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Reflections on Education for Sustainable Development: Insights from Icelandic Preschool Teachers on Concepts, Curriculum, and Teacher Training

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Abstract

Research Objective: This study has two main objectives: (1) to investigate Icelandic preschool teachers' reflections o n c oncepts, c urriculum, a nd teacher training related to education for sustainable development (ESD), and (2) to explore any differences in reflections between more experienced and less experienced teachers.

Research Method: Eight preschool teachers participated in this study, which involved semi-structured interviews and thematic analysis.

Structure of the Article: The article begins with an introduction discussing the importance of ESD for teachers' pedagogical content knowledge (PCK) and teaching models. Next, it reviews previous studies on ESD in early childhood education and the concept of PCK. The method, findings, and discussion sections then follow.

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A Brief Description of the Context of the Issue: Education for sustainable development (ESD) demands the involvement of multiple stakeholders, with teachers playing a key role. Despite UNESCO's call for teacher training in ESD over a decade ago, research on teachers' concepts, curriculum design, and related training remains limited.

Research Findings and Impact on Educational Sciences: The results indicated that teachers' understanding of ESD was largely ecological in focus. The curriculum and teacher training were found to be critical for effective ESD. No significant difference in reflections was found between more experienced and less experienced teachers.

Conclusions and Recommendations: Both in-service and pre-service teacher training that incorporates PCK and teaching models for ESD is highly needed and recommended. Teachers require cross-curricular knowledge and teaching strategies to address the complex, multidisciplinary nature of ESD.

***Keywords*:** preschool teacher, reflection, ESD concept, curriculum, teacher training

Introduction

The concept of sustainability has been widely discussed, debated, and developed globally in recent years, particularly during the Decade for Education for Sustainable Development (DESD) from 2005 to 2014. Despite the emphasis on the critical role of educators and trainers in promoting sustainability since the DESD (UNESCO, 2014; 2020), challenges surrounding ESD remain. The concept of ESD is still vague, with misunderstandings and misuse persisting (Block & Paredis, 2019; Chang Rundgren & Yamada, 2023). Studies have shown that teachers' understanding of ESD tends to be superficial and mainly focused on ecological or environmental aspects while overlooking social and economic dimensions (Aksland & Chang Rundgren, 2020; Borg et al., 2014; Hedefalk et al., 2015; Waltner et al., 2020). This limited understanding and lack of effective teaching strategies for ESD are also prevalent among early childhood

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education (ECE) teachers (Davis, 2009; Dyment et al., 2014; Hedefalk et al., 2015). Dyment and colleagues describe early childhood education as "the natural starting point" for all ongoing education (2014, p. 661), and further emphasize the need for ECE teachers' professional development in understanding and confidently teaching ESD (Dyment et al., 2014). For teachers to incorporate ESD effectively, they must first understand its scope and learn how to teach it (Chang Rundgren, 2023), which aligns with Shuman's (1986; 1987) concept of pedagogical content knowledge (PCK). Given the complexity of ESD (Birdsall, 2015), both PCK (Forsler, Nilsson, & Walan, 2024a, 2024b) and didactical models are necessary for teachers and teacher training (Aksland & Chang Rundgren, 2020; Chang Rundgren, 2023).

ESD, with its focus on values such as democracy, human rights, equality and environmental stewardship, resonates strongly with the Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden), which have a long history of embracing these values (Aksland & Chang Rundgren, 2020; Cars & West, 2015). ESD is integral to Norway's new curriculum as one of three interdisciplinary cornerstones, alongside public health and life management, and democracy and citizenship (Norwegian Directorate for Education and Training, 2019). In Iceland, sustainability has been one of the six pillars in the national curriculum for all educational levels since 2011, along with literacy, ESD, democracy and human rights, equality, health and welfare, and creativity (Ministry of Education, Science and Culture, 2011, p. 14). These pillars are intended to be recognized and implemented holistically through related practices, and are aligned with UNESCO's statement that "ESD is holistic and transformational education which addresses learning content and outcomes, pedagogy, and the learning environment" (2014, p. 12). In Iceland, a country with a population of just 350,000, there are 200 Eco-Schools, including 77 preschools (Landvernd, 2019). Despite this engagement, to our knowledge, little focus has been placed on ESD research in Iceland, especially at the preschool level. Thus, it seems timely to examine Icelandic preschool teachers' PCK on ESD after over a decade of its inclusion in the curriculum. The following sections discuss ESD in early childhood education and related PCK in detail.

