Chapter 11
Curious Curiosity – Reflections on How Early Childhood Lecturers Perceive Children's Curiosity

Marianne Presthus Heggen and Anne Myklebust Lynngård

Abstract Curiosity and wonder are considered fundamental for children's development. However, no precise definition of curiosity exists, and there is little research on the nature of curiosity. There is also a lack of knowledge and ideas about how pedagogy can sustain and stimulate curiosity. Drawing upon empirical material from semi-structured interviews with seven Early Childhood Teacher Education (ECTE) lecturers from the disciplines of mathematics, arts, literature, drama, pedagogy, science and physical education about their view of children's curiosity, the authors aim to explore the lecturers' understanding of children's curiosity and how this understanding varies between disciplines. Children enact their curiosity in a cultural-historical context. The cultural-historical tradition of outdoor play is a part of the institution's practices influencing the children, while the children may use curiosity to influence the content of these practices. Although the lecturers are from different disciplines, their understanding of curiosity were consistent, particularly with regards to their focus on bodily expressions of curiosity. Expanding the concept of curiosity, we suggest the term *bodily curiosity* to recognise and operationalise a sensory, active and embodied search for answers. Similarly, we suggest the term *bodily wonder* about a kind of embodied philosophising.

Keywords Curiosity · Bodily curiosity · Bodily wonder · Cultural conditions for curiosity · ECE

> With respect then to curiosity, the teacher has usually more to learn than to teach. (Dewey, 1910, p. 29)

M. P. Heggen (✉) · A. M. Lynngård
KINDknow, Western Norway University of Applied Sciences, Bergen, Norge
e-mail: Marianne.Presthus.Heggen@hvl.no; Anne.Myklebust.Lynngard@hvl.no

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11.1 Introduction

Curiosity is one of the most commonly used words to describe children's behaviour in early childhood. Children's curiosity is often expressed by asking questions and there is an understanding that the more questions asked, the more curious a child is (Jirout & Klahr, 2012). However, children explore the world with all their senses, not only verbally.

As natural science lecturers in early childhood teacher education (ECTE) we wanted to investigate children's curiosity in nature; thus, in a pilot study in 2017 we equipped children with action cameras worn on their chests and filmed their activities in nature. We expected to see curious children asking questions in line with earlier research. Through our analysis, we found that the children were actively engaged with and explored nature, but they asked few concrete questions. We noted many interesting situations and will share two of those here. These, as well as others, made us realize that we did not have a good tool to categorise and discuss children's behaviour and link it to curiosity. We found a need for a deeper understanding of the concept *curiosity*, the difference between curiosity and wonder, and its link to exploratory behaviour. The situations described below demonstrate some of the dilemmas we faced when we tried to analyse behaviour as signs of curiosity.

> We are in a nature area with a Norwegian pre-school. Only a minute after we start our trip a little boy screams happily and jumps up and down on the ground. "Look, I found two of those things with spit on it," he says. "Spittlebug," the teacher replies. "Oh, there are more of them; there are three, no four," the little boy continues. He is very eager and looks happy. Several other children are joining him, looking at the bushes with all the spittlebugs. The teacher asks him if he remembers reading about this animal in a book. "Yes," he replies, and continues looking for more of them. "Let`s see if we can find anything inside the spit. We can use a straw," the teacher suggests. "There is nothing inside," one of the girl states. "Maybe it has moved," the teacher replies. "Yes, maybe it has moved to here," another child says. A girl starts to explore some bushes a bit away from the other children. She is talking to herself saying, "I also found a, eehh, spittlebug, no I found two, and there is a third."
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> The next day, in a forest with another pre-school, we discovered a boy sitting alone by a pond putting his hands into it, shifting them from inside to outside very slowly. This continued, looking like a ritual. The boy did not speak, and he was just looking at his hands in the pond. He was concentrating intently. After many minutes, I asked him what he was doing. "I am washing my hands," he said, and the moment he had with the pond was over. He stood up and walked away.

In the first situation, the child discovered an animal they have been reading about earlier. Was his reaction a sign of curiosity and desire to learn more about the animal, or was it a sign of pure happiness at meeting an old friend? They looked inside the spit to find the real animal as the teacher suggested, yet the situation ended in a competition to find the most animals. In the second situation the boy involved did not speak at all. He just held his hands in the pond and stared into his hands in the water. Was he curious about anything, or was it a situation of silent wonder? What are the differences between curiosity and wonder, and does it really matter?

These examples show how important it is that pre-school teachers recognize different signs of curiosity to be able to maintain and develop it. Outdoors, and

especially in nature, there is an expectation that children's innate curiosity will bloom. In the outdoor-tradition in Scandinavian pre-schools, many learning activities take place in nature. These activities are often expected to start with children's initiative and curiosity, but studies indicate that it is necessary to question the quality of follow-up learning interactions (Lynngård, 2015), as well as whether such initiatives are followed up in the pre-schools (Ejbye-Ernst, 2011; Thulin, 2011).

