

Master's Thesis

Improving Child Outcomes and Quality in Early Childhood Education and Care Through Implementation of Professional Development: A Systematic Literature Review

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Abstract

This thesis delves into the evolving landscape of Early Childhood Education and Care (abbreviated as ECEC onwards), underlining its increasing importance in contemporary society. It meticulously examines the multifaceted dimensions of quality within ECEC, and how it impacts children, with a particular emphasis on the pivotal role of staff education and training. Additionally, it explores various measurement methods and tools used to evaluate ECEC quality, ultimately framing the thesis's focus on enhancing ECEC quality through comprehensive professional development (abbreviated as PD onwards) initiatives. Through a systematic literature review of meta-analytical studies and systematic reviews on the topic, this thesis will analyze the characteristics and effects of professional development of ECEC staff, both pre-service and in-service. Through data extraction and cross-sectional analyses, the thesis aimed to uncover patterns and differences in findings, ultimately informing effective PD strategies in ECEC. Results show promising effects of In-service professional development through evidence-based practices, like coaching and mentoring, to improve educator practices and benefit children's outcomes. Pre-service PD highlights varying, but positive, associations between educator qualifications and child outcomes, urging policy interventions to improve staff education programs and improve ECEC quality. However, global context and intended outcomes hinder generalizability. Additionally, promising strategies still depends on factors such as duration, intensity, and outcome alignment. Tailored, specifically targeted and collaborative PD interventions- and measures, adaptable to diverse contexts in ECEC, are recommended. PD interventions show promise in enhancing ECEC practices and child outcomes, with some pre- and in-service attainments and elements showing more effect than others. Hence, further research is needed to refine approaches and clarify distinctions and variety in effects.

Keywords: Early Childhood Education and Care (ECEC), Professional Development (PD), Structural Quality, Process Quality, Child Outcomes, Pre-service qualification, In-service Training- and Education, Systematic Literature Review.

Introduction and theoretical exploration

The importance of Early Childhood Education and Care

Early Childhood Education and Care (abbreviated as ECEC onwards) is becoming more important for families and children, in modern society – with a large majority of children in Western nations

having gone through some form of childhood education and care before they start in regular school (OECD, 2019). What began as childcare to facilitate parental workforce participation evolved into a scientific approach and a developmental perspective focused on individual children within ECEC settings, catering to both the child and their family as part of the childcare system (Schaffer, 2006). Larger national- and international research has published promising cost-benefit analysis results, showing the positive results for children and society; with significant and positive correlations between quality ECEC and later outcomes in life (Dietrichson et al., 2020; Ulferts et al., 2019). Partaking in ECEC is believed to be beneficial for the child in terms of academic skills as reading, spelling, writing and math (Bauchmüller et al., 2014; Roser & Ortiz-Ospina, 2016), as well as for the individual child's more socio-emotional abilities. The latter helps the child develop social skills, behavioral, and the child's overall cognitive learning (Cunha et al., 2006; Cunha & Heckman, 2009; Heckman et al., 2006).

Children are viewed as unique individuals, integral members of child-communities and families, as well as part of the broader ECEC community, and rather than opposing ideals, these facets collectively contribute to the holistic well-being of the child (Broström et al., 2015; Emilson & Johansson, 2018). Therefore, it is imperative that these entities collaborate harmoniously in the best interest of the child's day-to-day life and development. It is when the child is engaging in ECEC-child communities, participating in mutual play, and undertaking child-oriented activities and instruction, that children develop their social skills, learn and develop, and experience greater well-being (Melhuish et al., 2015; OECD, 2018; Pianta et al., 2005; Sylva, 2010) Within these contexts, they refine negotiation- and communication abilities, creating bonds with peers and adults. Such interactions are engaging for the child, but also serve as pivotal learning experiences integral to various international ECEC traditions (Baustad & Bjørnstad, 2022; Broström et al., 2018; Melhuish et al., 2015; Sylva, 2010). The interactions between teachers¹ and the children in ECEC are often described as the most crucial factor for quality development, learning, and well-being, and ultimately child outcomes; placing the focus of large parts of the scientific ECEC literature on the quality related to the skills, knowledge, and prerequisites of the ECEC staff (Dalgaard et al., 2022; OECD, 2018; Pianta et al., 2016). Hence, the proficiency and readiness of ECEC staff emerge as critical

¹Teachers' will be used for clarity and abbreviation in this thesis, encompassing all professional staff members in ECEC settings. Some countries use 'Pedagogical workers' in 0-6 years of age-ECEC, while others define them as preschool- or kindergarten-teachers according to regional context (Garvis et al., 2018; Næsby & Sperling, 2023). Studies also use the definition 'caregiver', which also encompasses the care-portion in Early Childhood Care and Education (ECEC)(Dalgaard et al., 2023). Collectively, the differently defined ECEC workers will be called 'teachers' throughout.

components warranting extensive research to determine methods for their maintenance and improvement.

Quality in ECEC

In ECEC, ensuring quality is a primary concern of governments and leadership (McMullen et al., 2020; OECD, 2022; The Council of the European Union, 2019). However, the endeavor to define and achieve quality is complex and multifaceted. While many acknowledge its importance, the exact parameters of quality can be difficult to establish, and therefore, caution is advised when aiming to achieve quality in ECEC, as it is influenced by various contextual factors and encompasses multiple dimensions (Eadie et al., 2022; Munton, 2002; Pianta et al., 2005). Many research reports and studies on ECEC quality construct comprehensive lists of distinct categories and elements of quality to improve - making education, training and professional development of staff only one point of improvement among many others (Center on the Developing Child, 2007; Dalli & Buchanan, 2011; European Commission, 2021; Melhuish et al., 2015; Næsby & Sperling, 2023; NICHD, 2006; The Council of the European Union, 2019). Considering this, it is imperative to identify the most effective practices and development interventions for ECEC staff. Doing so could offer valuable insights for administrators and leadership when allocating resources for quality improvements across the spectrum of ECEC.

Emphasizing specific aspects of quality, such as the education and training of staff, holds considerable potential to enhance the overall quality of ECEC, and is commonly acknowledged as a direct means of ensuring quality standards (Eadie et al., 2022; Early et al., 2006; OECD, 2018; Von Suchodoletz et al., 2023). According to findings from a large UK study, the presence of trained staff in early childhood programs significantly impacts quality (Sammons, 2010a, 2010b; Sylva, 2010). Within the studies, 'educated staff' mostly refers to individuals holding a minimum of a bachelor's degree in pedagogy or education, with an even more pronounced effect observed when the program leader also possesses a bachelor's degree. Similar results have been found in the research from my native country Denmark, with educated staff increasing both quality and child outcomes (Bauchmüller et al., 2014; VIVE & EVA, 2023). However, other studies have shown mixed results, with little and modest results from educational attainment of staff (Bowne et al., 2017; Eadie et al., 2022). Additionally, it is also possible to ensure training and education of ECEC staff when they are in service, with promising results showing effects of small- and large-scale professional development programs in ECEC (Eadie et al., 2021; Gregoriadis et al., 2018; B. Jensen & Iannone, 2018).

Different types of quality

The above-mentioned aspects are part of what is usually deemed structural quality in ECEC, but that only represent one level of quality in ECEC. Organizationally, at a macro-level, policy leadership, and allocated resources determine what is possible, and set the requirements and standards in law and guidance, ultimately shaping what is structurally possible; and what happens procedurally in practice (Burchinal, 2018; Eadie et al., 2022; Penn, 2014; Slot, 2018). There are different conceptions of this division, but most researcher and professionals tend to divide types of quality into mainly; *process quality*, and *structural quality*². Process quality represents *child-staff-interactions, instructional learning and day-to-day activities*, representing the engagement between children and staff.; while structural quality represents *staff experience and education, leadership, work environment, organization, activity-, play- and learning materials, & facilities* etc. (Burchinal, 2018; Eadie et al., 2022; EVA, 2017; Ulferts & Anders, 2016).

The conceptual framework depicted in Figure 1, developed by researcher Pauline Slot (1960), adapted by the OECD, draws upon the theoretical quality-relationships. It describes ECEC quality and its correlation with child outcomes; emphasizing the interplay between quality 'levels' of interpretation (OECD, 2018; Slot, 2018). Structural resources are changed through policy changes, which in turn facilitate changes in procedural quality; for instance, interventions leading to better instructional- and interactional quality. Additionally, advancements in organizational structure, provision of materials, and facility

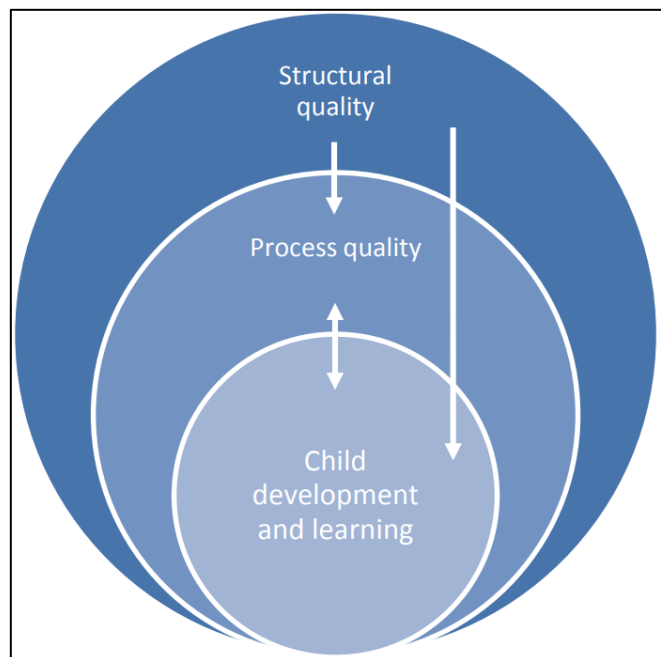


Figure 1- OECD adaption of the conceptual model of quality relationships in ECEC from Slot (2018). - (OECD, 2018)

² This distinction is most common but not exhaustive, as a minority of researchers employ additional quality categories. For instance, some distinguishes "system-quality" for macro-level policy, funding, and requirements (Eadie et al., 2022), and others employ "results-quality" for specific child outcomes, separating them from process quality which mainly focuses on center quality, teacher skills, and teacher-child interactions etc. (EVA, 2017; Svinth & Henningsen, 2021).

enhancements play pivotal roles in cultivating conducive environments for both teacher processes and child activities.