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ESD in Early Childhood Education (ECE)

Sustainable Development Goal (SDG) number four calls for every child to receive quality education (United Nations, n.d. a), while Siraj-Blatchford et al. (2010, p. 6) point out that, even from an early age, children have the capacity to think about socio-environmental issues in a sophisticated manner. Early childhood is a time of significant brain development, and according to Siraj-Blatchford et al. (2010, p. 6), the earlier children are introduced to ESD and the underlying concepts, the more likely it is that ESD will have a lasting impact. They stress that ECE is the first step of many towards ESD in a child's educational journey; hence, it plays a vital role in cultivating a sustainable, action-oriented mindset in future generations (Ibid., p. 7). In a review study of ECE teachers and ESD, Hedefalk et al. (2015) identified three major views about the purposes of ESD among ECE teachers:

1. Teaching children environmental facts
2. Influencing student behavior
3. Developing children's critical thinking skills

The first group of teachers, who viewed ESD as *educating children about their environment*, approached it from an ecological perspective, focusing on nature and science. Instruction centered on environmental topics such as pollution, the cycle of nature, facts about animals and plants, and deforestation. Teaching tended to be more closed, relying on question-and-answer techniques, and knowledge was transmitted from teacher to child with the assumption that if children were sufficiently informed about the environment, they would automatically start taking action for change. However, their understanding of nature was limited and superficial, and their teaching did not incorporate other aspects of ESD, such as social or economic dimensions (Aksland & Chang Rundgren, 2020).). Moreover, these teachers did not encourage action for social improvement (Flogaitis & Agelidou, 2003; Hedefalk et al., 2015; Lee, 2001; Ärlemalm-Hagsér & Sandberg, 2011).

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The second group of teachers understood ESD to be something that should *influence children's behavior* to act for sustainability. By raising children's awareness of the environment and encouraging environmentally friendly approaches, these teachers believed that children would learn to protect the environment, both immediately and in the future. However, these children may not have been taught to think critically or make their own decisions about the environment and sustainability but instead encouraged to act according to the teachers' instructions or modeled behaviors (Kennelly et al., 2008; Lee, 2011; Sandberg & Ärlemalm-Hagsér, 2011).

The third group of teachers understood *ESD as a means to educate* children to think critically by exploring the relationship between the nvironment and society. For example, Kennelly et al. (2008) observed that teachers taught children about recycling and engaged them in discussions about its importance. One preschooler in the study expressed concern that pollution would prevent "forests and fields from breathing," which Kennelly et al. (2008) interpreted as a sign of critical thinking. The child was contemplating the human-nature relationship and how they could make a difference. The goal of the teachers in this group was to encourage children to think about environmental issues and consider what they could do to effect change. The teachers had the children participate in problem identification and decision-making and required them to make judgments and compare different outcomes. By examining various perspectives, the children came to understand that decision-making is often complex and sometimes requires risk evaluation, a skill the teachers helped them develop (Dyment et al., 2014; Hedefalk et al., 2015; Kennelly et al., 2008; Sandberg & Ärlemalm-Hagsér, 2011; Ärlemalm-Hagsér & Sandberg, 2011). These findings demonstrate the importance of preschool teachers' ESD teaching strategies, specifically the relevance of their pedagogical content knowledge (PCK) in ESD.

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Pedagogical Content Knowledge (PCK)

Shulman's (1986, 1987) work on teacher knowledge emerged from a debate in the U.S. on the professionalism of teachers. In 1986, Shulman published a paper titled "Those Who Understand: Knowledge Growth in Teaching," which investigated U.S. teacher training examinations dating back to the 19th century. He found that about 95% of these exams focused on how much teachers knew about the content of their subjects—what he called subject matter knowledge—and only about 5% addressed pedagogy (Shulman, 1986). When comparing these exams to those in current teacher training programs, Shulman found that the emphasis had shifted from subject matter knowledge to pedagogical knowledge. At that time, teacher preparation focused on planning and organizing lessons, evaluating students, recognizing individual differences, understanding young people, classroom management, cultural awareness, and knowledge of educational procedures and policies. Subject matter knowledge played an insignificant role; in fact, Shulman drew attention to what he called the "missing paradigm" of subject matter knowledge in both research and policy (Ibid., p. 6). Specifically, there was an absence of detailed analysis on the types of questions asked and the explanations teachers provided.

