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Fostering Effective Early Learning (FEEL) Study

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Executive Summary

Background

A growing body of research attests to the fact that early childhood education and care (ECEC) brings a wide range of benefits, such as: better child well-being and learning outcomes as a foundation for lifelong learning; more equitable child outcomes and reduction of poverty; increased intergenerational social mobility; higher levels of female labour market participation; and better social and economic development for society at large (Heckman, 2008; Melhuish et al., 2015; OECD, 2012; Siraj & Mayo, 2014). Therefore, if a country can provide quality ECEC for its children, it not only enhances children's lives in the here and now, it also advances the long-term outcomes for children - and by doing so is an investment in the future.

However, realising that the benefits of ECEC provision is largely dependent upon the ECEC being of good quality (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2004, 2011). Expanding access to ECEC without attending to quality will not deliver good outcomes for children or long-term productivity benefits for society.

There are a number of recognised methods for governments to promote quality in ECEC. Governments may promote quality through framework documents, standards and accreditation, dissemination of research and information, technical support, raising the training and status of staff, encouraging self-evaluation and action-practitioner research, and establishing a rigorous inspection system. Some of these, such as national regulatory frameworks, are already well-established in Australia through the Education and Care Services National Law. For example, in partnership with state and territory regulatory agencies, the Australian Children's Education and Care Quality Authority (ACECQA, 2017) implements the National Quality Framework (NQF), approves educator qualifications, and maintains national registers of approved services and providers.

Under the NQF, ACECQA publishes service ratings against the National Quality Standard (NQS), with each service assessed against seven quality areas and assigned an overall rating: Significant Improvement Required, Working Towards National Quality Standard, Exceeding National Quality Standard, or Excellent. ACECQA's comprehensive data and reporting, which has been provided to services since 2012, supports a national context of recent changes in service quality, in addition to ratings of specific services against each quality area and overall.

Australia, particularly NSW, has a strong framework for ECEC in place, but successful implementation of frameworks also requires investment in staff support, including in-service training, pedagogical guidance and favourable structural conditions.

One strategy that can be particularly efficient for improving quality is in-service professional development (PD). Up-skilling the workforce is now a priority in many countries because of inconsistency in training and the unequal quality of initial undergraduate and other qualifications (Ishimine, Tayler, & Bennett, 2010; Siraj & Kingston, 2015).

Building on the existing body of international research, the findings of the Fostering Effective Early Learning (FEEL) study, detailed in this report, address the need for quality improvement in ECEC by showing how a particular form of evidence-based in-service PD can produce substantial and practically meaningful improvements in both staff practices and child outcomes.

Study Design

The FEEL study investigated the effectiveness of an evidence-based in-service PD for improving the quality of curricula and interactions in a number of ECEC services (i.e., preschools, long-day care) across NSW. The FEEL study was selected after competitive tender by the NSW Department of Education in response to a growing body of evidence identifying a range of long-term benefits of high-quality ECEC provision.

Following a comprehensive literature review (available online through NSW DoE; Siraj et al., 2017), the research team from Early Start, University of Wollongong, designed the innovative Leadership for Learning PD program for delivery to ECEC educators at 90 preschool and long-day care centres. These centres were selected to reliably compare outcomes across a range of metropolitan and regional locations, socioeconomic areas, NQS ratings, and service types.

The Leadership for Learning PD was designed to cover the foundational principles of child learning and development, including: self-regulation; language and communication; conceptual development in maths; and science and critical thinking. The PD featured a cascading model of delivery to prepare participants to take up a leadership role within their workplaces and share their new knowledge with colleagues and families.

The FEEL study adopted a cluster randomised controlled trial design to generate the strongest possible evidence for efficacy of the PD intervention. That is, the research team recruited an initial 90 ECEC services in NSW and more than 1200 children who attend those services. Prior to the start of the PD program, highly trained observers undertook a one-day observation to assess curricular and interactional quality using two reliable, quality rating scales: the Early Childhood Environment Rating Scale-Extension (ECERS-E); and the Sustained Shared Thinking and Emotional Well-Being (SSTEW) scale. Assessments of participating children's cognitive and social-behavioural development were also undertaken, using measures of language (verbal comprehension and expressive vocabulary), numeracy (early numeracy and early number concepts) and social-behavioural development (self-regulation, internalising and externalising problems, and prosocial behaviour).

Participating ECEC services were then randomly allocated to either the intervention or control group, each containing 45 services. The Leadership for Learning program was then delivered to the intervention group over a period of three and a half months. This program began with two full-day intensive face-to-face sessions, followed by fortnightly half-day workshops and ongoing facilitated online learning throughout the remainder of the year.

The study faced some logistical challenges common to the sector that impacted levels of PD participation. Prior to commencement of the PD, seven centres in the intervention group had to withdraw due to significant staffing or ownership changes that precluded their participation. For the remaining intervention centres, barriers reported by the participating educators that complicated delivery included attendance issues relating to staff coverage, absence and turnover. Success of the PD program in any centre was also contingent on engagement of participating educators, support received from colleagues and management, and the availability of required IT skills (for the online phase of the PD).

Participants at the remaining 38 intervention services were surveyed about their experience of the program after each of the three phases of PD delivery.

Participants at the remaining 38 intervention services were surveyed about their experience of the program after each of the three phases of PD delivery. The survey following the first phase of the program consisted of open-ended questions, with the responses from participants used to inform the delivery of the following two phases.

Following the conclusion of the program, all participating services in the intervention and control groups were rated in a second blind assessment of environmental quality, again using ECERS-E and the SSTEW scales, and children were assessed using the same cognitive and social development measures.

Key Findings

The FEEL study initially evaluated effects of participation in the Leadership for Learning PD by assessing the direct impact on participating early childhood educators (through observation of educators' practices related to indicators of curricular and interactional quality, which are translated into quality ratings on ECERS-E and SSTEW, taken before and after the PD). The study also assessed the indirect impacts on children – potentiated by increased quality of environments, and the experiences children in the ECEC intervention centres received – by measuring child outcomes before and after the PD.

A comparison of intervention centres against control centres demonstrated a number of direct and indirect benefits of participation in the PD program, as follows.

Changes to pedagogical leadership

Significant improvements in quality of curricula (e.g., literacy, mathematics, science, diversity) and interactions (e.g., sustained shared thinking, supporting children's social-emotional well-being) as measured by two quality scales (with the changes approaching 1 whole point on each 7-point scale).

Impact on child outcomes

1) Improved cognitive outcomes for children in language and numeracy development:

   a) Children in intervention centres demonstrated twice the growth in verbal comprehension when compared to the control group but no difference was observed between the two groups in expressive vocabulary development, possibly because change in productive language takes much longer to occur.

   b) Numeracy development also improved significantly and more than expected based on normal development (i.e., growth in the control group), on two separate measures; children in centres having undertaken the PD showed 23% greater gains in number concepts and 28% greater gains in early numeracy.

2) Children in the intervention group also demonstrated improved socio-emotional development, with a reduction in reported internalising behaviours (an indicator for emotional and peer problems).

While it was anticipated that the training would lead to positive changes in ECEC quality and educator practices, and that these improvements would, in time, have an impact on children's development, the team did not expect to observe such notable improvements in children's cognitive and socio-emotional development given the brief seven-month intervention period.

Data analysis by the Early Start research team relating to children's development was reviewed by NSW Education's Centre for Education Statistics and Evaluation, which confirmed, using an alternate methodology, that there was moderate to strong evidence that the PD had a positive impact on early numeracy and verbal comprehension for the children in the intervention centres (see Appendix K).

A further qualitative process analysis of ECEC services in the intervention group found evidence of a number of direct benefits from the PD program, with the participating educators reporting:

- increased confidence and motivation
- increased intention and sense of purpose in teaching practice, extending themselves to incorporate concepts and ideas covered in the PD program
- deeper understanding of child development and the evidence base underpinning effective practice
- increased awareness of the importance of reflective practice
- deeper understanding of their role in influencing outcomes
- improved capacity to share information with families, colleagues, and the broader community

Together, these findings provide a strong motivation to make such PD routinely available for all ECEC practitioners. However, the benefits of staff quality improvement schemes are radically reduced if there is instability of staffing, as trained staff are beneficial only while they stay in the job. Hence, stability of staffing should be addressed alongside PD and in conjunction with the use of rigorous, reliable quality and practice improvement scales such as the SSTEW and ECERS-E, which in this study appeared to support and empower educators.

Policy Implications

FEEL study provides strong evidence that targeted, evidence-informed in-service PD can not only have a positive impact on the engagement and motivation of early childhood educators, but also has the potential to lead to significant increases in ECEC learning-environment quality and flow-on improvements in child cognitive and socio-behavioural outcomes. These improvements were found after only a relatively short intervention period. Such findings also highlight further opportunities for research into the link between educator training and child outcomes, and provide a strong indication of the value of delivering PD training across preschool and long-day care settings.

Improvements in the quality of centres were evidenced by tangible changes in practice. Aspects that supported the PD included: (a) the use of of structural supports, such as quality descriptions (from SSTEW and ECERS-E) and planning tools; (b) an increase in evidence-based practices; (c) the fidelity and effectiveness linked to the capability, credibility and knowledge of the presenters; (c) the professionalisation of participants; and (d) a structure that allowed for reflective practice during the PD (e.g., duration, time between the half-day sessions).

Finally, there was also a reported impact on children. Most educators described changes among the children in their care as a result of the PD. These changes were framed in two ways: educators' own modified practices with the children (what children experienced), and how the children themselves responded to new experiences. The impact of the PD was reported largely with respect to children's increased engagement and motivation and, to a lesser degree, improved problem solving and learning.

These reported benefits to children's responses to learning were aligned with the improvements detected using objective measures.

The rest of this report provides a complete accounting of the FEEL study, and gives full description of the rationale, study design, PD intervention, child assessments, quality rating scales and detailed discussion of the findings. Much of the technical data are presented in the appendices.

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The Fostering Effective Early Learning (FEEL) Study

1.1 Introduction and Background to the FEEL Study

In 2015, after competitive tender, New South Wales' (NSW) Department of Education (DoE) awarded Early Start, University of Wollongong (UOW), a grant to undertake the following:

1. A literature review of current international evidence on quality early childhood education and care (ECEC) program delivery, pedagogies and practices, which are shown to have the greatest impact on learning and development outcomes for children.

2. A research project – subsequent to the literature review – with ECEC services rated against National Quality Standards (NQS) that involved:

- developing and delivering an intervention aligned with best-practice evidence on improving children's learning and development outcomes
- evaluating intervention effects on services' educational programming
- evaluating intervention effects on children's short- and longer-term outcomes against established development and learning measures

The outcome of this tender was the Fostering Effective Early Learning (FEEL) study, comprising a literature review that synthesised international best evidence on quality ECEC practices and models of professional learning (Siraj et al., 2017) and a study on the impact of an evidence-based professional development (PD) program called Leadership for Learning. The form, structure and content of the FEEL PD were developed after recognising the vital contribution that PD can make to enhancing ECEC programmes. It was informed by (i) the relatively new, but growing, international evidence-base relating to effective PD; (ii) a recent pilot study conducted in NSW, Australia; (iii) knowledge of the target ECEC workforce; (iv) baseline quality rating assessments of participating centres; and (v) aspects relating to practicality and reach. The FEEL study also included continuous evaluation of the PD by the participants which was used to inform and shape the structure and content. The background, delivery and results of the FEEL study form the focus of this report.

1.2 Overview of the FEEL Study

This innovative study, depicted in Figure 1, involved 90 ECEC settings across NSW (i.e., preschools, long-day care services) each with an Early Childhood Teacher (ECT) and in the year before school entry (termed preschool in NSW). Half the centres participated in the Leadership for Learning PD program (the intervention group) in the first year, 2016. To evaluate the intervention, two baseline assessments were conducted: environmental quality ratings (described below) were conducted at the end of 2015; child assessments were conducted at the beginning of the intervention year, 2016. Follow-up assessments were conducted at the end of the intervention year. Alongside the cluster randomised controlled trial (RCT) evaluation of the efficacy of the PD, a qualitative evaluation was conducted of educators' experiences and perceptions, the PD's influence on participants as professionals and Leaders for Learning Champions, and perceived improvements to quality for the staff, children and families with whom they worked.

The centres not participating in the PD in the intervention year (the control group) received the PD in the subsequent year (2017) after data collection for the initial PD evaluation had been completed. Figure 1 provides a summary of the study design.

The approach of the study, along with random assignment of centres to intervention and control groups, conformed to a cluster RCT design, the strongest available design for drawing conclusions about the causal effects of the PD intervention. Additional precautions, such as the data collection team not knowing (i.e., being blinded) which centres were in the intervention and control groups, and the efforts to ensure broad diversity amongst centres, minimised the possible influence of confounding factors in drawing conclusions from the study findings.

The main objective of the FEEL study was to evaluate whether the bespoke Leadership for Learning PD program, when compared to routine practice, could enhance ECEC classroom quality, child development and learning outcomes. The goal of the PD was to improve the knowledge, skills and attitudes of those educators who took part in the intervention, with the aim of improving children's experiences and ultimately their outcomes.

To evaluate the success of the PD program in achieving these aims, the study team identified direct and indirect outcomes at the preschool room and child level. Direct outcomes were at the room level because the PD directly involved ECEC educators in preschool rooms. Effects of the PD on educator practices were captured by objective observational measures of ECEC quality, namely: (1) the Early Childhood Environment Rating Scale – Extension (ECERS-E; Sylva, Siraj-Blatchford, & Taggart, 2010), which has a focus on curriculum content, concept development and pedagogy; and (2) Sustained, Shared Thinking and Emotional Well-being (SSTEW; Siraj, Kingston, & Melhuish, 2015) scale, which focuses on interactional quality and supporting children's social-emotional development via relational and intentional pedagogy. Indirect outcomes of the PD were at the child level, as the intervention did not operate directly on or with children. Child-level outcomes consisted of two measures of language (i.e., verbal comprehension and expressive vocabulary), two measures of early numeracy (i.e., early numeracy and early number concepts) and two measures of social-behavioural development (i.e., early self-regulation, internalising and externalising problems, and prosocial behaviour).

The FEEL study thus sought not only to deliver this evidence-based PD intervention for ECEC educators, but also to evaluate, empirically and rigorously, whether the PD had a positive effect on important room-level quality indicators and child outcomes.

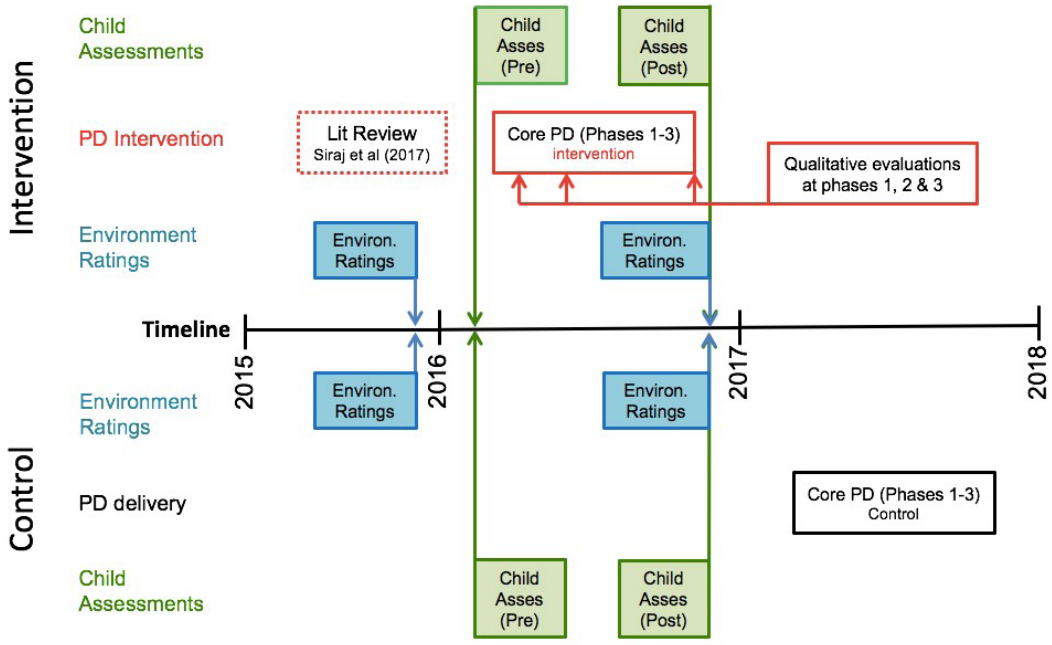


Figure 1.
The design of the FEEL cluster RCT examining the efficacy of the Leadership for Learning Professional Development (Core PD).

Given the evidence base upon which the Leadership for Learning PD was founded, improvements were expected in quality and child outcomes amongst those centres participating in the PD. If supported, these improvements could potentially provide evidence that: (1) high-quality and evidence-based PD can yield positive change in educator practices; (2) these improvements in practice positively influence objectively measured indices of classroom quality; and, importantly, (3) these changes in practice can enrich children's ECEC experiences and improve their learning and development outcomes.

1.3 Research Context of the FEEL Study

Prior to undertaking this study, the FEEL team wrote a literature review synthesising the international evidence on the relationship between quality, PD and child outcomes (Siraj et al., 2017). The literature review, which can be accessed here, should be read in conjunction with this report. To provide some essential context for this research, an abbreviated summary of this review is presented below.

The FEEL study was undertaken in the context of a national regulatory framework that is designed to ensure that minimum levels of quality are met within the ECEC sector. All services must undergo periodic assessments of quality in relation to Australia's National Quality Standards (NQS), which yields an index of ECEC quality across a range of quality domains. This includes elements of structural and process quality, but also covers a diverse range of elements such as staffing, leadership and child safety considerations.

The NQS assessment and rating process yields a holistic quality designation of significant improvement required, working toward, meeting or exceeding these standards. Services rated exceeding in all seven quality areas are also eligible to apply for the rating of excellent.

Ratings are made publically available by Australian Children's Education & Care Quality Authority (ACECQA).This assessment and rating process also serves as one mechanism through which quality improvements can be stimulated, and supplemented by approaches such as pre-service training and in-service PD. NQS ratings form an important basis from which to identify centres at varying levels of quality.

Independent of regulatory frameworks, which are typically driven by statutory bodies, there is a substantial international research base demonstrating the robust and lasting positive impact of high structural and process quality on various aspects of children's development (Heckman, 2008; Melhuish et al., 2015; Siraj & Mayo, 2014). In fact, this is one of the most consistent findings in the scientific evidence on early education and care. It is, therefore, to be expected that the goal of improving the quality of ECEC is widely viewed as an essential element in achieving more positive and equitable child outcomes, especially for children from more vulnerable backgrounds (OECD, 2012). The full version of the literature review expounds this evidence base.

While structural elements of ECEC, such as staff qualifications and child-teacher ratios, contribute to quality of practice in ECEC, research shows

The NQS assessment and rating process yields a holistic quality designation of ***significant improvement required, working toward, meeting or exceeding*** these standards.
Services rated exceeding in all seven quality areas are also eligible to apply for the rating of ***excellent***.

increasingly that process aspects of adult-child and child-child interactions are the most influential aspects of ECEC, and are the most powerful predictors of children's subsequent outcomes (e.g., Sylva et al., 2011). Especially important to the quality of adult-child interactions is the capacity of adults to engage deliberately with pedagogy and practices intended to support relationships with children and to extend children's learning (relational and intentional pedagogies). The full literature review discusses the important role of qualifications and PD to support high quality ECEC and child outcomes.

Given this evidence, it is imperative that future intervention efforts focus on equipping ECEC educators with the capacity to create high-quality environments and experiences that are conducive to children's learning and development (Melhuish & Gardiner, 2017; Otero & Melhuish, 2015). However, there is relatively little research on enhancing quality within the ECEC sector via provision of professional development, and a large variation amongst educators in terms of qualification (i.e., CERT-3, Diploma, Bachelor and Masters degrees), roles, understandings and experiences.

The FEEL PD responded to this inherent diversity by advocating team based approaches and collaboration, and accommodating different styles and processes for learning. PD programs that support change and improvement usually include key features (e.g. Dunst, Trivette, & Hamby, 2010), however exactly what those key features are remains contested. Kingston (2017) grouped those more widely acknowledged features across the current evidence-base into three domains: (i) content: evidence-based practice, including links between theory and practice, specialist expertise, assessment and planning; (ii) process: intensity, duration and attendance, as well as collaboration, critical mass of staff and the involvement of managers/leaders; and (iii) affect: developing professional relationships, motivation, confidence and supporting personal characteristics.

The results of a number of studies using Environment Rating Scales (ERS) such as ECERS-E and SSTEW were scrutinised, together with the extant literature, before developing the content of Leadership for Learning PD. Based on this analysis, a typical pattern of strengths and weaknesses in the knowledge, skills and understandings of ECEC educators were identified; these were consistent across both higher and lower quality settings (albeit to differing extents). From this, the PD content was developed to improve educator knowledge and practice in those areas. A complete overview of the PD content is provided in the Methods section.

Several models have proposed how PD can function to influence educators and the outcomes of children in their care. Desimone (2009) proposed a conceptual framework for effective PD for educators which she suggested needed to include both the critical or key features of effective PD (and she included content focus, active learning, coherence, duration and collective participation) and an operational theory outlining how the PD works to influence both the educators and children's outcomes. In 2011, she suggested the following sequential steps to explain this change: (i) educators experience the PD; (ii) PD increases educators' knowledge and skills and/or changes their attitudes and beliefs; (iii) educators use their knowledge, skills, attitudes and beliefs to improve the content of their instruction and/or their approach to pedagogy; and (iv) instructional changes introduced by the educators boost the children's learning.

Dunst (2015) developed this model further and applied it to the ECEC context. He advocates that PD should be evidence-based, that practice improvements and changes following from the PD should shift educator attitudes and beliefs in positive ways and that changes can occur at the family and the child level. He suggests five related steps: (i) evidence-based in-service PD practices, lead to (ii) changes in the early childhood educators' knowledge and skills, which lead to (iii) educators' use of evidence-based intervention practices, which lead to (iv) changes and improvements in child and family outcomes, which result in (v) changes in educators' attitudes and beliefs.

Simple stage-like models are useful for conceptualising the basic processes by which

educators are likely to learn new skills, concepts and abilities, and thereby adopt new approaches and attitudes. These models can be further enhanced by considering the contextual influences on the individual and the complex interrelationships which occur between the systems in which they operate (e.g., existing knowledge, understandings and beliefs, relationships with colleagues, children and parents within schools/settings, existing legislation, policy frameworks, systems of accountability). The model adopted within this study recognises the interrelated nature of the systems in which educators work (Bronfenbrenner & Morris, 2006). It also considers the content, process and support for affect known to be associated with effective PD (Kingston, 2017; Siraj et al., 2017).

To sum, the Leadership for Learning PD was founded upon this evidence base, which demonstrates the importance of process quality (e.g., curricular and interactional quality) and highlights the aspects of professional learning that are most likely to yield positive changes in professional practice. As a consequence of these changes in practice, it was expected that the quality of the ECEC provision (as objectively measured using ERS) and, by extension, subsequent child outcomes, would also be improved.

1.4 The Leadership for Learning Professional Development (PD) Intervention

At the centre of the FEEL study is the Leadership for Learning PD, which constituted the intervention sought by the DoE in 2016. The PD was delivered across three distinct phases, each with multiple sessions. These sessions were based on a program developed from previous research that documented weaknesses revealed by SSTEW and ECERS-E quality ratings in Australian and international contexts, as well as by the project's own quality baseline measures and growing evidence-base on PD. In addition, the PD was bespoke in that it responded to the educators' needs as they evaluated each phase of the PD delivery, with the final phase incorporating their suggestions and self-identified areas for further development. This PD was packaged as Leadership for Learning.

Phase 1 involved two full-day intensive face-to-face sessions on aspects and evidence supporting quality in ECEC. Phase 2 consisted of five fortnightly half-day sessions that focused on key areas of professional competence and curriculum content (e.g., literacy, self-regulation, numeracy, science, and critical thinking), and also gave the participants a chance to apply the PD content to their own practice before feeding it back at the next session. Educators were encouraged to make their own individual adaptations, which support ownership and the sustainability of any changes. The sessions led to further improvement and planning for changes in practice and supported critical reflection of their own and others' practice. Aspects of practice emphasised throughout each of these sessions included: observation, assessment and planning; relational and intentional pedagogy; supporting the home learning environment; and pedagogical leadership.

Finally, Phase 3 involved a concurrent online support program that provided resources and facilitated discussions outside face-to-face interactions, as well as one additional half-day face-to-face session that was added to the PD delivery in response to educator Phase 2 evaluative feedback. A timeline of the delivery and content focus is outlined in Appendix A.

The training sessions involved key staff from the 38 intervention centres - a total of 90 educators - and were designed to strengthen their skills in leadership, pedagogy and practice. Each PD session in Phase 1 and 2 was delivered across three intervention sites (hubs) and included examples of practice and discussions of the underlying theoretical models and concepts, together with recent research to enable critical reflection and to support possible future improvements. Links were made to appropriate frameworks, including the National Quality Standard (NQS) and the Early Years Learning Framework (EYLF), ensuring relevancy for participants.

Fundamental to each PD session was the inclusion of evidence-based understandings of how young children learn best, including the notions of holistic learning and extending children's active engagement and participation in activities.

