experts, not only in terms of their practices and knowledge but also through their relationship with those who identify them as experts (Stengers et al., 2014, pp. 85–86), the preschool children are experts through their situated knowledge of their practices and their neighbourhoods. Thus, the concept of an *expert* can be discussed as fluent, inconsistent and emergent when practices that are otherwise not practised together meet. This point has implications. I argue about how education in ECE is perceived, in particular, environmental education in the precarious time of the Anthropocene; how young children are involved in research and society as well as in societal and environmental inquiries.

Furthermore, I argue that the focus of this article, the hydrosocial cycle – generated by the question "Where do water, poo, pee and/or toilet paper go when I flush the toilet?" – displays an approach to (environmental) education in ECE. This mundane question connects with water and water technologies as ecology and society entwine (Boelens et al., 2017, p. 26) with a young Swedish child's everyday life. However mundane and taken-for-granted it is in a Swedish context, it pinpoints the tangible threat posed to water in contemporary time, due to, for example, climate change. At the same time, the hydrosocial cycle also considers the reciprocity in natural-societal relational processes, where "water and society make and remake each other" (Linton & Budds, 2014, p. 170). Thus, our own lives and those of other organisms are threatened if water is threatened.

The article is an invitation to further knowledge exchanges between young children, societal specialists and researchers through common matters of concern, which will potentially make other questions possible and alternative methods conceivable. It should be noted, for example, that the collaboration between the water specialists, the preschool children and myself was the starting point for an extended collaborative project. This collaborative project included five preschools and was initiated at the end of 2019, and it aimed to monitor the status of five stormwater ponds in the municipality. The preschools monitored the ponds by: 1) reporting what they considered to be important changes; and 2) reporting on predetermined parameters such as temperature and pH values. In these other ecologies of practice, relations presupposed need to be established, re-established and cared for. As Stengers (2010, 2011) argues, these relational collaborations encompass longer-term commitment. This point is important today and, in the future, to influence science and politics. A collective practice exists through the individuals who engage in it, in the process of making and remaking (Stengers, 2010), the promotion of knowledge and new collaborations.

Acknowledgements

I would like to thank the children who took part in this study for their participation and for sharing their documentation with me to make this article possible. My warmest thanks to the water specialists and educators for their engagement and curiosity in the study.

Disclosure statement

No potential conflict of interest is reported by the author.

Funding

The author received no financial support for the research, writing and/or publication of this paper.

Author biography

Teresa Elkin Postila (MSc GeoSc., MSc Edu., PhD ECE) is currently a lecturer in the Department of Child and Youth Studies at Stockholm University, Sweden. She teaches in the teacher education program for early childhood education, in courses focusing on the

natural sciences, sustainability, mathematics and technology, and she also supervises students. Teresa's areas of interest and research are preschool, climate change, environmental issues, the natural sciences, mathematics, technology, feminist posthumanist and new materialist theory and methodology.

References

- Alaimo, S. (1994). Cyborg and ecofeminist interventions: Challenges for an environmental feminism. *Feminist Studies*, *20*(1), 133–152.
- Alaimo, S. (2010). *Bodily natures: Science, environment and the material self.* Indian University Press.
- Barad, K. (1998). Getting real: Technoscientific practices and the materialization of reality. *Differences: A Journal of Feminist Cultural Studies*, *10*(2), 87–128.
- Barad, K. (1999). Agential realism: Feminist interventions in understanding science practices. In M. Biagioli (Ed.), *The science studies reader*. Routledge.
- Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning.* Duke University Press.
- Bates, B. C., Kundzewicz, Z. W., Wu, S., & Palutikof, J. P. (Eds.). (2008). Climate change and water. Technical paper of the Intergovernmental Panel on Climate Change. IPCC Secretariat.
- Boelens, R., Hoogesteger, J., Swyngedouw, E., Vos, J., & Wester, P. (2017). Hydrosocial territories: A political ecological perspective. In R. Boelens, B. Crow, J. Hoogesteger, F. E. Lu, E. Swyngedouw, & J. Vos (Eds.), *Hydrosocial territories and water equity: Theory, governance, and sites of struggle.* Routledge.
- Crutzen, P. J., & Stoermer, E. F. (2000). The Anthropocene. *Global Change Newsletter*, 41, 17–18.
- Despret, V. (2013). From secret agents to interagency. History and Theory, 52, 29-44.
- Elkin Postila, T. (2019). Water as method: Explorations of locally situated environmental issues together with preschool children. *Australian Journal of Environmental Education*, *35*(3), 1–8.
- Elkin Postila, T. (2021). *(In)finite water: A study of how preschool children as connoisseurs engage in social environmental issues* [Doctoral dissertation, Stockholm University]. DiVA. http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-179837
- Elkin Postila, T. (2022). Stories of water: Preschool children's engagement with water purification. *Cultural Studies of Science Education*, *17*(2), 277–299.
- Eriksson, C. (2020). A preschool that brings children into public spaces: Ontoepistemological research methods of vocal strolls, metaphors, mappings and preschool