As natural science lecturers, we have our understanding of curiosity and wonder, but other lecturers may have other perspectives. Through early childhood teacher education, the students develop their understanding of such concepts from lecturers based in different disciplines; these multiple perspectives shape their practices together with the "culture" in the pre-schools themselves. Therefore, in the multidisciplinary context of ECTE, we wanted to investigate how lecturers from different disciplines conceptualise curiosity.

Importantly, to understand and discuss how we can support children's curiosity, a deeper understanding of the terms *curiosity* and *wonder* is needed, and, how these concepts are established and expressed. In this article, we first explore and discuss these two terms, then turn to our research question: How is curiosity understood among lecturers from different disciplines in early childhood teacher education?

11.2 Curiosity and Wonder in Theory

Curiosity, as a concept, seems to be taken for granted (Chak, 2007); although it is a concept that has been discussed for centuries, no exact definition exists (e.g. Jirout & Klahr, 2012). Based on Loewenstein's (1994) broad review of studies on curiosity theories, Jirout and Klahr (2012, p. 125) propose an operational definition for measuring children's scientific curiosity, as 'the threshold of desired uncertainty in the environments that leads to exploratory behaviour.' Yet, this definition is too complex to function as an everyday definition of curiosity in ECE and ECTE. It neither includes the value perspectives related to relational and democratic perspectives that Menning (2017) suggests to include in a definition of curiosity.

Central in Loewenstein's (1994) review is the information gap theory of curiosity, suggesting that curiosity is a result of the unpleasant feeling of deprivation. This gives a motivation to seek information to reduce the negative feeling. There are, however, no clear distinctions between the terms *curiosity* and *interest* (Luce & Hsi, 2015). This link between interest and curiosity is recognized when Kashdan and Silvia (2005, p. 368) suggest defining curiosity 'as the recognition, pursued and intense desire to explore novel, challenging and uncertain events.' In this understanding, it is the individual's motivation that links interest to curiosity in which new discoveries enhance interest and increase curiosity.

Dewey (1910) describes curiosity as a desire for fullness of experience. He describes a flow in this process starting with physical curiosity, based on sensory experiences. This curiosity may be developed by social influence, and further supported as intellectual curiosity when it is transformed into interest in problem

solving. Berlyne (1954) distinguishes between perceptual and epistemic curiosity. Perceptual curiosity is aroused by new or special sensory impressions leading to specific explorations (Berlyne, 1954), while epistemic curiosity is stimulated by intellectual uncertainty leading to questioning to gain knowledge (Berlyne, 1966). Others have separated curiosity into 'diversive' and 'deep epistemic' curiosity (Lindholm, 2018, p. 988). Diversive curiosity is expressed as a somewhat 'superficial' desire to know facts. Deep epistemic curiosity builds upon diversive curiosity, but also includes characteristics of wonder, such as reflection and experiential questioning. Lindholm (2018) argues that a child needs to have a solid foundation of facts before independent and scientific thinking can take place. Hence, Lindholm (2018) argues that deep epistemic curiosity normally take place in older children. In this kind of curiosity, the combination of wonder and diversive curiosity causes reflection, knowledge and a desire to find out more, implying a tight connection between curiosity and wonder.

Lindholm (2018) and many others (e.g. Hadzigeorgiou, 2014; Opdal, 2001) articulate the differences between the two concepts. Opdal (2001) describes wonder as 'the state of mind that signals we have reached the limits of our present understanding, and that things may be different from how they look' (p. 332). He suggests that wonder can contribute to a desire to investigate and seek new discoveries, thus playing an important part in development of creativity and critical sense. Philosophical pondering is more often connected to wonder, and physical exploration linked to curiosity (Opdal, 2001). Lindholm (2018) describes wonder as a silent experience of something that triggers the senses and is ignited by perception rather than reflection.

Children are assumed to be born curious (Hodgkin, 1976), but other arguments suggest this is not the case (e.g. Lindholm, 2018). Some studies indicate differences between children's curiosity (Cohen, Schone-Bake, Elger, & Weber, 2009; Gruber, Gelman, & Ranganath, 2014). It is difficult, however, to know how curious a child is. Children express their curiosity in different ways (Luce & Hsi, 2015), and their curiosity may be reflected towards different objects (Coie, 1974). Curiosity is often thought to be verified by verbal questioning, and the more questions the child asks, the more curious a child is perceived (Jirout & Klahr, 2012; Patrick & Mantzicoupoulus, 2015). Expressions of curiosity, however, vary between different cultures (Rogoff, 2003), and children from different cultures are known to ask different types and amounts of questions (Harris, 2012).