Quality in early childhood education and care (ECEC) is subdivided into specific categories. Among these, researchers often highlight three critical aspects of structural quality: staff-to-child ratios, child group sizes, and various metrics of staff qualifications and educational attainment. These elements are commonly referred to as the 'iron triangle' of structural quality (Phillipsen et al., 1997; Ulferts & Anders, 2016), and they influence government strategies worldwide, in their efforts to elevate ECEC standards through structural efforts (Garvis et al., 2018). However, it is imperative to evaluate if they could raise standards more affordable through e.g., professional development of staff, as lowering ratios and group sizes can be very expensive in proportion to its benefits (Bowne et al., 2017; De Økonomiske Råd, 2021b; Muenchow & Marsland, 2007; Ruopp et al., 1980). Additionally, quality elements impact each other more than the conceptual division will imply, and researchers are trying to pinpoint the overlapping effects, as they are crucial in the analysis of cost-benefit effects (Cadima et al., 2023; Fink, 2023; Næsby & Sperling, 2023; OECD, 2018; Slot et al., 2015). Some researchers still advocate more stringent investigations into how they effect each other, as the research shows varying and ambiguous results (Slot, 2018; Von Suchodoletz et al., 2023). Nevertheless, these categorizations remain pivotal for the holistic evaluation and future development of ECEC, and serves as categories for research endeavors into the effects of ECEC, and quality enhancement in practice (Slot, 2018; Slot et al., 2015; Wysłowska & Slot, 2020). Also, for many researchers, administrators, and professional leaders, these quality categories serve as fundamental benchmarks against which they estimate overall quality, and the effectiveness of their initiatives and practices (Burchinal, 2018; Næsby, 2021).

Measurement methods and tools

Understanding the intricate relationship between quality and child outcomes in early childhood education is challenging due to their interdependence across various structural levels, including interactions among children, groups, and staff (Markussen-Brown et al., 2017; Slot, 2018; Slot et al., 2015). Despite this dynamic complexity, researchers have devised methodologies and tools to assess specific dimensions of quality in ECEC settings.

Internationally, when measuring ECEC-quality, professionals are using experimental designs, and big data to observe and calculate effects on children, classrooms and ECEC centers. When measuring overall ECEC quality, professionals Quality Rating and Improvement Systems (QRIS's)

(McMullen et al., 2020), or so-called Environment Rating Scales (ERS); e.g., ECERS-(R) for children, ITERS-(R) for Infants and toddlers, and CLASS used for classrooms (Bjørnstad & Os, 2018; Ramírez et al., 2021; Ulferts & Anders, 2016; Von Suchodoletz et al., 2023). Critics would point out that this focus on ‘environments’ mainly relates to ‘learning environments’ when measuring quality, which potentially will put the focus on the ‘school-like’ parts of ECEC, neglecting other important aspect of being a child that cannot be easily scaled in data (Furenes et al., 2023; Ringsmose, 2017; Sommer, 2019). That said, researchers can pursue measurements of outcomes across cognitive (e.g., math, literacy, phonology, word association) and non-cognitive (e.g., social-, emotional-, and behavioral) outcomes, ensuring that the focus of research is pointed towards all important aspects (Cunha et al., 2006; Sammons, 2010b).

Two recent studies conducted in the Netherlands and Denmark have examined ECEC quality using the CLASS-ERS on preschool children (Slot et al., 2015, 2018). These studies have revealed that the overall quality of specific domains and subdomains significantly influences intra- and inter-categorical associations with child outcomes; with a broad spectrum of effects (see Figure 2). The findings underscore weak-to-strong positive correlations between improvements in one domain and

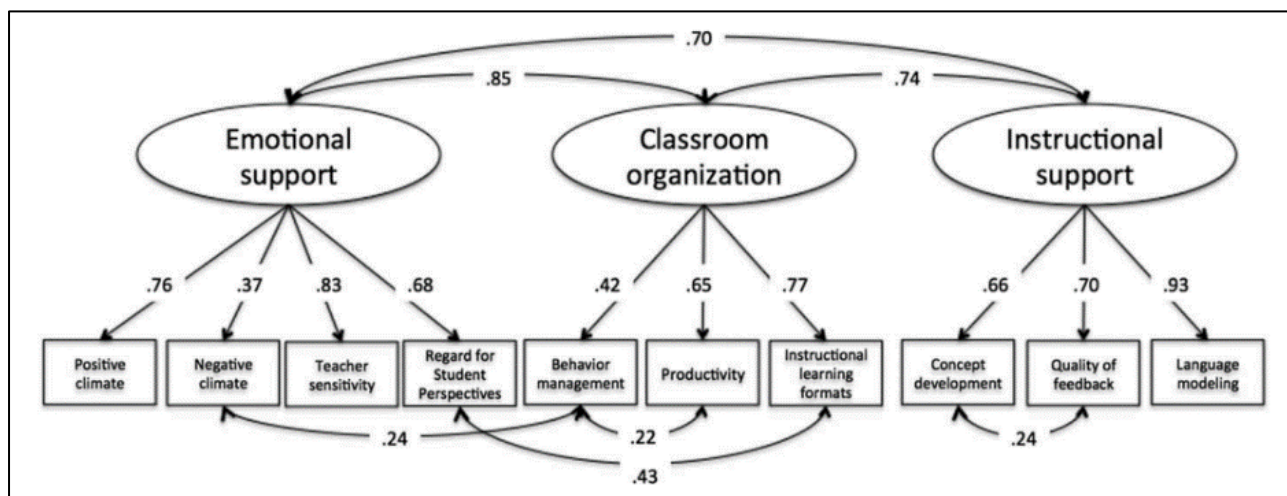


Figure 2 - Factor structure of CLASS-ERS in Danish preschool (Slot et al., 2018, p. 588)

subsequent enhancements in others, e.g., teachers with a ECEC-related bachelor showed higher levels of both emotional support and better classroom organization leading to positive child outcomes (Slot et al., 2018). This suggests that interventions aimed at improving process quality through structural modifications have far-reaching effects on various subdomains within ECEC, irrespective of their primary focus. Earlier, extensive studies on early childhood-investment also demonstrate how improvements can ‘trickle’ into other domain; implying that some investments in ECEC domains yield greater returns, as skills cultivated in one domain foster development in others

(Cunha et al., 2006; Heckman & Masterov, 2007; Heckman & Mosso, 2014; Van Huizen & Plan-
tenga, 2018).

Learning, playing and development is in many ways more than what can be measured in a reading or math test, and will most likely also be present in the ECEC literature on quality, leading to re-
search in *non-instructional interactions, playing, children's participation, self-organized child communities* etc. (Bernstorff, 2023; Broström et al., 2015; Guldbrandsen et al., 2024). These less-
easily quantifiable domains of ECEC are seen as equally valuable in a holistic view of the ECEC
environment (Lekhal, 2016; Wysłowska & Slot, 2020); and therefore they will also be important in
researching ECEC quality. Research into the more empirically 'soft' areas of ECEC can highlight
substantial knowledge on the facilitation of safe and engaging child-environments, that is perceived
to be crucial for the overall ECEC quality and child outcomes (Garvis et al., 2018; Ministry of
Children and Education, 2020; Van Laere et al., 2012).

Problem definition

Advancing ECEC quality through In- and Pre-service, education, training, and pro- fessional development of ECEC staff

While decision-makers have the flexibility to enact quality improvement strategies across various
structural domains, this thesis will specifically concentrate on enhancing the professional develop-
ment of ECEC staff. This encompasses pre-service education, training, as well as in-service
measures like coaching and short-term education programs. Henceforth, education, training, and
staff will collectively be termed as 'professional development', abbreviated as PD.

PD is widely recognized as an effective method for improving staff quality in ECEC settings (Urban
et al., 2012). As detailed in the preceding text, it serves as an effective means to elevate the quality
standards of ECEC centers, classrooms, and interactions with children, thereby positively influenc-
ing outcomes (Eadie et al., 2022; EU Commission/EACEA/Eurydice, 2023). Various approaches
exist to conceptualize and articulate professional development in ECEC, primarily categorized into
two main streams: in-service interventions for existing staff and pre-service education and training
for aspiring professionals. These categories further subdivide measures based on specific methods
of professional development (Eadie et al., 2021; Manning et al., 2019; Olesen & Henriksen, 2018;
Pendergast & Garvis, 2023). In this thesis, 'pre-service PD' refers to all training, education, and spe-
cialization endeavors pursued by ECEC staff prior to their engagement in professional roles within

ECEC settings. Conversely, 'in-service PD' encompasses all training, education, and specialization initiatives aimed at enhancing the skills and expertise of already employed ECEC professionals (Pendergast & Garvis, 2023).

Pre-service PD is believed to yield significant outcomes based on the educational attainment of staff. In ECEC, achieving specific educational levels is deemed crucial, with a minimum requirement of a bachelor's degree regarded as a key determinant of ECEC quality assurance. (Manning et al., 2017; Melhuish et al., 2015; Sammons, 2010b, 2010a; Sylva, 2010). However, there are also readily accessible educational, vocational and training opportunities that equip future ECEC staff with pre-service skills, such as classroom assistant education programs (Dunst et al., 2019; Næsby & Sperling, 2023).

Following the recruitment of staff into ECEC centers, there exists diverse approaches to ensure continuous PD. Notably, substantial disparities in the characteristics, funding, and prerequisites of these measures are evident across countries and regions (CoRe, 2011; EU Commission/EACEA/Eurydice, 2023). Nonetheless, the consensus regarding PD as a beneficial and indispensable component for maintaining qualified ECEC is firmly established (OECD, 2020; Schachter, 2015).

Numerous methods of ensuring continual PD vary in their duration, methodology, intent and intensity (Didion et al., 2020; Obee et al., 2023), with some elements of intent such as *teacher practice*- or *fidelity*, and methods like *coaching* being prevalent across studies (Schachter, 2015). Coaching and instructional guidance for staff, whether provided internally by experienced experts or through external consultants, have long been acknowledged as effective professional development measures within organizational structures (Kraft et al., 2018; Lang et al., 2024). However, the landscape of ECEC professional development is evolving, with innovative approaches emerging to tailor in-service PD to unique contexts and desired outcomes (B. Jensen & Iannone, 2018; Yang et al., 2022).

The broad range of PD interventions and measures can be tailored to various domains within ECEC, as previously delineated. These interventions may span different levels: some PD initiatives concentrate on overarching structural enhancements, while others target specific classrooms or child groups.

Additionally, certain interventions aim at refining teacher skills creating cascading effect that enhances procedural and instructional quality, which in turn shapes the learning and development tra-

jectory of each child. Conversely, other measures are directly aimed towards the child individual development by enhancing the teachers' beliefs, or consequential knowledge pertaining to the need of children. The concept is outlined through the conceptual model of change in ECEC by Yang et al. (2022) (see Figure 3), aligning with the similar aforementioned conceptual model of quality relationships by Slot (2018) (see Figure 1).