While the training focused on effective practice for all children, and draws from these findings, it also emphasised pedagogies and practices known to support the learning and development of children of indigenous descent, children with additional needs and those living in homes situated in areas of disadvantage. `In keeping with the conceptual model adopted (Desimone, 2009), the PD emphasised a content focus, collective participation, coherence, duration and active learning.

The PD was designed to support collective participation of educators and directors from the same settings, thereby creating cohesion in their approach. Such joint participation helped to support a professional culture and ensured sustainability of new techniques and skills (for a discussion, see Zaslow, Tout, Halle, Whittaker & Lavelle, 2010). It was designed to promote collaborative working and deeper knowledge regarding aspects of leadership, change management, quality improvement and self-assessment. Appendix A provides an overview of the structure, aims and content of each of the PD sessions.

Methods

2.1 Study Design

The FEEL study adopted a clustered RCT design to yield the strongest evidence about the efficacy of the PD intervention to effect improvements in ECEC quality and child outcomes. 90 ECEC centres in NSW, Australia, were recruited to participate. These centres were selected to ensure representation across National Quality Standard (NQS) ratings (working towards, meeting, exceeding), location (metro, regional), centre type (long-day care, preschool) and socioeconomic areas (based on Socio-Economic Indexes for Australia; SEIFA). Although this sampling approach captured important diversity, it was not intended to yield a fully representative sample of the population.

Random assignment of centres to control and intervention groups occurred after collecting baseline environment ratings in the year prior to intervention (October-November 2015).

Once collected, participating centres were then randomly allocated to one of two groups: an intervention group (n = 45 centres) that received the Leadership for Learning PD intervention in 2016; or a control group (n = 45 centres) that continued to engage in typical classroom practice (and subsequently received the intervention in 2017). Fieldworkers blinded to group allocation conducted baseline child assessments early in the intervention year (February-March), and again post-intervention in late 2017 (October-November). The average assessment interval was seven months. There was no appreciable difference in the assessment interval for the intervention and control groups. Phase 1 of the PD began in February, with Phase 2 extending from April through to May. An optional one day session was conducted mid-September 2016. The online component of the PD was available to participants throughout the entire intervention (February-December).

2.2 Centre Characteristics and Recruitment

In order to select centres, an initial exhaustive list of eligible ECEC centres in NSW (N = 348) was examined for potential inclusion. Criteria for inclusion of centres were: (1) being within 1.5 hours of one of the three study hubs; (2) being within socioeconomic (SEIFA) deciles 1-8 (thereby excluding highly advantaged areas); (3) not currently participating in other research; and (4) not being a Department of Education (who funded the study) centre. This yielded a list of 181 eligible centres. A selection of 90 centres for initial recruitment approach was made to ensure representation across all NQS ratings (approximately equal numbers of Working Towards, Meeting, Exceeding), service types (two-thirds long-day care, one-third preschool), locations (approximately equal numbers of metro and regional ECEC centres) and socioeconomic areas (Decile 1-8, according to SEIFA Advantage and Disadvantage indices, with at least one-third of the sample derived from areas of known deprivation). The remaining centres were placed on a backup list to supplement recruitment where initial approach was unsuccessful (46 of these were contacted, yielding an acceptance rate of 66.2%).

A total of 90 ECEC centres were recruited from the areas surrounding one metropolitan city (n = 45) and two regional cities (n = 45) in Australia. The metropolitan city consisted of residents from diverse backgrounds (44.0% born in Australia), with an unemployment rate of 5.8%, median parental age of 32.9 years, and median household income of $49,068, which was slightly below the state's average (ABS, 2016a). The regional cities consisted predominantly of residents born in Australia (72.3% across both cities), with unemployment levels of 7.0% and 5.8% respectively, median parental age of 38.5 and 36.9 years respectively, and median household income levels of $45,233 and $47,427 respectively, which is in line with state averages for regional communities.

The proportion of families who at home spoke a language other than English was variable (3.3% to 29.9%) across the different hubs. The recruited centres were largely balanced in their geographic location (42 regional, 49 metropolitan; AIHW, 2004) and NQS ratings (25 working towards, 27 meeting, 37 exceeding, 2 not yet rated). The centres were intentionally unbalanced in service type (64 long-day care, 27 preschool) and socio-economic area (46.2% from SEIFA deciles 1-3, 53.8% from SEIFA deciles 4-8). This approach was adopted to mirror the prevalence of long day care centres in the state (65.0%; ABS, 2016b) and the study's focus on disadvantaged areas.

2.3 Child Characteristics and Recruitment

Early in 2016, after centre recruitment (which occurred toward the end of 2015), and preceding the intervention, children in the year before formal schooling (4-5 years, or as indicated by their centre or parent as possibly entering formal schooling in the next year) were recruited from participating centres. This yielded a sample of 1346 3-5 year old children, and an average of 14.17 children per room (ranging from 3-41), with whom child assessments were conducted. This corresponded to a consent rate of 56.5% among those invited to participate, and a participation rate of 96.2% among consented children. Non-participation was due to absence at time of assessment (n = 56 children) or early withdrawal from the centre (n = 8 children).

The recruited sample had an average age of 4.59 years at baseline (SD = 0.37; range: 3.10-5.69 years) and a slight over-representation of boys (nboys = 735, 54.6%). Family socio-demographic data was also requested from participants' parents or caregivers and was returned for 96% of children, though some questions had lower rates of response (i.e., income = 83.1% response rate).

Available data indicated that families were born predominantly in Australia (87.4%), English-speaking (90.0%), with a range of maternal education levels (41.6% with a degree or higher, 18.0% with a diploma or certificate, 40.4% completed high school) and family income (as defined by Australia's Defined Child Benefit income thresholds: low, $0-$49,999; 19.5%; middle, $50,000-$124,999 = 46.0%; high, $125,000+; 34.5%). Children identified as Aboriginal or Torres Strait Islander (3.8%) were slightly under-represented relative to the population (5.7%; ABS, 2011).

2.4 Cluster Randomisation

After completion of baseline environmental ratings at the end of the year prior to intervention, centres were assigned to the intervention or control group. After group assignment, eight centres from the intervention group (17.4%) withdrew from the study. Each withdrawing centre did not have the capacity to attend the PD: two had maternity leave for key staff, and six had key staff resign, which is typical of the staff turnover rates across the sector (United Voice, 2014). All dropouts occurred prior to commencement of the PD, resulting in an intervention group size of 38 ECEC centres. Characteristics of the final sample are presented in Table 1. As such, plans for analyses were slightly revised to include adjustments for these consequent group differences after withdrawals. It is noteworthy that baseline levels of quality or child measures were not elevated in the intervention group (see Appendix B).

The sustained consistency of centre randomisation, after withdrawals, was examined by comparing intervention and control groups at baseline on key baseline measures. This comparison is presented in Appendix B and showed that the two groups were highly similar.

2.5 Intervention Evaluation: Quantitative Measures

2.5.1 Environmental quality ratings

To evaluate the direct effects of the Leadership for Learning PD on classroom practice, environmental quality ratings were conducted by highly trained observers through a one-day observation of each preschool room in participating ECEC centres. The two environment rating scales administered were the Early Childhood Environment Rating Scale – Extended and the Sustained Shared Thinking and Emotional Well-being scale (see Appendix C).

The Early Childhood Environment Rating Scale – Extended (ECERS-E; Sylva et al., 2010) measures the quality of the curricula, environment and pedagogy in ECEC settings (for a sample item, see Appendix D). ECERS-E comprises 15 items, which yield four subscales: literacy; mathematics; science and environment; and diversity. Each of the 15 ECERS-E items is rated from 1 (inadequate practice) to 7 (excellent practice) derived on a trained observers' on-balance judgements of the presence or absence of the scale's indicators of quality (e.g., educator practices), across a one-day room observation. ECERS-E has been shown to have good reliability and predictive validity of child development progress at school entry (Sylva et al., 2006). Items that comprise each subscale were averaged to create subscale scores. Subscales were averaged to generate an overall scale score.

	Intervention	Control
Number of centres	38	45
# of preschool rooms	39	54
Geographic Location	18 regional, 20 metro	18 regional, 27 metro
Service Type	28 long day care, 10 preschool	31 long day care, 14 preschool
NQS Rating	9 WT, 9 M, 19 E, 1 UR	12 WT, 14 M, 18 E, 1 UR
SEIFA Decile	M = 3.84 (45% Decile 1-3)	M = 3.89 (49% Decile 1-3)

Table 1.
Final Sample Centre Characteristics by Group.

The Sustained Shared Thinking and Emotional Well-Being (SSTEW) scale (Siraj et al., 2015) brings together different dimensions of the ECEC environment to consider practice that supports children aged two to five in developing skills in sustained shared thinking and emotional wellbeing (for a sample item, see Appendix E). The scale consists of 14 items across five subscales: building trust, confidence and independence; social and emotional wellbeing; supporting and extending language and communication; supporting learning and critical thinking; and assessing learning and language. Like the ECERS-E, each scale item is rated from 1 (inadequate practice) to 7 (excellent practice) based on the pattern of presence/absence of the item's indicators of quality (e.g., educators' practices). Items are averaged to yield subscale scores and the subscales were averaged to generate an overall scale score. SSTEW has been shown to have good reliability and predictive validity of child development (Howard et al., 2017).

The ECERS-E and SSTEW scales focus most on process aspects of quality within ECEC. They consider aspects of the educator's role in supporting early learning, including: the recognition of the importance of intentional pedagogy; a child-centred approach; and appropriate concept development and curriculum/content knowledge being flexibly applied and co-constructed with the children. The scales outline progressive supports that educators can provide to enhance children's progress and learning in the various aspects of pedagogy and practice covered by each scale, with the intention of supporting children in becoming motivated, self-regulated, autonomous learners. Each scale covers different aspects of early years pedagogy and practice: ECERS-E was specifically tailored to tap the dimensions of quality linked to notions of emergent academic skills and the curriculum in England, while the SSTEW scale was devised to support sustained shared thinking and emotional wellbeing. Current research continues to point to these aspects as having the greatest impact on children's outcomes (e.g. Pianta, 2012; Siraj-Blatchford, Sylva, Muttock, Gilden, & Bell, 2002).

The ECERS-E and SSTEW scales promote relational and intentional pedagogies and link successful interactions (e.g., sustained shared thinking) to educators' deep knowledge and understanding of effective ECEC pedagogies and practices. Higher scores on these scales are achieved when: staff show that they know individual children well, including their interests, beliefs, cultures, and achievements; there is a culture in the setting that supports children's curiosity, thinking, problem solving and questioning; children are seen to engage in appropriate, cognitively challenging activities and discussions with the educators and with each other; the educators support knowledge, confidence, risk-taking and autonomy in the children's learning, through play and playful interactions; and each child is supported according to their needs, by educators who use a range of different teaching and learning strategies, together with a comprehensive and relevant content knowledge, that they apply flexibly with contextual, individual, and socio-cultural sensitivity.

2.5.2 Child assessments

The FEEL study also evaluated the 'indirect' effects of the Leadership for Learning PD on children's learning and development (termed 'indirect' as the PD did not involve direct intervention with children).

Children in the intervention and control groups underwent individual assessments of their language, numeracy and social-behavioural development early in their preschool year (2016), before the delivery of the PD (pre-test), and then again toward the end of the preschool year once the PD intervention was complete (post-test). Due to competing time frames (maximising PD delivery time, while ensuring completion of a large number of child assessments) the effective time for the intervention was relatively short, only seven months on average (between pre-test and post-test assessment). Despite this short time frame, the study design meant that the amount of developmental change observed in the control group, which engaged in routine ECEC practice, could be directly compared with the change experienced by children whose educators engaged in the PD. That is, the cluster RCT examined the additional growth in these children's development, when compared to the control group.

Primary outcomes consisted of two measures of language development: the Verbal Comprehension subscale of the Differential Ability Scales, and the Early Years Toolbox Expressive Vocabulary assessment. It was expected that there would be a significant, positive effect of the PD on these outcomes. Secondary outcomes included measures of children's number concept understandings (as measured by the Preschool Early Numeracy Scale and Early Number Concepts subscale of the Differential Ability Scales) and social-behavioural development (as measured by educator-rated Strengths & Difficulties Questionnaire and Child Self-Regulation and Behaviour Questionnaire). It was expected that for the two numeracy-related outcomes, there would be a significant and positive effect of the PD. Further, based on the Leadership for Learning PD, it was expected that children in the intervention would show more prosocial behaviour and fewer internalising problems. It was also expected that there would be modest gains in children's self-regulation in the intervention group, which could support improvements in externalising problems, although the timeframes and strategies employed in the PD were nor directly oriented to this outcome. All assessments are detailed below.

Verbal comprehension. The Verbal Comprehension subtest of the Differential Ability Scales (DAS-II) consists of 42 items and requires children to identify and manipulate objects in response to verbal instructions. Administration continues until the earlier of completion or non-satisfaction of a performance threshold at identified stop rule junctures. The DAS-II is appropriate for use from 2.5 through 17 years of age, and has shown good reliability (i.e., internal consistency, test-retest reliability) and validity (i.e., concurrent, predictive) in children within and outside of typical development ranges (Elliott, 2007).

Expressive vocabulary. The Early Years Toolbox (EYT) Expressive Vocabulary test – a 54-item measure of a child's expressive vocabulary development – requires children to produce verbally the correct label for each depicted stimulus (Howard & Melhuish, 2017). Participants respond verbally and a data collector records this response within an app. In cases of an incorrect label initially being produced, the data collector prompts participants by asking 'what else might this be called' until there is either a correct production or some indication that the child is unable to produce the required word. The measure ceases at the earlier of completion or six consecutive incorrect responses. This assessment has been used successfully with children aged 2.5 to 6 years, with good internal consistency and convergent validity in a large and demographically diverse Australian sample (Howard & Melhuish, 2017).

Early numerical understanding. The Early Number Concepts subscale of the DAS-II is comprised of 33 items that require children to count, identify digits and quantities, perform basic mathematical operations, and demonstrate knowledge of basic numerical concepts (e.g., few, many). Administration rules and assessment properties parallel those for Verbal Comprehension (described above). In addition, four Preschool Early Numeracy Scale (PENS) subscales were administered to capture elements of early numeracy not assessed in the DAS-II. These were: one-to-one counting; counting subsets; number order; and set-to-numerals. Together, a total of 21 PENS items were administered. PENS was designed for use with children from three years of age, with good reliability and predictive validity (Purpura & Lonigan, 2015).

Social-behavioural development. The Strengths and Difficulties Questionnaire (SDQ; Goodman, Meltzer, & Bailey, 1998), a 25-item educator-report questionnaire, was used to assess prosocial behaviour, hyperactivity, conduct problems, peer problems, and emotional problems. Respondents rate each item according to the frequency with which a child engages in that behavior, ranging from 0 (Not True) to 2 (Certainly True). SDQ has strong reliability and validity in diverse international samples (Downs, Strand, Heinrichs, & Cerna, 2012; Sharp, Croudace, Goodyer, & Amtmann, 2005). In line with scoring conventions of the SDQ, we generated an internalising scale (mean of emotional problems and peer problems subscales) and externalizing scale (mean of hyperactivity and conduct problems subscales), which were subjected to analyses along with the SDQ prosocial subscale. The Child Self-Regulation and Behaviour Questionnaire (CSBQ) was also administered. This is a 33-item educator-report questionnaire that yields subscales of cognitive self-regulation, behavioural self-regulation, emotional self-regulation and other social-behavioural outcomes. Each item asks the adult respondent to evaluate the relative frequency of target behaviours on a scale from 1 (not true) to 5 (certainly true). This questionnaire has shown both very good internal consistency and structural and convergent validity, in a large Australian sample (Howard & Melhuish, 2017). We used a single overall index of children's self-regulatory capacities that represented the mean of the CSBQ's three subscales.

2.6 Intervention Evaluation: Qualitative Measures

Following completion of each Phase 1/2/3, participants were asked to complete three short evaluative questionnaires. Responses from Phase 1 were used to inform and shape delivery of Phases 2 and 3. At the end of Phases 2 and 3, participants completed a questionnaire that asked them to evaluate their overall experience of the PD program (examples of questions are detailed in Appendix F).

The questionnaire used at the end of Phase 1 consisted of open-ended questions that asked participants to consider the key messages they had received from the PD, which aspects of the PD they found to be most helpful and challenging, how the PD influenced them as practitioners, any changes they may have implemented or witnessed as a result of the PD (to their own practice, colleagues, children and families), aspects that may have facilitated or impeded their ability to implement changes, their thoughts on the actual delivery of the PD, and their ideas on how they could be best supported in the next phase of PD.

The questionnaire used at the end of Phase 3 consisted of both Likert-scale and open-ended questions. Likert-scale questions asked participants to rate the degree of change they had experienced as a result of the PD in different domains (e.g., their level of motivation, confidence and collaboration with colleagues), and to rate how useful they found specific topics within each Phase. The open-ended questions in Phase 3 were similar to those used in Phase 2, but also asked participants to describe the greatest impact the PD had on their practice, how they had cascaded their learning from the PD to other colleagues in their centre, and the process for how changes in practice occurred in their centre. Simple demographic information was also collected at the end of the questionnaire, including position, qualification, years of teaching experience and hours worked per week at centre.

Participants completed the questionnaire for Phase 1 and Phase 2 at the PD venue. For Phase 3, participants were given the option to complete the questionnaire in their own time and location either in hard copy or online (via Survey Monkey). Each questionnaire took approximately 30 to 45 minutes to complete.

2.7 Intervention Evaluation: Procedure

Environmental quality ratings occurred late in the year prior to intervention, and again at the end of the intervention year to evaluate change. Environment quality ratings were conducted by highly trained observers through a one-day observation of each preschool room (i.e., containing 4-5 year old children) in participating centres.

Observers underwent five days of intensive training, including in-field practice ratings with a highly experienced trainer/observer, followed by rigorous inter-rater reliability checks. Prior to entry into field, observers were required to meet the following rigorous standard of inter-rater reliability against a highly experienced trainer/observer: (1) an intra-class correlation exceeding .70 (M = .86); (2) a correlation exceeding .70 (M = .86); (3) a mean difference in ratings less than 0.75 (M = 0.43); and (4) agreement of ratings (within 1 point) of at least 80% (M = 93%).

The child cognitive, academic and social-behavioural assessments were collected both at the beginning and end of the intervention year. In total, child outcome assessments involved 40-50 minutes of direct assessment per child (split into two sessions) and 10 minutes of educator time per child at each data collection time point. In all cases, a rigorously trained fieldworker conducted these child assessments in a quiet area within the child's ECEC centre. Assessor training involved full-day training on the assessment battery, expert observation and feedback of administration, and on-going feedback from regular quality control checks of the data. All fieldworkers were blind to each centre's assignment to the intervention or control group.

2.8 Intervention Evaluation: Analytic Plan

The efficacy of the intervention was evaluated using a combination of quantitative and qualitative analyses, as outlined below.

2.8.1 Quantitative evaluation of direct effects on educator practice and behaviour

The effects of the PD intervention on environmental quality ratings were analysed using regressions across the full sample (i.e., intention-to-treat), controlling for variables that might account for observed differences (i.e., geography, service type, NQS rating, area-level SES, baseline environment quality ratings). In order to consider the effect of the PD amongst those centres that maintained a minimum threshold of participation (to more accurately examine its effect with adherence), these analyses were repeated with a per-protocol sample. A series of planned follow-up analyses sought to explore further the impact of initial quality on intervention effects, and on variability in intervention effects.

2.8.2 Quantitative evaluation of indirect effects on child outcomes

To examine the impact of the FEEL PD on child development outcomes, analyses were conducted using multilevel models for longitudinal data (Steele, 2008). The levels were: Level 1 – between times within child; Level 2 – between children; and Level 3 – between centre. This approach involved fitting models with random intercepts (at Level 3 for up to 95 preschool rooms and at Level 2 for up to 1328 children). Time-specific responses from each child were fitted at Level 1. This multilevel approach provided the flexibility for imbalanced data (i.e., responses from children completing baseline assessments but not follow-up assessments) in the model and for estimating the treatment effect while taking into account the initial quality levels, rather than treating baseline values as a nuisance to be controlled out. It also permitted insights into the degree of variation in outcomes between preschool rooms over time; this was crucial for the evaluation of the intervention, given the centre-level allocation of the treatment. For full detail of the analytic approach, see Appendix G.

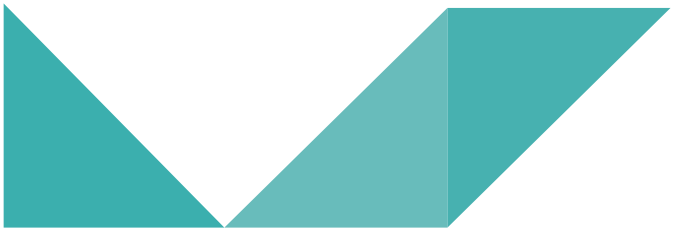
2.8.3 Qualitative analyses of educator experience and perceptions of the PD

To further understand the potential reasons for variability in intervention effects across centres, a qualitative analysis of educators' perspectives and experiences of the PD was carried out. These analyses sought to identify educator-reported changes within their centres (e.g., personal or among colleagues, children, and families), and to recognise particular structural, process or content factors that may have facilitated or impeded change.

Analyses of participants' responses to the questionnaires was approached in three stages. In the first stage, the researchers familiarised themselves with the data and began to generate initial ideas for a coding scheme. Using a deductive approach based on existing literature (Kingston, 2017), individual questions from each questionnaire were grouped under key overarching themes that captured the range of participants' responses effectively (Table 2). Illustrative quotes for each theme were also identified.

In the second stage, the data were imported into NVivo (version 11) and participant responses were coded for common concepts, using the initial overarching themes as a guide. Qualitative analysis software was used to 'model' preliminary ideas. An inductive process was used to generate a coding structure, with categories derived from empirical data. The coding process in NVivo was thorough, comprehensive and inclusive, with all participant responses coded. An iterative process of coding and refining nodes involved adding new nodes, taking some away and combining them where relevant. For example, initial coding nodes such as motivation, confidence, and knowledge were identified - and then collapsed under the overarching theme of personal journey.

Reliability and validity of the data was ensured through a cross-checking process using a subset of illustrative quotes to ensure that each quote had been coded appropriately.
A hierarchical framework was formed of the overarching themes initially identified. The participant responses were re-examined carefully to ensure that the agreed codes were applied across all data. It is important to note that, although NVivo software was used to organise data thematically, the process of analysis involved switching focus between the nodes of the theoretical framework and complete responses to maintain the depth of participants' perspectives.



Key Theme	Question example
Leader for Learning Champion:Personal journey (reflective practice, shifts in pedagogy, philosophy)	• What were the 'key messages' you received from Phase 2 of the professional development (PD)? • What challenged you the most as a Leader for Learning Champion during Phase 2 of the PD (i.e., content, philosophy, practice, and approach to pedagogy? • How has the PD influenced you as practitioner? Consider, for example, your learning, motivation, planning, knowledge?
Perceived practice change and perceived impact	• Describe change(s) you have made to your practice since participating in the PD. Please provide examples • Describe the impact the changes you have made to practice for: the children, other staff and families
Supports and challenges for implementation of centre change	• What factors supported implementation of the PD learnings throughout your centre/preschool (e.g., receptiveness of staff, having access to the online Moodle)? • What barriers have you experienced to implementing the PD in your centre/preschool?
Evaluation of the PD in terms of content, process of delivery, and affect	• Which aspects of the PD have you found most helpful and why (please provide an illustrative example)? • Are there improvements to the PD sessions you would recommend?

Table 2. Summary of Key Overarching Themes and Example Questions

Results: Environmental Quality

3.1 Brief Overview of Environmental Quality Findings

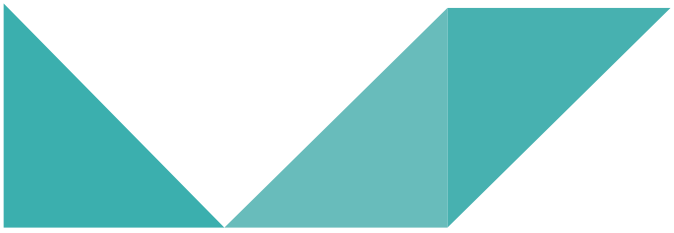
For both environmental rating scales, ECERS-E and SSTEW, the centres receiving the intervention improved over the course of the year when compared to the centres not receiving the intervention. Importantly, control centres not receiving the intervention stayed, on average, at essentially the same quality levels on both ERSs (see Figure 2). By contrast, centres receiving the intervention improved significantly on both scales. The magnitude of improvement found approximately 1 point on a 7-point scale has been suggested to be sufficient to yield child-level change (Clifford, Reszka, & Rossbach, 2010). See Appendix H (Table H.1) for a further summary of the effects of the PD on environmental ratings.

When considering only those centres that met a minimum threshold of participation in the PD (see per-protocol analyses, below), the positive effects of the intervention were further enhanced (see Figure 3), although it was noteworthy that only 8% of centres failed to meet an objective criterion for satisfactory participation. Furthermore, the positive effects of the intervention remained when accounting for geographic category, service type, NQS rating, SEIFA decile and baseline ERS quality rating, which suggests that they were very robust (see Appendix H, Table H.2). Additional analyses of the relation between initial quality levels and the effectiveness of the PD are presented in Appendix I.