Curiosity can also be seen as exploratory behaviour or as collecting and touching (Jirout & Klahr, 2012). Gurholt and Sanderud (2016) introduce the concept of curious play as a theoretical framework to understand children's attractions and explorations in nature. Based on Merleau-Ponty's (2013) argument that children's existence is rooted in their bodily orientation to the environment, Sanderud and Gurholt (2014) suggest that curious play may help children's self-understanding and generate more curiosity. Children's curious, explorative and playful activities in nature can be interpreted as a drive to explore their bodies through sensory interactions with the surroundings (Sanderud & Gurholt, 2014).

The terms curiosity and wonder are widely used in pre-schools as well as in curriculums and literature concerning early childhood (e.g. Menning, 2017). Hammer (2012) showed in her study that *wondering* was among the highest valued activities in pre-schools. Although curiosity and wonder are considered as fundamental for development in any society, there is a lack of knowledge, ideas and even discussions on how pedagogy can nurture or inhibit curiosity (Cohen et al., 2009; Egan, Cant, & Judson, 2014; Lindholm, 2018). Curiosity seems to be valued as a tool for gaining knowledge (Menning, 2017), and teachers that support children's own investigations are seen to support children's curiosity and learning more than those explaining verbally (e.g. Milne, 2010; Van Schijndel, Franse, & Raijmakers, 2010).

Indeed, Lindholm (2018) argues that the scientific explanations teachers give in response to children's curiosity may prevent further curiosity instead of promoting it. He concludes that early childhood teachers should pay attention to moments of wonder to maximize children's experiences. This is in line with the pedagogical practices Hammer (2012) found; it did not matter what the child was wondering about, wonder in itself was seen to be important. According to this line of thought, children in pre-schools should be stimulated through experiences in nature, arts, aesthetics and stories (Hadzigeorgiou, 2005; Lindholm, 2018). If we consider curiosity and wonder as different concepts, one of the conclusions must be that they call for different actions from the teachers in pre-school; certainly, Lindholm (2018) argues that a focus on wonder in early childhood stimulate curiosity in the future.

The lecturers in ECTE may be seen to represent different disciplinary cultures. Our knowledge is developed and formed in the cultures in which we participate (Rogoff, 2003; Vygotsky, 1978). If, as Menning (2017) argues, we do not necessarily share a common understanding of the terms curiosity and wonder, these different understandings may affect the way lecturers treat curiosity in early childhood teacher training.

11.3 Research Context

Although children's curiosity is considered a general phenomenon, curiosity is also shaped by culture. From this cultural-historical perspective, ECTE lecturers may have contributions which may be applicable generally across cultures, as well as culturally specific contributions. Therefore, we will present the research context.

This study was undertaken in Norway, where most children between one- and six-years old attend early childhood education institutions. There is a strong sociocultural tradition in these settings that emphasises play, learning and care (Ministry of Education and Research, 2017). Pre-school staff consists of one to two pedagogues and trained assistants per group of children. The pedagogues have completed a three year Bachelor's degree course in Early Childhood Teacher Education (ECTE); the three year programme is organized around multi-disciplinary subject areas, such as arts; nature, health and movement; children's play and learning, etc. The lecturers of these subjects are mixed from different disciplines and the courses

are structured in a range from disciplinary to interdisciplinary teaching (Hauge & Heggen, 2019). Some pedagogues in the pre-schools also have a post-graduate Master's degree in Early Childhood. The assistants may have a high-school specialization in Early Childhood, but this is not compulsory. Some assistants have had previous careers or training in other backgrounds.

Knowledge may be seen in a cultural-historical context as something that we construct and reconstruct (Fleer & Pramling, 2014). We postulate that the knowledge, or understanding, of curiosity by the staff in the pre-schools is shaped by the university training of the pedagogues, as well as their everyday pedagogical life in the pre-schools. In parallel, we believe that the ECTE lecturers' perceptions of curiosity are coloured by their culture, in the sense of their disciplinary background and professional environment. In order, therefore, to get an insight into the views on curiosity that exist in ECTE in Norway, we interviewed ECTE lecturers from different disciplines on their conception of children's curiosity.

11.4 Methodology

To explore the concept of curiosity in ECTE, we interviewed ECTE lecturers from seven disciplines on subjects related to their understanding of curiosity. We chose a semi-structured interview, structured around five questions upon which elaborations were made during the interviews. The interview revolved around our open-ended questions: Can you say a little on what you consider 'curiosity' to be in children? How can one discover children's curiosity? Should one stimulate children's curiosity? Is there a separation between curiosity and wonder? Which literature, if any, do you think your understanding of curiosity is based on?

In our invitations to the interviews, the lecturers were informed that we worked with children's curiosity. They were asked to refrain from reading literature on the theme prior to the interview, as we wanted to explore their already established understandings that they convey to the students. The interviews lasted around 30 minutes; they were recorded and transcribed by the researchers.