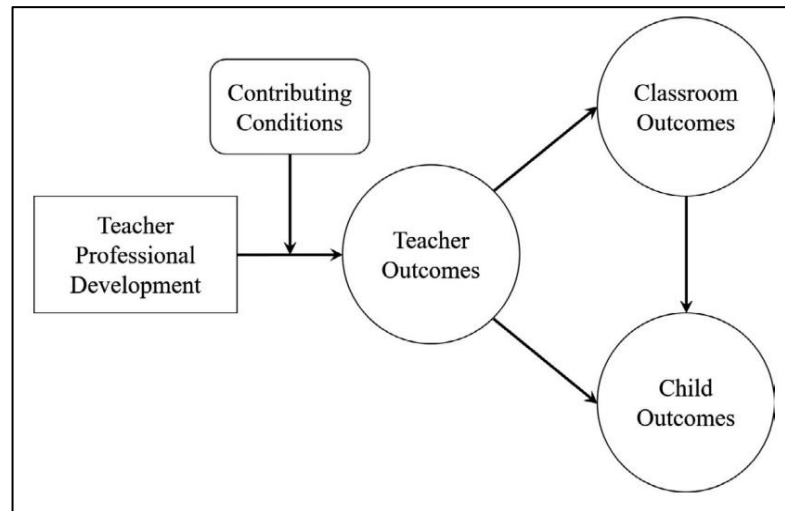


Figure 3 - 'Model of change' from Yang et al. (2022, p. 5).

Scope of the thesis research

This thesis will investigate various methods by which ECEC can develop qualified staff through In- and Pre-service PD, aiming to clarify how these strategies may enhance quality and positively impact child outcomes. The inspiration for this research stems from the assertions or speculations of prominent researchers in the ECEC field, suggesting that investing in staff development could offer a cost-effective means to improve quality and child outcomes compared to more expensive alternatives targeting other structural quality areas (Bowne et al., 2017; De Økonomiske Råd, 2021a; Muenchow & Marsland, 2007; Ruopp et al., 1980; Von Suchodoletz et al., 2023).

Hence, a systematic literature review of relevant scientific literature will be conducted to examine the significance of education, training, and ongoing professional development for the workforce in ECEC settings. This review will specifically investigate the effects of both pre- and in-service professional development in ECEC on the quality of care and outcomes for children. Through this exploration of both categories of PD, the research aims to determine whether the timing of professional development impacts its effectiveness, thereby guiding resource allocation for optimizing the qualification of ECEC staff.

Within each category of PD, a range of knowledge also exists regarding the specific characteristics of interventions and measures that could be pursued for greater understanding. Buysee et al (2009) present an additional conceptual model of change, delineating various levels, domains and characteristics of PD targeting ECEC, which provided valuable insights for this research (see Figure 4). It

is imperative to scrutinize the intended outcomes and the quality domains targeted by these initiatives. Therefore, it is necessary to examine the ‘How’-, ‘What’-, and ‘Who’-elements of the PD interventions and measures, as they influence the teacher outcomes, which in turn lead to improvements in classroom- and child outcomes.

- The ‘how’ addresses the organization and delivery of training, advocating for intensive, sustained PD with structured guidance and evaluation, for optimized outcomes.
- The ‘what’ focuses on specific content improvements aligned with the usefulness of participants prior knowledge or experience, and quality rating scales for enhanced effectiveness.
- The ‘who’ emphasizes the diverse backgrounds of participants and providers within ECEC, and to some extent also the ECEC target population, highlighting organizational contexts.

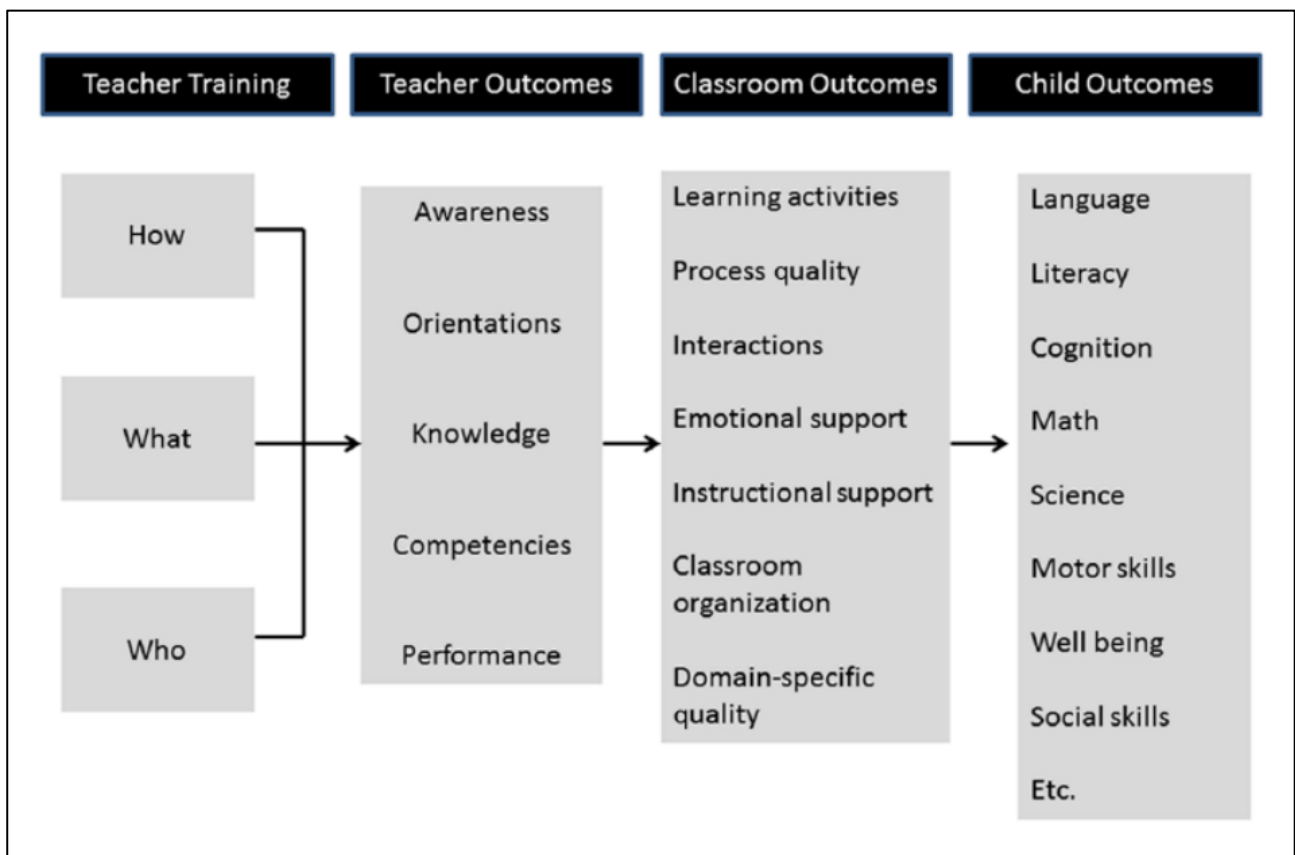


Figure 4 - Model of change in ECEC, from Egert et al. (2018, p. 405)

Understanding the scope of desired outcomes in PD in turn becomes essential. PD initiatives may target broad enhancements in quality, such as enriching teacher knowledge or optimizing classroom environments. Conversely, they may focus narrowly on specific child outcomes. It is crucial to assess the levels at which PD is directed to achieve these goals effectively. Furthermore, certain PD

methods may be better suited for specific desired outcomes, whether they pertain to non-cognitive or cognitive skills or fostering classroom coherence. Exploring potential cascading effects between these levels provides invaluable insight into the holistic impact of PD initiatives. Thus, investigating these topics can enhance our understanding and inform effective PD strategies in ECEC.

This information serves as a valuable resource for guiding decision-making and policy formulation concerning the education and training of ECEC staff at national and regional levels. Synthesizing relevant literature provides insights into potential benefits and challenges associated with various PD approaches, clarifying enhanced quality and outcomes by specific interventions.

Understanding the cost-effectiveness of implementing PD measures on a broader scale, while considering nuanced differences in local contexts, is vital. Findings derived from this synthesis can guide local leadership in organizing and accurately implementing effective PD programs. Informed decisions about PD activities, delivery methods, duration, and expected outcomes ensure tailored support for ECEC staff, ultimately enhancing the quality of care and education provided to young children.

Research aims and research questions

The research aim in this thesis is to find evidence of providing ECEC quality or better child outcomes for children in ECEC, through; Pre- or In-service education, training, and development (PD) of staff in ECEC.

Research questions:

- 1) What is the effect of in-service professional development on ECEC quality and child outcomes?
 - a. What are the defining characteristics of the most effective measures and initiatives found within the literature? In what areas of quality and child outcomes do they demonstrate effectiveness?
- 2) What is the effect of pre-service education, training, and qualification on ECEC quality and child outcomes?
 - a. What are the discernable differences in the effects on quality and outcomes depending on the multiple levels of pre-service qualification or educational attainment in the ECEC staff? Are there benefits related to proportions or thresholds of educational attainment in the ECEC staff?

Method

Research design

This study will conduct a systematic literature review to assess the impact of education, training, and ongoing professional development in ECEC settings. The review aims to evaluate existing evidence, summarize findings, and provide an evidence-based synthesis accessible to ECEC leadership (Knopf, 2006). The goal is to inform and potentially challenge prevailing paradigms, identify gaps in knowledge, and distinguish scientifically supported findings from commonly held but unsubstantiated beliefs in the literature. This comprehensive analysis aims to contribute to the advancement of evidence-based practices and policies in the field of ECEC (Okoli, 2015; Petticrew & Roberts, 2006). Literature reviews are essentially secondary research, which either summarize primary research findings or further knowledge within a specific scope of research - and they vary greatly in both scope and focus, as well as methods and publishing styles (Hart, 2018)

This systematic literature review is inspired by the protocols and checklist of the PRISMA guidelines for systematic reviews (Moher et al., 2010; Page et al., 2021), using the criteria of a preset checklist to analyze and synthesize the body of literature found (Knopf, 2006). Furthermore, the searches will be systematically run through the EBSCOhost database, the Scandinavian ECEC research database *NB-ECEC*, ERIC and Google Scholar, using the same criteria throughout, outlining every step consistently to prevent assumptions of bias in the exclusion and inclusion process (Petticrew & Roberts, 2006).

Selecting study types for the review

Research within the Nordic pedagogical field, my area of origin, primarily focuses on the significance of professional development, training, and education, by employing a qualitative and/or descriptive approach (Bondebjerg et al., 2019; Guldbrandsen et al., 2024), which also holds true to some extent across the international scientific ECEC literature as well (Falenchuk et al., 2017; Nind et al., 2016; Peleman et al., 2018). This approach may provide only restricted insights into the measured outcomes of children or the quality of ECEC settings, as it relies on perceptions and opinions that are challenging to quantify. It lacks the capacity to fully clarify the cause-and-effect relationship between PD and ECEC quality- and child outcomes, thereby undermining the ability to

comprehensively predict the significance of improvements in individual structural elements such as PD (Baškarada & Koronios, 2018; EVA, 2017; Yilmaz, 2013).