3.2 Full Sample (Intention-to-Treat) Evaluation

Initially, the efficacy of the intervention for effecting positive change in ECEC quality was evaluated initially using regression analyses, adjusting for geography, service type, NQS rating, area-level SES and baseline environment ratings, across the full sample (for an exploration of ERS ratings according to these factors, see the secondary analyses in Section 11). Even though a minority of the intervention centres did not maintain a high level of PD participation across the entirety of the study, these analyses are important to maintain the demographic balance generated through the initial randomisation. That is, intention-to-treat analyses avoid possible over-optimistic estimates of an intervention's efficacy that can result when ignoring non-participants (Gupta, 2011). Instead, analysis of the full sample accepts that non- or low-participation, and other protocol deviations, are a likely outcome in real-world implementation and thus seeks to determine impact of the intervention under these real-world conditions.

Results of intention-to-treat regression analyses, examining the effect of group on quality of ECEC post-intervention, indicated a significant effect of the PD intervention for all scales and subscales (Figure 2). These effects remained after controlling for geographic category, service type, NQS rating, SEIFA decile, and pre-intervention ERS quality rating (see Appendix H). All control variables, except SEIFA and geographic category, tended also to be significant independent predictors of quality levels in the expected manner (preschools, higher NQS and higher ERS at baseline were associated with higher post-intervention quality ratings). When considering the within-group change (i.e., improvements for each group from baseline), the intervention group showed increases for all scales, and all but one subscale (Diversity subscale of ECERS-E; Figure 2), whereas the control group showed no significant improvements. The degree of change in environment ratings was significant both in terms of effect size (ranging from η^2 = .04 for Diversity to η^2 = .39 for Mathematics) and assumptions that a 1-point change is sufficient to yield child-level effects (Clifford et al., 2010).



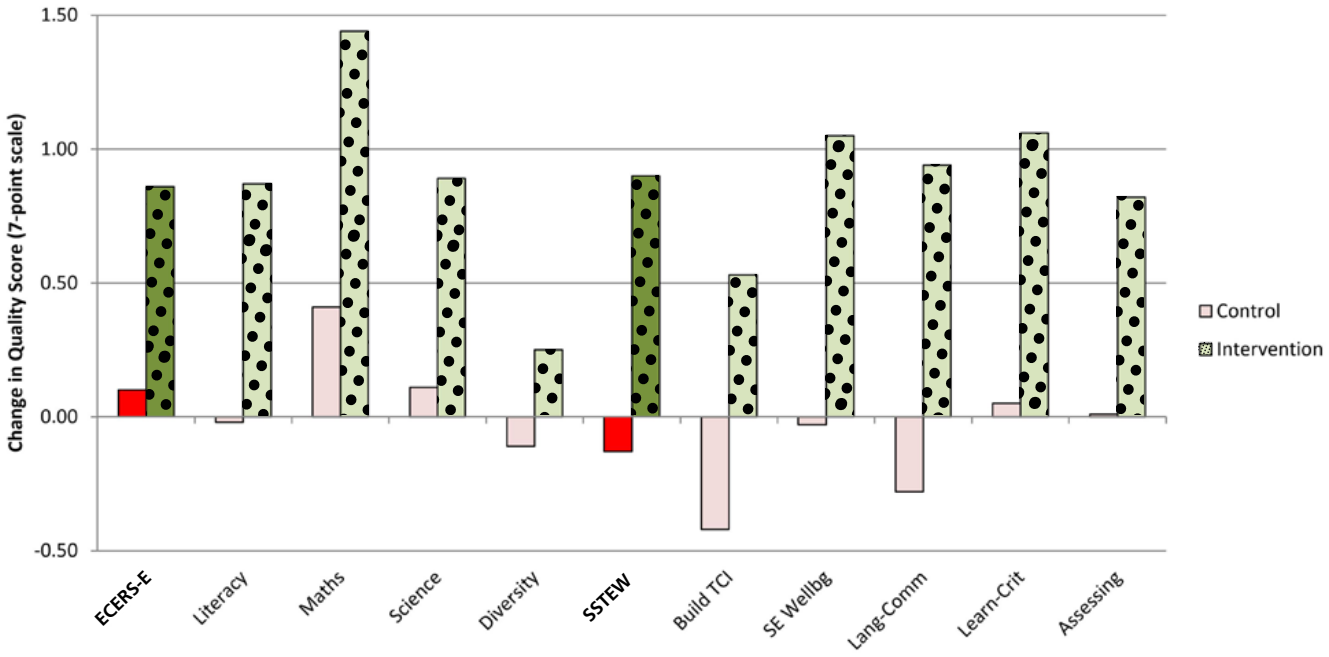


Figure 2. Comparison of scale and subscale scores for intervention and control group. ECERS-E indicates average change score (baseline to post-intervention) across all ECERS-E subscales. SSTEW indicates average change score across SSTEW subscales. Build TCI = Building Trust, Confidence and Independence. SE Wellbg = Social-Emotional Wellbeing. Lang-Comm = Supporting and Extending Language and Communication. Learn-Crit = Supporting Learning and Critical Thinking. Assessing = Assessing Learning and Language.

3.3 Participating Sample (Per-Protocol) Evaluation

Given that intention-to-treat analyses provide a generally conservative estimate of the intervention's effect (Gupta, 2011), subsequent intervention analyses typically consider those who met a sufficient threshold of participation and adherence to intervention protocols (a per-protocol evaluation). Per-protocol adherence was referenced against the study's requirement for at least two staff members from each centre to attend the face-to-face PD (participation in Phase 3 was more difficult to index because number of users and quality of use was impossible to discern from numbers and lengths of – and pages visited during – login).

To create an index of a centre's attendance, two core principles were considered: (1) that no face-to-face session was more important than another (thus, sessions were divided into half-days to provide a uniform metric); and (2) that there is additional benefit from a second (and third, etc.) educator attending the PD, although the degree of benefit is likely diminishing with each additional educator in attendance. As such, attendance was considered using the following formula: [(# of half days attended by Educator 1) + ([# of half days attended by Educator 2 * 0.50) + ([# of half days attended by Educator 3 * 0.33)]. This generated a maximum score of 16.50, representing three educators attending all Phase 1 and Phase 2 sessions.

The mean attendance score for all intervention centres was 12.77 (SD = 2.50, range = 5.00-16.50). One centre did not attend Phase 1 at all. All other centres sent at least one educator, with most (86.8%) sending two or more educators. For Phase 2, most centres (84.2%) had at least one educator attend all half-day sessions, four centres (10.5%) had an educator at four of the five sessions, and two centres (5.3%) sent an educator to only two of the five sessions. Given this pattern of attendance, and stated attendance expectations, the minimum threshold to be

included in per-protocol analyses was set at two educators attending the first two full days and at least half the half-days (10.50 points). This per-protocol threshold removed three intervention centres from per-protocol analyses.

Results of the per-protocol regression analyses again indicated a significant effect of the PD intervention for all scales and subscales (see Figure 3). These effects remained after controlling for identified covariates. The size of the intervention effect, as indicated by standardised regression weights, was improved in nearly all cases. Further, the degree of change in environment ratings was improved for the intervention group.

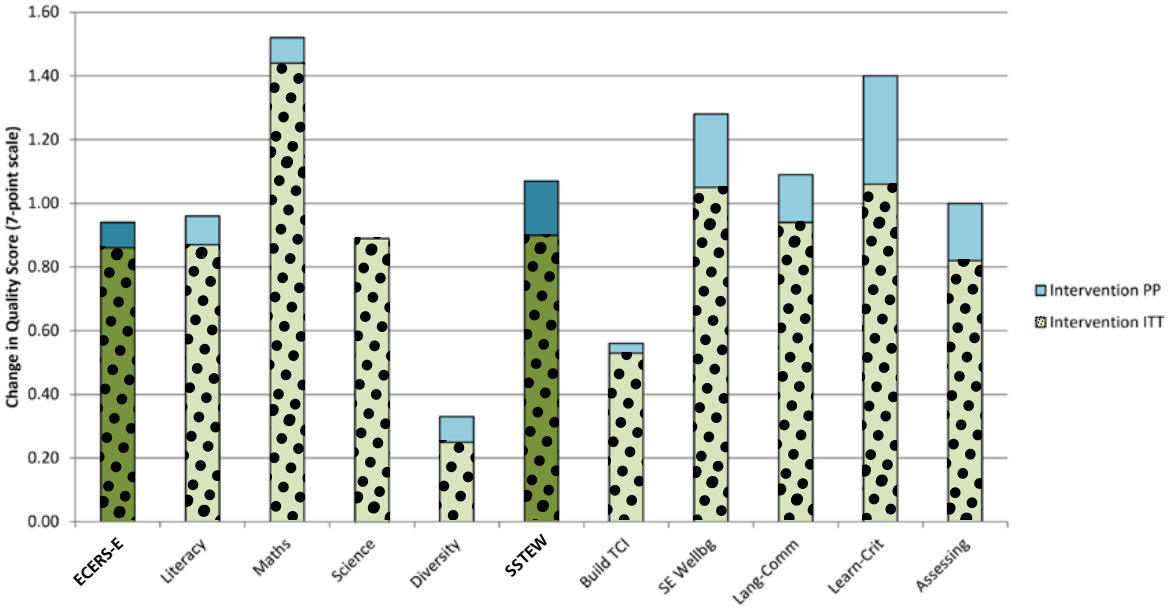


Figure 3. Comparison of scale and subscale scores for per-protocol intervention centres. Blue area of bars shows the increased average change in quality when considering per-protocol centres compared to all intention-to-treat intervention centres (the average change for which is indicated by the blue area of the bars). ECERS-E indicates average change score (baseline to post-intervention) across all ECERS-E subscales. SSTEW indicates average change score across SSTEW subscales.

Results: Child Outcomes

4.1 Brief Overview of the Child Outcome Findings

On the two measures of children's language development and the two measures of their numerical understanding, a robust improvement over the seven month period was observed in the control group. However, on three of four measures, there was also a statistically significant additional rate of growth in children whose educators had participated in the Leadership for Learning PD (see Figure 4). This additional growth in the intervention group was descriptively quantified in relation to growth observed in the control group. This analysis showed that children in the intervention group experienced, effectively, double the growth in their verbal comprehension compared to children in the control group. On the early number concepts assessment, there was 23% more growth in the intervention group. On the early numeracy assessment, there was 28% more growth in the intervention group. There was no difference between the intervention and control group in the rate of growth on the expressive vocabulary assessment.

Follow-up analyses, which examined contribution of age, gender, maternal education and family income on these child outcomes, did not alter these key findings appreciably in relation to the effect of the PD on children's learning (see Appendix J). Nevertheless, these follow up analyses did confirm that older children performed better on these outcome measures, as did children whose mothers had a higher level of education or whose families had a higher income. Similarly, the per-protocol analyses, including only those centres from the intervention who adhered to the PD intervention (92%), did not alter this overall finding.

In addition to the analyses presented here, the NSW Centre for Education Statistics and Evaluation (CESE, NSW Government) conducted independent analyses on: (1) indirect intervention effects (i.e., child outcomes); and (2) the relationship between the FEEL intervention in preschool and children's subsequent performance on the NSW BestStart Kindergarden assessment on a sub-set of children (N = 781) who could be followed up. Results of these analyses broadly confirmed our conclusions concerning child outcomes, although the alternative methodology adopted by CESE did not provide evidence of an indirect effect of the FEEL intervention for children's number concepts on the DAS-II.

Furthermore, there was little evidence that the indirect intervention effects of the FEEL PD on child outcomes translated to children's performance on the BestStart assessment in Kindergarten. These findings are presented in more detail in Appendix K.

Regarding socio-behavioural and self-regulation outcomes, the indirect effects of the PD intervention were less pronounced but they still showed an advantage for the children in the intervention group. Specifically, teacher assessments of children's internalising problems differed significantly between the groups, revealing that there were fewer signs of internalising problems in the intervention group, as measured on the SDQ, in comparison to the control group children. Differences between the groups in the other socio-behavioural and self-regulation measures were not significant.

4.2 Verbal Comprehension

As expected, children in the control group improved from pre- to post-test in routine ECEC practice (see Figure 4). By contrast, the intervention group children showed an additional 102% gain in verbal comprehension over the same time period. This added gain in the intervention group was a significant improvement over and above typical development.

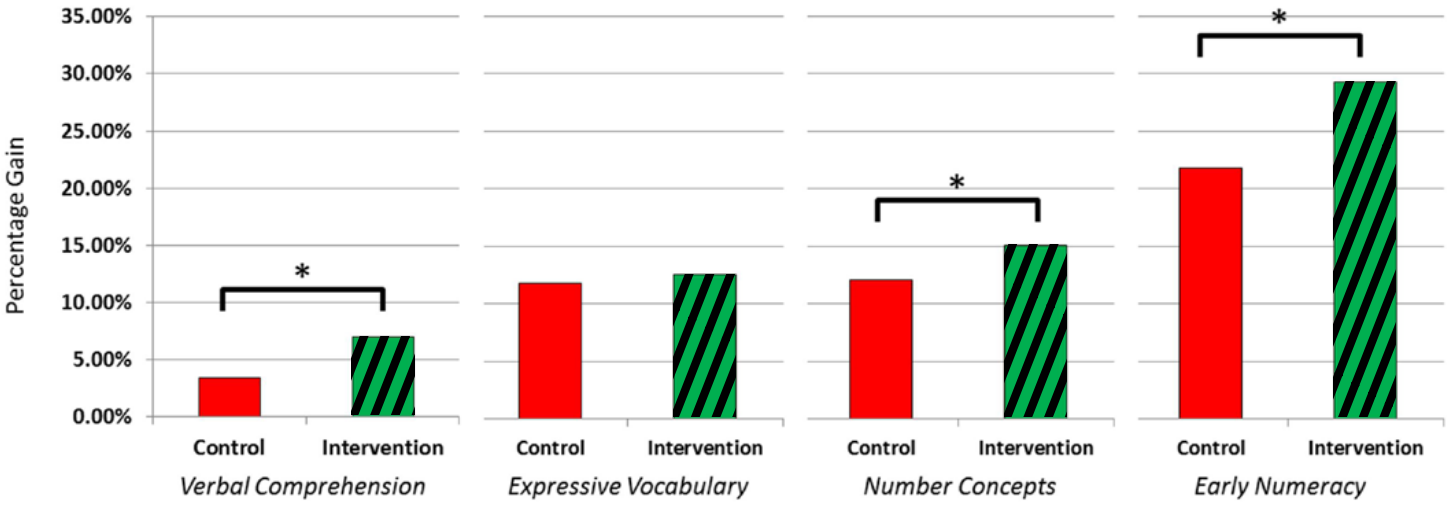


Figure 4. Change in children's verbal comprehension, expressive vocabulary, number concepts, and early numeracy for intervention and control groups.

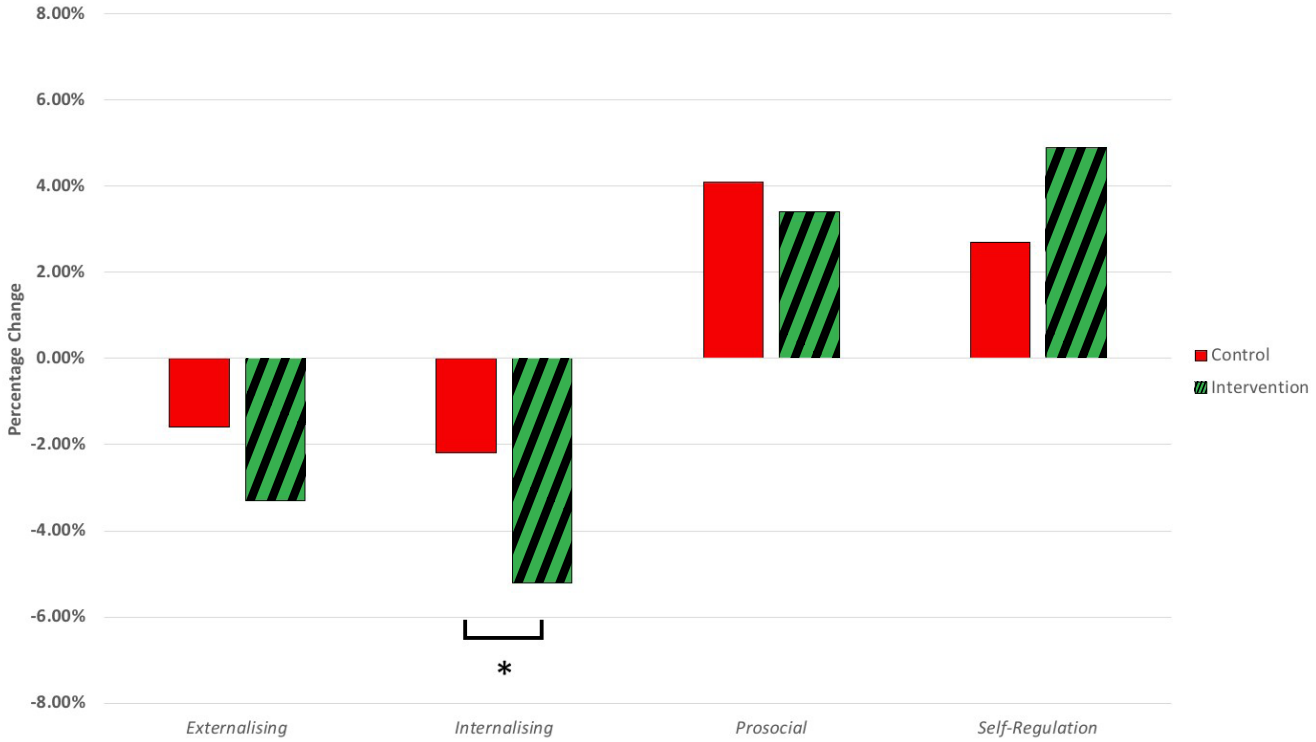


Figure 5. Change in teachers' reports of children's social-emotional and self-regulation development for intervention and control groups. Decreases in externalising and internalising represent improvements for children. Similarly, increases in prosocial and self-regulation represent improvements for children.

4.3 Expressive Vocabulary

As expected, there was an improvement from pre- to post-test in both the control group and the intervention group. However, there was no additional gain in the intervention group. Thus, there was no significant improvement for children in the intervention group beyond that expected from typical development.

4.4 Number Concepts

As expected, children in the control group improved from pre- to post-test in routine ECEC practice (see Figure 4). By contrast, children in the intervention group showed an additional 23% gain in number concepts over the same time period. The additional gain in the intervention group represented a significant improvement over and above typical development.

4.5 Preschool Early Numeracy

As expected, children in the control group improved from pre- to post-test in routine ECEC practice (see Figure 4). By contrast, intervention group children showed an additional 28% gain in early numeracy over the same time period. The additional gain in the intervention group represented a significant improvement over and above typical development.

4.6 Socio-Behavioural and Self-Regulation Outcomes

There were expected improvements in children's socio-behavioural and self-regulation outcomes from pre- to post-test in the control group for children in routine ECEC practice (see Figure 5). By contrast, children in the intervention group showed an additional improvement over the same period, but only for internalising problems. The intervention did not appear to produce an added benefit for children in the intervention group in relation to externalising problems, prosocial behaviours and self-regulation (see Appendix J).

5.1 Variability in Quality Change Across Intervention and Control Groups

The previous analyses illustrated, quantitatively, that there was a direct influence of the Leadership for Learning PD on educators' practice and behaviour, as indexed by ECERS-E and SSTEW, and also some indirect positive impacts on children's early learning and behaviour. These findings, however, reveal little about the variability in change across the sample. Therefore, prior to undertaking qualitative analyses, we first examined the distribution of direct effects of the PD on educators' practice and behaviour at the centre level. Because we see variable improvements across a broad spectrum of initial quality levels (Figure 6a and 6b), it is important to, qualitatively, understand the likely facilitators and barriers of effective implementation of the PD. These diverse patterns of the influence of the PD also suggest focused case studies to more richly explore the conditions that support positive change, which are currently being undertaken and will be reported separately.

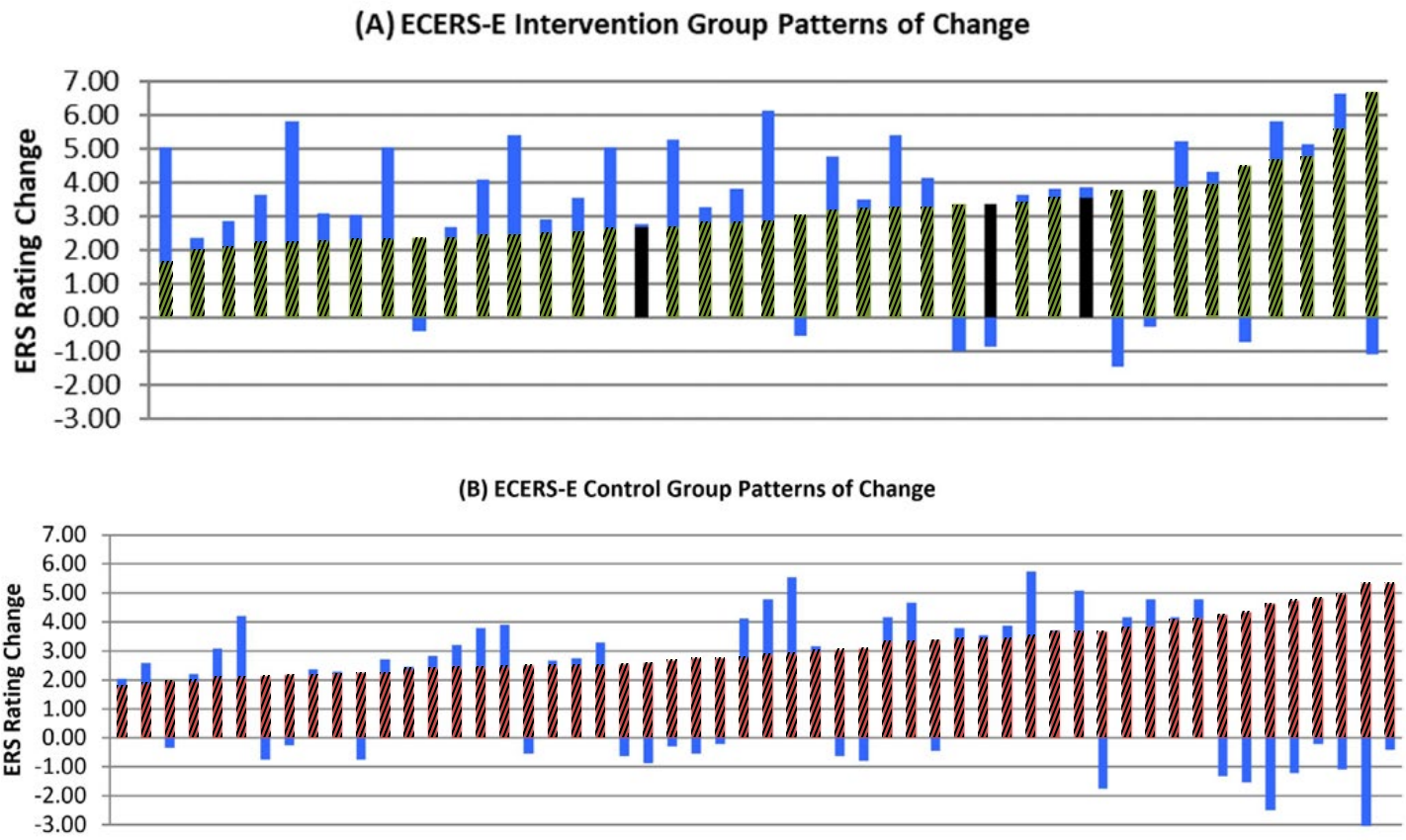


Figure 6a. Pattern of quality change for each sample room in ECERS-E for Intervention (A) and Control (B). Green/red bars indicate baseline quality scores and blue bars indicate change in quality at post-intervention. Where the blue bar appears below the green/red bar, this indicates the level of decrease in room quality since baseline rating. Black bars indicate centres eliminated from per-protocol analyses.