The interviews were analysed using a conventional qualitative content analysis (Hsieh & Shannon, 2005). The researchers familiarized themselves with the material by transcribing and reading the material individually. We then discussed the material and started identifying codes that seemed apparent in the material. Both researchers then coded all the transcriptions individually. During a subsequent discussion, we coded the categories based upon our findings in relation to the following themes: *expressions of curiosity*, *stimulation of curiosity*, *curiosity or wonder*, *curiosity in ECE [Early Childhood Education] and ECTE*, *theoretical perspectives on curiosity*, *disciplinary perceptions of curiosity* and *curiosity as a cultural trait*. These categories form the basis for the discussions in this chapter.

The ECTE lecturers included in this paper were selected to represent the variety of disciplines present in ECTE. Although most subjects in ECTE have a practical aspect, some disciplines are seen as more theoretical than others. We wanted to

cover both practical and more theoretical disciplines; therefore, we invited lecturers from pedagogics, science didactics, arts, mathematical didactics, drama, physical education and language. We invited one lecturer from each field, and everyone responded positively to participating in the research. We selectively chose to invite lecturers that we consider to have a particularly tight connection with early childhood education. Six of the lecturers were among those we first invited. One was our second choice.

The pre-school lecturers portrayed a rich understanding of curiosity. It is our impression that they share many of their views on curiosity, although their understandings also differ. To shed light on how the different professional cultures may have coloured their views on curiosity, quotes and some of the general descriptions are labelled with initials: Arts lecturer (AL), Drama lecturer (DL), Science lecturer (SL), Mathematical lecturer (ML), Pedagogue lecturer (PL), Physical Education lecturer (PE), Language lecturer (LL).

11.5 Portrayed Perceptions of Curiosity

Overwhelmingly, the lecturers saw intrinsic values in children's curiosity. They also seemed to consider children as born curious, in line with research literature (e.g. Hodgkin, 1976; Jirout & Klahr, 2012). This implies that the trait is universal for all children, and the lecturers justified this with evolutionary explanations, *e.g*. that the children need to explore the world to learn and to get to know themselves, their environment, and the relationships between humans and between humans and their environment. *If you consider curiosity as a basis of existence... then it is clear that if you stop being curious then, no, that is only depressing. No. But, if you stop being curious, you stop caring about your surroundings* (PL). This quote demonstrates how the pedagogue, as well as several of the other lecturers, see connections between curiosity and development, thus emphasising the value she gives it. In this section, we will look further into how the lecturers describes children's curiosity and reflect upon how this relates to literature on curiosity.

11.6 Understanding Curiosity

11.6.1 Curiosity in Different Cultures

In Norwegian pre-school culture, children's participation forms the basis for the pedagogical activities (Menning, 2017; Ministry of Education, 2017). The lecturers in our study state that although they, in line with this culture, consider curiosity as a positive trait, it may cause challenges in the daily life in the pre-schools: *Curious*

children may give the adults challenges in busy everyday situations. [...] I think that curious children, not always are considered positively (LL).

Some of our lecturers pinpoint that different cultures value curiosity differently. Their view is supported by the finding that children's questioning differs between cultures in different countries (Gauvain, Munroe, & Beebe, 2013) and that children asking questions to elder in a society may be considered impolite (Harris, 2012). Lindholm (2018) sees curiosity as more of a cultural than a genetic trait. The art's lecturer expressed how she saw this: *The view on curiosity might have changed, and it might also be culturally dependent. Do we want curious children? In different cultures, this might not be so important. [...] But, I have concluded, that of course we want curious children. It is a quality in the act of being curious, and curiosity is something we want in our education, and in my discipline, we try to stimulate curiosity because in curiosity, there is a drive to understand, to learn and understand your life and yourself.*

One of the lecturers also mention how she considers gossip to be a negative form of curiosity. When we asked if she saw this in children, she said: *No, no. Thank god! It is a cultural thing that comes later, I think* (DL). Surprisingly, a study by O'Neill, Main, and Ziemski (2009) shows that pre-schoolers talk about other people and their thoughts and feelings, in ways that are similar to the concept of gossip. There may be good reasons to talk about other's feelings and thoughts, although this is considered negatively in many cultures.

11.6.2 Curiosity or Wonder?

As we have seen in the theoretical outline on curiosity and wonder, these concepts are often intermingled with an indistinct separation between the two. The lecturers in our study attempted to distinguish between the two concepts. The arts lecturer described that for her, wonder and curiosity have different colours. The language lecturer stated: *If you look it up in a dictionary, wonder might be listed as a synonym, and vice versa.* She continues to explore her own separate understanding of the two concepts: *...Curiosity for me means that you have a bigger drive to figure things out, to find a result, while to wonder, then you are not so concerned to link this to a result.* Curiosity was often described as a will, an urge or a need to understand, an understanding in line with the information-gap-theory where children are curious because they feel a need to achieve understanding (Loewenstein, 1994).