displacements [Doctoral dissertation, Stockholm University]. DiVA. http://urn.kb.se/ resolve?urn=urn:nbn:se:su:diva-176333

European Parliament and Council. (2016, April 27). *Regulation (EU) 2016/676*. Retrieved June 23 2022 from https://eur-lex.europa.eu/legal-content/EN/ ALL/?uri=celex%3A32016R0679

Geological Survey of Sweden. (1994). Jordartskartor, Metodik och jordartsinledning tillämpad vid geologisk kartering i skala 1:50 000 [Soil type maps, methodology and soil type division applied for geological mapping scale 1 50 000]. Geological Survey of Sweden.

- Gerholm, T., Kallionen, P., Tonér, S., Frankenberg, S. J., Kjällander, S., Palmer, A., & Lenz Taguchi, H. (2019). A randomized controlled trial to examine the effect of two teaching methods on preschool children's language and communication, executive functions, socioemotional comprehension, and early math skills. *BMC Psychology*, 7(59). https://doi.org/10.1186/s40359-019-0325-9
- Haraway, D. (1998). Situated knowledge: The science question in feminism and the privilege of partial perspective. *Feminist Studies*, *14*(3), 575–599.
- Haraway, D. (2008). When species meet. University of Minnesota Press.
- Haraway. D. J. (2016). *Staying with the trouble: Making kin in the Chtulucene*. Duke University Press.
- Kraftl, P., Taylor, A., & Pacini-Ketchabaw, V. (2020). Introduction to symposium: Childhood studies in the Anthropocene. *Discourse: Studies in the Cultural Politics of Education*, 41(3), 333–339. https://doi.org/10.1080/01596306.2020.1779448
- Lenz Taguchi, H. (2000). *Emancipation och motstånd: dokumentation och kooperativa läroprocesser i förskolan. [Emancipation and resistance: Documentation and cooperative learning processes in preschool]* [Doctoral dissertation]. Stockholm Institute of Education.
- Lenz Taguchi, H. (2010). *Going beyond the theory/practice divide in Early Childhood Education: Introducing an intra-active pedagogy*. Routledge.
- Lenz Taguchi, H. (2012). A diffractive and Deleuzian approach to analysing interview data. *Feminist Theory*, *13*(3), 265–281.
- Linton, J., & Budds, J. (2014). The hydrosocial cycle: Defining and mobilizing a relationaldialectical approach to water. *Geoforum*, 57, 170–180. https://doi.org/10.1016/j. geoforum.2013.10.008
- Millei, Z., & Rautio, P. (2017). 'Overspills' of research with children: An argument for slow research. *Children's Geographies*, *15*(4), 466–477. https://doi.org/10.1080/14733285.2 016.1277182
- Moore, J. W. (2016). Introduction, Anthropocene or Capitalocene? Nature, history, and the crisis of capitalism. In J. W. Moore (Ed.), *Anthropocene or Capitalocene? Nature, history, and the crisis of capitalism*. PM Press.