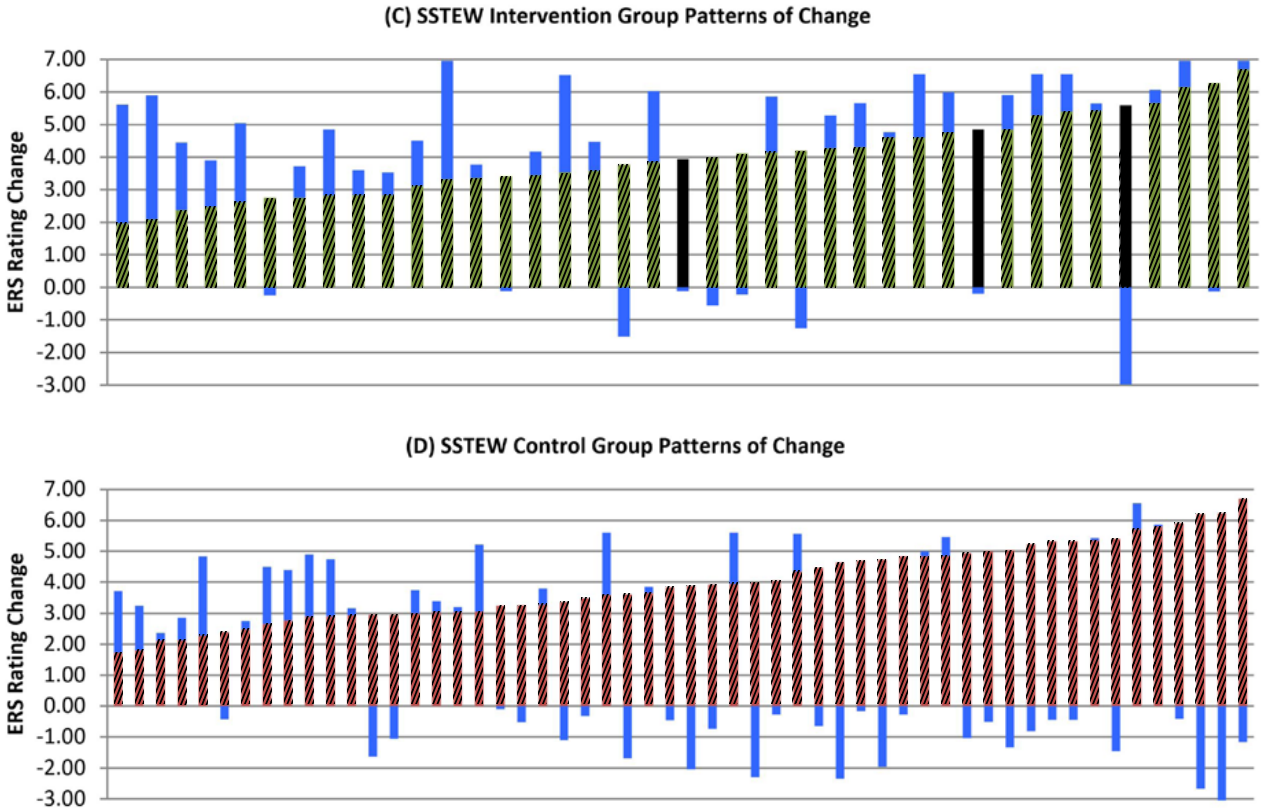


Figure 6b. Pattern of quality change for each sample room in SSTEW for Intervention (C) and Control (D). Green/red bars indicate baseline quality scores and blue bars indicate change in quality at post-intervention. Where the blue bar appears below the green/red bar, this indicates the level of decrease in room quality since baseline rating. Black bars indicate centres eliminated from per-protocol analyses.

5.2 Shifts in Personal Pedagogy, Philosophy and Reflective Practice

Following completion of each phase (Phase 1 – a two day intensive face-to-face workshop; Phase 2 – five fortnightly half-day face-to-face workshops; Phase 3 – ongoing facilitated online support and learning combined with an additional face-to-face half day session; see Section 1.4 and Appendix A) participants were asked to complete a short evaluative questionnaire. Responses from Phase 1 were used to inform and shape the delivery of Phases 2 and 3. Face-to-face PD sessions (Phases 1 and 2) were evaluated at the end of the last session in each phase. A final online evaluative survey was sent to participants in November 2016. Of the 90 participants, 70 completed the evaluation (78%) at Phase 1, 70 completed the evaluation at Phase 2 (78%), and 66 completed the evaluation at Phase 3 (73%). The following elements of the questionnaires are reported below: first, how educators perceived how the PD influenced them as professionals and Leaders for Learning Champions; second, which were the biggest changes/improvements to quality for the staff, children and families; and third, the aspects of the PD that participants found supported or challenged practice change.

Educators were asked to provide ratings of any changes in their beliefs, pedagogies and practices following the PD. They were asked to rate their agreement on 5-point Likert scales (1 = not at all to 5= very much) for 21 statements.
The statements included: I feel more motivated/ the PD has renewed my enthusiasm for teaching; my understanding of how children learn and develop has improved/deepened;
I am more open to change. Educators' ratings of the same statements allowed for comparisons and averages to be considered. The range of mean responses (3.42 – 4.39) demonstrated the participants' overwhelmingly positive responses to the statements and PD.

When the mean scores on the statements were separated according to the four highest and four lowest means, some tentative conclusions could be drawn. The highest scoring statements - where participants very much agreed with the statements - appeared to be on some of the simpler and more readily achievable aspects of change. For example, the educators agreed that the PD supported their motivation and confidence and renewed their enthusiasm for teaching. They felt the PD confirmed what they knew and believed about children's learning, and they reported that they were much more reflective and analytical following the PD. While the lowest mean scores (which were in fact relatively high when considered objectively) clustered around some of the more complex aspects of change, including those which implied a change in the culture of the setting, a new openness to change and, not unexpectedly, around collaboration with colleagues both within and outside their own settings. These clustered differences link to current thinking regarding change and PD; resistance to change is not unusual and developing collaborative teams may take time to achieve (Rodd, 2006). Time is also needed for new understandings, practices and approaches to become embedded.

Participants were asked to reflect on how the PD had influenced them as a practitioner. Changes noted by educators reflected personal, philosophical and attitudinal shifts, improved pedagogy and practice, renewed sense of purpose, better understanding of the educational and social-emotional needs of the children in their care, and a deeper understanding of their role as an educator in the lives of children and families (see Appendix L, Table L.1 for an overview of key themes and illustrative quotations). The majority of educators surveyed (95%) reported a shift in their pedagogical approach through the PD. Educators who did not mention changes to their practice attended fewer sessions of the PD with an average of 5.4 sessions (of maximum of 10 sessions, such that each half-day of PD was considered as one session).

Discussing their changes to pedagogy, educators referred to an increased awareness of children's capacity for learning, the realisation that learning can occur in a range of everyday opportunities, and how they can modify their teaching practice to one that is more intentional and purposeful (i.e., explicit mention of intentional teaching in relation to pedagogy; 41%).

Educators also noted their role in scaffolding children's learning and thinking;

> "Our goal has always been to provide positive experiences for children, both through small group work and respecting individuality and needs and the FEEL study has taken this to another level"

"Our goal has always been to provide positive experiences for children, both through small group work and respecting individuality and needs and the FEEL study has taken this to another level. I have a renewed enthusiasm and awareness as an educator. I see learning opportunities and experiences EVERYWHERE now, have better skills and knowledge in identifying, planning and implementing these experiences." (Cert III, Assistant)

Participants appreciated links made throughout the PD to national requirements such as NQS and EYLF and felt that the PD reinforced or validated their existing knowledge (43%), providing them with more confidence to engage in practices they were already implementing, while extending themselves to incorporate new concepts and ideas. Sustained Shared Thinking (SST) was widely mentioned by educators (54%) as being valuable for extending children's thinking, with participants highlighting their intention to use it more frequently in their daily interactions with children. As a result of the PD, educators were more aware of the important role that high quality interactions play in facilitating children's learning and SST (46%) and the use of questioning in extending children's thinking (40%).

Educators had changed their practice by recognising the environment as important for children's learning and making associated changes (33%), shifted from a predominantly large group, whole-class pedagogical approach to one that incorporated small group experiences with individuation (27%), and had renewed value for children's voice and agency through increased use of pauses and listening during their interactions with children (31%).

"Having a much clearer image of what 'high quality' actually looks like has made it much easier to confidently provide rich environments, interactions and experiences for children that are proven to be supportive of positive outcomes and successful learning. The clarification of my role in children's learning (particularly in children's play.) I really feel that this training has given me permission to educate! I had always faced the dilemma of 'when is my interaction an interruption?' and 'how and when is it appropriate to "teach" children rather than simply sit back and let them discover for themselves?' i.e. the balance between child initiated learning and focused learning… As an educational leader, it has really helped me to focus my support and training, to educate educators (and families), and to have confidence in my role." (Educational Leader and Assistant Director)

> I had always faced the dilemma of "when is my interaction an interruption?" and "how and when is it appropriate to "teach" children rather than simply sit back and let them discover for themselves?"

Participation in the PD also resulted in increased confidence and motivation among educators (46%) and increases in reflective practice (46%). The PD encouraged the participants to be more reflective in their practices and to reflect deeper to find ways to better support the needs of children and extend children's thinking. Another positive aspect of the PD included inclusion of the RAPIE (Reflect and Assess, Plan, Implement and Evaluate) Improvement Cycle to guide educators' practices (26%). This RAPIE, developed for FEEL participants, was an effective tool for guiding educator practice, evaluation and reflection.

Most notably, the PD renewed participants' sense of purpose as an educator. They acknowledged the relationship between high quality in the early years and better developmental outcomes for children, and noted that they had an important role in such a relationship (41%). Educators also highlighted that the PD inspired them to improve and be more goal-oriented in their practice (29%) and referred to increased knowledge and understanding of high quality practice (29%). Almost half of the educators (40%) indicated that the PD motivated them to have a broader worldview, extending beyond their immediate classroom to also include families and the broader community. They reflected on their improved capacity to share information with families and community, and felt the PD supported them in being advocates for high quality in early childhood education. Most significantly, the PD provided educators with a language with which to discuss and deliver learning, empowering both their own practice and the practices of others.

5.3 Impact on Other Staff

The Leadership for Learning PD was structured around a cascading model of delivery where participants were asked to share with their centre or preschool colleagues the information and practices they had examined through the face-to-face PD sessions. Improvements in overall classroom quality, rather than merely changes in attendees practices, were enhanced by including more than one educator from each participating context – as was the promotion of a model of leadership that underscored the active role of participants in driving practice change, and access to the online platform of learning which housed all content and resources provided in the face-to-face sessions.

Throughout both Phase 1 and 2, educators were actively encouraged to see themselves as Leaders for Learning Champions, playing an integral role in the development of their non-attending peers. A measure of success for the PD, therefore, was to see changes among other educators in the classroom rather than simply among the educators who attended the PD.

Analysis of responses showed that the main approaches to sharing information with colleagues in their room or centre were through presentations at staff meetings (40%), formalised PD using the online Moodle supports (58%), informal daily discussions (88%), modelling teaching practices (24%), sharing hand-outs (25%), mentoring staff (28%) and integrated approaches (26%). A comparison of educator responses across centres showed that those with the greatest improvements in environmental quality over the course of the intervention were those who truly embraced the Leadership for Learning model of influence as illustrated in the quotation below. A number of educators (29%) identified the importance of both allowing staff the time to reflect and digest the new information and learning and supporting opportunities for reflective practice - with many educators adopting a similar model of delivery with their staff to the facilitators delivering the face-to-face PD.

"We developed and presented several training packages from the information we were given, we shared the practical games and examples from the PD sessions and opened up discussions as a group. We looked at the scales and informally compared our own practices and environments against it. Our room coordinators, through the lens of our service philosophy, then supported their teams to translate this all into practice and develop improvement plans. Our educators now have a deeper understanding of what 'high quality' is, and why it is so important; what areas we should really focus our energy into; and what strategies can be used to support and assess them. This has allowed them to be far more effective and confident advocates and practitioners."
(Educational Leader and Assistant Director).

"Our educators now have a deeper understanding of what 'high quality' is, and why it is so important; what areas we should really focus our energy into; and what strategies can be used to support and assess them."

While educators identified changes among themselves more easily than among their peers, there were still many notable shifts in staff pedagogy and practice as detailed in Appendix L (Table L.2). One dominant theme was around the importance of distributing and sharing information with their colleagues. The ECERS-E and SSTEW environmental assessments were seen to be particularly useful in supporting practice change amongst their colleagues.

Notable changes to practice among staff included increased use of SST practices (19%), improved planning and use of the RAPIE planning and reflection cycle (17%), increased support for children's self-regulation (18%), and the creation of more opportunities for children to engage in science and critical thinking (17%). Improvements among staff were also noted for increases in reflective practice (35%), improved pedagogy including increased use of questioning to extend children's thinking (27%), and increased use of small group experiences (17%), intentional teaching (23%) and relational pedagogy (16%).

Four participants from three centres commented on seeing little to no changes amongst their peers. Notably, these centres were amongst those that experienced a decline or minimal gain in quality ratings when comparing pre- and post-test scores on the ECERS-E and SSTEW. Reasons cited for a lack of change included staff resistance, ("challenging with new concepts introduced. Not co-operative", Director) and limited opportunity and time to pass information on. Despite these barriers, educators still hoped to continue supporting staff beyond the confines of the study.

As well as specific practice changes, participants also noted changes in their colleagues in terms of improved knowledge and understanding (20%), increased teamwork (21%), greater awareness of quality in shaping interactions with children (31%), and increased collaboration and shared vision amongst staff through the PD (45%). The increased confidence and motivation noted among the participants themselves extended to their colleagues with nearly half the participants (42%) noticing changes in their colleagues' motivation and confidence in their approach to practice:

"They have become 'playful pedagogues', embedding learning into everyday experiences and offering engaging environments and opportunities that are both meaningful and deeply interesting to the individuals in their care. [I've seen] increased confidence in their roles as educators and knowledge of children's learning and development, and best practice…" (Educational Leader and Assistant Director).

"They have become 'playful pedagogues', embedding learning into everyday experiences and offering engaging environments and opportunities that are both meaningful and deeply interesting to the individuals in their care."

5.4 Impact on Children

The Leadership for Learning PD model not only addresses the need for whole-room or centre change but also draws on practices and processes which are evidence-based as important in fostering developmental outcomes for children (Siraj-Blatchford et al., 2002; Sylva et al., 2004). Supplementing objective measures of child development, it was equally important to draw on educators' perceptions of how the PD impacted children in their room. Eighty-one of the 90 educators surveyed were able to notice changes amongst the children in their care through the PD.

Changes among children were framed by educators in two ways. First, they described changes for children in terms of educators' modified practices and children's resultant experiences. For example, there were mentions of children being part of smaller groups, being engaged in more meaningful learning experiences, encountering more question-asking and engaging in SST. Second, educators described changes for children in terms of how the children responded. For example, they were more engaged in their learning:

"Sustained shared thinking-Wow! The other day while I am involved in a small group activity about measurement I had the thought 'is this really happening?' Through my initial question the children began supporting and extending each other and when they were asking me to lie down on the ground so they could compare and measure objects against my height before they began ordering them to determine which would be most suitable to retrieve a toy over the fence, I was delighted by the way they worked together in their thinking. As problems arose all children were utilised and listened to within the group." (Educator)

The impact of the PD on children, as perceived by educators, was seen largely in terms of: (1) changes to children's engagement and motivation, and (2) increased learning and problem solving. The educators commented on the children being more engaged (60%), asking more questions (43%), more active problem solvers (60%) and more confident in their interactions (19%):

"The children are so much more involved in their learning, more engaged and interested in discovering new things and even extending upon their prior knowledge. They have taken their learning to a new level that is deeper, where they are eager to use trial error with things and investigate without being worried about being wrong or right. They show a sense of being proud of their achievements and really want to share these achievements with others. Having the Educator facilitate their learning they are thinking more for themselves and wanting to do things and discover things for themselves. They are able to think more about their own behaviour and be accountable for their behaviour and how this might influence others." (ECT - Supervisor)

"They have taken their learning to a new level that is deeper, where they are eager to use trial error with things and investigate without being worried about being wrong or right."

Although some educators thought it too early to notice changes, others observed change within a few weeks. Many educators commented on how children took charge of their own learning and were far more capable of engaging in learning than the educators had anticipated. Several educators commented "taking a step back and observing children" had made a large impact. One of the PD's strengths was that it allowed educators to see the direct link between providing quality experiences and the children's behaviour and outcomes. Appendix L (Table L.3) summarises the most frequent themes that emerged when educators described changes for children.

In their responses to the Phase 3 questionnaire, educators noted more changes than at Phase 2, suggesting greater impact on child behaviours with increased 'soak time'.
The potential longer-term influence of the PD, both in terms of educator practice and child engagement and performance, is captured in the following response:

"Confidence is improving over time, and was the main issue to making changes within our service. Small changes at the beginning, and now we are more inclined to make huge changes across each room. We had educators resistant to change and eventually lost two of our 26, as a direct result to the changes made. Three others did not initially see the value in improving the educational practices of educators, but have seen good results over time and heard good feedback, which has resulted in them changing practices and even promoting them now. Parents' lack of value in 'Child Care' education is beginning to change as well as we promote our values and beliefs more, and they see the abilities of their children improving. This year would have been better to study the changes in our children, as we feel we have deepened our understanding and improved our practices more and more as time goes by." (Director, Educational Leader, ECT, Nominated supervisor, owner).

5.5. Changes for Families

From an ecological perspective, genuine change occurs when there is consensus and connection across the multiple contexts in which children operate (Bronfenbrenner, 1979). A focus of the PD was to ensure improvements in both understanding of child development and enhanced pedagogy and practice - with the goal that these would extend beyond the ECEC setting to encompass the Home Learning Environment (HLE).

Nearly two-thirds of educators surveyed (61%) commented on the PD resulting in enhanced connections and increased involvement with families. This included sharing ideas, supporting parents in their interactions with their children, parents noticing changes in their children, positive feedback received from families, and an indication that families showed greater understanding of their children's learning, particularly with respect to recognising the role of educators in their child's development (i.e., beyond baby-sitting), and the importance of high quality early childhood practice.

Some educators noted that they already had strong relationships with their families, which were seen to facilitate efforts to share new information and learning acquired through the PD. Many educators reported receiving positive feedback from parents (28%) and also provided strategies to engage parents in children's learning - such as using 'yarn bags' to bring home, holding parent information evenings related to self-regulation, and posting information on the PD on the centre's Facebook site. These items are elaborated in Appendix L (Table L.4).

"The importance of self-regulation and informing families of this brought about our 'Game bags' idea. Sending a fun family activity home that could cross many areas of development and learning and involve families in thinking about what we all what to achieve for our children." (ECT)

Eighteen educators mentioned little to no changes for families as a result of the PD. Reasons included not having yet received feedback from families, uncertainty about how information could be filtered through to families, lack of awareness or interest of families, and variability in educators' work days so they could not speak with families.

The greater numbers of educators reporting fewer changes for families (compared to changes to own practice, for other educators, and for children) is unsurprising given that the PD focused on what occurs inside the room. While educators were branded as leaders who would share information with other educators throughout the PD, the focus remained largely on their colleagues and the children in their rooms. Even so, one of the educators noted that they did not see many changes with families because her team already had a strong bond with them.

5.6 Structural, Process and Content Impact

Participants were asked to reflect on (a) how the different elements of the PD supported them in making changes to pedagogy and practice within their centre or preschool, and (b) any structural or process qualities that facilitated this practice change. Appendix L (Table L.5) provides an overview of the main themes that emerged from the content analysis of educator responses.

Participants were very positive about the PD's process of delivery. They appreciated the fact that it was a continuous PD, not a one-off single day. One of the most frequently cited supportive elements was access to the environmental quality rating scales (45%) - with participants using these both for self-assessment and goal setting.

Other frequently mentioned positive aspects of the PD included the use of the RAPIE Improvement Cycle to guide their practices, SST and using small groups. Some centres said they would not go back to one large group as the smaller groups worked much better. The inclusion of evidence-based practices, with clear links between practice and child outcomes, was also cited frequently by participants as a supportive element in effecting practice change.

Participants also valued the inclusion of illustrative practice examples (i.e., resources, games, practice videos and hands on activities). They liked the interactive nature of the half-day sessions and saw opportunities for networking and discussion of practices with other educators and centres, which were also seen as an important aspect impacting on practice change. One centre even reported that they were considering doing a 'staff swap' following the completion of the study to continue to sustain practice change and on-going quality improvement.

The fidelity and effectiveness of the PD was also linked to the capability, credibility and knowledge of the presenters, this being the most oft cited catalyst for practice change. Educators (70%) commented on the approachability, passion and professionalism of the facilitators and felt this was a key element impacting the success of the PD:

> "Yes, the knowledge was there but without effective engagers some of the knowledge could well have been missed. So I do believe that it was the presenters that created the success and the 'support'"

"I believe that all the elements could not be without each other it was very holistic and I also believe that the human component to the phases and elements that were presented and cannot be over looked, without the presenters and their infectious motivation and enthusiasm I question if I would have rated the elements as highly. Yes, the knowledge was there but without effective engagers some of the knowledge could well have been missed. So I do believe that it was the presenters that created the success and the 'support'... I also believe that the value of the opportunity to talk with other educators from other centres and to hear their stories and see their examples etc. cannot be under-estimated in helping the elements to 'support'" (ECT).

What stood out among participants was their feeling of being valued and treated as 'professionals', with a number of respondents noting that many PDs and facilitators 'dumb things down'. A participant said :
"You aren't 'academics' preaching knowledge that you haven't actually implemented" (Educational Leader), and commented on how the presenters are very much in touch with early childhood education.

The PD provided many participants with the opportunity to reflect on their practices and affirm what they already knew but had not always implemented. When asked how participants would like to be supported in their role as Leader for Learning Champions throughout the year, many mentioned that they would like to have more face-to-face sessions or even a monthly visit. Participants mentioned several times they would like the presenters to come to their centres and see how they had implemented the ideas and receive feedback. They also thought it important to continue sharing ideas, examples and research beyond the scope of the study.

Effective PD also depends on a deeper understanding of the aspects that challenge participants. Many educators reported the largest barrier to implementing changes through the PD was time (66%). Overall, few challenges were cited by participants, with most respondents holding very positive views. The amount of content delivered over the initial two days, however, was cited as a challenge for some of the educators (29%). Interestingly, these were areas of the online learning environment receiving the greatest amount of traffic, with educators subsequently noting the importance of this information and revisiting this content throughout the intervention.

Additional challenges cited by educators included the ability to share and distribute information about the PD to colleagues (57%), difficulties accessing online learning platforms for resources (54%), the specific team or management characteristics (e.g., lack of interest; 48%), difficulty providing information to staff who did not attend the PD (26%), staff resistance to change (29%), variability in number of days attending educators were actually present in their centre (28%), the amount of content and complexity of the information (28%), irregular or short staff meetings (20%), and difficulty getting staff to share the vision (18%).

With respect to suggested improvements, 10 participants cited the need for further content, with particular requests for greater depth around numeracy and literacy. This may reflect requirements around Best Start baseline measures of children's literacy and numeracy upon starting school. Several participants mentioned they were somewhat uncomfortable with accessing the online platform due to lack of computer skills.

In summary, the majority of educators who completed questionnaires were very positive about the PD. They noticed changes in themselves, their colleagues, children and families.

Discussion and Policy Implications from the FEEL Study

6.1 Discussion

The Fostering Effective Early Learning (FEEL) Study involved designing and developing an evidence-based, cutting-edge PD program - and then evaluating its direct impact on early childhood educators and its indirect impact on children. This mixed method study of the impact of a PD program for ECEC staff has revealed findings of great interest to academics, policy-makers, ECEC trainers, practitioners and parents.

Regarding the impact on the quality of ECEC environments for young children, the study found that there was an overall effect of the PD on curricular and interactional quality – for all scales and subscales. This change in environmental quality approached 1 point (on a 7-point scale) for ECERS-E (.86) and SSTEW (.90), and ranged from .25 (Diversity) to 1.44 (Mathematics) amongst the subscales.

It would be hoped that, in the fullness of time, improvements in children's environments would have an impact upon children's development. Yet, within the constraints of the FEEL study, there was only a very short period of time available for the changes brought about by the PD to affect children. However, even in this narrow time frame (7 months, of which 3.5 months included delivery of the PD), there were discernible improvements in children's development for three (of four) child cognitive outcomes:

a. Language development as measured by verbal comprehension showed twice the growth (102%) in the intervention relative to the control group, while expressive vocabulary showed essentially no difference between the groups.

b. Numeracy development improved in the intervention group, as shown by two separate measures. For number concepts, there was 23% more growth in the intervention relative to the control group; and, for early numeracy, the added improvement was 28%.

Additionally there were discernible benefits for aspects of children's socio-emotional development. Children in the intervention group showed a reduction in internalising problems (peer and emotional problems) relative to the control group. Other aspects of socio-emotional development showed no significant difference between the groups.

> "While it is expected that changing children's environments would have an impact on child outcomes, to see changes over such a narrow time period was somewhat surprising and indicative of the power of the PD program."

The qualitative study of practitioners' perceptions partly elucidates how the benefits of the PD program arose. Overwhelmingly, educators reported experiencing a positive shift in their personal pedagogy (e.g., higher expectations, increased awareness of the children's capacity to learn), increased reflective practice, and a deeper understanding of child development and the evidence base underpinning effective practice. Educators' positive attitudes were also associated with PD attendance; educators who reported experiencing fewer changes to their personal pedagogy and practice attended fewer sessions of the PD.

A unique feature of the PD was the cascading model of delivery, whereby participants adopted a leadership role with responsibility for leading not only personal change, but also change in their teams. Centres with the highest levels of growth in environmental quality over the course of the intervention embraced the leadership for learning model of influence (i.e., they were intentional and purposeful in the strategies in ensuring their peers' engagement in the PD journey). Participants reporting improved confidence and motivation extended this to their non-participating colleagues.

The focus of the PD was to ensure improvements would extend beyond ECEC to the early home learning environment. Two-thirds of the educators commented on the PD enhancing communications and connections with families. Educators noticed that families showed greater understanding of their children's learning and an increased awareness of the educator's role in their child's life.

Improvements in the quality of centres was matched by tangible changes in practice. Aspects supporting the PD's efficacy were: the use of structural supports such as the environmental quality descriptions and the planning tools; the increase in evidence-based practices, where the PD provided clear links between educator practices and child outcomes; the fidelity and effectiveness linked to the capability, credibility and knowledge of the presenters; professionalisation of participants; and the structure that allowed for reflective practice during the PD (e.g., duration, time between the half-day sessions). However, there were barriers too, namely: time; support from management or teams; staff resistance; challenge of being a pedagogical leader; and IT skills (for accessing online supports).

Almost all the educators described changes among the children in their care as a result of the PD. Changes were framed in two ways: the educators' modified practices with the children (what children experienced); and how children responded to new experiences. The impact of the PD was seen largely with respect to children's increased engagement and motivation, and secondly in terms of improved problem solving and learning.