While the physical education lecturer links curiosity to bodily activity, she links wonder to thought processes: *I believe that wonder is more a process of thoughts, they may question things, but they don't have to be active. [...] if you are to separate it like that.* This resembles how Berlyne (1966) describes epistemic curiosity, showing how the concepts of curiosity and wonder is intermingled. Wonder was linked to situations of imagination or fantasy, seeking a different kind of knowledge. *Wonder has a more philosophical aspect than curiosity* said the pedagogue. However, she

continues with a reservation: *...the way I understand this.* This understanding is similar to the distinction used by Opdal (2001).

Lindholm (2018) argues that children's predispositions to wonder and curiosity is affected by age and claim that we should have more attention to wonder than curiosity in early childhood education. The lecturers we interviewed however argue that both wonder and curiosity belongs in the field of early childhood education. They are in line with the Norwegian Framework plan for Pre-schools (Ministry of Education, 2017) which describes how *pre-school staff shall stimulate children's curiosity [...] and encourage them to wonder, investigate, trial and experiment* (pp. 50–51). The difference between the concepts of wonder, curiosity and exploration, seems to be unclear in this framework also, but wonder and curiosity are used in relation to different subject areas. Where curiosity is linked with learning natural sciences, wonder is more commonly used in connection with arts and music (Menning, 2017).

11.7 Expressions of Curiosity

11.7.1 Bodily Expressions

All the lecturers highlighted how one could observe children's curiosity in their body language and activities. Several of the lecturers talked about body language as an expression of curiosity: *that they put their nose and head forwards* (DL). Some of them also talked about children's gaze. *I see it in their eyes!* (PL). The pedagogue also notes that we may discover when curiosity is satisfied in children's body language and eye-movement. The language lecturer express: *I also believe that one may be curious and quiet. That depends on the topic of the children's curiosity.* While definitions of curiosity often state that curiosity leads to exploratory behaviour (Jirout & Klahr, 2012), it seems as the lecturers we interviewed linked bodily movements as indicators of curiosity directly, not only as indictors of further exploration derived from curiosity. This understanding of bodily expressions of curiosity might be understood in light of Merleau-Ponty's (2013) bodily phenomenology, in which the world is sensed through bodily exploration. In Merleu-Ponty's (2013, p. 330) words, "It is not consciousness who touches or who palpates, it is the hand."

The lecturers also underlined how children's bodily expressions of curiosity differ. The pedagogue lecturer elaborates: *[W]hen a one-year-old is curious, it is often about pulling that cord and put it in their mouth to see what happens then. [...] Every time a small child gets their hands on new things, they explore them. [...] Older children may start to be curious about more than what they see right in front of them. [...] When you are older you tend to explore more in depth, and spend more time on each thing*. The sensory curiosity she describes here can be seen as physical curiosity, the first step in the development of reflective thoughts (Dewey, 1910). This understanding seems to be in line with earlier studies on the curiosity of small

children that share their attention and ask questions by pointing their finger towards the object of interest (Begus & Southgate, 2012).

The physical education teacher links curiosity with bodily movement, but also that it could lead to physical exploration: *I see an active child, exploring the environment. How can I use this environment? [...] They explore the environment and they try out activities and such things, then I consider them as curious, they are curious on the room, or they are curious on this area, or ... So, I first and foremost think of an active child* (PE). This spontaneous exploration has also been highlighted in earlier behavioural studies on curiosity (Jirout & Klahr, 2012), and such physical exploration has been linked to children's investigation of the environment and their own bodies through curious play (Gurholt & Sanderud, 2016).

11.7.2 Verbal Questions

Verbally expressed questions are often described as the foundation of children's curiosity (Jirout & Klahr, 2012; Patrick & Mantzicopolous, 2015). Still, the lecturers we interviewed all talked extensively about bodily expressions of curiosity before they refered to verbal questions. Questioning was only described after first having described the bodily expressions. The lecturers then elaborated how verbal questions would supplement other signs of curiosity. They also described how the ability to ask questions could be age-dependent. *While a bit older children might perhaps ask questions in addition. Not in place of, but in addition* (PE). Such an age-dependent development of verbal inquiry is described in Engel (2015) and might be connected with deep epistemic curiosity. As this relies on an age-dependent development, Lindholm (2018) suggest that deep epistemic curiosity is uncommon in pre-school age children. For the study participants, it appears they think that questions were over-rated. The science lecturer underlined that the questions did not have to be verbal: *No... the kid stops in the middle of a movement, or gaze, or...* The lecturers in our study hence seem to value bodily expressions of curiosity over questioning.

Questions are not necessarily signs of curiosity, and both the pedagogue and the science-lecturer problematize this. The science lecturer described how children might express genuine curiosity through questions, but she also underlined that it was hard to interpret these signs, and she suggested that often children ask questions in order to gain attention or recognition, rather than expressing curiosity. The science lecturer refers to a recent article in a newspaper: *He [the author] claimed that children ask questions although they are not interested in the answers. Hence, that it was just a façade, that it was not important... to get answers* (SL). She continues however with: *I do not think I recognize this*. It is not clear whether answers to such questions lead to enhanced interest and curiosity.