Therefore, I have chosen to search for systematic reviews and meta-analytic studies that can quantify the effect of PD in ECEC through empirical investigations of effect sizes, as well as systematic gathering of categorical and numerical data and research results (Sataloff et al., 2021). Through these types of publications, my aim is to collectively establish whether assumptions regarding the ability of PD to improve ECEC quality and child outcomes are well-founded in the research literature (Knopf, 2006).

Systematic reviews

Systematic reviews are a methodological approach wherein researchers systematically review, evaluate, and synthesize existing scientific literature on a specific topic. This enables the identification of any biases or scientific deficiencies, while also forming a cohesive picture of the overall quality of research (Petticrew & Roberts, 2006). Criticism on systematic reviews often centers on their stringent requirements for methodological rigor and bias elimination, which may potentially result in the exclusion of significant findings from the final synthesis and conclusion (Petticrew & Roberts, 2006). However, proponents argue that this approach is suitable for examining and understanding various viewpoints and illuminating the influence of dominant perspectives. Bias presents a significant challenge in research, as it can impact the outcomes of individual studies, potentially leading to 'false' significant results, including in systematic reviews (Guldbrandsen et al., 2024; Podsakoff et al., 2012). Systematic reviews aim not to encompass all available knowledge but to provide a scientific answer to a specific question based on documented effects, while being able to exclude irrelevant and bias-laden research (Petticrew & Roberts, 2006).

Meta-analyses

Meta-analyses are a well-established analytical technique used in research to synthesize results across studies and analyze how specific aspects and characteristics of these studies influence the overall effect. These analyses predominantly rely on statistical methods, pooling results from multiple individual studies to estimate and quantify the overall effect size. It's important to note that various types of meta-analyses exist, differing in their statistical and qualitative foundations (Hart, 2018). Meta-analysis combines data from diverse studies to improve precision in estimating effect size or association, thereby enhancing statistical robustness and pinpointing sources of heterogeneity, and its effect among studies (Borenstein et al., 2021). Properly conducted meta-analyses synthe-

size existing evidence without supplanting primary research, necessitating rigorous methodologies to uphold validity, which in turn also could lead to new insights (Lipsey & Wilson, 2001). Nonetheless, the quality and limitations of included studies, such as biases and heterogeneity, can impact outcomes, potentially compromising validity. Considering publication bias and inherent study limitations underscores the importance of meticulously addressing methodological constraints and potential biases in meta-analyses (Borenstein et al., 2021).

Search strategy

I conducted a systematic literature search to identify pertinent research concerning the impact of pre- and in-service PD on ECEC quality, as manifested in children's outcomes or ECEC quality assessment. The study focuses mainly on the age group of 0-6 years, encompassing the approximate standard demographic across various ECEC settings worldwide. Furthermore, the target population of the study should be primarily standard center-based ECEC, excluded narrowly defined settings or specialized care and education. To refine the search process, I developed distinct sets of keywords for the search comprising terms and phrases relevant this thesis (see Table 1). These keywords were

Table 1: Keywords¹

Type of pre- or in-service training, education or professional development	professional development or professional learning or professional training or professional education or continuing* education or continuing* training or continuing education or teacher qualification or caregiver qualification or staff* qualification or teacher improvement* or caregiver improvement or staff* improvement or in-service* training or coaching or feedback or mentor or mentoring* or pre-service* training or pre-service* education
Type of Study	systematic reviews or meta analysis or meta- analysis
Target Population	early years or early years education or EYE or child care or or preschool or kindergarten or pre-K or Pre-kindergarten or childcare or early childhood education and care or ECEC or creche or nursery or ECE or Early childhood education
Quality/Outcome	outcomes* or benefits* or effects* or impact* or effectiveness* or efficacy* or quality* or achievement*

¹Informed by search words used in introductory literature; and personal communication with experts

then employed in an extensive search conducted on the EBSCO-host database, targeting studies published between 2014 and 2024 for a collection of recently performed studies. Additionally, as previously indicated, the search was restricted to systematic reviews and meta-analyses to ensure a comprehensive and rigorous synthesis of existing evidence.

Inclusion and exclusion criteria and process

Following my search performed in the EBSCO database, I found 609 articles/chapters/reports for screening, with a total of 454 from 2014 to 2024 after the removal of duplicates. The process of selecting the studies for final inclusion in the in-depth review involved a process divided into distinct stages of; identification, screening, eligibility, and final inclusion of studies in the review (see Figure 5 - flowchart).

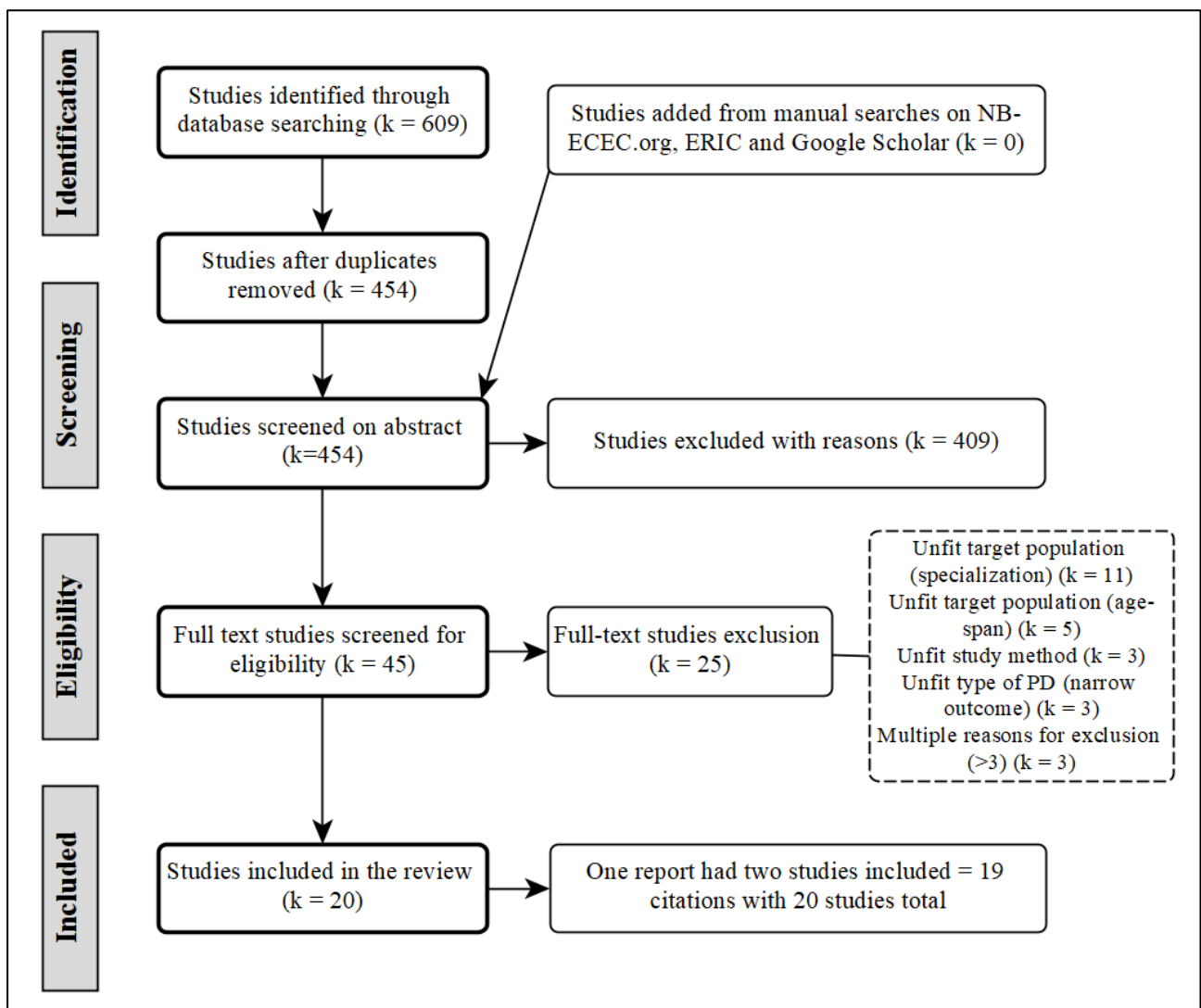


Figure 5 – Flowchart diagram based on Prisma standards (Page et al., 2021)

Initially, I screened each study according to preset inclusion criteria (See Table 2), also excluding duplicate publications. Each study underwent thorough assessment based on the preset criteria and objectives. Employing a predefined evaluation scheme ensured alignment with my research questions, study objectives, and inclusion criteria. By evaluating the aim, target group, and methodology

of each study in this sequence, the relevance for inclusion in the research was ensured, facilitating the subsequent possibility of a synthesis of results into collective findings. This approach streamlines the synthesis process, enabling the derivation of more substantive conclusions and recommendations beyond the mere summarization of individual study results (Gough, 2007; Knopf, 2006).

Table 2: Criteria for Inclusion

<i>Criteria</i>	<i>Reasoning</i>
1) Professional Development	
Focus on pre-, or in-service professional development, training, or education. sub-domains of pre- or in-service PD-categories - for examples see search words in table 1, or definitions at the onset of this thesis.	This study examines the professional development of ECEC staff, covering both pre- and in-service stages. It explores the educational content, training modalities, and developmental progression across various stages, including initial- and ongoing development or educational attainment. Sub-domains within these categories are also considered, as outlined in Table 1 or defined at the outset of this thesis.
2) Outcome- or Quality measures, and/or categorical- and numerical data.	
Data on outcomes for individual children, groups, or classrooms, as well as for the teachers and/or caregivers in ECEC settings; Data on ECEC quality measures, both processual and structural quality measured with ERS-tools	The focus on child outcomes and ECEC quality is crucial for understanding their impact on children's development. Child outcomes reflect cognitive, non-cognitive, socio-emotional-, and academic skills, and overall development trajectories; while ECEC quality influences these outcomes through interactions and activities. Describing professional development characteristics through categorical- and numerical data aids in outlining typical program formats and content.
3) Age of Target Population; (primarily or exclusively) 0-6 years of age	
This is the standard age of children in ECEC. Most studies typically focus on age ranges at approx. 0-2-, or 3-6 years of age; targeting either toddlers/infants or children aged 3 to almost 6, reflecting those receiving early childhood care and education	The 0-6 years age range is typical for ECEC worldwide, notably in Western contexts. Variations exist in settings: toddlers and infants experience nurturing care-focused environments, while older children gradually encounter settings resembling formal schooling with room for unstructured play. Transition to formal schooling often happens around age 6, marking ECEC completion. This study aims to cover the entire ECEC age group, including studies solely, or primarily, focusing on the 0-6 years demographic.
4) Setting of Target Population; (primarily or exclusively) standard care and education	
Specialized group settings or care are excluded from this thesis due to their characterization as atypical, making them unsuitable for synthesis across other settings; or to inform the broader ECEC sector.	In ECEC, various settings provide different types of care and education for children. Some studies narrowly define their groups and include only specific groups, such as; children in full- or part-time residential care; children who are severely at risk; or children in specialized care for specific disabilities or illnesses, etc. While they hold valuable insights in certain contexts, they would complicate the synthesis of the literature. Instead, the focus is on center-based care, which represents the majority of the ECEC target population.
5) Systematic Review or Meta-analysis	
Chosen for their methodical approach, which allows for comprehensive coverage of a wide range of studies, facilitating effective synthesis of the literature.	Systematic reviews and meta-analyses compile extensive scientific theories, evidence, and knowledge from global literature. Within the diverse ECEC sector, numerous studies on professional development, spanning pre- and in-service training, exist across various settings and countries. To synthesize literature comprehensively within the thesis timeframe, only these methodologies were chosen. They provide a systematic and rigorous approach to summarizing content and effects more effectively than individual studies
6) Publication date; 2014 - 2024	
Only recent studies are included to ensure the possibility of obtaining new knowledge and insights	Recent studies have insights and knowledge that are more relevant to current ECEC conditions, and might hold new and crucial information not present in the broader, less contemporary, scientific literature. Additionally, the time allocated for this thesis limits the ability to include studies from broader time span.
7) English language	
Only English-language studies for possible assessment of both author and assessors.	My country of origin is Denmark, and I am proficient in Nordic languages and English, while assessors likely comprehend Dutch and English. Therefore, English, being the mutually understandable language, is chosen.