6.2 Policy Implications

A growing body of research recognises that ECEC brings a wide range of benefits, for example: better child well-being and learning outcomes, as a foundation for lifelong learning; more equitable child outcomes and reduction of poverty; increased inter-generational social mobility; more female labour market participation; increased fertility rates; and better social and economic development for the society at large (OECD, 2012). All these benefits, however, are conditional on "quality". Expanding access to ECEC without attention to quality will not deliver good outcomes for children or the long-term productivity benefits for society.

ECEC has experienced a surge of policy attention in most OECD countries in recent years. Reasons for investing in ECEC are embedded in cultural beliefs about young children, the roles of families and government, and purpose of ECEC.

In many countries, responsibility for the education and care of young children is shifting from the private to the public domain, with attention to complementary roles of families and ECEC in children's early development and learning. Often countries seek to balance views of children "here and now" with views of children as a future adult. Underlying these changes is growing awareness of research findings on ECEC, and the realisation that if a country wishes to enter and maintain a position amongst the most economically successful countries, the education of its population needs to be comparable with that of competitor countries. This is evident in the post-industrial world wherein economic success follows educational success.

It is increasingly becoming clear that ECEC is a substantial contributor to the longer-term educational, social, and economic success of individuals (e.g., Heckman, 2008; Melhuish et al., 2015; Siraj & Mayo, 2014). Hence, if a country can provide quality ECEC for its children, then it is not only enhancing children's lives in the "here and now" it is also advancing the long-

term outcomes for children, and by doing so is investing in the future.

Policy-makers are also coming to recognise that access to good quality ECEC improves lifelong learning for all children, and supports educational and social needs of families. In fact, realising the benefits of ECEC provision are largely dependent upon the ECEC being of good quality (Sylva et al., 2011). Governments may promote quality in ECEC through: framework documents; standards and accreditation; dissemination of research and information; technical support; raising the training and status of staff; encouraging self-evaluation and action-practitioner research; and establishing a rigorous inspection system.

Australia, particularly NSW, has a strong framework for ECEC in place, but successful implementation of frameworks requires investment for staff support, including in-service training and pedagogical guidance, as well as favourable structural conditions. One strategy that can be particularly efficient is in-service PD, particularly where the initial qualification levels of staff are low – as is typical for many countries. For example, research in the UK has found that the availability of in-service PD is a key contributor to differences in quality between ECEC centres (Melhuish & Gardiner, 2017) and family day care (Otero & Melhuish, 2015).

Building on the existing body of research, the findings of the FEEL study fit into the need for quality improvement in ECEC by showing how a particular form of in-service PD can produce substantial and practically meaningful improvements in both staff practice and child outcomes. Up-skilling the workforce is now a priority in many countries given the variance in training and the unequal quality of initial under-graduate and other qualifications (Ishimine et al., 2010; Siraj & Kingston, 2015).

These findings are a strong motivation to make such PD routinely available for all ECEC practitioners. However, the benefits of any kind of staff quality improvement effort will be radically reduced if there is instability of staffing; trained staff are only beneficial if they stay in the job. Hence, stability of staffing should also be addressed. These points are particularly appropriate given the nature of ECEC staffing across Australia, where historically there has been under-investment in the training (or retention) of ECEC staff.

References

Australian Bureau of Statistics (ABS). (2011). Estimates of Aboriginal and Torres Strait Islander Australians, June 2011, (Catalogue 3238.0.55.001). Retrieved from http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3238.0.55.001June%202011?OpenDocument

Australian Bureau of Statistics (ABS). (2016a). Community Profiles. Retrieved from http://www.abs.gov.au/websitedbs/censushome.nsf/home/communityprofiles?opendocument&navpos=230

Australian Bureau of Statistics (ABS). (2016b). Preschool Education, Australia, 2016, (Catalogue 4240.0). Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/0/7763A80C0386A792CA2580DC00152A33?Opendocument

Australian Children's Educations & Care Quality Authority (ACECQA). (2017). Guide to the National Quality Standard. Retrieved from http://www.acecqa.gov.au/national-quality-framework/the-national-quality-standard

Australian Institute of Health and Welfare (AIHW). (2004). Rural, Regional and Remote Health: A Guide to Remoteness Classifications, (Catalogue Number PHE 53). Retrieved from http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442459567

Bronfenbrenner, U. (1979). The Ecology of Human Development. Cambridge: Harvard University Press.

Bronfenbrenner, U., & Morris, P. A. (2006). The bioecological model of human development. In W. Damon & R. M. Lerner (Eds.), Handbook of child psychology, Vol. 1: Theoretical models of human development (6th ed., pp. 793 – 828). New York: Wiley.

Clifford, R., Reszka, S., & Rossbach, H. (2010). Reliability and validity of the early childhood environment rating scale. Unpublished manuscript, Chapel Hill: FPG Child Development Institute, University of North Carolina.

Desimone, L. M. (2009) Improving impact studies of teachers' professional development: Towards better conceptualizations and measures. Educational Researcher, 38, 181-199. doi:10.3102/0013189X08331140

Downs, A., Strand, P. S., Heinrichs, N., & Cerna, S. (2012). Use of the teacher version of the Strengths and Difficulties Questionnaire with German and American preschoolers. Early Education & Development, 23, 493-516. doi:10.1080/10409289.2010.532082

Dunst C. J., Trivette C. M., Hamby D. W. (2010). Meta-analysis of the effectiveness of four adult learning methods and strategies. International Journal of Continuing Education and Lifelong Learning, 3(1), 91–112.

Dunst, C. J. (2015). Improving the design and implementation of in-service professional development in early childhood intervention. Infants & Young Children, 28, 210-219. doi:10.1097/IYC.0000000000000042

Elliott, C. D. (2007). Differential Ability Scales (2nd ed.). San Antonio, TX: Harcourt Assessment.

Goodman, R., Meltzer, H., & Bailey, V. (1998). The Strengths and Difficulties Questionnaire: A pilot study on the validity of the self-report version. European Child and Adolescent Psychiatry, 7, 125-130. doi:10.1007/s007870050057

Gupta, S. K. (2011). Intention-to-treat concept: A review. Perspectives in Clinical Research, 2, 109–112. doi:10.4103/2229-3485.83221

Hamre, B. K., Downer, J. T., Jamil, F. M., & Pianta, R. C. (2012). Enhancing teachers' intentional use of effective interactions with children: Designing and testing professional development interventions.' In R. C. Pianta (Eds.), Handbook of early childhood education. New York, NY: The Guilford Press.

Heckman, J. J. (2008), Schools, skills, and synapses. Economic Inquiry, 46, 289–324. doi:10.1111/j.1465-7295.2008.00163.x

Howard, S. J. & Melhuish, E. (2017). An early years toolbox for assessing early executive function, language, self-regulation, and social development: Validity, reliability, and preliminary norms. Journal of Psychoeducational Assessment, 35, 255-275. doi: 10.1177/0734282916633009

Howard, S. J., Siraj, I., Melhuish, E., Kingston, D., Neilsen-Hewett, C., de Rosnay, M., Duursma, E., & Luu, B. (2017). Investigating interactional and curricular quality in preschool settings and their predictive associations with child development. Manuscript submitted for publication.

Ishimine, K., Tayler, C., Bennett, J. (2010). Quality and early childhood education and care: A policy initiative for the 21st century. International Journal of Child Care and Education Policy, 4(2), 67-80. doi: 10.1007/2288-6729-4-2-67

Kingston, D. (2017). A mixed methods study: Evaluating the impact of a bespoke professional development based on an analysis of existing quality in one local authority (Unpublished doctoral thesis). University College London, London. Retrieved from http://discovery.ucl.ac.uk/1551541/

Melhuish, E., Ereky-Stevens, K., Petrogiannis, K., Ariescu, A., Penderi, E., Rentzou, K., Tawell, A., Slot, P., Broekhuizen, M., Leseman, P. (2015). A review of research on the effects of Early Childhood Education and Care (ECEC) upon child development. CARE project. Curriculum quality analysis and impact review of European Early Childhood Education and Care (ECEC). (Technical report FP7-SSH-2013-2). European Commission. Retrieved from http://ecec-care.org/fileadmin/careproject/Publications/reports/new_version_CARE_WP4_D4_1_Review_on_the_effects_of_ECEC.pdf

Melhuish, E & Gardiner, J. (2017). Study of Early Education and Development (SEED): Study of quality of early years provision in England. London: Department for Education.

OECD (Organisation for Economic Co-operation and Development). (2012). Starting Strong III: A quality toolbox for early childhood education and care. Retrieved from http://www.oecd.org/edu/school/startingstrongiii-aqualitytoolboxforearlychildhoodeducationandcare.htm

Otero, M. P., & Melhuish, E. (2015). Study of Early Education and Development (SEED): Study of the quality of childminder provision in England. (Research Report DFE-RR480B). Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/459432/RR480B_-_SEED_the_quality_of_childminder_provision_in_England.pdf

Pianta, R.C. (Ed). (2012). Handbook of early childhood education. London: Guildford Press.

Purpura, D. J., & Lonigan, C. J. (2015). Early numeracy assessment: The development of the Preschool Numeracy Scales. Early Education and Development, 26, 286–313. doi:10.1080/10409289.2015.991084

Rodd, J. (2006). Leadership in early childhood (3rd ed.). Crows Nest: Allen & Unwin.

Sharp, C., Croudace, T. J., Goodyer, I. M., & Amtmann, D. (2005). The Strengths and Difficulties Questionnaire: Predictive validity of parent and teacher ratings for help-seeking behaviour over one year. Educational and Child Psychology, 22(3), 28–41.

Siraj, I., & Kingston, D. (2015) An independent review of the Scottish Early Learning and Childcare (ELC) workforce and Out of School Care (OSC) workforce. Edinburgh: The Scottish Government. Retrieved from http://www.gov.scot/Publications/2015/06/5902/downloads

Siraj, I. & Mayo (2014) Social Class and Educational Inequality: The Impact of Parents and Schools. Cambridge: Cambridge University Press

Siraj, I., Kingston, D. & Melhuish, E. (2015). Assessing quality in early childhood education and care. Sustained Shared Thinking and Emotional Wellbeing (SSTEW) Scale for 2 – 5 year olds provision. London: IOE Press.

Siraj, I., Kingston, D., Neilsen-Hewett, C., Howard, S. J., Melhuish, E., de Rosnay, M., Duursma, E., & Luu, B. (2017). A review of the current international evidence considering quality in early childhood education and care programmes – in delivery, pedagogy and child outcomes. Sydney: NSW Department of Education, External Affairs and Regulation. Retrieved from https://education.nsw.gov.au/media/ecec/pdf-documents/FEEL-Study-Literature-Review-Final.pdf

Siraj-Blatchford, I., Sylva, K., Muttock, S., Gilden, R., & Bell, D. (2002). Researching Effective Pedagogy in the Early Years (Research Report RR356). London: Department for Education and Skills. Retrieved from http://dera.ioe.ac.uk/4650/1/RR356.pdf

Steele, F. (2008). Multilevel models for longitudinal data. Journal of the Royal Statistical Society: Series A, 171, 5-19.

Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2004). The effective provision of pre-school education (EPPE) project: Findings from pre-school to end of key stage 1. Nottingham: Department for Education and Skills.

Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I. & Taggart, B. (2011). Pre-school quality and educational outcomes at age 11: Low quality has little benefit. Journal of Early Childhood Research, 9, 109-124. doi: 10.1177/1476718X10387900

Sylva, K., Siraj-Blatchford, I., & Taggart, B. (2010). Assessing Quality in the Early Years Early Childhood Environment Rating Scales Extension (ECERS-E): Four Curricular Subscales. Stoke on Trent: Trentham Books.

Sylva, K., Siraj-Blatchford, I., Taggart, B., Sammons, P., Melhuish, E., Elliot, K., & Totsika, V. (2006). Capturing quality in early childhood through environmental rating scales. Early Childhood Research Quarterly, 21, 76-92. doi: 10.1016/j.ecresq.2006.01.003

United Voice. (2014). Quality matters: Investing in early childhood education and care. Submission to the 2013 Productivity Commission Inquiry into childcare & early childhood learning. Retrieved from http://www.pc.gov.au/inquiries/completed/childcare/submissions/initial/submission-counter/sub319-childcare.pdf

Zaslow, M., Tout, K., Halle, T., Whittaker, J. V. & Lavelle, B. (2010). Towards the identification of features of effective professional development for early childhood educators: Literature review. Washington D.C: U.S. Department of Education. Retrieved from http://files.eric.ed.gov/fulltext/ED527140.pdf

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Glossary of Terms

2IC	.....	Second (2nd) in charge
ABS	.....	Australian Bureau of Statistics
CSBQ	.....	Children's Self-Regulation and Behaviour Questionnaire
DAS	.....	Differential Ability Scales
DoE	.....	Department of Education, New South Wales
E	.....	Exceeding (NQS)
ECEC	.....	Early Childhood Education and Care
ECERS-E	.....	Early Childhood Environmental Rating Scale – Extension
ECT	.....	Early Childhood Teacher
ERS	.....	Environmental Rating Scales
EYLF	.....	Early Years Learning Framework
EYT	.....	Early Years Toolbox
FEEL	.....	Fostering Effective Early Learning (study)
HLE	.....	Home Learning Environment (early)
IT	.....	Information Technology
LDC	.....	Long Day Care
M	.....	Meeting (NQS)
NQS	.....	National Quality Standard (Australia)
NSW	.....	New South Wales (Australia)
OECD	.....	Organisation of Economic Cooperation and Development
PENS	.....	Preschool Early Numeracy Scale
RAPIE	.....	Reflect and Assess, Plan, Implement and Evaluate Improvement Cycle
RCT	.....	Randomised Controlled Trial
SDQ	.....	Strengths and Difficulties Questionnaire
SEIFA	.....	Socio-Economic Indexes for Area (Australia)
SES	.....	Socio-Economic Status
SST	.....	Sustained Shared Thinking
SSTEW	.....	Sustained Shared Thinking and Emotional Wellbeing (scale)
UOW	.....	University of Wollongong
UR	.....	Unrated (NQS)
WT	.....	Working Towards (NQS)

Secondary Analyses Requested by the NSW Department of Education

11.1 Introduction

Below we present secondary analyses that have been conducted on the FEEL data, in a post hoc fashion. It is important to stress that the sampling for the FEEL study was designed to assess the questions outlined in the introduction, and summarised in Figure 1, concerning the effectiveness of the Leadership for Learning PD. Because this study conformed to a cluster RCT design, in which centres were randomly allocated to intervention and control groups, it was not a prerequisite of this study that centres were truly randomly and representatively sampled across NSW. Nevertheless, the FEEL study accrued data on a large number of centres from different geographic and socio-economic contexts, and there was no reason to believe that there was a systematic bias in the sampling other than that introduced by the implementation constraints of the PD; i.e., three geographical training hubs. It is therefore of value to ask secondary questions about key aspects of these centres, with the caveat that such findings should not be generalised without caution.

11.2 To what extent do NQS and ERS ratings correspond?

There is currently limited published data on the extent to which Australia's National Quality Standards (NQS) assessment ratings are associated with child development outcomes, or with environmental quality measures (e.g., ECERS-E, SSTEW) that predict children's outcomes (Howard et al., 2017; Sylva et al., 2004). Whilst the FEEL data allow for an examination of associations between NQS and ERSs, there are arguably too few centres (N = 83) to draw firm conclusions, especially given the fact that available NQS assessments spanned a period of at least three years. Therefore, we combined FEEL centre ratings with additional centre ratings derived from other Early Start projects to create an opportunistic but sufficiently large sample to examine these relations with some confidence, and allow an examination of whether correspondence between NQS ratings and ERS ratings is influenced by time since NQS rating: while some centres have had their NQS rating within a year of the environmental rating, for other centres this has exceeded three years. In these analyses, a total of 257 ECEC services across three Australian states were included. Within this sample there were 64 (25.4%) that had two rooms and one (0.4%) that had three rooms for children 3-5 years of age. As ERSs are conducted on individual rooms rather than centres, this yielded a possible 323 rooms. Despite the existence of multiple room ERS ratings for many centres, each centre only receives one NQS rating. Therefore, to avoid non-independence of observations, one room was randomly selected in centres with multiple rooms, yielding 257 independent ratings for each ERS. There were no significant differences in NQS and ERS associations across states, so pooled data are reported. Average ERS scores and subscale scores, as a function of NQS rating, are shown in Table 3.

Table 3. Average ECERS-E and SSTEW scores and subscale scores at baseline as a function of National Quality Standards (NQS) assessment ratings

	Working Toward		Meeting		Exceeding	
	M (SD)	Range	M (SD)	Range	M (SD)	Range
ECERS-E	**2.61 (.72)**	**1.67-4.42**	**2.69 (.83)**	**1.29-5.33**	**3.14 (1.02)**	**1.29-6.71**
Literacy	3.16 (.76)	1.67-4.83	3.32 (.98)	1.50-6.33	3.85 (1.12)	1.67-6.50
Mathematics	2.56 (1.19)	1.00-6.00	2.55 (1.16)	1.00-5.67	2.93 (1.34)	1.00-7.00
Science	2.37 (.81)	1.00-4.00	2.53 (1.02)	1.00-6.00	3.05 (1.32)	1.00-7.00
Diversity	2.33 (.90)	1.00-4.67	2.34 (.95)	1.00-6.00	2.72 (1.06)	1.00-6.67
SSTEW	**3.41 (1.07)**	**1.48-5.98**	**3.51 (1.28)**	**1.05-6.23**	**3.92 (1.20)**	**1.23-6.70**
Building TCI	4.26 (1.07)	2.33-6.67	4.37 (1.49)	1.00-7.00	4.81 (1.29)	1.67-7.00
SE Wellbg	3.75 (1.78)	1.00-7.00	3.83 (1.69)	1.00-7.00	4.30 (1.55)	1.00-7.00
Lang-Comm	3.88 (1.23)	1.50-6.00	4.14 (1.43)	1.25-7.00	4.47 (1.26)	1.50-7.00
Learn-Crit	2.67 (1.29)	1.25-6.25	2.51 (1.26)	1.00-6.00	2.98 (1.40)	1.00-7.00
Assessing	2.48 (1.11)	1.00-4.50	2.69 (1.38)	1.00-6.50	3.06 (1.46)	1.00-7.00

Note. ECERS-E and SSTEW are measured on a 7-point scale, such that 1 = inadequate quality ECEC, 3 = minimum quality ECEC, 5 = good quality ECEC, 7 = excellent quality ECEC. Build TCI = Building Trust, Confidence and Independence. SE Wellbg = Social-Emotional Wellbeing. Lang-Comm = Supporting and Extending Language and Communication. Learn-Crit = Supporting Learning and Critical Thinking. Assessing = Assessing Learning and Language.

Overall, mean quality levels were low as indicated by ECERS-E and SSTEW. Specifically, curricular and interactional quality levels were, on average, at or around 3 (on a 7-point scale), which corresponds to 'basic/minimal' levels of practice on the ERSs. Even amongst Exceeding centres (MECERS-E = 3.14, SD = 1.02; MSSTEW = 3.92, SD = 1.20), there was substantial room for further growth in the areas of quality indexed by these scales.

There was also substantial variability in ERS ratings within NQS designations. Within an Exceeding designation on the ECERS-E, for example, centres ranged from poor (1.29) to excellent (6.71) practice. There was similar disparity across all NQS ratings. Some centres designated as Working Toward showed Good practice according to ERS and, conversely, a number of Exceeding centres showed Poor practice according to ERS. Nevertheless, there were positive associations between NQS ratings and ERS scores, which are described below. Here we focus on NQS Quality Area 1 (QA1; Educational program and practice) rather than NQS Overall ratings as QA1 is closely aligned with both the ECERS-E and the SSTEW. (The SSTEW is also closely aligned with NQS Quality Area 5, Relationships with children.)

Initial ANOVAs were conducted to examine relations between NQS QA1 ratings (working toward, meeting, exceeding) and overall ERS scores. Figure 7, below, shows mean ERS scores (± 1 S.E.) for the different NQS ratings. For the ECERS-E, the overall model was significant, $F(2,254) = 7.99$, $p < .001$, and post-hoc Tukey's HSD contrasts showed that centres receiving an

Exceeding rating had significantly higher ECERS-E scores than centres receiving Working Toward or Meeting (ps < .01). Similarly, for SSTEW the overall model was significant, $F(2,254) = 5.08$, $p = .007$, and post hoc contrasts showed the same pattern (ps < .05). Follow-up regression analyses were conducted to establish whether these differences entailed when SEIFA, geographic region (metropolitan, inner regional, outer regional), service type (long day care, preschool), and maximum number of places were controlled for. These analyses confirmed that Exceeding centres has significantly higher scores than Meeting centres for both ECERS-E ($\eta = .17$, $p < .01$) and SSTEW ($\eta = .14$, $p < .05$).

This pattern of findings was not specific to QA1 for the ECERS-E, which showed similar relations with all NQS quality areas. By contrast, the SSTEW showed more specific relationships with QA1 and QA5, and also with QA7 (Leadership and Service Management). It is also important to note that systematic associations between NQS ratings and ERS scores were not observed in centres for which the respective ratings were more than two years apart. This is perhaps unsurprising given the high levels of attrition and turnover in staff, potential policy changes, and time for practices to evolve.

Together, these results suggest that while there is a common core of quality assessed by NQS and ERS ratings, they are, in their summative evaluations, reflecting predominantly different aspects of quality. Given that these two forms of assessments are so different, it is notable that this common core is consistently found. However, after two years since NQS rating, it appears that the NQS designations assigned no longer consistently reflect curricular or interactional quality (as indexed by ECERS-E and SSTEW) in the centres.

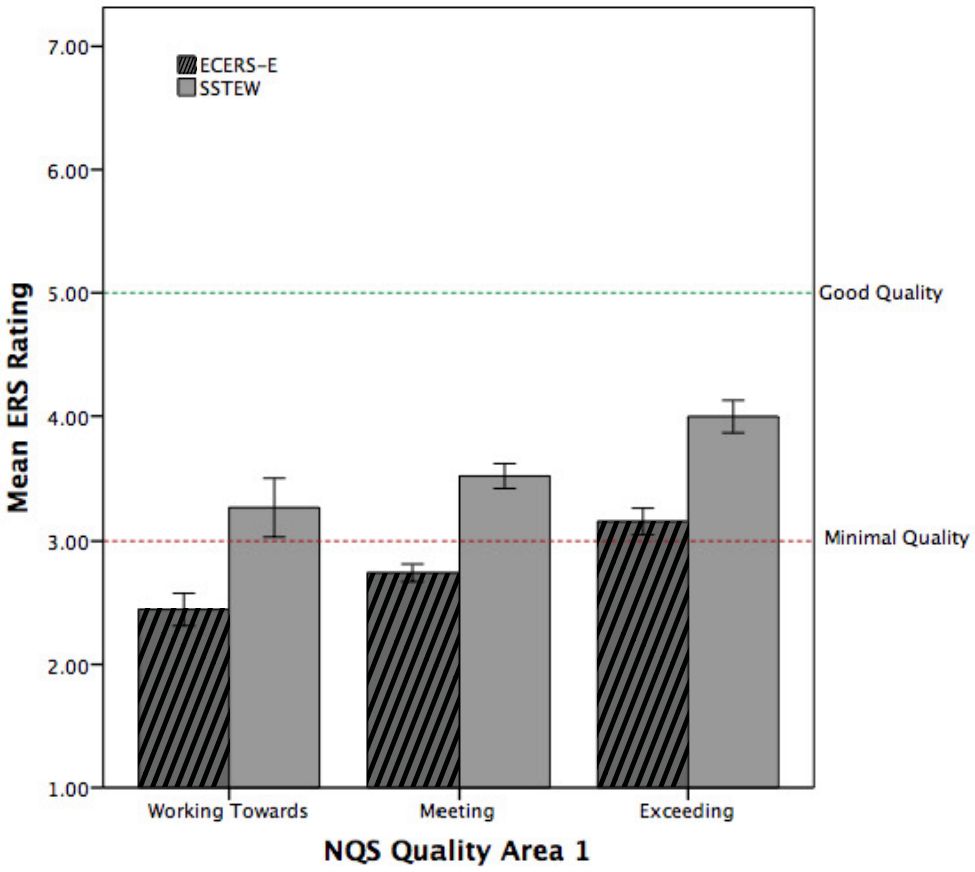

Figure 7. ECERS-E and SSTEW scores by NQS QA1 (Educational program and practice).
Note. QA1 = Quality Area 1; ECERS-E and SSTEW are measured on a 7-point scale, such that 1 = inadequate quality ECEC, 3 = minimum quality ECEC, 5 = good quality ECEC, 7 = excellent quality ECEC.

11.3 Do quality differences exist by Service Type?

Comparing baseline ERS ratings from control and intervention centres, it was notable that the differences we observed between service types (long day care {LDC} versus preschool) on the ECERS-E (MLDC = 3.00, SD = 0.97; MPRE = 3.38, SD = 0.96; p = .080) and the SSTEW (MLDC = 3.84, SD = 1.17; MPRE = 4.24, SD = 1.32; p = .139) were not significant.

11.4 Was the effect of the intervention related to Service Type?

Figure 8 below shows there is clear change in ECERS-E and SSTEW ratings across both levels of service type (LDC versus preschool) in the expected direction. There was no significant difference in the intervention effect between LDC and preschool services (i.e., the Group x Service Type interaction was non-significant when entered into the full model). Nevertheless, it was clear that, all things being equal, preschool services had significantly higher ERS ratings at follow-up when compared to LDCs. This effect was not simple, and appears in some measure to be due to a 'natural' improvement, which was uniquely observed in the preschool context, irrespective of group membership (see control group).