- Nxumalo, F., & Pacini-Ketchebaw, V. (2017). 'Staying with the trouble' in child-insecteducator common worlds. *Environmental Education Research*, *23*(10), 1414–1426. https://doi.org/10.1080/13504622.2017.1325447
- Nxumalo, F., & Villanueva, M. (2019). Decolonial water stories: Affective pedagogies with young children. *The International Journal of Early Childhood Environmental Education*, 7(1), 40–56.
- Rautio, P. (2013a). Being nature: Interspecies articulation as a species-specific practice of relating to environment. *Environmental Education Research*, *19*(4), 445–457. https://doi.org/10.1080/13504622.2012.700698
- Rautio, P. (2013b). Children who carry stones in their pockets: On autotelic material practices in everyday life. *Children's Geographies*, *11*(4), 394–408. https://doi.org/ 10.1080/14733285.2013.812278
- SFS 2003:460. *Act Concerning the Ethical Review of Research Involving Humans*. Ministry of Education.
- SFS 2010:800. Education Act. Ministry of Education.
- Sjökvist, E., Abdoush, D., & Axén, J. (2019). Sommaren 2018 en glimt av framtiden? [Summer 2018 - a glimpse of the future?] *Klimatologi*, *52*, 1–40. Swedish Meteorological and Hydrological Institute.
- Stengers, I. (2010). *Cosmopolitics I* (R. Bononno, Trans.). University of Minnesota Press. (Original work published 2003)
- Stengers, I. (2011). *Cosmopolitics II* (R. Bononno, Trans.). University of Minnesota Press. (Original work published 2003)
- Stengers, I. (2015). *In catastrophic times: Resisting the coming barbarism* (A. Goffey, Trans.). Open Humanities Press. (Original work published 2009)
- Stengers, I. (2018). Another science is possible. A manifesto for slow science (S. Mueke, Trans.). Polity Press. (Original work published 2013)
- Stengers, I., Despret, V., & collective (2014). Women who make a fuss: The unfaithful daughters of Virginia Woolf (A. Knutson, Trans.). Univocal. (Original work published 2011)
- Stockholm International Water Institute. (2018). Water pollution data in the Baltic Sea Basin – a local to regional approach. Retrieved June 23 2022 from https://siwi.org/publications/ water-pollution-data-in-the-baltic-sea-basin-a-local-to-regional-approach/
- Stockholm vatten och avfall. (2015). Så fick Stockholm kranvatten [This is how Stockholm got tap water]. Retrieved June 23 2022 from https://www.stockholmvattenochavfall. se/vatten-och-avlopp/kranvattnets-historia/sa-fick-stockholm-kranvatten/
- Sveriges radio. (2017). Tonvis med matfett proppar igen avlopp även i Sverige [Tons of food grease clogs up the drains – also in Sweden]. Retrieved June 23 2022 from https://sverigesradio.se/artikel/6778128

- Swedish Meteorological and Hydrological Institute. (2015, December 14). *New analyses show how climate can change in Swedish counties*. Retrieved June 23 2022 from https://www.smhi.se/en/news-archive/new-analyses-show-how-the-climate-can-change-in-swedish-counties-1.96960
- Swedish Meteorological and Hydrological Institute. (2018, October 4). Sommaren 2018 – Extremt varm och solig [Summer 2018 – Extremely warm and sunny]. Retrieved June 23 2022 from https://www.smhi.se/klimat/klimatet-da-och-nu/arets-vader/ sommaren-2018-extremt-varm-och-solig-1.138134

Swedish Research Council. (2017). *Good research practice*. Swedish Research Council. Taylor, A. (2013). *Reconfiguring the natures of childhood*. Routledge.

- Taylor, A., Blaise, M., & Giugni, M. (2013). Haraway's 'bag lady story-telling': Relocating childhood and learning within a 'post-human landscape'. *Discourse: Studies in the Cultural Politics of Education*, 34(1), 48–62. https://doi.org/10.1080/01596306.2012. 698863
- Taylor, A., & Pacini-Ketchabaw, V. (2015). Learning with children, ants, and worms in the Anthropocene: Towards a common world pedagogy of multispecies vulnerability. *Pedagogy, Culture & Society, 23*(4), 507–529. https://doi.org/10.1080/14681366.2015. 1039050
- Tsing, A. L. (2015). *The mushroom at the end of the world: On the possibility of life in capitalist ruins.* Princeton University Press.
- Tsing, A. L. (April 14 2021). *Lecture: Pluralizing the Anthropocene. The view from the feral atlas.* Retrieved June 23 2022 from https://www.youtube.com/watch?v=EzlA-5_soh0
- UNICEF. (2017). *Thirsting for a future: Water and children in a changing climate*. United Nations Children's Fund.
- Wilfong, M., & Pavao-Zuckerman, M. (2020). Rethinking stormwater: Analysis using the hydrosocial cycle. *Water*, *12*(5), 1273–1288. https://doi.org/10.3390/w12051273
- Åberg, A. & Lenz Taguchi, H. (2018). *Lyssnandets pedagogik: etik och demokrati i pedagogiskt arbete [Listeners' pedagogy: Ethics and democracy in educational work] (2nd ed.)*. Liber.