This process resulted in the exclusion of 409 publications and the inclusion of 45 studies for in-depth screening. Subsequently, the included studies were rigorously reviewed according to predefined criteria, leading to the exclusion of 25 additional studies that did not meet all criteria. The primary reasons for exclusion were as follows: Eleven studies focused solely on specialized needs or care, five studies encompassed a broad spectrum of education including a significant number of irrelevant studies, and studies that mainly covered an age-span far beyond 0-6 years were excluded (See Figure 5). Methodological issues led to the exclusion of three studies, while another three were

considered too narrow in scope, focusing on a small component or sub-category. The remaining three studies were excluded due to a combination of the aforementioned reasons.

In total, 20 systematic reviews (SR) or meta-analytical (MA) studies were included for review, with one report (OECD, 2018) conducting studies on both In-service PD and Pre-service qualifications, totaling 19 distinct articles and reports on pre- and in-service PD, of which 14 studies on In-service PD (see Table 3), and 6 studies on Pre-service PD (see Table 4).

Table 3: In-service Professional Development

<i>Citation</i>	<i>Specification of PD</i>	<i>Method of study</i>
Brunsek et al. (2020)	In-service (PD Programs)	SR/MA
Egert et al. (2018)	In-service (Training)	MA
Jensen et al. (2019)	In-service (PD)	MA
Joo et al. (2020)	In-service (PD)	MA
Kraft et al. (2018)	In-service (Teacher Training)	MA
Lang et al. (2023)	In-service (Characteristics of coaching)	SR
Lee et al. (2023)	In-service (programs)	SR/MA
Markussen-Brown et al. (2017)	In-service (language- and literacy- focused PD)	MA
Obee et al. (2023)	In-service (PD)	SR
OECD (2018)	In-service PD (AND Pre-service qualification)	SR/MA
Peleman et al. (2018)	In-service (PD)	SR
Rogers et al. (2023)	In-service (PD- and Learning)	SR
Werner et al. (2016)	In-service (Interventions programs)	MA
Yang et al. (2022)	In-service (PD through coaching)	SR

Table 4: Pre-service Professional Development

<i>Citation</i>	<i>Specification of PD</i>	<i>Method of study</i>
Dunst et al. (2019)	Pre-service education	MA
Falenchuck et al. (2017)	Pre-service education	SR/MA
Manning et al. (2017)	Pre-service education	SR
Manning et al. (2019)	Pre-service education	MA
OECD (2018)	Pre-service qualification (AND In-service PD)	SR/MA
Nocita et al. (2020)	Pre-service Specialization	SR/MA

I conducted manual searches using descriptors corresponding to my keywords on the Scandinavian ECEC Research Database *NB-ECEC.org* and the US education database *ERIC*, whereas I utilized descriptors and keywords for a manual search on Google Scholar. However, no additional studies

were found for inclusion in my review. The studies identified through these methods were already revealed in the EBSCO-search and obtained for the second stage of the inclusion process.

Data extraction from Publications/studies

Before reviewing and analyzing the 19 publications, I constructed a data table containing preselected data points for later synthesis and comparison across the publications. The goal was to systematically examine consistent aspects in each publication, thereby maximizing the opportunity to draw conclusions about the literature under investigation (Knopf, 2006).

These points included: 1) Citation, method, and origin of study (and included studies); 2) Research question or purpose of the study, along with preconceived assumptions about PD impact; 3) Number of secondary publications and effect sizes included in synthesis and analysis; 4) Results; 5) Conclusions; 6) Limitations; 7) Recommendations for future research and the ECEC field.

The aim of this process was to simplify the association of the contents of the publications into a comprehensive description of their individual contributions to each point in the data table. Additionally, compiling comprehensive descriptions of the data, results, and conclusions of the 20 studies provides a clear overview for the overall synthesis of the literature (Page et al., 2021), and simplifies the creation of overarching descriptions of the results and conclusions of each publication and explore their contributions to addressing my research question (Okoli, 2015).

Finally, I will conduct a cross-sectional analyses of the research to investigate potential variations in results across different types of studies. By categorizing publications based on factors such as research type, research objectives, target group characteristics, and origin, I aim to illustrate how research outcomes may be influenced by specific characteristics and traditions within each field of research or practice (Knopf, 2006; Okoli, 2015). Through this analytical process, I seek to uncover patterns, correlations, or differences in findings, providing valuable insights into the dynamics of study-variables within the literature on pre- and in-service PD in ECEC. The studies will be divided into two sub-groups based on the two types of PD described previously, aligning with the distinction made in the two research questions: Pre-service PD, and In-service PD. Furthermore, I will analyze the characteristics of the studies, considering factors such as their distinct features, aim, and measured quality and outcomes (for outline of primary characteristics, see Table 5).

Table 5: Characteristics of included studies

Citation	Type of Study	Pre-, or in-service domain	Outcome- or skill measured	Target population	Country of origin: 1) main study 2) included studies	Publication date of included studies	Number of included studies and samples
OECD (2018)	SR / MA	Both	Academic/Socio-Emotional/Behaviour/Interactions	3 to 6 years of age	1) US (Meta-analysis), 2) 13 US, 5 Germany, 3 Portugal, 1 Netherlands, Chile, Tanzania, Belgium, Finland & Australia (A total of 28 studies included in Meta-analysis - rest unknown)	2007 - 2017	44 studies, 28 studies for meta-analysis, number of samples unspecified
Bransck et al. (2020)	SR / MA	In-service (PD Programs)	Language and Literacy/Academic - To a lesser degree: Health/Socio-Emotional/Adults Learning	Preschool age	1) Canada, 2) 55 US, 5 Canada & Bermuda, 2 Bangladesh & Portugal, 1 Germany, Chile, Singapore & NR	1987 - 2015	73 studies, 92 samples
Dunst et al. (2019)	Meta-analysis	Pre-service degree	ECEC Quality / Child outcomes	Preschool age (Study includes other ages)	1) US, 2) N/A	N/A	15 meta-analysis, each with a mean of 8,5 studies, and 18,33 effect sizes
Egert et al. (2018)	Meta-analysis	in-service (training)	Quality ratings / Child development	0-7 years of age	1) Germany, 2) 34 US, 2 Canada	1992 - 2011	36 studies, 42 samples
Falenchuck et al. (2017)	SR / MA	Pre-service education	Academic/Cognitive/Socio-Emotional	30 to 72 months	1) Canada, 2) 36 US, 1 Canada, 1 Mixed 1 N/A,	1972 - 2014	39 studies, 50 samples
Jensen et al. (2019)	Meta-analysis	In-service (PD)	Literacy/Math/Cognitive/Socio-Emotional/Behavior	3 to 6 years of age	1) Denmark, 2) 3 Germany, 2 Denmark & Netherlands, 1 France & Wales (only European studies as criteria for inclusion)	2009 - 2017	9 studies, samples NR*
Joo et al. (2020)	Meta-analysis	In-service (PD)	Cognitive/Academic/Health/Mental Health/Behavior/Socio-Emotional	0-5 years of age	1) US, 2) 9 US	1972 - 2006	9 studies, 9 contrasts, 54 effect sizes
Kraff et al. (2018)	Meta-analysis	In-service (teacher coaching)	Classroom instruction/student achievement	Pre-K age (Study includes other ages)	1) US, 2) NR*	2006 - 2017	31 studies on Pre-K
Lang et al. (2023)	Systematic Review	In-service (Characteristics of coaching)	N/A*	0-6 years of age	1) US, 2) NR*	2008 - 2020	117 studies
Lee et al. (2023)	SR / MA	In-service (programs)	Teacher/student interactions	0-5 years of age	1) US, 2) 30 US, 8 Korean	1992 - 2019	38 studies, 40 samples
Manning et al. (2017)	Systematic Review	Pre-service education	Quality ratings (Learning environment)	0-5 years of age	1) Australia, 2) NR*	1994 - 2015	48 studies, 82 samples
Manning et al. (2019)	Meta-analysis	Pre-service education	Quality ratings (Learning environment)	0-5 years of age	1) Australia, 2) NR*	1992 - 2015	49 studies, 83 samples
Markussen-Brown et al. (2017)	Meta-analysis	In-service (language- and literacy- focused PD)	Vocabulary/Phonological awareness/Alphabet knowledge	3-6 years of age	1) Denmark, 2) NR* - (Mostly US, according to text)	1995 - 2013	25 studies, 30 trials
Nocita et al. (2020)	SR / MA	Pre-service specialization	Academic/Cognitive/Socio-Emotional	30-72 months old	1) Canada, 2) 20 US	1972 - 2018	6 studies, 6 samples (Quantitative Synthesis) - 16 studies, 21 samples (Qualitative Synthesis)
Obee et al. (2023)	Systematic Review	In-service (PD)	Classroom management/Behavioral support	3-5 years of age	1) UK, 2) NR* (Mostly US, according to text)	1998 - 2021	42 studies
OECD (2018)	SR / MA	Both	Academic/Socio-Emotional/Behaviour/Interactions	3 to 6 years of age	1) US (Meta-analysis), 2) 13 US, 5 Germany, 3 Portugal, 1 Netherlands, Chile, Tanzania, Belgium, Finland & Australia (1 unknown)	2007 - 2017	44 studies, 28 studies for meta-analysis, number of samples unspecified
Pelcman et al. (2018)	Systematic Review	In-service (PD)	ECEC Quality Ratings	0-7 years of age	1) Belgium, 2) 7 UK, 5 Portugal, Iceland & Sweden, 2 Belgium, 1 Croatia, Germany, Italy, Netherlands & Slovenia (including native language studies)	1993 - 2013	29 studies
Rogers et al. (2023)	Systematic Review	In-service (PD- and Learning)	Characteristics of Professional Development- and Learning	0-6 years of age	1) UK, 2) NR* (Mostly US, according to text)	2004 - 2012	24 studies
Werner et al. (2016)	Meta-analysis	In-service (Interventions programs)	Quality promotion of Caregiver-child interactions	0 to 5 years of age	1) Netherlands, 2) 14 US, 2 Netherlands & Canada	2003 - 2012	18 studies, 19 samples
Yang et al. (2022)	Systematic Review	In-service (PD through coaching)	Teacher instruction/Child development/Language- and Literacy	3-5 years of age	1) China, 2) NR* (Mostly Western, according to text)	2006 - 2017	33 studies

Results

The included studies comprise 14 studies on the effect and characteristics of In-service PD, and 6 studies on Pre-service PD, with one study (OECD, 2018) focused on both In- and Pre-service PD, adding up to a total of 20 studies from 19 citations. Additionally, two studies on Pre-service PD (Manning et al., 2017; 2019) demonstrate significant overlap in their analyzed studies, with the former being a systematic review and the latter a meta-analysis.