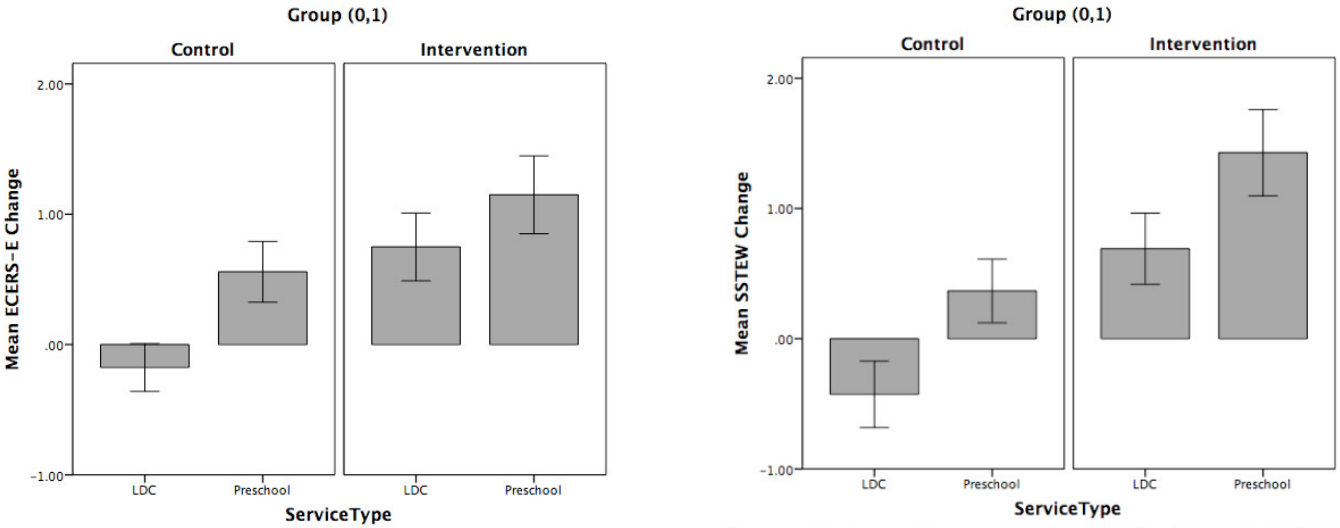

Figure 8. Mean Change in ECERS-E (left) and SSTEW (right) scores, posttest – pretest, by Service Type and Group.

The mean change scores for the control group indicate that there is improvement with time in an ERS in the control group. This suggests that, over the course of the year, preschools but not LDC rooms are improving. Despite this 'natural' or incidental improvement, however, there still appears to be a positive impact of the intervention. An interesting interpretation of these findings is that preschools tended to improve 'naturally' or incidentally on both ERSs over the course of the 12 months, but also showed an additional benefit for participating in the intervention. LDC rooms, on the other hand, showed a marked improvement in the intervention, but little evidence of improvement otherwise. The 'natural' improvement is hard to account for, however, as ERS measures were made at the same time in each calendar year, which suggests that these repeat measurements may be capturing some other underlying systematic factor. For example, it is worth exploring whether the natural improvement seen in preschools, but not LDCs, may be mediated by factors such as increased stability of staff, available time for staff reflection and development, etc.

11.5 Do quality differences exist by centres' geographic location?

Across the whole sample at baseline, regional locations outperformed metropolitan locations on ECERS-E (M_R = 3.36, SD = 1.13; M_M = 2.92, SD = 0.77; p = .029) and SSTEW (M_R = 4.27, SD = 1.29; M_M = 3.73, SD = 1.13; p = .034). There thus appeared to be a systematic and robust difference in quality as a function of geographic category (metropolitan versus regional) within the FEEL sample. This was paralleled in NQS ratings, such that regional centres had greater rates of high quality designations (53.5% Exceeding for inner regional, 36.0% for metropolitan) and fewer centres with lower quality designations (18.6% Working Toward for regional, 32.0% for metropolitan).

11.6 Was the effect of the intervention related to Geographical Categorisation?

Figure 9 below shows that there was a clear change in ECERS-E and SSTEW ratings across both levels of geographical category (metropolitan versus regional) in the expected direction, while there was little change in the control condition. Furthermore, the size of the effect was similar for metro and regional locations. However, unlike the ECERS-E, for SSTEW the change was more pronounced for regional centres in the intervention condition than metropolitan centres. While regional centres tended to obtain higher SSTEW mean scores, again this difference was more marked in the intervention condition.

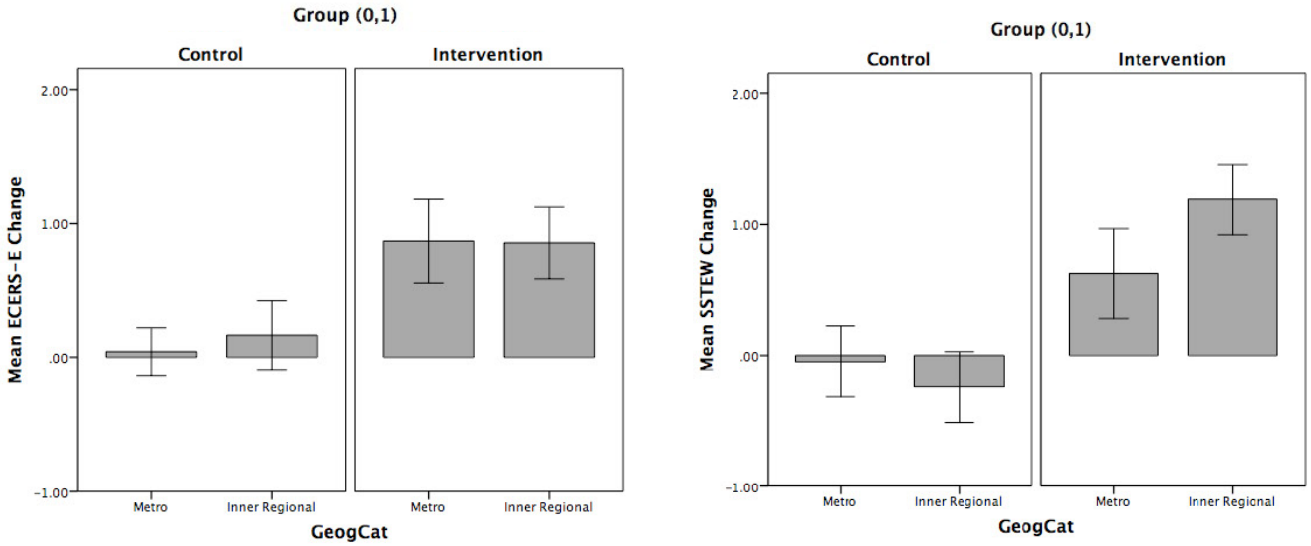

Figure 9. Mean Change in ECERS-E (left) and SSTEW scores (right), posttest – pretest, by Geographical Category and Group

There was clear evidence at both levels of geographical category (metro and regional) that the intervention was effective, and the change was particularly marked for the SSTEW in regional locations. It is plausible that this marked improvement in the SSTEW reflects the fact that regional centres had higher baseline SSTEW scores, although this (possible) explanation would not apply to the change in ECERS-E scores despite similar baseline profiles. Further, it is inconsistent with the finding that centres lower in initial quality showed similar or superior improvement, on average, after the intervention.

Overall, it is noteworthy that regional centres tended to have higher baseline ERS scores, particularly in the intervention group. Whilst this finding is interesting, there is no pre-existing reason to believe that it is systematically true of the NSW context; a question which could be partially investigated through existing regulatory data.

11.7 Why do quality levels indicated by ECERS-E and SSTEW tend to differ?

The ECERS-E and SSTEW scale are designed to support quality practices within early educational environments and to ultimately support practices that foster positive developmental outcomes for children. The subscales within each of the measures are drawn from a rich evidence-based of proven practice, and can be used both as a research tool and to support reflective practice and quality of provision. Both tap into important but distinct aspects of quality practice. While the ECERS-E focuses mostly on curriculum content (literacy, numeracy, science and diversity), the SSTEW scale builds on this by focussing on the pedagogy within the setting, the adult's role in supporting learning and development, high quality interactions with and between children as well as the adults' role in supporting critical thinking, assessment for learning and supporting and extending language and communication. Of the two scales, the SSTEW aligns more closely with the relational pedagogical practices identified within the EYLF and NQS, although the practices outlined within the SSTEW extend beyond those required in these documents. Higher scores on SSTEW were expected given the closer alignment with Australian early years frameworks of practice, as illustrated in Table 4 below.

Table 4. Baseline and Follow-Up Ratings for Per-Protocol Centres, by Group

	Overall	Control			Intervention		
Sub/Scale	Baseline	Baseline	Post-Test	Change	Pre-Test	Post-Test	Change
ECERS-E	3.13 (0.97)	3.09 (0.94)	3.19 (1.12)	+0.10	3.17 (1.07)	4.11 (1.25)	+0.94*
Literacy	3.85 (1.09)	3.81 (1.12)	3.79 (1.17)	-0.02	3.85 (1.07)	4.81 (1.21)	+0.96*
Mathematics	2.85 (1.18)	2.83 (1.20)	3.24 (1.57)	+0.41	2.89 (1.21)	4.41 (1.67)	+1.52*
Science	3.13 (1.25)	3.08 (1.18)	3.19 (1.24)	+0.11	3.21 (1.41)	4.08 (1.64)	+0.87*
Diversity	2.68 (1.12)	2.65 (1.02)	2.54 (1.01)	-0.11	2.72 (1.31)	3.05 (1.06)	+0.33
SSTEW	3.98 (1.23)	3.96 (1.25)	3.83 (1.28)	-0.13	3.93 (1.22)	5.00 (1.34)	+1.07*
Building T,C,I	4.95 (1.23)	4.89 (1.30)	4.47 (1.44)	-0.42	5.02 (1.14)	5.58 (1.28)	+0.56*
Soc-Emo W-B	4.10 (1.69)	4.09 (1.70)	4.06 (1.60)	-0.03	4.00 (1.72)	5.28 (1.63)	+1.28*
Lang-Comm	4.46 (1.29)	4.44 (1.34)	4.16 (1.53)	-0.28	4.42 (1.26)	5.51 (1.32)	+1.09*
Learn-Critical	3.02 (1.38)	2.98 (1.38)	3.03 (1.31)	+0.05	3.00 (1.34)	4.40 (1.58)	+1.40*
Assessing	3.35 (1.48)	3.40 (1.48)	3.41 (1.37)	+0.01	3.22 (1.55)	4.22 (1.66)	+1.00*

Note. ECERS-E = average of ECERS-E subscale scores for a given room. SSTEW = average of SSTEW subscale scores for a given room. A score of 1 is considered inadequate, 3 as basic, 5 as good and 7 as excellent quality. Asterisks (*) next to change values denote significant pre- to post-test change according to paired samples t-tests.

Appendices

12.1 Appendix A Leadership for Learning Professional Development (PD) Outline

Phase		Group A	Group B	Group C
1	Full days 1 & 2	Fri 26th February Sat 27th February	Fri 4th March Sat 5th March	Fri 11th March Sat 12th March
2	Half day 1: Self-regulation	Tue 15th March	Tue 29th March	Tue 22nd March
	Half day 2: Language and Literacy development	Thu 31st March	Fri 8th April	Tue 5th April
	Half day 3: Scientific concept development	Tue 26th April	Tue 17th May	Fri 29th April
	Half day 4: Numeracy development	Mon 9th May	Tue 17th May	Wed 11th May
3	Half day 5: Leadership and assessment for learning	Mon 23rd May	Tue 31st May	Fri 27th May
	Online component	Throughout the year – February to December		
	Additional face-to-face half day session	Mon 12th Sept	Wed 14th Sept	Friday 16th Sept

Phase 1: Two-day intensive training in face-to-face setting

The sessions began with an overview of research on quality in ECEC contexts, drawing on key national and international studies. Participants were introduced to the environment rating scales, key concepts and ideas designed to support them in identifying areas of practice that they would target for improvement. They examined those elements of quality teaching pedagogy and practice that have the greatest impact on children's learning and development.

Phase 1 supported them in understanding the importance of high quality interactions, allowing them to unpick and consider all of the elements that contribute. The importance of relational and intentional pedagogy leading to sustained shared thinking and ways to support and extend language development were also addressed. Participants were given the opportunity to practice and evaluate interactions within, between and beyond the training. The importance of high quality adult-child interactions was emphasised throughout the content sessions.

Phase 2: Five bi-weekly half-day sessions across face-to-face setting

Effective PD combines curriculum and child development knowledge with practice, allowing time for the educators to use newly learnt knowledge, understanding, approaches etc. within their settings and to analyse critically, and reflect upon, impact (Hamre, Downer, Jamil, & Pianta, 2012).

Domains of learning and aspects of practice addressed throughout these sessions included cognitive development, self-regulation and social-emotional development, language and literacy, mathematics and early numeracy development, science and critical thinking, observation, assessment and planning, supporting the home learning environment (HLE) and leadership for learning.These sessions allowed participants to try, test and evaluate different aspects of practice and their new knowledge during and between sessions. Participants were encouraged to make individual adaptations, which were designed to support ownership and the sustainability of any changes made.

The sessions supported critical reflection of participants own and others' practice and supported improvement and planning for changes in practice through the Improvement Cycle: Reflect and Assess, Plan, Implement and Evaluate (RAPIE). Each session included adequate time for reflection and critical analysis, engagement with hands on practical learning experiences, and the sharing of practices.

Phase 3a: Online Sustainability

A unique challenge of many PD programs is the limited reach, with only those attending the sessions directly benefitting from the content. The sustainability phase - Phase 3 - built on the previous phases and was available to participants throughout the duration of the project.
The online supported learning platform was designed to support the face-to-face sessions in Phases 1 and 2 and then became, in Phase 3, a platform for communication, collaboration and further learning. This third phase encouraged continued PD through online modules and staff induction while providing a platform for participants to share content with colleagues back in their workplaces.

Online activities and resources were designed to promote staff engagement and establish an online community of educators. The PD content was housed within modules or 'E-books' which combined video streamed content integrated with questions and text, including links to activities and an educator discussion forum. The E-books were designed to guide educators through an interactive learning experience that encouraged, and required, self-reflection and connection with other educators.

Phase 3b: Half-day follow-up face-to-face session

In response to feedback received for Phase 2 evaluation, participants were brought back together for a non-compulsory final face-to-face session. Session content was responsive to both participant evaluations and an analysis of staff needs identified from Phase 3 online discussion and activities. This session included presentations from all participating centres, reflective discussion and future planning.

12.2 Appendix B: Comparability of intervention and control groups at baseline

Groups were highly comparable in initial environmental ratings, as measured by ECERS-E (Control: M = 3.03, SD = 0.92; Intervention: M = 2.98, SD = 0.94) and SSTEW (Control: M = 4.00, SD = 1.43; Intervention: M = 3.98, SD = 1.25) ($p > .05$ for all scales and subscales). Analyses comparing groups on initial child demographics and assessment results were also conducted.

Results similarly indicated a high degree of consistency between the groups on the outcomes measures ($p > .05$) for verbal comprehension, expressive vocabulary, and age; however, the intervention group was significantly lower on early number concepts ($p = .037$; Control: M = 19.91, SD = 4.83; Intervention: M = 19.32, SD = 5.12) and early numeracy ($p = .023$; Control: M = 0.56, SD = 0.25; Intervention: M = 0.53, SD = 0.27). Effect sizes showed that these differences could be considered small. Further examination of observed variable ranges suggested there were no apparent ceiling or floor effects (see Table B.1).

Table B.1. FEEL Child Participant Characteristics Relative to Targets

		Intervention	Control
Baseline Demographics			
Number of children		677	669
Age		M = 4.59	M = 4.59
		Range: 3.30-5.43	Range: 3.10-5.69
Sex		46.4% Female	44.4% Female
Baseline Child Assessments	Range	M(SD)	M(SD)
Language and Literacy			
DAS Verbal Comprehension	4-41 (42)	20.21 (4.91)	20.50 (4.75)
EYT Expressive Vocabulary	1-45 (45)	27.70 (6.92)	27.72 (6.81)
Numeracy			
Early Number Concepts	3-37 (38)	19.32 (5.12)	19.91 (4.83)
Preschool Early Numeracy	0.00-1.00 (1)	0.56 (0.25)	0.53 (0.27)
CSBQ			
Sociability	1.43-5.00 (5)	3.77 (0.81)	3.80 (0.78)
Externalising	1.00-5.00 (5)	1.63 (0.88)	1.67 (0.87)
Internalising	1.00-5.00 (5)	1.56 (0.74)	1.63 (0.78)
Prosocial	1.00-5.00 (5)	3.88 (0.83)	3.93 (0.82)
Behavioural Self-Regulation	1.00-5.00 (5)	3.88 (0.99)	3.91 (0.98)
Cognitive Self-Regulation	1.00-5.00 (5)	3.64 (0.90)	3.62 (0.87)
Emotional Self-Regulation	1.17-5.00 (5)	3.83 (0.81)	3.83 (0.81)

Note. Although the target age range was 4-5 years, all children who were identified by a parent and/or educator as attending formal schooling in the subsequent year were considered eligible for inclusion in this study.

Table B.1. FEEL Child Participant Characteristics Relative to Targets			
		Intervention	Control
SDQ			
Externalising	1.00-2.80 (3)	1.44 (0.44)	1.45 (0.43)
Internalising	1.00-2.60 (3)	1.34 (0.35)	1.35 (0.35)
Prosocial	1.00-3.00 (3)	2.43 (0.51)	2.40 (0.51)
Hyperactivity	1.00-3.00 (3)	1.65 (0.59)	1.65 (0.58)
Conduct Problems	1.00-2.80 (3)	1.22 (0.36)	1.24 (0.37)
Emo. Problems	1.00-3.00 (3)	1.31 (0.41)	1.32 (0.42)
Peer Problems	1.00-2.40 (3)	1.37 (0.42)	1.37 (0.38)

Note. Although the target age range was 4-5 years, all children who were identified by a parent and/or educator as attending formal schooling in the subsequent year were considered eligible for inclusion in this study.

12.3 Appendix C : Environmental Rating Scales: Subscales and Items

When measuring structural and process quality variables in ECEC, researchers commonly use observation-based rating scales. These allow direct comparisons of environmental quality to be made across studies, and promote greater objectivity of observations. The most widely used observation scales are linked to a family of early childhood Environment Rating Scales (ERS).

Many studies choose ERS as measures because of their international reputation for measuring important aspects of ECEC quality that relate to children's outcomes, and the fact that they provide a numerical index of quality ranging from 1 (inadequate) to 7 (excellent practice), making comparisons between and within centres helpful as pre- and post-assessments of environmental quality (see also two example ERS items on the following pages).

For the FEEL study, quality of provision in centres was measured using the Early Childhood Environment Rating Scale - Extended (ECERS-E) and Sustained Shared Thinking and Emotional Well-Being (SSTEW) scale, which use concepts central to child development, early childhood education, diversity, care and pedagogy. These scales are briefly summarised in Table C.1 below.

Table C.1. Summary of Environmental Rating Scales

Environment Rating Scale (ERS)	Brief description of quality aspects covered	Provision for which it is designed
Early Childhood Environment Rating Scale-Extended (ECERS-E) Sylva, Siraj-Blatchford & Taggart, 2010	Considers the curriculum and educational pedagody. In the following 4 areas: 1. Language and literacy; 2. Maths and number; 3. Science and the environment; 4. Diversity (meeting and planning for the needs of individuals and groups).	ECEC environments for children aged 3 to 5
Sustained Shared Thinking and Emotional Wellbeing (SSTEW) Scale Siraj, Kingston & Melhuish, 2015	Considers 5 aspects of process quality including: 1. Building trust, confidence and independence; 2. Social and emotional well-being; 3. Supporting and extending language and communication; 4. Supporting learning and critical thinking; 5. Assessing learning and language.	ECEC environments for children aged 2 to 5

12.4 Appendix D : Example ECERS-E Item (Sylva, Siraj-Blatchford & Taggart, 2010, p. 38)

Item	Inadequate		Minimal		Good		Excellent
	1	**2**	**3**	**4**	**5**	**6**	**7**
Item 10. Natural Materials							
	1.1 There is little access indoors to natural materials (fewer than 3 examples).		3.1 Some natural materials are accessible to the children indoors.*		5.1 Natural materials are used beyond decoration to illustrate specific concepts, (e.g. planting seeds or bulbs to illustrate growth, seed dispersal). P D *		7.1 Children are encouraged to identify and explore a range of natural phenomena in their environment outside the centre and talk about/describe them. (P D) *
			3.2 Natural materials are accessible outdoors.*		5.2 Children are often encouraged to explore the characteristics of natural materials. *		7.2 Children are encouraged to bring natural materials into the centre. D Q*
					5.3 Adults show appreciation, curiosity and/or respect for nature when with children (e.g. interest in, rather than fear or disgust, for fungi or worms). *		7.3 Children are encouraged to make close observations of natural objects and/or draw them. P D R *

12.5 Appendix E: Example SSTEW Item (Siraj, Kingston & Melhuish, 2015, p.14)

Item	Inadequate		Minimal		Good		Excellent
	1	**2**	**3**	**4**	**5**	**6**	**7**
Item 1. Self-regulation and social development.							
	1.1 Staff do not appear to agree about the boundaries/rules/ expectations or apply them consistently*.		3.1 Expectations and boundaries are made explicit and shared by all staff*.		5.1 Staff explain carefully to the children what they need to do and pre-empt any difficulties*.		7.1 Staff congratulate children when they follow the rules well. E.g. I saw you help put the tractor away. And/or the children are encouraged to tell staff how they followed the rules etc*.
	1.2 Some children are left even though they are obviously confused or distressed.		3.2 Staff are respectful and professional around the children, parents/carers and each other*.		5.2 Staff show empathy and understanding when children do not want to follow rules or get upset*.		7.2 Staff have agreed processes that they follow when conflicts arise. The process includes engaging the children in problem solving and finding solutions to disputes together*.
					5.3 Staff show an awareness of individuals and their needs, giving additional support and allowing some flexibility*.		
					5.4 Staff redirect inappropriate behaviour by stating what the children should do rather than what they should not.		

12.6 Appendix F: Examples of questions included in the Educator Evaluation of the Professional Development

Table F.1. Description of Questions Included in Educators' Evaluation of Phase 3

Question	Description
1.	What has changed for you as an educator as a result of the 'Leadership for Learning' professional development? Please rate each statement (e.g., I feel more motivated/the PD has renewed my enthusiasm for teaching).
2.	Please mark your top two changes listed above with an asterisk (*)
3.	Please describe the biggest changes/improvements to quality for you as an educator
4.	Please describe the biggest changes/improvements to quality for your colleagues
5.	Please describe the biggest changes/improvements to quality for the children
6.	Please describe the biggest changes/improvements to quality for the families
7.	Briefly describe (giving up to three examples) what you think has been the greatest impact on your practice for the longer term.
8.	Now we would like you to think about how each element of the professional development has supported you. Please give a rating below to each element to reflect how important they were in supporting your knowledge base in early childhood education and care or improvements to practice (e.g., Phase 1 – Learning about quality practice and research evidence).
9.	Please provide a little more detail here about the elements you rated most highly in Question 8. What was it that most supported you? If you find it more helpful to write about the ways in which the elements worked in combination then please feel free to do this.
10.	Provide a little more detail about the elements you rated least highly in Question 8.
11.	Now we would like you to think a bit more about the online learning environment. Please describe how you engaged with the online content (i.e., used this to support and share information with colleagues in your centre; revisited content; contributed to discussions)
12.	What (if any) were the barriers to using or accessing the online learning environment? How could this be improved?
13.	If you did not use the online environment, what else would have helped you?
14.	How competent are you in using computers/digital tools?
15.	Now think about how you have exercised your role as a Leader for Learning Champion. What ways have you cascaded your learning from the PD to other colleagues in your centre/preschool? What impact has there been for colleagues as a result of your involvement? This might include personal impacts (e.g. openness to change), practice impacts, or differences in the ways you collaborate as a team.
16.	What have been the main challenges during the PD in enacting changes? These might be personal (e.g. confidence) or relate to your centre/preschool (e.g. engaging colleagues), to wider factors.
17.	Which factors have most supported you in enacting changes as a result of this PD?

18. This questionnaire has encouraged you to think carefully about your learning and professional growth, the changes to practice you have made and how the project has supported you identified in Questions 3 to 6. This final question asks you to tie all of these things together. Please choose one of the changes to practice that you identified in Questions 3 to 6 and briefly describe how this change came about. What was the catalyst for you working on this area? How did the project support you? Who did you work with to make the change and how did you go about it?

12.7 Appendix G: Detailed Plan for Analysis

The treatment effect was estimated using a combination of fixed effect parameters. First, a fixed effect was used to identify the average amount of change in each outcome between baseline and follow-up. Second, a fixed effect was fitted to distinguish between the mean outcomes of children in the treatment versus the control groups. Third, a two-way interaction was included between the fixed effects of time and treatment/control, in order to identify the difference, experienced by children in the treatment group compared to those in the control group, between the mean change in the outcome between baseline and follow-up. The models presented include both the time and treatment/control fixed effects, and the two-way interaction between each variable. Finally, to account for potential biases in the treatment allocation at baseline, these models were adjusted for the age and gender of the child, the highest educational qualification of the child's mother, and their household income. All these models can be regarded as 'Intention To Treat' (ITT), as the data was fitted assuming that all children allocated to the treatment group received the treatment.