The lecturers hence described how children's expressions of curiosity differ. The diversity of expressions, especially those which are subtle, such as the children's gaze, challenge the teacher's ability to recognize curiosity. We will look further into

this when we explore what the lecturer expressed about curiosity in early childhood education.

11.8 Stimulation of Curiosity

11.8.1 The Role of the Environment

In line with Dewey (1910), the interviewed lecturers agreed that teachers who provide children with rich environments and experiences will support their curiosity. They express that it is important to create space and designate sufficient time for curiosity. The Drama lecturer expressed it as *opening doors [...] to where the answers are, to where we may explore more. To more inspiration.* This may refer to what other lecturers describe as rich and generally stimulating environments or activities. Hackman and Engel found that children's curiosity varied more between children in different environments than between children of different ages, underlining the importance of the environment (Engel, 2015). Creating space for exploration, questioning and wonder in rich environments has been argued to condition curiosity (Gurholt & Sanderud, 2016). Lindholm (2018) argues for maximising situations with a rich variety of experiences, drawing from art, nature and culture, and the interviewed lecturers found rich environments in nature to be well suited for stimulation of curiosity.

However, even in what might be described as a rich environment, such as the outdoors, the role of the teacher is still critical. The mathematics lecturer was concerned that teachers too often minimize situations in which children express or could express curiosity. She questioned the focus on teaching children the definition of a perfect circle, which, in a mathematical sense, is so strict and theoretical that children may not be able to find a perfect circle in nature. Instead, she argued that encouraging children to find many examples of 'almost round' objects in nature was more likely to stimulate curiosity.

11.8.2 The Role of the Teachers

The lecturers expressed that, in their opinion, curiosity can be stimulated and sustained and they shared many reflections on how this is possible. They highlight ECE centres and the teacher's important role in sustaining curiosity: *It is important to take care of it too; [it is] one thing to stimulate it, [and another] to take care of it* (ML). Dewey (1910) suggested that teachers could merely "keep alive the sacred spark of wonder and to fan the flame that already grows" (p. 29). Participants saw this stimulation as the responsibility of the teachers and stated that teachers could

stimulate children's curiosity by creating opportunities for rich experiences and by their reactions to children's expressed interests.

Teachers' reactions to children's exploratory behaviour affect their further investigation (e.g. Chak, 2010). The science lecturer links the tendency to extend an explorative situation with the ability of the teachers to be curious themselves: *It is particularly dependent on being with curious adults. [...] I am certain there is a contagion effect* (SL). The science lecturer later elaborates about having '*…a behaviour that makes you collect sensory perceptions. I guess it will tempt others to ask you what you are doing. Hence a kind of "look here", but "listen here" – the exploring movements one step ahead of "Look here!"* (SL).

The physical education lecturer expressed it her way: *How the adults are in the pre-schools [...] in relation with movement and development and in connection with the development of the entire child. [The child] must be able to experience different environments and then it is clearly the adult that has to seek out the different environments* (PE). There are many aspects to this conditioning, and the pedagogue touched upon several of these in the following statement: *You must create space for questions from the children, and you have to acknowledge the children when they bring forward whatever they have to contribute [...] It is not sufficient to sit and be ready to answer questions when they come, but you have to show, as an adult, that we may have these manners, and that I as an adult also can be curious, and ... when we suddenly find something in the forest, find [an animal] cadaver, or whatever might show up, then for adults to be curious yourself [...] For adults, it is so easy to think safety straight away, let's keep away, there might be bacteria here. What? What in the world, what has happened here, and yes, how can we find out what kind of animal it is. [...] Then we start to wonder. What do you think it is? It is probably a dinosaur, or maybe a deer, or maybe a dog or, and then they start* (PL). The pedagogue lecturer stresses that adult's use of time, opening up situations and being curious are important in such situations. Where adults actively ask many questions, it has been found that also children ask more questions (Harris, 2012). It might be easier to support children's curiosity, to maximize a situation, to prioritize time to explore and enter situations of sustained shared thinking as a curious adult. Certainly, if met the right way, children's own curiosity may often be the best stimulation of even more curiosity. The lecturers focus on how teachers should take the time to be a good conversational partner. When children and adults have a common commitment and share their thoughts in sustained shared thinking, conversations last longer and better support children's development (Siraj-Blatchford, 2009). Focusing on the role of the teachers, the language lecturer said: *Be a conversation partner that supports wonder, rather than hurrying to a closed answer.*