Shulman proposed that teacher knowledge could be categorized into three areas: subject matter knowledge, pedagogical content knowledge (PCK), and curricular knowledge (ibid., p. 9). 9). He pointed out that PCK, in particular, needed more attention, as it represents a unique body of knowledge specific to teaching (Shulman, 1987, p. 8). Content and pedagogy are intertwined, as teachers combine their teaching strategies with their knowledge and understanding of a subject. As Shulman (1987, p. 8) explained, PCK is:

> the capacity of a teacher to transform the content knowledge he or she possesses into forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented by the students. (Shulman, 1987, p. 8)

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Later, Kind (2009) defined PCK as the knowledge that teachers need and use in the teaching process, where subject knowledge intersects with teaching strategies. He suggested that it is not enough for teachers to just know a lot about the subject content, as they must also possess the tools and strategies to successfully deliver that knowledge to their students (Kind, 2009). Baumert and Kunter (2013) demonstrated that PCK is related to student comprehension and learning and that the development of PCK is linked to teaching experience. Abell (2008) observed that besides subject content knowledge, teachers should develop teaching strategies that integrate this knowledge. These strategies are enriched as teachers gain classroom experience, become more confident in their roles, and learn which methods resonate most with students and yield the greatest impact. Similarly, Kini and Podolsky (2016) found that teachers' teaching effectiveness and student outcomes improve with teaching experience.

It is worth mentioning that in Nordic countries, like Iceland, preschool education (for children aged two to five) emphasizes social pedagogy and learning through play (Einarsdottir et al., 2015; Siraj-Blatchford, 2010, p. 151). Therefore, teaching practices vary between primary and higher grades. In Iceland, preschool teachers' PCK focuses less on subject matter knowledge—since there are no distinct subjects—and more on being knowledgeable about various topics that children might encounter or find interesting in their daily lives. They must also have the tools to explore and learn about the environment and life alongside the children (Einarsdottir, 2006, p. 167).

Aim of the Study and Research Questions

To promote ESD in early childhood, this study has two main aims: (1) to investigate Icelandic preschool teachers' reflections on concepts, curricula, and teacher training related to ESD, and (2) to explore whether differences exist in these reflections between more experienced and less experienced teachers. The research questions guiding this study are:

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1. What are Icelandic preschool teachers' reflections on concepts, curricula, and teacher training related to ESD?
2. Are there differences in preschool teachers' reflections on ESD based on their teaching experience?

Methodology

This study employed semi-structured interviews with participants recruited through purposive and snowball sampling (Bryman, 2012). In the spring of 2021, the second author posted a shareable status on her Facebook page introducing the aim of the research. Preschool teachers and preschool teacher candidates were invited to contact the second author via email or Facebook Messenger if they were interested in participating. The post emphasized that participants did not need any prior knowledge or specific opinions about ESD to join the study.

The second author received responses from interested participants and from friends and acquaintances who referred potential participants. These individuals were then contacted to set up interviews. To expand the participant pool, the second author reposted the invitation in a Facebook group for preschool employees and enthusiasts in Iceland which generated additional responses. However, recruitment during the COVID-19 pandemic was not easy, and eventually only eight individuals participated in the study. Given the qualitative nature of this research, the small sample size was deemed sufficient for achieving data saturation. However, the authors acknowledge the limitations this poses for the generalizability of the findings. The participants' backgrounds, as well as the methods of data collection and analysis, are described in detail below.

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Participants' backgrounds

Eight preschool teachers participated in the study. All were either currently working in or had previously worked in preschools run by municipalities, not private preschools. Three participants lived and worked in the center of Iceland's capital, Reykjavik; three were from a large municipality in Reykjavik; one was from a small rural town in the west of Iceland; and one was from a town in the northwest. All participants were Icelandic females, which was expected given the low number of male preschool teachers in Iceland. Participants' ages ranged from 25 to 60 years. Their experience as preschool teachers varied from one to 27 years, and they were categorized as more experienced teachers (METs), with five or more years of experience, and less experienced teachers (LETs), with fewer than five years of experience (see Table 1).