Although this approach was consistent across all the analyses, sensitivity analyses were also conducted. It was found that three classes out of 95 did not adhere to the study protocol. As they were in the treatment group, the above mentioned models were re-run after omitting the children affiliated with those three classes (referred to as 'per protocol' models).

Finally, most outcomes were close to normally distributed and that permitted the use of multilevel linear regression models. Those outcomes were 'Verbal Comprehension', 'Expressive Vocabulary', 'Number Concepts', and 'Early Numeracy. The mean of three CSBQ self-regulation sub-scales (CSBTBSR, CSBTCSR, and CSBTESR) was slightly less normally distributed, so this outcome was transformed using the cubic function (i.e. CSBQ^3) to achieve greater normality to satisfy model assumptions.

However, the internalising, externalising and prosocial subscales of Goodman's Strengths and Difficulties Questionnaire (SDQ) were not normally distributed. No standard transformations were found to address sufficiently the non-normality of these variables. Accordingly, negative binomial regressions were used to account for over-dispersion (when the variance is greater than the mean, resulting in highly skewed distributions). To satisfy model assumptions that the outcome be a count variable (i.e. whole numbers), each internalising, externalising and prosocial variable was multiplied by 10 and rounded to the nearest significant figure to avoid loss of information. They were also adjusted so the starting value for each was zero to fit model assumptions.

Finally, the prosocial scale was inverted due to it previously having significant left-skew, meaning that higher scores on the transformed prosocial scale denoted less prosocial behaviour (i.e. negative outcomes). The internalising and externalising scales had right-skew and therefore did not require a similar final transformation, meaning that higher scores continued to identify more internalising and/or externalising behaviours (i.e. also negative outcomes). The results shown for the linear regressions are coefficients with 95% confidence intervals (95%CIs). The results shown for the negative binomial regressions are rate ratios with 95%CIs, wherein rate ratios above 1 indicate positive association and below 1 indicate negative association with the explanatory variables.

12.8 Appendix H: Summary of PD Effects on Environmental Ratings

Table H.1. Baseline and Follow-Up Ratings by Group

	Control			Intervention		
Sub/Scale	**Baseline**	**Post-Test**	**Change**	**Pre-Test**	**Post-Test**	**Change**
ECERS-E	3.09 (0.94)	3.19 (1.12)	+0.10	3.17 (1.03)	4.03 (1.25)	+0.86*
Literacy	3.81 (1.12)	3.79 (1.17)	-0.02	3.89 (1.05)	4.76 (1.21)	+0.87*
Mathematics	2.83 (1.20)	3.24 (1.57)	+0.41	2.87 (1.17)	4.31 (1.66)	+1.44*
Science	3.08 (1.18)	3.19 (1.24)	+0.11	3.19 (1.36)	4.08 (1.64)	+0.89*
Diversity	2.65 (1.02)	2.54 (1.01)	-0.11	2.74 (1.27)	2.99 (1.04)	+0.25
SSTEW	3.96 (1.25)	3.83 (1.28)	-0.13	4.00 (1.21)	4.90 (1.36)	+0.90*
Building T,C,I	4.89 (1.30)	4.47 (1.44)	-0.42	5.03 (1.14)	5.56 (1.25)	+0.53*
Soc-Emo W-B	4.09 (1.70)	4.06 (1.60)	-0.03	4.10 (1.70)	5.15 (1.66)	+1.05*
Lang-Comm	4.44 (1.34)	4.16 (1.53)	-0.28	4.49 (1.24)	5.43 (1.32)	+0.94*
Learn-Critical	2.98 (1.38)	3.03 (1.31)	+0.05	3.08 (1.40)	4.25 (1.61)	+1.06*
Assessing	3.40 (1.48)	3.41 (1.37)	+0.01	3.28 (1.50)	4.10 (1.66)	+0.82*

Note. ECERS-E = average of ECERS-E subscale scores for a given room. SSTEW = average of SSTEW subscale scores for a given room. A score of 1 is considered inadequate, 3 as basic, 5 as good and 7 as excellent quality. Asterisks (*) next to change values denote significant pre- to post-test change according to paired samples t-tests.

Table H.2. Standardised Beta Weights for Predictors of Post-Intervention ECERS-E and SSTEW Ratings, Intention-to-Treat and Per-Protocol

	ECERS-E					SSTEW					
	Overall	Literacy	Math	Science	Diversity	Overall	T,C,I	Soc-Emo	Lang	Lear-Crit	Assessing
	Std. B	Std. B	Std. B	Std. B	Std. B	Std. B	Std. B	Std. B	Std. B	Std. B	Std. B
Intention-to-Treat											
Group	.31*	.35*	.29*	.26*	.20*	.35*	.35*	.29*	.38*	.35*	.23*
Geog. cat	.06	.08	.09	-.01	.09	.07	.08	.04	.08	.07	.09
Service type	.26*	.28*	.23*	.19*	.30*	.27*	.30*	.20*	.27*	.25*	.26*
NQS rating	.37*	.31*	.36*	.39*	.27*	.42*	.33*	.47*	.34*	.38*	.32*
SEIFA dec.	.03	.12	.07	-.02	-.02	.12	.13	.04	.14	.12	.08
ERS T1	.29*	.29*	.22*	.23*	.22*	.32*	.13	.24*	.25*	.31*	.49*
PD Attend.	.36*	.36*	.35*	.34*	.20	.37*	.19	.34*	.34*	.45*	.33*
Per-Protocol											
Group	.33*	.37*	.31*	.29*	.22*	.38*	.35*	.32*	.40*	.40*	.27*
Geog. cat	.07	.08	.11	.02	.11	.07	.08	.04	.09	.08	.10
Service type	.24*	.27*	.21*	.17*	.28*	.25*	.29*	.18*	.25*	.22*	.24*
NQS rating	.37*	.30*	.36*	.40*	.27*	.41*	.33*	.47*	.34*	.38*	.32*
SEIFA dec.	.05	.14	.04	.01	.00	.15*	.14	.08	.16*	.16*	.11
ERS T1	.28*	.29*	.22*	.21*	.22*	.36*	.13	.28*	.27*	.35*	.52*
PD Attend.	.26	.31	.27	.24	.02	.17	.18	.12	.16	.21	.11

Note. Initial regressions considered associations of group with subsequent quality, controlling for the complement of covariates. A subsequent regression removed the group variable and, instead, entered a PD attendance variable to investigate the association between level of PD attendance and subsequent quality, after controlling for this same complement of covariates. *p<.05; **p<.001

12.9 Appendix I: Influence of initial quality level on the effect of the intervention

In this section the effect of the PD intervention is examined in relation to initial levels of room quality. This was not a core goal of the FEEL study but nevertheless provides important information about the way in which the PD was able to affect change.

ECERS-E. First, the nature of the relation between baseline ECERS-E ratings and amount of change in environmental quality at post-test was compared for the control and intervention groups using regression analysis. In an initial analysis, post-test ECERS-E ratings were regressed on pre-test (i.e., baseline) ECERS-E ratings and group (control versus intervention) using the intention-to-treat sample.

This model was significant, $F(2,90) = 15.91$, $p < .001$, $R2 = .26$, and confirmed that both ECERS-E pre-test, $p < .001$, and group, $p = .001$, made independent contributions to ECERS-E post-test ratings. Second, the possibility of an interaction between ECERS-E pre-test and Group was explored by considering both linear and quadratic interaction terms. As is depicted in Figure I.1, subsequent regression analyses confirmed a significant quadratic interaction between pre-test (baseline) ECERS-E ratings and group, $p = .011$. Again, the overall model was significant, $F(5,87) = 8.03$, $p < .001$, $R2 = .32$, and confirmed that ECERS-E pre-test, $p < .001$, made a significant independent contribution to ECER-E post-test. Importantly, the influence of group on post-test ECERS-E was qualified by the interaction, depicted in Figure I.1.

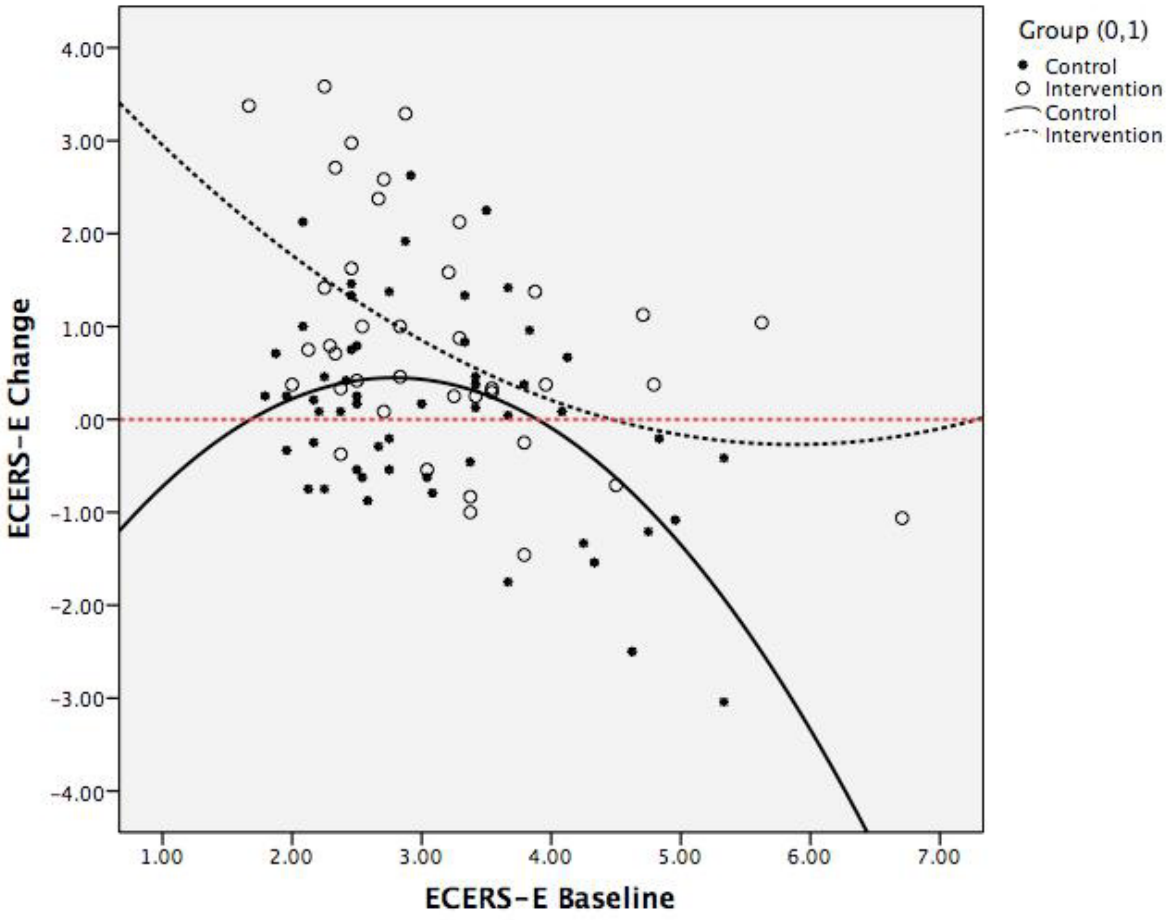

Figure I.1. Depiction of Full Model of ECERS-E Posttest Regressed on ECERS-E Pretest and Group with Quadratic Term and Full Interactions

To understand the meaning of these findings for the influence of the Leadership for Learning PD in relation to initial (i.e., baseline) ECERS-E ratings, Figure I.2 shows differences in ECERS-E change scores (post-test minus pre-test) between the control and intervention groups within different levels of initial quality as described on the ECERS-E. Across the sample, there were 48 rooms of initially low quality, 27 rooms of initially medium-low quality, 11 rooms of initially medium-high quality, and four rooms of initially high quality.

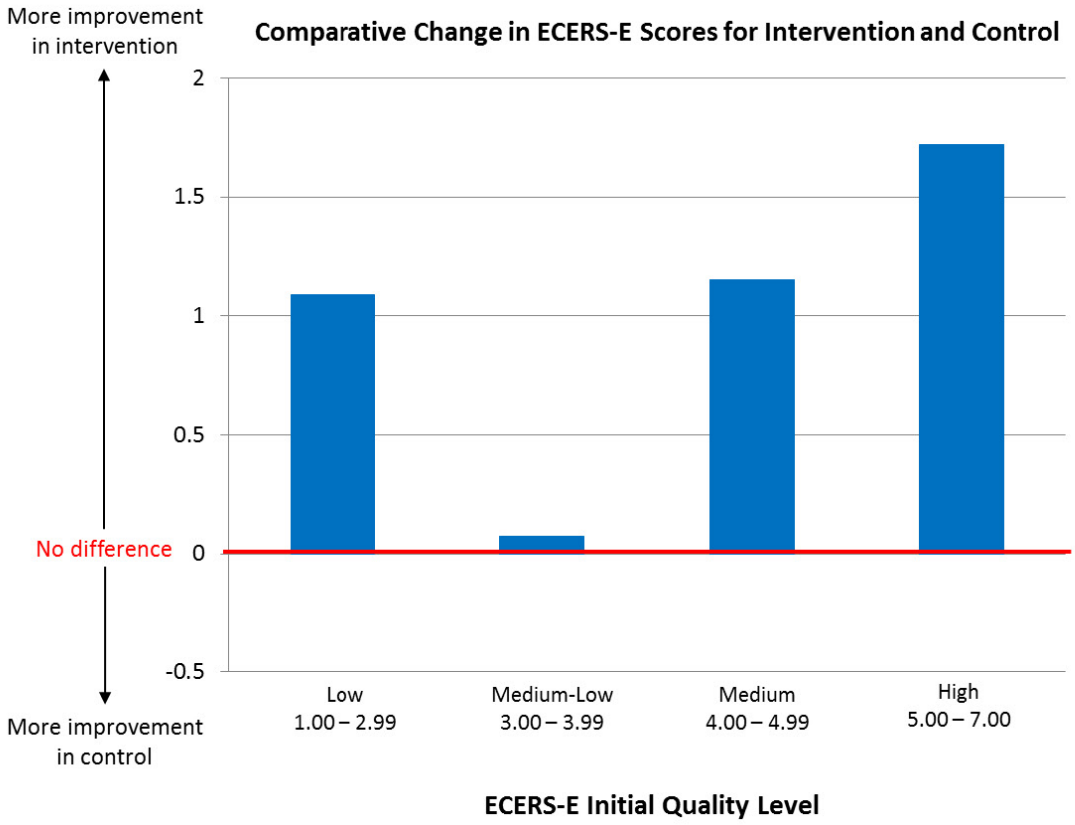

Figure I.2. Comparative change in ECERS-E scores between Intervention and Control, by initial ECERS-E quality level.

Figure I.2 reveals that the overall positive effect of the intervention was evident for rooms of all initial quality levels except the medium-low group, for whch there was little difference between the control and intervention. The pronounced improvement in intervention centres initially in the high quality range on the ECERS-E should be interpreted with caution due to the small number of centres in that category.

SSTEW. First, the nature of the relation between baseline SSTEW ratings and amount of change in environmental quality at post-test was compared for the control and intervention groups using regression analysis. In an initial analysis, post-test SSTEW ratings were regressed on pre-test (i.e., baseline) SSTEW ratings and group (control versus intervention) using the intention-to-treat sample. This model was significant, $F(2,90) = 17.78$, $p < .001$, $R2 = .28$, and confirmed that both SSTEW pre-test, $p < .001$, and group, $p = .001$, made independent contributions to SSTEW post-test ratings. Second, the possibility of an interaction between SSTEW pre-test and group was explored by considering both linear and quadratic interaction terms. As is depicted in Figure I.3, there was little evidence of any relation between pre-test (baseline) SSTEW scores and the magnitude of the effect of the Leadership for Learning PD (note that the regression lines in Figure I.3 are essentially parallel). Neither interaction term was significant, and their inclusion did not alter the overall pattern of findings from the initial model.

To understand the meaning of these findings for the influence of the Leadership for Learning PD in relation to initial (i.e., baseline) SSTEW ratings, Figure I.4 below shows differences in SSTEW change scores (post-test minus pre-test) between the control and intervention groups within different levels of initial quality as described on the SSTEW.

Across the sample, there were 25 rooms of initially low quality, 26 rooms of initially medium-low quality, 19 rooms of initially medium-high quality, and 20 rooms of initially high quality.

Figure I.4 reveals that there were very consistent improvements in quality in the intervention relative to control (i.e., the absolute difference between control and intervention centres) regardless of initial quality level on the SSTEW.

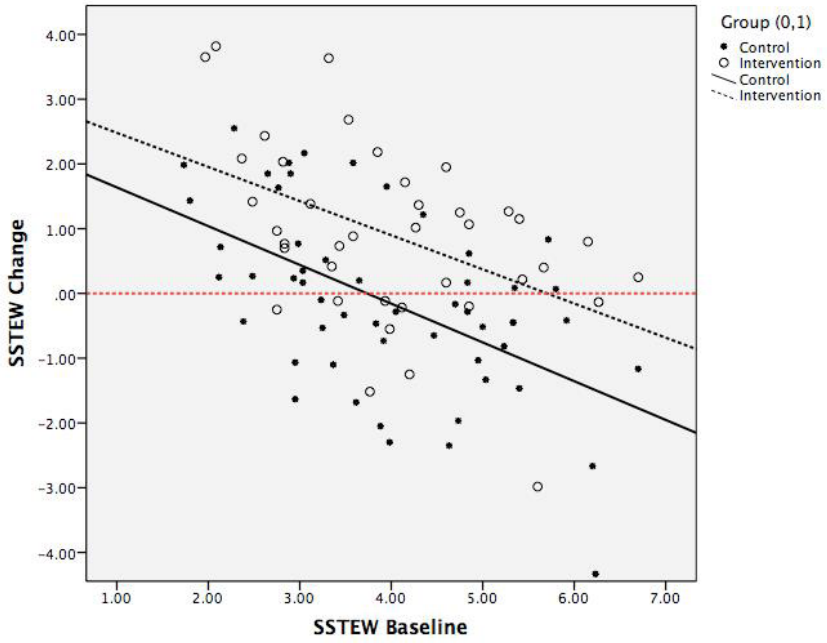

Figure I.3. Depiction of Full Model of SSTEW Posttest Regressed on SSTEW Pretest and Group

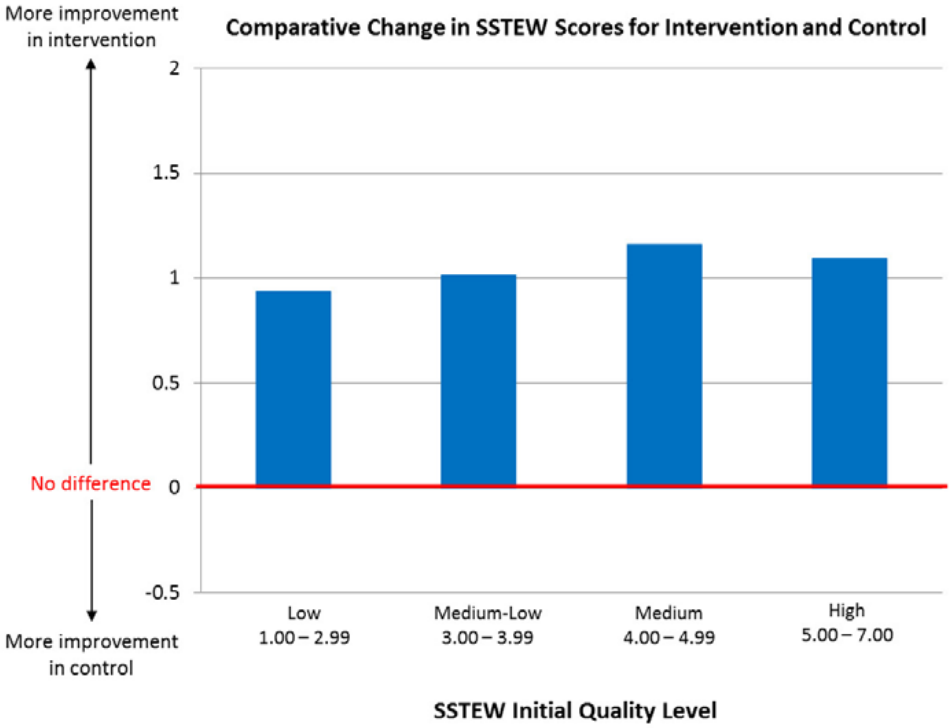

Figure I.4. Comparative change in SSTEW scores between Intervention and Control, by initial SSTEW quality level.

12.10 Appendix J: Child Assessment Results

Table J.1. Verbal Comprehension

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)
Intercept	20.49 (20.03, 20.95)	6.98 (4.01, 9.95)	20.49 (20.03, 20.96)	7.31 (4.29, 10.34)
Difference in the control over time	0.68 (0.28, 1.08)	-0.64 (-1.17, -0.11)	0.68 (0.28, 1.08)	-0.60 (-1.14, -0.07)
Difference between treatment and control at baseline	-0.37 (-1.05, 0.31)	-0.31 (-0.91, 0.28)	-0.37 (-1.07, 0.32)	-0.32 (-0.93, 0.29)
Difference between treatment and control over time	**0.69 (0.11, 1.26)**	**0.67 (0.10, 1.25)**	**0.75 (0.16, 1.33)**	**0.73 (0.15, 1.32)**
Age		2.28 (1.68, 2.88)		2.21 (1.61, 2.82)
Female (ref: male)		0.65 (0.22, 1.09)		0.65 (0.21, 1.09)
Maternal education (ref: <high school)				
High School		1.42 (0.63, 2.20)		1.39 (0.58, 2.19)
Diploma		1.36 (0.50, 2.22)		1.43 (0.55, 2.31)
University or higher		2.28 (1.49, 3.06)		2.30 (1.50, 3.10)
Missing		1.22 (-0.16, 2.60)		1.31 (-0.12, 2.73)
Income (ref:low)				
Moderate		0.57 (-0.09, 1.23)		0.55 (-0.12, 1.22)
High		1.07 (0.35, 1.78)		1.04 (0.31, 1.76)
Missing		-0.26 (-1.06, 0.53)		-0.32 (-1.12, 0.49)

12.10 Appendix J: Child Assessment Results

Table J.1. Verbal Comprehension

	ITT Unadjusted Coefficient (95%CI)	ITT Adjusted Coefficient (95%CI)	Per Protocol Unadjusted Coefficient (95%CI)	Per Protocol Adjusted Coefficient (95%CI)
Level 3 Variance (SE)	0.969 (0.327)	0.458 (0.230)	0.990 (0.337)	0.464 (0.236)
Level 2 Variance (SE)	9.591 (0.730)	8.304 (0.681)	9.722 (0.743)	8.459 (0.695)
Level 1 Variance (SE)	12.787 (0.535)	12.810 (0.536)	12.748 (0.540)	12.781 (0.541)
Level 3 N rooms	95	95	92	92
Level 2 N participants	1303	1303	1266	1266
Level 1 N observations	2433	2433	2367	2367

ITT = 'Intention To Treat'; *denotes models also 'per protocol'; 95%CI = 95% Confidence Interval; SE = Standard Error

Table J.2. Expressive Vocabulary

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)
Intercept	27.61 (26.82, 28.40)	1.45 (-2.84, 5.74)	27.61 (26.81, 28.41)	1.69 (-2.67, 6.05)
Difference in the control over time	3.26 (2.96, 3.57)	0.48 (-0.11, 1.06)	3.26 (2.96, 3.57)	0.49 (-0.10, 1.09)
Difference between treatment and control at baseline	-0.14 (-1.33, 1.04)	0.03 (-0.89, 0.95)	-0.27 (-1.49, 0.95)	-0.08 (-1.02, 0.86)
Difference between treatment and control over time	**0.04 (-0.39, 0.48)**	**0.03 (-0.41, 0.47)**	**0.03 (-0.41, 0.47)**	**0.01 (-0.43, 0.45)**
Age		4.80 (3.94, 5.66)		4.77 (3.90, 5.65)
Female (ref: male)		0.26 (-0.37, 0.89)		0.23 (-0.42, 0.87)
Maternal education (ref: <high school)				
High School		1.87 (0.72, 3.02)		1.82 (0.65, 2.99)
Diploma		2.21 (0.96, 3.46)		2.31 (1.03, 3.59)
University or higher		4.08 (2.93, 5.23)		4.19 (3.01, 5.36)
Missing		0.50 (-1.52, 2.52)		0.27 (-1.81, 2.35)
Income (ref: low)				
Moderate		1.17 (0.20, 2.14)		1.07 (0.09, 2.05)
High		2.26 (1.21, 3.31)		2.14 (1.07, 3.21)
Missing		0.44 (-0.72, 1.60)		0.32 (-0.85, 1.50)

Table J.2. Expressive Vocabulary

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)
Level 3 Variance (SE)	5.069 (1.176)	0.000 (2.171)	5.249 (1.225)	2.198 (0.699)
Level 2 Variance (SE)	32.965 (1.511)	0.000 (28.371)	33.212 (1.543)	28.628 (1.351)
Level 1 Variance (SE)	7.042 (0.298)	0.000 (7.013)	7.058 (0.302)	7.022 (0.301)
Level 3 N rooms	95	95	92	92
Level 2 N participants	1302	1302	1265	1265
Level 1 N observations	2420	2420	2353	2353