In this review, I extracted various effect size measurements to comprehensively assess the impact of PD. Different studies employ different statistical techniques and methodologies, leading to the utilization of diverse effect size metrics, with various reasoning, to capture the nuances of their findings accurately. I have chosen to represent them, as they are stated in the original study, throughout this review, as the different calculations have their own distinct nuances and applications (Borenstein et al., 2021; Petticrew & Roberts, 2006).

In-service professional development

The synthesis of studies on in-service PD in ECEC reveals a diverse display of valuable insights, spanning various approaches, outcomes, and implications for educator practices and child development. While the studies concentrate on a distinct part of structural quality, the specific areas of research vary significantly, yielding a diverse array of valuable insights that contribute pivotal information for the comprehensive understanding of improvements through PD in ECEC.

A recurring theme across multiple studies is the pivotal role of staff-child interactions in shaping children's outcomes, e.g., in literacy and numeracy learning (OECD, 2018; Yang et al., 2022), for improving overall process quality in ECEC (Markussen-Brown et al., 2017), and the fostering of positive child development outcomes (Werner et al., 2016).

In the OECD report (2018) the In-service training of staff emerged as the single-most critical structural quality across regions and child outcomes in their Systematic Review. While training effects vary across targets, it consistently enhances language and literacy-specific quality. Specialized training focusing on staff-child interactions, particularly with coaching components, proves most effective. Short-term interventions with feedback components are also notably successful. Moreover, training involving early childhood education content, on-site support, and appropriate duration yield better outcomes (OECD, 2018). Yang et al. (2022) found promising results regarding the impact of

coaching components on language and literacy in several studies, indicating large effects in studies assessing coaching within professional development (PD). Notably, studies examining in-service PD, specifically combining a PD course with coaching, demonstrated substantial effects. For instance, one included study reported a large effect size³ (Cohen's $d = 0.77$) for the combined approach, whereas having only a PD course yielded a smaller effect size (Cohen's $d = 0.23$).

Markussen-Brown et al. (2017) also found that effect sizes of the language- and literacy focused PD was influenced by the duration and intensity, but most importantly, the total numbers of components to the PD intervention. The study showed small to medium effects on receptive vocabulary (SMD = 0.21), phonological awareness (SMD = 0.30), and alphabet knowledge (SMD = 0.12) across the trials. Medium and large significant effects on the overall quality was also found (Process quality SMD = 0.59; Structural quality SMD = 1.07) but these results are possibly influenced by ECEC quality components outside the specific PD intervention (Markussen-Brown et al., 2017), and a similar study on this topic in the OECD-report (2018) found less effective effects. Collectively, these studies underscore the pivotal role of in-service professional development in shaping teacher-child interactions and child outcomes across diverse developmental domains. They also emphasize the importance of cultivating supportive and enriching environments within ECEC settings to optimize children's developmental trajectories. Moreover, they highlight the critical influence of specific characteristics of professional development on outcomes for children, professionals, and overall ECEC quality.

The significance of evidence-based guidance in designing and implementing effective PD programs also emerges as a common thread in several studies. Peleman et al. (2018) emphasize the need for PD programs to be grounded in research and empirical evidence, ensuring that interventions are based on proven strategies and methodologies. By incorporating evidence-based practices, PD programs can better address the diverse needs of educators and promote high-quality teaching practices in ECEC settings. In addition, several other studies emphasize the importance of evidence-based guidance in designing and implementing effective professional development (PD) programs. For example, Rogers et al. (2023) discuss the effectiveness of coaching and mentoring as methods rooted in evidence-based practices for improving teacher outcomes and promoting children's learning outcomes. Furthermore, Kraft et al. (2018) highlight the value of integrating coaching with other

³ Cohen's d -, Hedges' g -, and SMD effect size thresholds can vary between field of study, but are typically interpreted as follows: small (0.2), medium (0.5), and large (0.8) (Borenstein et al., 2021; Cohen, 1992).

professional development elements, such as group training and resources, to enhance teaching practices and ultimately benefit children's outcomes; similar to Markussen-Brown et al. (2017). Coaching consistently showed a significant positive effect on instructional practices, with their meta-analysis showing an average effect size of 0.49 SD across studies, leading to a significant effect size of 0.16 SD for children's achievement; an effect which is adequate or larger in magnitude compared to the effect of 5 to 10 years of experience (Kraft et al., 2018)⁴. These studies collectively underscore the significance of evidence-based approaches in shaping the effectiveness of PD interventions in early childhood education settings. This emphasizes a shift towards empirically supported approaches that yield evident benefits for both educators and children, aligning with the broader movement towards evidence-based practices in education; with coaching, or programs including coaching consistently showing promising evidence.

However, amidst the common themes, some studies diverge in their findings, revealing nuanced perspectives and complexities in the relationship between PD interventions and outcomes. For instance, Joo et al. (2020) report small but negative effects of -0.18 SD from intensive PD on pre-academic skills, challenging the prevailing notion of PD as universally beneficial. Werner et al. (2016) & Egert et al. (2018) discuss the difference in effect on outcomes across their studies, with variations in results based on the level of intervention (classroom level, caregiver level, child level). In one study, meta-analyses revealed distinct effect sizes: Hedges' $g = 0.39$ for classroom-level outcomes across 11 studies, Hedges' $g = 0.44$ for caregiver-level outcomes across 10 studies, and Hedges' $g = 0.26$ for child-level outcomes across 6 studies (Werner et al., 2016). The study by Egert et al. (2018) showed a small effect at the child level ($ES = 0.14$, $p < .001$) and a medium effect at the corresponding classroom level ($ES = 0.45$, $p < .001$). This challenges the one-size-fits all approach across levels, underscoring the importance of context, specific characteristics, and the target intent of In-service PD-interventions in ECEC.

Jensen et al. (2019) likewise observed a comparable outcome in their meta-analysis, finding an overall beneficial impact of PD interventions on children's outcomes. Their analysis revealed an estimated effect size of 0.35, signifying a 'modest' effect that falls slightly short of the significance seen in similar international research findings. This underscores the importance of scrutinizing po-

⁴ This result should be interpreted with some caution, as a meta-analytical study excluded at the final stages of the inclusion-process for this thesis, McMuellen et al. (2020), describes evidence from prior and recent research that shows, paradoxically, that experience is not necessarily equal to better quality and outcomes.

tential methodological factors and contextual bias when interpreting results in PD research. In a similar vein, Brunsek et al. (2020) delved into the correlations between PD program content and outcomes for children in ECEC. Their comprehensive review uncovered inconsistencies in these associations, particularly contingent upon the measured outcomes. They observed significant but modest effect sizes spanning from 0.07 to 0.27, with the most favorable outcomes evident in domains such as language/literacy, letter identification, and behavioral changes (Brunsek et al., 2020). Accumulatively, this highlights the importance of considering contextual factors and individual differences when evaluating the impact of PD interventions.

While most studies demonstrate positive effects of PD interventions, a minority presents contrasting findings, indicating the need for a nuanced understanding of PD effectiveness. Inconsistent associations between PD program content and child outcomes, suggests the need for further investigation into the mechanisms underlying PD effectiveness.

Beyond the direct impact on child outcomes, studies also explore the influence of PD interventions on educator practices and program quality through specific types of PD. Notably, coaching has emerged as a powerful PD strategy, showing significant effectiveness across various domains; but the results also, like the overall effects, depend on the specific characteristics.

For example, Yang et al. (2022) conducted a comprehensive study on coaching interventions within PD-frameworks, revealing their crucial role in enhancing teacher-child interactions, fostering a supportive classroom environment, and improving instructional quality. Egert et al. (2018) also found compelling evidence of solely-coaching-program's impact, reporting a remarkable threefold increase in process quality ($g = 1.98$) compared to other programs ($g = (0.67)$); with results not showing differing results depending on the number of components, or whether it was on-site or online.

In opposition, some research has highlighted the benefits of integrating coaching with specific other PD elements, such as group trainings and resources. Kraft et al. (2018) demonstrated the shared effects of combining coaching with instructional materials, e.g., curricula and materials, showed enhanced teaching practices and positive child outcomes (0.21 SD larger); while 'video-libraries' as extra material can limit benefits (-0.27 SD smaller). This integrated approach equips educators with a diverse toolkit to address the varied needs of young learners effectively, with varying effects. These studies underscore the transformative potential of coaching in improving educator practices and program quality in ECEC; but ambiguous results warrant careful implementation.

The researchers consistently advocate tailored training programs adaptable to diverse geographical and cultural contexts. Integrating ECEC-content, providing on-site support, and ensuring suitable training durations are key. Additionally, incorporating collaboration and feedback into professional development is widely endorsed, enhancing classroom quality, and fostering collaboration through, e.g., Professional Learning Networks (PLNs) as a resource for the ECEC staff and leadership (Rogers & Brown, 2023).

Clear reporting standards and research quality are perceived as imperative. Transparent reporting of study design, program components, and sample characteristics is necessary, along with assessing implementation fidelity for accurate evaluation. Diverse samples are emphasized for applicability across contexts, and cultural responsiveness in interventions is deemed crucial. Long-term follow-up and impact assessment are essential, with longitudinal studies being recommended to evaluate sustainability and lasting benefits on educators and children. (Falenchuk et al., 2017; Lang et al., 2024; Lee & Sung, 2023; Nocita et al., 2020; Yang et al., 2022).