11.8.3 Stifle Curiosity?

Several of the lecturers were concerned that teachers may stifle children's curiosity. The arts and the mathematics lecturer describe how we often don't prioritize time to let curiosity flourish. *Because we do some things that I believe minimize a little bit*

quickly in our everyday activities, you are in a hurry and then reply too quickly or dismiss it. Are not entering into the curiosity in a way. One are not ready to accept the invitation to tag along, to be curious (ML). The mathematics and science lecturer specify how pre-school teachers may resolve questions by giving absolute answers. *We know so much. It is hard not to give all the answers.* (ML). The mathematical lecturer is further concerned that an apparent availability of correct answers deprive room for curiosity, and she questions whether curiosity is valued in early childhood mathematics education: *Because you think there is only one right answer. Then there will be no room for curiosity or wonder.* The science lecturer gave an example: *Maybe there is a tendency that we might say: "Yes, that is a Crested Tit" and then it stops. So, some answers stop communication* (SL). Closed answers, such as mentioning species names, have been found to shorten children's engagement (Gustavsson & Pramling, 2014), while open-ended communication may sustain it (Siraj-Blatchford, 2009).

In fact, children may stimulate other children's curiosity more successfully than teachers are able to. In line with Harris (2012), many of our lecturers express how they believe that children of the same age often are the best stimulators of curiosity: *To be in an environment where other children also may be curious, like three-year olds, then it is very socializing with a three or four-year old that is already curious. This will be more decisive than an adult* (SL).

11.9 Curiosity and Learning

The lecturers we interviewed seemed to consider that stimulation of wonder and curiosity are a way to ensure appropriate learning in early childhood. *You may say that curiosity, wonder and exploration belong in the field of early childhood education. [...] to lead us into a different way to work according to frameworks* (DL). The Drama lecturer expands this further when she describes how both curiosity and wonder are present in the framework plans *to ensure that they are not tempted to old fashioned teaching. No early childhood persons want that, but maybe, maybe people outside the field of early childhood. Parents, or...* Therefore, it seems the lecturers value curiosity for its learning potential. Whereas Dewey (1910) links curiosity through wonder to learning, others (e.g. Opdal, 2001) suggest that philosophical wonder can lead to curiosity and exploration, further leading to learning. Although the lecturers separated between curiosity and wonder, and linked them to learning, it was not clear from this material how they made this link.

Whereas curiosity has been linked with the motivation to learn and more effective learning experiences (e.g. Gruber et al., 2014), the lecturers in this study seem to be more concerned that curiosity may ensure an appropriate method by which to learn. The focus on curiosity in whitepapers and frameworks (Menning, 2017) may however lead to an anticipation of many questions from the children. Several of the lecturers underline that equating frequent questioning from children with curiosity is a problematic myth. Moreover, the drama lecturer express concern: *It may be*

something to hide behind... that they [the children] are so curious, hence that they are given the responsibility to learn everything by themselves today. That the adult disclaim responsibility... Right? (DL). She continued: *Not all children are equally curious, I think that is part of a myth. Of course, they are different. Children are very different. [...] It is not that simple* (DL). Thus, she echoes Gruber et al. (2014) who found individual differences in curiosity.

11.10 Curiosity in Early Childhood Teacher Education

11.10.1 Theoretical Perspectives on Curiosity

None of the lecturers gave a clear definition of curiosity, and few used literature on curiosity in their teaching. Yet, the lecturers were able to provide a few examples of literature that they linked to curiosity. The arts lecturer said she used thinking from Reggio Emilia to support her understanding. The drama lecturer cited Vygotsky as central to linking curiosity to learning in a suitable way for small children. The science lecturer also used Vygotsky to link curiosity with fantasy; and, she linked curiosity with research on brain development. Not surprisingly, the lecturer with most clear references on this theme was the pedagogue. She linked curiosity to Næss and Huizunga's concept of *Homo ludens*, the playing human and Piaget's thoughts on equilibrium. These theoretical backgrounds range from theories close to early childhood practices to more philosophical works on the human mind.

Jirout and Klahr (2012) discuss that such variation may result from a lack of a good operational understanding of the concept of curiosity. It is interesting to see that lecturers in ECTE, where curiosity is a central concept, have an incomplete understanding of these concepts. An increased theoretical understanding of curiosity seems to be needed in early childhood teacher education. As the science lecturer in this study exclaimed: *I feel ashamed!*

11.10.2 Disciplinary Differences in Perception of Curiosity

The lecturers' understanding of curiosity and wonder have been developed within their disciplinary theoretical frameworks, but the understanding of curiosity also includes other interdisciplinary differences. The lecturers we interviewed described various objects of curiosity, such as different natural objects, animals or trees, or on how things work, often framed within their discipline. While the arts lecturer described curiosity on materials, the drama lecturer talks about the implicit exploration in process-drama. Curiosity was also described as playing with words or creation of new words (LL), on different forms or figures (ML), on different phenomena

(SL) or active exploration (PE). The object of curiosity was sometimes also described as abstract, such as language or relations between humans: *What is important for me is not only about how things work, but how relations work* (PL). Menning (2017) calls for this broad understanding as it includes curiosity as a democratic value, and points to the implications of this in teacher education.