Table 1. Participants' backgrounds

	License	Work experience (years)	Green Flag School	Position	Location	Year of Studies	Additional Information
MET1	Yes	19	Yes	Head of unit	Capital city	Not a student	15+ years since graduation
MET2	Yes	27	Yes	Head of unit	Capital city	Not a student	15+ years since graduation
MET3	No	13	Yes	Head of unit	Capital city	First year of Masters	Licensed elementary school teacher (B. Ed)
MET4	No	12	Yes	Head of unit	Capital city	First year of Masters	
LET1	No	4	No	Special education teacher	Rural	First year B. Ed	
LET2	No	1	No	Assistant teacher	Rural	First year of Masters	Not currently working in a preschool
LET3	No	4	No	Head of unit	Capital city	Finishing Masters	
LET4	No	4	No	Head of unit	Capital city	Finishing Masters	BA Degree in Humanities

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Data Collection

Data were collected through semi-structured interviews conducted by the second author. An interview guide (see Appendix 1) was developed to ensure all relevant information for the study was gathered from each interview. A pilot study was conducted with two teachers who were not part of the main group of eight participants. Both the interview technique and guide were revised based on feedback from the pilot. The interviews ranged from 20 to 36 minutes, with a mean length of 28 minutes. They were conducted in Icelandic, the native language of both the second author and the participants. Due to the Covid-19 pandemic, all interviews were conducted via Zoom, as the second author was unable to travel to Iceland or conduct face-to-face interviews.

The audio data were recorded on the second author's mobile phone. After all interviews were completed, the recordings were transferred to a secure online data storage cloud at the university and deleted from the phone. Verbal consent from each participant was recorded at the start of each interview, and participants were reminded that they could withdraw from the study at any time by contacting the first author. The second author transcribed the interviews verbatim using VLC media player.

Data Analysis

Thematic analysis, useful for identifying patterns or themes in data and interpreting different aspects of a topic (Braun and Clarke, 2006), was used to analyze the data. We considered this method suitable due to our interest in exploring the participants' teaching experiences and their understanding of ESD. Both authors collaborated to ensure the validity and reliability of the analysis. The first author, a senior researcher with expertise in ESD and over 20 years of experience in educational research, contributed significantly to this process.

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Results

Based on interview data from the eight teachers (four METs and four LETs), we found that the participants recognized the complexity of ESD and found it difficult to explain what ESD and sustainability meant. They tended to associate ESD with the environment or ecology, lacking a more holistic grasp of the concept. While the teachers connected other aspects of ESD, such as democracy, equality, and gender, to their practices, they did not explicitly link these elements to ESD until the second author read a description of ESD from the curriculum. The teachers identified policy documents like the curriculum, teacher training, and school culture as crucial for ESD. Although the LETs felt that ESD training was included in their teacher training program, they still found it difficult to define sustainability or ESD. We use the term "sustainability" more frequently than "ESD" in our results section, as the teachers themselves used this term more often in their responses.

The concept of ESD is broad and complex

The participants were asked if they were familiar with the terms "sustainability" and "ESD" All but one said they associated sustainability with nature conservation or discussed it from an ecological perspective. However, some noted that even though the ecological perspective was the first thing that came to mind, they were aware that the concept had a broader meaning but could not elaborate on this. A few mentioned that sustainability had become a popular term in recent years and some even felt that it might have been overused to the point of losing some of its meaning. When asked to define or explain sustainability, all participants found this difficult. For example, LET2 said that she had certainly heard the term and recognized it as prevalent in contemporary society and present in the national curriculum. She mentioned that the word had been used in many different contexts, maybe even overused, and that it was hard to understand and explain it.

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LET2: *In my experience, it's mainly about awareness of nature and the environment. It's maybe an abstract concept … but also involves sustainable cultivation and eating locally produced foods.*

MET4 and LET3 expressed similar views, noting the difficulty in understanding what people actually meant when they talked about sustainability, whether it truly was sustainability or not. They felt that the concept was often vague and ambiguous. MET3 felt that businesses and policymakers had a tendency to use the term under false pretenses with the intention of attracting environmentally conscious consumers.

MET3: *I also think about greenwashing and how it's become a buzzword because I feel like we've started to overuse it. Many things might not necessarily be sustainable or nature-friendly by definition… But of course, anyone can use the concept, and it's also used in greenwashing.*

MET1 and MET2 both admitted that the concept of sustainability was hard to explain, but they associated it with reusing everyday items.