The researchers recognize several limitations in their studies. Diversity in research designs, encompassing various methodologies and outcome domains, poses challenges for generalization. Additionally, inconsistent reporting practices impede the assessment of program quality. There is also a regional bias that restricts the applicability of findings, exacerbated by a scarcity of research consistently evaluating the effects of professional development on children's outcomes. Furthermore, the absence of socio-economic moderators complicates the interpretation of results (Manning et al., 2019). Underpowered studies and the lack of meta-analysis further undermine the strength of certain conclusions, albeit they offer valuable insights into overarching trends (Lee & Sung, 2023; Nocita et al., 2020; Werner et al., 2016). Tailored, collaborative, consistent, and culturally responsive professional development in ECEC is recommended, with clearer reporting, diverse research samples, and rigorous evaluation methodologies being needed for ECEC advancement (Brunsek et al., 2020; Falenchuk et al., 2017; Lang et al., 2024; Obee et al., 2023).

To summarize, the synthesis of research on in-service PD in ECEC provides a nuanced understanding of its impact. Key findings highlight the importance of evidence-based practices and supportive environments, yet diverse results emphasize the need for context-specific approaches. While challenges persist, the potential for enhancing quality in ECEC, including caregiver competence and child outcomes, is evident. In-service PD emerges as a valuable, cost-effective intervention with the capacity to enrich both caregiver practices and child development in ECEC settings.

Pre-service professional development

The synthesis of multiple studies in the field of ECEC sheds light on several critical themes. On the topic of teacher qualification, a consensus emerges regarding its positive correlation with overall ECEC quality. Higher teacher qualifications are associated, in theory and through extensive systematic reviews, with improvements in program structure, activities, language and reasoning, and interactions with parents and staff (Manning et al., 2017; Nocita et al., 2020; OECD, 2018).

However, the significance of teacher qualifications varies across different aspects of ECEC quality, with some subscales of pre-service educational attainment showing little-to-no effect on the quality or outcomes. Nevertheless, the accumulated evidence advocates investing in teacher education to elevate the quality of ECEC settings, thereby fostering positive developmental outcomes for children. The meta-analysis of Manning et al. (2019) showed that the overall evidence suggests a positive correlation between teacher qualification and overall ECEC quality, as measured by Environment Rating Scales, indicating a moderate to strong positive association between teacher qualifications and the quality of the ECEC learning environments. Out of 72 samples examined, 61 demonstrated a positive correlation between teacher qualifications and ECEC quality, further strengthening the observed relationship. However, like other studies, they also acknowledge methodological challenges, such as heterogeneity in defining and measuring staff education, which underscores the need for refined research approaches to better understand the relationship between staff education and child outcomes. Their meta-analysis showed an overall '*small-to-medium*' effect size of 0.19 on overall quality from higher levels of qualified teachers (Manning et al., 2019, p. 401).

Conversely, the impact of pre-service qualifications on child outcomes appears to vary across specific ECEC settings. While the OECD report (2018), like Manning et al. (2019) suggest through their meta-analysis that there may be potential positive associations between pre-service qualifications and interactions between staff and children (ES= 0.12), normally leading to better child outcomes, their meta-analysis on this topics showed no direct effect of pre-service qualification on child behavior- and social skills, or academic skills with combined effect sizes close to 0 (OECD, 2018)⁵. The potential effect of pre-service qualification on child outcomes is therefore indirect at best and potentially non-existent in this study.

⁵ The 2018 OECD report lacks precise effect sizes, which are solely available in an internal document. Consequently, effect sizes are estimated approximately through graphical interpretation with standardized intervals.

Nocita et al. (2020) indicate that the overall evidence remains inconsistent, with limited significant associations found between educator ECEC-specialization and child outcomes; with effect sizes ranging from -0.03 to 0.07 resulting in non-significant mixed results across four cognitive categories ($r_{\text{pooled}} = 0.04; 0.03; 0.02; -0.05$), and weak positive associations for social skills ($r_{\text{pooled}} = 0.04$). In Falenchuck et al., (2017) their meta-analysis shows weak positive effects of 0.05 on *applied problems skills*, and a weak positive- and significant effect of 0.05 on *vocabulary skills* from teachers having a BA degree.

Thus, regarding staff educational attainment as a definition of pre-service qualification, a predominant finding emerges from the synthesis of various studies - the absence of substantial and consistent associations with child outcomes. Although some studies report weak positive correlations, particularly in language outcomes, some studies indicate no significant relationship between staff education and child development across cognitive, social-emotional, and physical domains. Surprisingly, there is ambiguous evidence outcomes across multiple levels of educational attainment, further complicating the analysis of the effects. One study showed small to no difference across educational attainment levels, and staff proportions (Falenchuk et al., 2017). A larger study performing multiple meta-analysis showed larger mean effect sizes of BA degrees compared to HS degree of 0.33 for *classroom quality* and 0.14 for *child-achievement* (Dunst et al., 2019). Furthermore, there are complex correlations between compared outcomes and quality, across multiple levels. The increase in quality is largest between BA and HS, with effect being lower when comparing BAs with AAs/CDAs, and MAs⁶. Most substantial is the difference in *teacher beliefs* between BA and HS-degrees (ES = 0.77), with BA teachers showing substantially higher levels of commitment to their work; and the difference in *teaching practices* (ES = 0.53) between BA in favor of HS-degrees. Notably, the largest effect in the comparison of *teacher beliefs* came from the smallest sample size of 550 children, Moreover, the authors noted that very little evidence can be obtained regarding specific child outcomes. This stands in contrast to the theoretical assumptions from the systematic reviews.

Through close examination of the study from Dunst et al. (2019), results indicates that the greater the disparity between the educational degrees being compared, the larger the effect sizes observed in terms of overall quality, which is true for child outcomes as well, but unexpectedly the effect siz-

⁶ HS = High school, AA = Associate's degree, CDA = Child development associate's degree, BA = Bachelor's degree and MA = Master's degree (Dunst et al., 2019, p. 8).

es are weaker with e.g., BA compared to HS being 0.14, and only 0.05 between MA and AA degrees. The results only further add to the complex nature of what specific child outcomes can be expected, compared to the overall quality in ECEC.

While some studies propose weak positive correlations between pre-service specialization and language and social skills, the overall body of evidence suggests limited significant associations with child outcomes. Notably, the absence of discernible disparities in outcomes based on children's backgrounds implies a nuanced relationship between pre-service qualifications and child development. Methodological complexities, such as variations in operational definitions of specialization and outcome metrics, underscore the complexity of comprehending how educator specialization influences children's development. This highlights the imperative for further research endeavors aimed at unraveling the subtleties of this relationship and effectively informing policy and practice. Although each subdivision of the meta-analysis included few studies, potentially impacting both the effect size and the ability to extrapolate findings to the broader ECEC field, the sample sizes remained substantial and should not be disregarded as insufficient for analysis⁷.

In conclusion, the synthesis of multiple studies in the field of ECEC underscores the importance of continued research efforts to enhance our understanding of the structural quality factors influencing child outcomes. However, it is important to note that there are conflicting sentiments between the systematic reviews and the meta-analysis; with assumptions from the former, not being supported to the same extent by the quantified evidence in the latter. Methodological improvements, such as consistency in defining and measuring variables, and a shift towards examining staff-child interactions, are imperative to advance the field. Furthermore, policy interventions aimed at enhancing teacher education and training programs are recommended to improve the quality of ECEC, thereby ensuring or maintaining positive lasting outcomes for children and their families.

Combined summary of Pre- and In-service PD results

The synthesis of the studies on both in-service and pre-service PD in ECEC provides valuable insights into enhancing the quality of ECEC settings and promoting positive developmental outcomes for children through staff development initiatives.

⁷ Sample sizes (based on available data) ranged from 550 to 14,750 children across up to 900 ECEC centers, across included studies.

In-service PD studies underscore the importance of evidence-based practices, particularly coaching and mentoring, in improving educator practices and program quality. Integrating coaching with other PD elements, such as group trainings, has shown promise in further enhancing teaching practices and program quality. However, the nuanced perspectives and complexities in the relationship between PD interventions and outcomes underscores the need for tailored, collaborative, and culturally responsive PD programs adaptable to diverse contexts.

Pre-service PD research highlights the positive correlation between teacher qualifications and overall ECEC quality. Higher teacher qualifications correlate positively with overall ECEC quality, yet the link between staff education and child outcomes remains less clear. Methodological challenges underscore the need for refined research approaches, with a focus on examining inconsistent effects.

Policy interventions aimed at improving both pre-and in-service PD-programs- and research, are recommended to improve ECEC quality and promote positive child outcomes. Overall, there is an optimistic sentiment for the future of PD in ECEC, emphasizing the importance of continued research and implementation of higher standards.

Discussion & Conclusion

Discussion

The results provide some clear answers to the research questions. The effects of in-service PD on ECEC quality and child outcomes are generally positive, with evidence indicating that well-designed and appropriate PD programs enhance teacher practice and ECEC quality. Characteristics of effective PD measures include evidence-based practices, especially coaching and mentoring, integrated with other PD elements and adaptability to diverse contexts. Studies show that coaching, especially combined with other PD elements like group training, significantly improves instructional practices and leads to better child outcomes.

For pre-service PD, higher levels of teacher education are positively correlated with overall ECEC quality, impacting settings, process, and interactions between teacher and children. However, some studies show weak, or no, positive correlations with some child outcomes. The inconsistent effect suggests that the benefits of higher educational attainment for ECEC staff has more indirect impact to the overall quality of ECEC settings, rather than through direct impact on child-teacher interactions.

Further research is needed to clarify the characteristics, dynamics, and interconnections of these impacts and to identify the specific levels of attainment that contribute to these benefits. Additionally, tailored approaches are necessary, as certain ECEC settings and traditions demand specific strategies due to diverse backgrounds and preconditions, varying pre-intervention levels of professional development, and the specific needs of child groups.

Contextual importance of professional development

The requirements for effective ECEC vary significantly across different settings, both within countries and across regions. This diversity makes it challenging to provide universal recommendations based solely on the findings of this literature review. Contextual factors, which are not fully captured in this review, play a crucial role in shaping ECEC practices and outcomes.

Despite efforts by international and national conventions to standardize ECEC resources and practices, substantial differences persist. Disparities in funding, availability of qualified personnel, quality of work environments, and the socio-economic backgrounds of children exist not only between Western nations and other developed countries but also within regions of the same country (EU Commission/EACEA/Eurydice, 2023; OECD, 2022, 2023; Unicef, 2008; Vermeer et al., 2016). As a result, recommending specific strategies for ECEC practice and further research must consider the unique contextual factors present in each setting. While this literature review provides valuable insights, it is essential to recognize the limitations in extrapolating findings to diverse ECEC contexts.

Contextual moderators complicate the analysis of the results of the meta-analysis, as well as the conclusions and theoretical assumptions drawn in the systematic reviews, as they may provide limited insights into PD-implementations in the context of specific countries, and within distinct traditions and standards of practice. Many studies heavily rely on US data and may not accurately represent global ECEC settings, even within the US context, due to variations in heterogeneity and unclear definitions of subdomains (Brunsek et al., 2020; Falenchuk et al., 2017; Lang et al., 2024; Obee et al., 2023). While homogeneity is desirable for meta-analysis and systematic reviews because it enhances result validity (Borenstein et al., 2021), homogeneous research poses a challenge in informing the international ECEC community due to significant variations in traditions and content (CoRe, 2011; Garvis et al., 2018; Sommer, 2019).