We see these different understandings as natural in a multidisciplinary education. Different children are curious about different objects (Coie, 1974), and there might be a risk that early childhood teachers recognize or stimulate the form of curiosity they value the most. The physical education lecturer expresses this: *First and foremost, I think of an active child. [...] And I think that for me that might be more important* (PE).

These differences need to be addressed in early childhood teacher education. As the science lecturer in our study expressed: *...I believe that those who will work in early childhood education should consider: Where do I stand in this context – which understanding do I have? And again, that they might shift between different conceptions of different subjects. It might be that curiosity in drama, arts, is something different than curiosity in relation to natural sciences.*

11.10.3 Curious Students

The lecturers seemed to have an underlying assumption that curiosity lessened as children got older, in line with Patrick and Mantzicopoulos (2015) study of children's motivation for learning science and Luce & Hsi's (2015) study which found that questioning seems to decrease with age. They problematized a lack of curiosity among the students, and they are not the only ones. As Parvanno states: 'students seem to lose what once came naturally' (Parvanno, 1990, in Jirout & Klahr, 2012, p. 126). This worries the lecturers we interviewed for two reasons. First, they worried for the students' own sake: *But I think that the students must be curious. They get nothing out of the education unless they have curiosity as a driving force to explore new things* (NT). This perspective is underlined by Hadzigeorgiou (2014) who saw that student involvement increases when teachers awaken wonder and emphasize this part of their learning process. Secondly, the lecturers stressed that early childhood teachers should be curious to stimulate children's curiosity in pre-schools. ECTE must support and develop the student's curiosity: *They must practice wondering. The children deserve that* (DL). The study's participants agree with Engel (2009), who argues that education programs must provide young teachers with a chance to pursue and expand their own curiosity to cultivate it in their students. There are, however, few studies which consider how we may stimulate curiosity at the university level (see discussions in Egan et al., 2014; Luce & Hsi, 2015).

11.11 Further Contemplations

We started this chapter with two stories in nature showing possible signs of curiosity in pre-school children. Both stories are open for interpretations, demonstrating the difficulty in knowing how to recognize curiosity and how it should be met. The question now remains to see if we are closer in our understanding of the two stories after interviewing early childhood teacher educators representing different disciplines?

All the lecturers we interviewed highlighted the importance of curiosity in pre-school and shared a surprisingly similar understanding of curiosity. Nevertheless, there were differences, mainly on views on the objects of curiosity. Some of the differences may indicate that their understanding is based within their disciplines, such as how the physical education teacher highlights bodily activities and the pedagogue highlights relationships. The disciplinary differences are also reflected in the lecturers' theoretical perspectives. The lecturers suggest similar ways to sustain and stimulate curiosity. Although the similarities between the lecturers are evident, the present differences reveal a challenge for early childhood teachers trying to understand, define, operationalize and theorize the concept of curiosity.

All the lecturers in our study state that curiosity must be sustained and stimulated, that ECE teachers are responsible for this, and that doing it effectively requires insight and knowledge. In the situation with the spittlebug, the pre-school teacher shared the situation with the boy and she seemed very interested in what he had found. Despite this, her intervention did not seem to stimulate further curiosity among the children. Rather, the children seemed to be motivated by each other, in line with what our lecturers claim: children at the same age often are the best stimulators of curiosity.

The way we meet children's apparent wonder and curiosity is important. When the boy was sitting with his hands in the pond, the adult abruptly ended the activity with her intervention. The boy's activity may have many similarities with what the lecturers described as wondering, a philosophical state where you might fantasize and seek a different kind of knowledge. This boy may also, of course, just have been enjoying the sensation of the water on his hands, not thinking of anything in particular at all. Regardless of what he was doing, it seems that by asking a question, the adult disrupted his interaction with the water.

These stories reveal the need for a better understanding of curiosity and how we may stimulate that in children. They also point back to one of the most interesting parts of this study, namely how all our lecturers highlight bodily curiosity. The lecturers describes how curiosity is expressed through bodily language and active explorative behaviour, and to a lesser degree by verbal questioning. This is unlike the impression we get from earlier research and literature. Where Dewey (1910) describes physical curiosity as sensory experiences and a first step in curiosity, our lecturers describes bodily curiosity as a state with an intrinsic value of equal or even higher significance than other varieties of curiosity. We hence suggest the term *bodily curiosity* to recognize and operationalize this sensory, active and embodied

search for answers. When the boy was sitting by the pond, we would like to suggest that he was in a sort of *bodily wonder* – not seeking cognitive understanding, but simply as a kind of embodied philosophizing. *Bodily curiosity* and *bodily wonder* will be subject to further research.

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