MET2: *Like what we do at work; it's something I can't quite explain; it's really hard to put into words now that I'm talking to you… Everything we use at our school, well, it's not a lot, at least not where I work. I don't think it's exactly how I imagined sustainability should be, where we'd make more use of the resources in our surroundings.*
…
Interviewer: *But when you think about sustainability, are there any specific things that come to mind in relation to it? You mentioned working with the resources around you—anything else?*
MET2: *No, not right now. I don't know.*

LET4 and LET1 were the only teachers who mentioned having heard or known that sustainability and ESD were possibly broader than the ecological perspective alone. LET1 recalled that, when she thought about it more deeply, she remembered sustainability being discussed in one of

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her teacher training courses in a somewhat broader sense, incorporating aspects like the economy.

> LET1: *We were talking about how we could teach children about sustainability, and that was what I was recalling before, and its relation to the economy, but we didn't go any deeper into it.*
> Interviewer: *I see, and did you discuss it in any context other than the ecological one?*
> LET1: *No, there was nothing more.*

This teacher did recall that there was a somewhat broader aspect to ESD, but she could not remember the specific context. Clearly, the holistic view of ESD was not explored in depth during her teacher training, as she remembered these discussions but noted they were not pursued beyond that point.

Similarly, LET4 remarked:

> LET4: *Yes, it* [the concept of sustainability*] is, of course, part of the curriculum, and science is one of the categories, but I've always had a hard time relating sustainability to anything other than, you know, recycling and nature conservation ... I think that this [*recycling and nature conservancy*] is what I relate to the most.*

The teachers often circled back to discussing sustainability rather than ESD, but did not have a clear understanding of the broader concept, even though some had more teaching experience and worked in Green Flag schools. Both groups of METs and LETs did not distinguish between sustainability and ESD, and they tended to use only the term "sustainability."

Although all the teachers were familiar with the term sustainability, their understanding was largely limited to the ecological perspective—they tended to stress the importance of using and reusing available resources, with many teachers focusing on recycling. Two teachers mentioned having some awareness of the broader aspects of sustainability, though neither could clearly explain what those aspects entailed.

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The need for policy and teacher training for ESD

Some teachers referenced the curriculum policy document in discussions about sustainability and ESD and were all aware that ESD is one of the six pillars of education in the curriculum. When the concept of sustainability was mentioned, LET2 described it as a "very popular topic in the community, as it appears often in the national curriculum." However, when asked if she remembered the specific context in which it appeared, she could not recall this. She added that they had received some training on ESD in preschool, but her only memory was a focus on the ecological perspective, specifically, a discussion on carbon footprint.

MET1 remembered that the curriculum included a section titled "Sustainability and Science" and added, "which makes it a special study element for preschools." She explained that her municipality evaluates one of the six pillars each year, and in 2021, the focus was on sustainability and science. MET3 commented that, in her view, the Eco-School Project supported the curriculum's sustainability goals. LET3 said that she wished she had received more training on being nature-friendly, indicating that the program had not provided sufficient training.

LET4 acknowledged, *Of course, sustainability and science are part of the national curriculum,* but mentioned that this pillar was the hardest for her to understand, as she struggled to connect it to anything beyond ecology.

Many METs had completed their teacher training more than ten years before (before or during the DESD), a period when ESD had not been extensively covered. MET4 said that she had received "incredibly little" training on sustainability and ESD in her teacher training program, and what little she had received was quite superficial:

> MET4: *During my undergraduate studies, we were immersed in arts and crafts and nature science courses, but I didn't feel that they addressed [*ESD*] specifically. It was mostly about arts, and yes, there was some mention of reusing things ... but it was mostly just looking at insects and flowers, which, of course, falls into that category, but I didn't feel like I got any real education about precisely this topic.*

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Did less experienced teachers feel more prepared by their teacher training programs, given that their studies had taken place closer to the time of the DESD? LET1 recalled a group project from her teacher training, where the objective was to reflect on how teachers could engage four- to five-year-old children with sustainability concepts, *How to use nature and the things around us, and learn about natural cycles and phenomena*. The group came up with activities such as holding awareness campaigns, picking up trash on walks, singing seasonal songs, having each child act as a meteorologist for a day, observing insects, and introducing children to natural features like waterfalls and mountains. LET4 felt that her teacher training had also been valuable. She mentioned that before starting her program, while working in a preschool, she had attended a teacher conference day focused on the national curriculum. Reflecting on that experience, LET4 said:

> LET4: *The units were divided, and each group picked a few pillars from the national curriculum to discuss. Now I'm really sorry that I hadn't started my studies at that point because … now I see it from a completely different perspective. I would like to redo some of it.*