Another complexity is the contextualization of results across diverse ECEC settings globally, given that some findings may stem from measurements of more school-like achievements, classroom en-

vironments, and various ECEC settings with differing durations, formats, and content. Hence, it is crucial to assess whether both socio-emotional learning and cognitive learning, require the application of identical didactical and pedagogical methods by teachers across all types of ECEC (Garvis et al., 2018; Kirschner et al., 2022; Van Laere et al., 2012). Additionally, this consideration gains particular significance when considering the age of the targeted children, as it defines their susceptibility to learning.

Furthermore, significant advancements have been made in ECEC in recent years, which, in turn, can complicate both the results and a subsequent analysis. It is possible that the field of ECEC has seen substantial improvements in the countries from which most of the samples for the meta-analysis are drawn, which in turn complicates the analysis potential due to overall higher quality, and consequently, less variation across settings (Vermeer et al., 2016; Von Suchodoletz et al., 2023)

Consistency and effects of specific components

Some PD components, such as coaching, demonstrate significant impact, albeit with mixed effect sizes, yet they still warrant policy interest among ECEC professionals. For instance, Yang et al. (2022) and Kraft et al. (2018) found coaching enhances outcomes, with varying effect sizes. Yang et al. (2022) reported a Cohen's d of 0.77 for combined coaching and PD courses, compared to 0.23 for PD courses alone. Kraft et al. (2018) demonstrated an average effect size of 0.49 SD across studies. Peleman et al. (2018) stress the need for evidence-based PD, which is supported by Kraft et al. (2018) showing coaching's consistent positive effect, with an effect size of 0.16 SD for children's achievement. Markussen-Brown et al. (2017) note duration, intensity, and intervention components influence PD effectiveness. Short-term interventions with feedback, highlighted by OECD (2018), and Professional Learning Networks (Rogers & Brown, 2023), shows promise and could be cost-effective, showing potential from both on-site and online-based approaches.

While some results seem modest in their effect, it is important to note that experts in the field of educational research point out that significant results, even under 0.20 justify 'policy interest' at a larger scale, as results of that size are not meager, when measuring overall quality of education programs or child outcomes (Borenstein et al., 2021; Hedges & Hedberg, 2007; Manning et al., 2019). Then again, that claim is disputed from experts in large scale meta-analysis synthesis of educational science proclaiming that the threshold could be at the 0.40 point (Hattie, 2023). Other critics argue that overreliance on evidence-based approaches in ECEC have not consistently produced desired outcomes (Fixsen, 2018), and cannot always be uniformly applied to every daycare facility due to

significant differences in their individual requirements, despite shared similarities (Biesta, 2007). Hence, what constitutes ‘substantial evidence’ is still up for debate in the scientific literature, and educational science is no different with strong opponents disregarding science based on threshold of effects, or the mode and method of the studies included for analysis (Center on the Developing Child, 2007; Fink, 2023; Hattie, 2023; Ioannidis, 2005, 2018; Van Ravenzwaaij et al., 2023).

Leading US child development experts point out, that small effects still can have large impact on children’s lives, and that large effect sizes in-and-of itself does not constitute good ECEC-policy, but should be analyzed based on its proportional effects and costs, given that:

“A cost-benefit approach may be more useful because it quantifies the value of a program’s effects relative to the costs incurred in achieving them.”

(Center on the Developing Child, 2007, p. 11)

Evaluating whether a single instance of a high effect size is less beneficial in the long term compared to a sustained, modest, yet consistent and cost-effective effect potentially leads to consequential and significant insights for decision-makers and warrants further research into this aspect of effect analysis.

However, regardless of the interpretation of results, the educational, and especially pedagogical field, are increasingly turning to more evidence-based approaches (Hattie, 2023; Nordahl et al., 2023), and the field of PD in ECEC practice do show promising results from these types of studies. Implementing evidence-based strategies in practice could represent a cost-effective means of enhancing overall quality and improving child outcomes. Especially In-service PD shows great promise, with consistent evidence indicating significant returns proportionate to the investment and effort (Eadie et al., 2022). Future research could seek to reconcile the divergent perspectives on effectiveness in ECEC studies by integrating qualitative and quantitative research methodologies, clarifying causal effects between PD elements and outcomes, while exploring contextual moderators. Additionally, prioritizing both immediate and longitudinal studies could enhance the cost-benefit analysis of PD in ECEC.

Careful decision-making in pursuit of specific outcomes

This review highlights specific dimensions of PD associated with potential positive outcomes relative to its investment. While acknowledging the significant impacts of PD on certain areas, such as mathematical or literacy proficiencies, it cautions against overgeneralizing findings. Effective poli-

cy formulation based on positive study outcomes necessitates precise alignment between observed effects and the targeted objectives of the PD intervention. It emphasizes the importance of discerning whether observed effects correspond to the intended improvements sought through the PD intervention. For instance, while a PD initiative may enhance cognitive skills, such as math or literacy, its effectiveness in improving socio-emotional skills or addressing negative behaviors may vary. This underscores the nuanced nature of PD outcomes and the need for judicious interpretation in policy decisions.

Research indicates a reciprocal relationship between the two sides of ECEC suggesting that proficiency in one subcategory fosters development in the other (Cunha et al., 2006; Heckman et al., 2006; Heckman & Masterov, 2007). However, prioritizing non-cognitive aspects during the early years may yield greater benefits, as they exert a more substantial influence on the subsequent development of cognitive skills compared to the reverse scenario (Cunha & Heckman, 2009, 2009; Heckman et al., 2006). A content analysis of the content of PD in ECEC showed that the majority of PD interventions are focused on the more cognitive aspects, with only 28% focusing on the socio-emotional learning, and only few interventions focused on child behavior; with a majority focusing on more cognitive aspects (Schachter, 2015). This observation prompts reflection, as socio-emotional learning, despite its recognized importance in both theory and empirical evidence, presents challenges in definition and measurement; with ongoing discourse regarding clear methods for assessing and quantifying its outcomes (Mondi et al., 2021).

Whether the above-mentioned discussions should lead to alterations of content, and intent, of PD in the future remains inconclusive; but these additional elements of analysis should be considered when deciding what to improve in ECEC, depending on the target population, the staff, or the quality domain- or child outcome desired to improve.

Limitations

While initially intending to incorporate a significant amount of qualitative research into my literature review, I encountered a scarcity of meta-analyses or systematic reviews that encompassed such material. In Europe, and Denmark, my country of origin, the prevailing trend in ECEC research leans heavily towards qualitative studies, presenting an opportunity to delve deeper into knowledge that aligns with this scientific tradition (Guldbrandsen et al., 2024; Nind et al., 2016). Adjusting the inclusion criteria of this study to encompass research beyond meta-analyses or systematic reviews, or directly targeting qualitative research, could have facilitated the incorporation of these narrative

accounts and opinions. Previous research initiatives focusing on a distinct aspect of ECEC, demonstrated contrasting outcomes and consequently, different conclusions when researched quantitative and qualitative studies separately (Dalgaard et al., 2022, 2023). Neglecting qualitative research potentially overlooks valuable insights into the experiences and perspectives of staff undergoing pre- and in-service professional development, which could offer crucial information; a problem noted in a similar recent research study (Eadie et al., 2022).

However, two studies of Scandinavian-origin studies was included in this review; one revealed a prevalence of samples sourced from other countries, predominantly from the US in one study (Markussen-Brown et al., 2017) and predominantly from other European countries in the other (P. Jensen & Rasmussen, 2019). Although both studies demonstrated robust and statistically significant positive outcomes from PD, the effect sizes were notably larger in the predominantly US sample compared to the strictly European samples. Delving into the reasons behind this deviation, appears to be a worthwhile pursuit for professionals operating within a European context; as they differ in their structures, traditions, and content (CoRe, 2011; EU Commission/EACEA/Eurydice, 2023; Garvis et al., 2018; Munton, 2002).

Furthermore, by solely reviewing secondary research studies, which involve large-scale synthesis through systematic reviews or meta-analyses, I was hindered in evaluating the primary research directly. While meta-analyses and systematic reviews adhere to stringent protocols aimed at minimizing bias and assessing methodological soundness (Borenstein et al., 2021; Hart, 2018; Lipsey & Wilson, 2001; Sataloff et al., 2021), they do not necessarily require the detailed description of primary research components and contextual specifics. This level of detail could have proven crucial for comprehensively understanding the development, participants, and outcomes of primary research, aiding readers seeking more nuanced insights into PD when interpreting evidence for future implementation and policymaking measures.

Conclusion

The synthesis of numerous studies in this review of PD in ECEC provides valuable insights into its impact and effectiveness. Key findings underscore the significance of evidence-based practices, supportive environments, and context-specific approaches in enhancing both teacher practices and child development outcomes in ECEC settings.

Despite the complexities and nuances observed across different studies, certain components of in-service PD, such as coaching, have consistently shown promising results in improving educator practices and program quality. Evidence-based guidance and the integration of diverse PD elements, including coaching, group trainings, and resources, offer potential avenues for enhancing teaching practices and ultimately benefiting children's outcomes. Furthermore, there seems to be potential in both in-person programs, and online-based approaches, if essential instructions are accompanied.

Whether pre-service PD is an effective measure to ensure quality remains somewhat inconclusive, as findings vary across studies. While some studies report substantial results, others show weak effects, and some indicate almost no effect. Additionally, there is ambiguous evidence regarding the impact of educational attainment overall, as different levels demonstrate varying effects across different quality- and outcome domains. Nevertheless, there is provisional evidence that pre-service PD ensures quality and better child outcomes through higher numbers of pre-service educated ECEC staff, especially Bas.

Additionally, it is essential to approach PD interventions with careful consideration, ensuring alignment between observed effects and targeted objectives. While some studies suggest modest effects, it is crucial to acknowledge the significance of even small improvements in overall quality and child outcomes, especially when considering their potential long-term impacts.

This review highlights the need for continued research efforts to address methodological challenges, refine research approaches, and unravel the complexities of the relationship between staff education, PD interventions, and ECEC quality- and child outcomes. Incorporating qualitative research alongside quantitative studies could offer valuable insights into the experiences and perspectives of educators undergoing PD, enhancing our understanding of effective strategies and practices.

Overall, while challenges and limitations exist, the synthesis of research on PD in ECEC underscores its potential as a valuable and cost-effective intervention for enriching teacher practices and promoting positive developmental outcomes for children. Moving forward, a nuanced understanding of PD effectiveness, informed by rigorous research and contextual considerations, is essential for advancing ECEC practice and policy.

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