After asking the participants about the meaning of sustainability and receiving responses that were mostly or exclusively related to ecology, the second author read aloud a paragraph about sustainability and ESD from the national curriculum. This was intended to provide them with an understanding of how the curriculum that they work with defines the concept and which aspects of their work might fall under the ESD umbrella. The paragraph reads as follows: *Education for sustainability encompasses creating a society of collective responsibility, where individuals develop as active citizens, conscious of their own values, attitudes, and feelings for global impact and equality for all the inhabitants of the earth, for nature and the environment, for democracy, human rights, and justice, for equality and multiculturalism, for welfare and health, and for economic development and a vision of the future*. (Ministry of Education, Science and Culture, 2011, p. 18)

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One example of how the paragraph was rephrased:

> Interviewer: *So, yes, you've mentioned the curriculum a couple of times, so you're aware that sustainability is one of the six pillars of education, so, like, in the 'official' definition of ESD, concepts like democracy, human rights, citizenship, economic growth, welfare, sustainable economy, and health are related to sustainability.*

It was clear that this prompt encouraged participants to reflect further. The most frequently mentioned aspects were democracy, gender equality, and human rights. Each participant provided examples of how they incorporated democracy in their work. LET2, when asked if there was an emphasis on democracy with the children at her workplace, responded: "Yes, definitely, though unofficially… for example, listening to the opinions of others or feeling free to voice your own opinions."

LET2, who taught at a preschool that practiced The Leader in Me philosophy (which emphasizes each individual's successes and personal growth; Franklin Covey, n.d.), felt this philosophy was a beneficial tool to encourage democratic values, with focus areas like being proactive and taking initiative. She described a course from her studies that had focused on democracy and civic consciousness in children and youth. She found it helpful in connecting concepts like multiculturalism, democracy, and equality to civic consciousness but noted that sustainability was rarely, if ever, mentioned in that context.

However, both MET2 and MET4, who worked with younger children, expressed that teaching the values of democracy to very young children was more difficult, especially in terms of using the actual word "democracy," compared to working with older children:

> MET2: *I'm working with the youngest kids now, but when I worked with older children, it was a lot different. Then, it was more like, 'What do you want?' and 'What do you think?' and questions like that ... and I just take, for example, when you're doing a play, and everyone wants to be the*

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wolf, you explain that not everyone can play the main role. You don't really do that with the youngest kids.
MET4: *You know, my kids are just that little; you're not going to go very deep into concepts like that.*

The need for a guiding policy, like the curriculum, was recognized. LET1 felt that there should be more emphasis on curriculum, both in her studies and at her workplace.

LET1: *I'd like it to be more like—why not just take this paragraph from the national curriculum? I mean, since I'm studying, having this text in front of us, printed out somewhere in our office or something, where it's more visible as a reminder. Then I could have answered you right away.*

Conclusion and discussions

This study found that the eight preschool teachers had difficulties explaining the meanings of sustainability and ESD, even though ESD has been addressed in their curriculum since 2011. The teachers tended to associate ESD with ecological perspectives but when presented with a text about ESD from their curriculum, they were able to recall school practices that related to other aspects of ESD, such as democracy and social aspects. Despite this, they did not initially associate democracy and equality education with ESD. Curriculum and teacher training were found to be critical for ESD—one teacher emphasized the importance of using the curriculum in teacher training for ESD, while another referenced a municipal policy involving annual evaluations to encourage teachers to engage more explicitly with ESD within the curriculum framework.

Block and Paredis (2019) noted that the term sustainability has become so omnipresent that it can be challenging to determine if it is being applied correctly and honestly. This issue was also evident in our research, where teachers spoke of their difficulties in defining and, to some extent, fully understanding the terms *sustainability* and *ESD*. We found that

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the teachers connected sustainability and ESD only with the ecological perspective, which aligns with previous research findings that the ecological aspect often dominates, and in some cases, is the only perspective that teachers are familiar with (Aksland & Chang Rundgren, 2020; Borg et al., 2014; Chang Rundgren, 2023). Some teachers in our study felt that sustainability had become an overused buzzword, and one teacher associated it with greenwashing. Rist (2007) has even called sustainable development an oxymoron. While the teachers did not go that far, they were aware that businesses sometimes abuse the term for economic gain.

The lack of any mention of the economic perspective by study participants may be due to the fact that this perspective is entirely absent from the preschool curriculum (Jóhannesson, 2017). One teacher explained that the reason she linked sustainability with the ecological perspective more than anything else likely reflected her real-life experiences. It may be that teachers find it difficult to connect the economic aspect to their personal encounters with sustainability, as they may not perceive economics through a sustainability lens themselves. Interestingly, while the term *democracy* does not appear in UNESCO's definitions of ESD, the two concepts are very closely linked in the Icelandic curriculum. The Nordic Council of Ministers' 2021 report on the status of ESD in the Nordic countries also highlights this connection, as the Nordic region has a tradition of intertwining democracy and ESD. This linkage is deeply rooted in Nordic culture and society, as exemplified by the "Nordic model" (Einarsdóttir et al., 2015; Siraj-Blatchford, 2010). Consequently, it is difficult to distinguish how much of this connection has been inculcated through teacher training and work experience versus how much has become ingrained in teachers' identities simply by growing up in Iceland, a society that has long emphasized values such as democracy, equality, and human rights.

This study found teacher training and the use of policy documents, such as the curriculum- to be important for ESD. However, teachers' understanding of ESD was relatively superficial, as observed in previous studies (Aksland & Chang Rundgren, 2020; Borg et al., 2014; Hedefalk et al., 2015; Waltner et al., 2020). When examining teaching strategies, it was clear that teachers focused mainly on children's participation. Sterling (2004)

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advocated for a participatory approach in sustainable education. By involving children in decision-making and day-to-day school activities, teachers are moving towards transformative, sustainable education. Some teachers mentioned that their work on ecological topics with children had inspired them to adopt more nature-friendly habits in their personal lives. Additionally, some reported that parents had told them their children were scolding them for not being environmentally conscious enough. This suggests that both teachers and parents are beginning to challenge their established habits.

In the teachers' interview data, there was no evident influence of ESD on their teaching experiences. While pedagogical content knowledge (PCK) has been shown to develop over time (Abell, 2008), ESD did not appear to follow the same pattern in this study. This shows that ESD should be embraced as part of PCK (Aksland & Chang Rundgren, 2020; Forsler, Nilsson, & Walan, 2024a, 2024b) and included in didactic models for both pre-service and in-service teacher training (Chang Rundgren, 2023).

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Appendix 1—Interview Guide

Introduction Questions

I'd like to start by asking you to introduce yourself briefly.

Follow-up: What is your occupation? What are your main interests?

What comes to mind when you hear the words "sustainable development?"

Have you heard of ESD?

What meaning do you associate with ESD, or what comes to mind when you hear the term ESD?

Do you know what the preschool curriculum says about ESD?

> **(For reference):** "Education for sustainability encompasses creating a society of collective responsibility where individuals develop as active citizens, conscious of their own values, attitudes, and feelings for global impact and equality of all the inhabitants of the earth, for nature and the environment, for democracy, human rights and justice, for equality and multiculturalism, for welfare and health, and for economic development and vision of the future." (Ministry of Education, Science, and Culture, 2011, p. 18).

Did you receive any training or courses on ESD in your teacher training program?

Do you remember anything specific about it? What was the main focus?

Have you ever worked, or are you currently working, in a preschool that emphasizes ESD?

> **If so:**
>
> Did your workplace explain what ESD is? How?
>
> What does your workplace do to emphasize ESD?
>
> Are/were students involved? How?
>
> Did you receive any ESD-related training or courses from your workplace?
>
> What were those courses about? Were they useful? Who conducted them?

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Do/did you have anyone at your workplace to consult about ESD-related matters?

Have you ever worked, or are you currently working, in a preschool that participates in any development programs?

If so:

What is/was the program?

What actions were/are taken as part of the program?

Are/were students involved? How?

In what ways, if any, do you discuss with your students the projects or topics you're working on?

Can you give some examples?

Do you apply, or do you plan to implement, ESD in your teaching? (If appropriate: How do you implement democracy/multi-culturalism/ecologic thinking etc. into your teaching)?

If so:

Could you describe what you do or how you plan to do it?

Have you encountered any challenges in implementing ESD?

What are some of those challenges?

Why do you think they arise?

Can you think of any possible challenges you might meet?

If you haven't faced challenges yet, can you anticipate any?

What might they be, and why do you expect them to be challenging?

Do you think ESD has made or will make a difference for you or your students?

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