ITT = 'Intention To Treat'; *denotes models also 'per protocol'; 95%CI = 95% Confidence Interval; SE = Standard Error

Table J.3. Early Number Concepts

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)
Intercept	19.81 (19.31, 20.32)	1.38 (-1.61, 4.37)	19.81 (19.31, 20.32)	1.72 (-1.30, 4.75)
Difference in the control over time	2.38 (2.04, 2.71)	0.38 (-0.10, 0.86)	2.38 (2.04, 2.71)	0.42 (-0.07, 0.90)
Difference between treatment and control at baseline	-0.64 (-1.39, 0.10)	-0.55 (-1.16, 0.05)	-0.70 (-1.46, 0.07)	-0.60 (-1.22, 0.02)
Difference between treatment and control over time	**0.55 (0.07, 1.03)**	**0.54 (0.07, 1.02)**	**0.55 (0.06, 1.03)**	**0.54 (0.06, 1.02)**
Age		3.44 (2.84, 4.04)		3.37 (2.76, 3.98)
Female (ref: male)		0.20 (-0.23, 0.64)		0.23 (-0.22, 0.67)
Maternal education (ref: <high school)				
High School		1.49 (0.70, 2.29)		1.48 (0.68, 2.29)
Diploma		1.88 (1.01, 2.75)		1.95 (1.07, 2.83)
University or higher		3.00 (2.21, 3.80)		3.09 (2.28, 3.89)
Missing		0.46 (-0.94, 1.86)		0.28 (-1.15, 1.71)
Income (ref: low)				
Moderate		0.31 (-0.36, 0.98)		0.19 (-0.49, 0.86)
High		1.13 (0.40, 1.86)		1.03 (0.29, 1.76)
Missing		-0.32 (-1.12, 0.48)		-0.42 (-1.23, 0.39)

Table J.3. Early Number Concepts

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)
Level 3 Variance (SE)	1.550 (0.434)	0.658 (0.266)	1.589 (0.447)	0.665 (0.271)
Level 2 Variance (SE)	13.276 (0.758)	10.850 (0.661)	13.274 (0.767)	10.854 (0.669)
Level 1 Variance (SE)	8.729 (0.364)	8.704 (0.363)	8.664 (0.367)	8.638 (0.365)
Level 3 N rooms	95	95	92	92
Level 2 N participants	1305	1305	1268	1268
Level 1 N observations	2447	2447	2380	2380

ITT = 'Intention To Treat'; *denotes models also 'per protocol'; 95%CI = 95% Confidence Interval; SE = Standard Error

Table J.4. Early Numeracy

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)
Intercept	0.56 (0.53, 0.58)	-0.56 (-0.71, -0.41)	0.56 (0.53, 0.58)	-0.55 (-0.70, -0.40)
Difference in the control over time	0.12 (0.11, 0.13)	0.00 (-0.02, 0.02)	0.12 (0.11, 0.13)	0.00 (-0.02, 0.02)
Difference between treatment and control at baseline	-0.03 (-0.07, 0.00)	-0.03 (-0.05, 0.00)	-0.03 (-0.07, 0.00)	-0.03 (-0.06, 0.00)
Difference between treatment and control over time	**0.03 (0.01, 0.05)**	**0.03 (0.01, 0.05)**	**0.03 (0.01, 0.05)**	**0.03 (0.01, 0.05)**
Age		0.21 (0.18, 0.24)		0.20 (0.17, 0.23)
Female (ref: male)		0.02 (0.00, 0.04)		0.02 (0.00, 0.04)
Maternal education (ref: <high school)				
High School		0.09 (0.05, 0.13)		0.09 (0.05, 0.13)
Diploma		0.11 (0.06, 0.15)		0.11 (0.07, 0.16)
University or higher		0.15 (0.11, 0.19)		0.16 (0.11, 0.20)
Missing		0.05 (-0.02, 0.12)		0.04 (-0.03, 0.12)
Income (ref:low)				
Moderate		0.03 (0.00, 0.07)		0.03 (-0.01, 0.06)
High		0.06 (0.02, 0.09)		0.05 (0.02, 0.09)
Missing		0.01 (-0.03, 0.05)		0.01 (-0.03, 0.05)

Table J.4. Early Numeracy

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)
Level 3 Variance (SE)	0.003 (0.001)	0.001 (0.001)	0.003 (0.001)	0.001 (0.001)
Level 2 Variance (SE)	0.040 (0.002)	0.033 (0.002)	0.040 (0.002)	0.033 (0.002)
Level 1 Variance (SE)	0.015 (0.001)	0.015 (0.001)	0.015 (0.001)	0.015 (0.001)
Level 3 N rooms	95	95	92	92
Level 2 N participants	1303	1303	1266	1266
Level 1 N observations	2432	2432	2366	2366

ITT = 'Intention To Treat'; *denotes models also 'per protocol'; 95%CI = 95% Confidence Interval; SE = Standard Error

Table J.5. Strengths and Difficulties Questionnaire Internalising Scale

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)
Intercept	3.60 (3.16, 4.10)	17.74 (9.28, 33.93)	3.60 (3.16, 4.10)	20.04 (10.46, 38.39)
Difference in the control over time	0.92 (0.86, 0.98)	1.07 (0.96, 1.18)	0.92 (0.86, 0.98)	1.08 (0.98, 1.20)
Difference between treatment and control at baseline	0.94 (0.77, 1.15)	0.94 (0.78, 1.14)	0.95 (0.78, 1.17)	0.95 (0.78, 1.16)
Difference between treatment and control over time	**0.88 (0.80, 0.98)**	**0.89 (0.80, 0.98)**	**0.89 (0.80, 0.99)**	**0.89 (0.80, 0.99)**
Age		0.77 (0.68, 0.88)		0.75 (0.66, 0.86)
Female (ref: male)		0.92 (0.84, 1.01)		0.92 (0.84, 1.01)
Maternal education (ref: <high school)				
High School		0.83 (0.70, 0.99)		0.82 (0.69, 0.97)
Diploma		0.89 (0.74, 1.07)		0.89 (0.74, 1.07)
University or higher		0.86 (0.72, 1.02)		0.86 (0.73, 1.02)
Missing		0.83 (0.61, 1.13)		0.82 (0.60, 1.13)
Income (ref:low)				
Moderate		0.87 (0.75, 1.00)		0.86 (0.75, 0.99)
High		0.77 (0.66, 0.90)		0.76 (0.65, 0.89)
Missing		0.78 (0.66, 0.93)		0.79 (0.67, 0.94)

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Table J.5. Strengths and Difficulties Questionnaire Internalising Scale

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)
Level 3 Variance (SE)	0.158 (0.031)	0.149 (0.030)	0.162 (0.032)	0.155 (0.032)
Level 2 Variance (SE)	0.470 (0.029)	0.480 (0.030)	0.456 (0.029)	0.464 (0.030)
Level 3 N rooms	95	95	92	92
Level 2 N participants	1324	1324	1285	1285
Level 1 N observations	2449	2449	2382	2382

ITT = 'Intention To Treat'; *denotes models also 'per protocol'; 95%CI = 95% Confidence Interval; SE = Standard Error
Scores are transformed; higher scores means more internalising behaviour

Table J.6. Strengths and Difficulties Questionnaire Externalising Scale

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)
Intercept	4.44 (3.99, 4.95)	25.92 (13.13, 51.20)	4.44 (3.99, 4.95)	24.86 (12.49, 49.46)
Difference in the control over time	0.93 (0.88, 0.99)	1.03 (0.93, 1.14)	0.93 (0.88, 0.99)	1.02 (0.93, 1.13)
Difference between treatment and control at baseline	0.98 (0.84, 1.15)	0.97 (0.83, 1.14)	0.98 (0.83, 1.15)	0.97 (0.83, 1.14)
Difference between treatment and control over time	**0.98 (0.90, 1.07)**	**0.98 (0.90, 1.07)**	**0.96 (0.88, 1.05)**	**0.96 (0.88, 1.05)**
Age		0.84 (0.74, 0.97)		0.85 (0.74, 0.97)
Female (ref: male)		0.57 (0.52, 0.63)		0.57 (0.52, 0.63)
Maternal education (ref: <high school)				
High School		1.03 (0.86, 1.23)		1.04 (0.86, 1.24)
Diploma		1.04 (0.86, 1.27)		1.05 (0.86, 1.28)
University or higher		0.83 (0.69, 0.99)		0.84 (0.70, 1.01)
Missing		0.91 (0.66, 1.26)		0.92 (0.66, 1.29)
Income (ref:low)				
Moderate		0.91 (0.78, 1.06)		0.90 (0.77, 1.05)
High		0.74 (0.62, 0.87)		0.74 (0.62, 0.87)
Missing		0.84 (0.70, 1.01)		0.85 (0.71, 1.03)

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Table J.6. Strengths and Difficulties Questionnaire Externalising Scale

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)
Level 3 Variance (SE)	0.077 (0.020)	0.070 (0.019)	0.078 (0.021)	0.068 (0.019)
Level 2 Variance (SE)	0.657 (0.033)	0.651 (0.034)	0.647 (0.033)	0.645 (0.034)
Level 3 N rooms	95	95	92	92
Level 2 N participants	1326	1326	1287	1287
Level 1 N observations	2461	2461	2393	2393

ITT = 'Intention To Treat'; *denotes models also 'per protocol'; 95%CI = 95% Confidence Interval; SE = Standard Error
Scores are transformed; higher scores means more externalising behaviour

Table J.7. Strengths and Difficulties Questionnaire Prosocial Scale

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)
Intercept	6.03 (5.39, 6.75)	28.66 (16.34, 50.28)	6.03 (5.38, 6.75)	27.17 (15.41, 47.90)
Difference in the control over time	0.83 (0.78, 0.89)	0.89 (0.81, 0.98)	0.83 (0.78, 0.89)	0.88 (0.81, 0.97)
Difference between treatment and control at baseline	0.97 (0.82, 1.14)	0.96 (0.81, 1.14)	0.99 (0.83, 1.18)	0.98 (0.82, 1.17)
Difference between treatment and control over time	**1.03 (0.94, 1.13)**	**1.04 (0.94, 1.14)**	**1.01 (0.92, 1.11)**	**1.02 (0.92, 1.12)**
Age		0.89 (0.79, 0.99)		0.89 (0.80, 1.00)
Female (ref: male)		0.58 (0.53, 0.63)		0.58 (0.53, 0.63)
Maternal education (ref: <high school)				
High School		0.94 (0.81, 1.08)		0.95 (0.82, 1.10)
Diploma		0.99 (0.84, 1.16)		1.00 (0.85, 1.18)
University or higher		0.90 (0.78, 1.04)		0.91 (0.79, 1.06)
Missing		0.98 (0.76, 1.28)		1.01 (0.77, 1.32)
Income (ref:low)				
Moderate		0.89 (0.79, 1.00)		0.89 (0.78, 1.00)
High		0.72 (0.63, 0.83)		0.73 (0.63, 0.83)
Missing		0.76 (0.66, 0.89)		0.78 (0.67, 0.90)

Table J.7. Strengths and Difficulties Questionnaire Prosocial Scale

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)	Rate Ratio (95%CI)
Level 3 Variance (SE)	0.114 (0.023)	0.120 (0.024)	0.117 (0.024)	0.121 (0.024)
Level 2 Variance (SE)	0.361 (0.023)	0.330 (0.023)	0.356 (0.023)	0.327 (0.023)
Level 3 N rooms	95	95	92	92
Level 2 N participants	1328	1328	1289	1289
Level 1 N observations	2480	2480	2413	2413

ITT = 'Intention To Treat'; *denotes models also 'per protocol'; 95%CI = 95% Confidence Interval; SE = Standard Error
Scores are transformed; higher scores means less prosocial behaviour

Table J.8. Composite mean of CSBQ self-regulation sub-scales (CSBTBSR, CSBTCSR and CSBTESR)

	ITT Unadjusted	ITT Adjusted	Per Protocol Unadjusted	Per Protocol Adjusted
	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)
Intercept	60.24 (56.50, 63.99)	-24.20 (-43.19, -5.20)	60.24 (56.47, 64.01)	-22.06 (-41.21, -2.90)
Difference in the control over time	5.17 (3.12, 7.21)	-1.25 (-4.26, 1.75)	5.17 (3.15, 7.19)	-0.97 (-3.97, 2.04)
Difference between treatment and control at baseline	0.04 (-5.57, 5.65)	-0.09 (-5.45, 5.27)	-0.32 (-6.09, 5.45)	-0.41 (-5.89, 5.08)
Difference between treatment and control over time	**2.24 (-0.68, 5.15)**	**2.20 (-0.70, 5.11)**	**2.41 (-0.50, 5.33)**	**2.36 (-0.55, 5.28)**
Age		11.05 (7.25, 14.84)		10.56 (6.73, 14.39)
Female (ref: male)		16.53 (13.80, 19.27)		16.48 (13.72, 19.24)
Maternal education (ref: <high school)				
High school		2.75 (-2.26, 7.76)		2.87 (-2.19, 7.92)
Diploma		1.85 (-3.62, 7.32)		2.17 (-3.35, 7.68)
University or higher		8.89 (3.86, 13.92)		8.61 (3.53, 13.70)
Missing		5.87 (-3.08, 14.82)		5.50 (-3.60, 14.60)
Income (ref: low)				
Moderate		3.21 (-1.00, 7.42)		3.50 (-0.72, 7.72)
High		8.94 (4.33, 13.56)		9.16 (4.53, 13.79)
Missing		7.33 (2.24, 12.41)		7.39 (2.29, 12.49)
Level 3 Variance (SE)	118.077 (25.723)	109.254 (23.275)	121.818 (26.592)	110.879 (23.804)
Level 2 Variance (SE)	531.968 (29.579)	429.389 (25.569)	524.391 (29.476)	424.360 (25.510)
Level 1 Variance (SE)	333.517 (13.682)	333.367 (13.668)	324.081 (13.502)	324.158 (13.497)
Level 3 N rooms	95	95	92	92
Level 2 N participants	1328	1328	1289	1289
Level 1 N observations	2512	2512	2437	2437

ITT = 'Intention To Treat'; *denotes models also 'per protocol'; 95%CI = 95% Confidence Interval; SE = Standard Error CSBTBSR, CSBTCSR and CSBTESR are transformed scores

12.11 Appendix K: Alternative analysis of indirect effects of intervention on child outcomes

The following analyses were conducted by the Centre for Education Statistics and Evaluation (CESE), NSW Government. The full Report should be requested from Ben Barnes, R/ Executive Director, CESE, ben.barnes@det.nsw.edu.au. Here only key findings, and conclusions are recapitulated.

Background

The evaluation component of the Fostering Effective Early Learning (FEEL) study consists of a cluster randomised controlled trial where educators from 95 childcare centres either participated in a professional development program in 2016 (treatment group; n = 40) or did not participate in the program (control group; n = 55). While the primary outcome for the evaluation involved measuring changes in educator practice and behaviour, the researchers hypothesised that changes in educator behaviours may ultimately influence child development.

Additionally, 781 children were also followed to the start of Kindergarten in 2017 where additional assessments regarding early literacy and numeracy skills are routinely administered (i.e., BestStart).

To investigate this hypothesis, two measures of early literacy (Verbal Comprehension and Expressive Vocabulary) and numeracy (Number Concepts and Early Numeracy) skills were administered to 1,346 children who attended the participating centres. Baseline assessments were conducted at the beginning of the intervention year while follow-up assessments were conducted at the end of the intervention year. Additionally, 781 children were also followed to the start of Kindergarten in 2017 where additional assessments regarding early literacy and numeracy skills are routinely administered (i.e., BestStart).

Results

Rather than compare the growth that occurred across the different treatment arms, the current analysis seeked to remove the variation in the post-test assessment scores that is attributable to baseline assessment scores. Adjusted post-test assessment scores can then be compared across the different treatment arms, with higher scores in the treatment group than in the control group indicative of a positive treatment effect. The results from the final fitted models indicated that:

For the measure of Verbal Comprehension, the expected post-test score for a child increases by around 0.11 standard deviations (95% CI [-0.01, 0.23]) when they are indirectly exposed to the treatment (η= 21.72, 95% CI [21.28, 22.15]) compared to when they are not exposed (η= 21.17, 95% CI [20.77, 21.16]). This difference was not statistically significant at a Šidák corrected alpha level of .013 ($\eta(1)2 = 3.19$, $p = .07$).

For the measure of Number Concepts, the expected post-test score for a child increases by around 0.03 standard deviations (95% CI [-0.08, 0.15]) when they are indirectly exposed to the treatment (η= 22.40, 95% CI [22.97, 22.83]) compared to when they are not exposed (η= 22.19, 95% CI [21.80, 22.57]). This difference was not statistically significant at a Šidák corrected alpha level of .013 ($\eta(1)2 = 0.33$, $p = .57$).

For the measure of Expressive Vocabulary, the expected post-test score for a child increases by around 0.02 standard deviations (95% CI [-0.06,

0.10]) when they are indirectly exposed to the treatment (η= 31.21, 95% CI [30.83, 31.59]) compared to when they are not exposed (η= 31.11, 95% CI [30.76, 31.46]). This difference was not statistically significant at a Šidák corrected alpha level of .013 (η(1)2 = 0.17, p = .68).

For the measure of Early Numeracy, the expected post-test score for a child increases by around 0.11 standard deviations (95% CI [0.02, 0.20]) when they are indirectly exposed to the 79 treatment (η= 0.69, 95% CI [0.68, 0.71]) compared to when they are not exposed (η= 0.67, 95% CI [0.66, 0.68]). This difference was not statistically significant at a Šidák corrected alpha level of .013 (η(1)2 = 5.64, p = .017).

Kindergarten Assessment Data

Since 2010, children who attend Kindergarten at a NSW public school undergo an assessment of their literacy and numeracy skills within the first five weeks of school (i.e., BestStart). The item-level assessment data is then used to place children on Literacy and Numeracy Continua that describe the skills and knowledge students should be able to demonstrate at particular points in time. Rather than investigate potential differences across each aspect of the Continua, only the most theoretically relevant aspects were examined. While limiting the scope of the analysis, this decision increases the confidence in any one particular result. The analysis focused on the measures of: (1) Comprehension; (2) Aspects of Speaking; and (3) Pattern Number Structure.

The results from the final fitted models indicated that: For Aspects of Speaking, the marginal odds that a child would be placed in a higher cluster are expected to be around 1.16 times larger (95% CI [0.83, 1.63]) when they are indirectly exposed to the treatment compared to when they are not exposed. This difference was not statistically significant at a Šidák corrected alpha level of .017 (η(1)2 = 0.77, p = .38).
For Comprehension, the marginal odds that a child would be placed in a higher cluster are expected to be around 1.06 times smaller (95% CI [0.73, 1.55]) when they are indirectly exposed to the treatment compared to when they are not exposed. This difference was not statistically significant at a Šidák corrected alpha level of .017 (η(1)2 = 0.11, p = .74). For Pattern and Number Structure, the marginal odds that a child would be placed in a higher cluster are expected to be around 1.11 times larger (95% CI [0.79, 1.55]) when they are indirectly exposed to the treatment compared to when they are not exposed. However, this difference was not statistically significant at a Šidák corrected alpha level of of .017 (η_((1))^2 = 0.34, p = .56).

Conclusion

When the alternative methodology was applied to the data from the measures of Verbal Comprehension and Expressive Vocabulary, the results were mostly consistent with those from the initial analysis. This was to be expected given the relatively small baseline differences between the treatment and control groups on these measures. While there was little evidence to suggest that indirect exposure to the treatment affected the measure of Expressive Vocabulary, there was moderate to strong evidence that indirect exposure to the treatment had a small positive impact on the measure of Verbal Comprehension. However, it is important to recognize that the estimated treatment effect for the measure of Verbal Comprehension was not statistically significant.

With regard to the measure of Number Concepts, the results from the alternative methodology suggest that the significant differences observed in the initial analysis were caused by imbalances in the baseline assessment scores and not indirect exposure to the treatment. Once these imbalances were corrected, the results showed that there was little evidence to suggest that indirect exposure to the treatment affected the measure of Number Concepts.

In line with the results from the initial analysis, the results from the alternative methodology suggest that there is moderate to strong evidence that indirect exposure to the treatment had a small positive impact on the measure of Early Numeracy. However, it is important to recognise that the estimated treatment effect was not statistically significant once

the multiplicity of comparisons was taken into account. While the estimated treatment effect was quite small, these results provide encouraging evidence that changes in educator practice and behaviours may indeed influence child development.

While the evidence regarding the indirect influence of the treatment on the measures of early literacy and numeracy was somewhat mixed, the results regarding the selected Continua aspects consistently showed that indirect exposure to the treatment is unlikely to have a positive influence on the selected Kindergarten assessments.

However, the measures administered at the start of Kindergarten were originally designed to help teachers identify the broad literacy and numeracy skills that each student possesses at particular points in time.
In other words, the assessments were never designed to be higher granular measures of early literacy and numeracy skills; thus small changes in underlying abilities may not be easily captured by the Kindergarten assessments.

12.12 Appendix L: Examples of Educator Responses

Table L.1. Top 10 Themes Identified By Practitioners with respect to Perceived Changes to Individual Practice

Theme	Number	Examples
Pedagogy and practice	49	Child initiated with co-construction and scaffolding happening with regard to the holistic child (including cognitive, maths, literacy and science) to complete opposite of adult-driven teaching, very focused on the process. Now need to get back and ensure a balance or ensure all my educators see their purpose and document this. (Nominated supervisor educational leader)
Confidence and motivation	44	The PD has definitely motivated me and refreshed me, giving me new focus and a new 'lens' to look at my practice/the children/ educators with. It has affirmed a lot of what I already knew/ did, but given me renewed vision, and reminded me of the importance of what I do and this has been really invigorating. (ECT, Team Leader)
Reflective practice	44	It has made me reflect on practices and think deeper about why/ how we do things. It has made me more aware of explaining practices how and why we do things to other staff. (ECT, Room leader – preschool)
Intentional teaching	39	This training has made me aware of my own pedagogical approach. I have made a conscious effort to respect the children and their abilities. The content of my teaching has become more purposeful and as a result has opened me up to the children even more. (Diploma)
Distribution of information and sharing	38	I am more confident and feel I can discuss aspects of our program and what works well along with what needs improvement with my colleagues and director and committee. This enables a better environment for the children, staff and families. I am also able to better implement changes and scaffold children's learning better by enhancing my intentional teaching strategies and modelling how to appropriately use these strategies with my colleagues. (Group Leader)

Theme	Number	Examples
Question-asking	38	I now pose better open-ended questions, wait and listen to children's responses. Instead of telling them the information, the children are engaging in more sustained shared thinking and making their own discoveries. (ECT, Room leader 4-5 years, Educational Leader)
Improvement as the goal	36	I just wanted to be better, I just wanted to enjoy again, I just wanted motivation... the PD made me see that I was teaching children more that I knew or acknowledged and that it was holistic and I could improve it as well... My practice became more conscious through the PD project rather than just going through the motions. Motivation and enthusiasm returned. I became more engaged within interactions with the children which meant that opportunities for children's learning became more obvious so much so that I would get disappointed that I couldn't follow up on every opportunity that presented itself as I then thought the children were missing out on learning. The PD project supported our existing knowledge, added to our knowledge, gave us confidence, motivation, validation and belief, it gave us opportunities to interact with other educators from other centres and to hear their stories and successes. (ECT and Educational Leader, Nominated Supervisor)
Environments as key	31	Being more involved in the children's play, not simply observing from a distance after I have set up a beautiful learning environment. Being mindful of the learning environments which we set up, having a 'science' area for example. Reflecting on 'what/why/how' when thinking about the way children will use the materials provided. (ECT)
Pause and listen	29	Pause. It is amazing to see that shy, quiet children really can answer questions when given time to. Children take time to process the questions and are so empowered when they give thought out responses - and they are so thoughtful. Through the FEEL study I have discovered the value of pausing and allowing the children to solve problems and contribute to their own learning and this is definitely achievable within a small groups situation. (Educator)
Science	28	Discussing with my colleagues areas in which we don't think we do enough of and focussing on that. For me it is probably Science and Critical Thinking. We have worked hard at adding more of this to our program planning. The project gave us ideas to start the ball rolling and the children took it from there. We knew that we needed to extend them through open ended questioning and getting them to begin to research their own answers through media, books and questioning. (ECT)

Theme	Number	Examples
Improved knowledge and understanding	28	Increased knowledge and understanding of the importance of evidence based learning in a child centred environment. We now strive to incorporate small group work wherever possible, allowing us the time required for effective individual learning and experiences to take place. This has proved to have positive outcomes for children with a quieter nature as well as children with special needs. This situation also allows for the child/children the time they require to learn, to predict, to hypothesise and to succeed. I now have a heightened awareness of science within our centre. I actually see it everywhere! From books, e.g., Pig in the pond - water displacement and volume and mass, to the weather and of course our wonderful outdoor environment. A child was spinning a bucket around with sand in it and commented to me that the sand didn't fall out. It was a light bulb moment as we had just completed the science section of the FEEL study and had identified our lack of science within our room. From this observation and interest we embarked on a journey to discover how forced moved and effected objects. (Cert III, Assistant)

Table L.2. Top 10 Themes Identified By Practitioners with respect to Perceived Changes to Other Educators in their Centre/Preschool

Theme	Number	Examples
Distribution of information and sharing	58	I feel my colleagues have witnessed a positive change not only in my attitude towards my role as an educator but within my room and my children. I try as best as possible to model and apply the skills and knowledge I have acquired through the FEEL study. I have a much deeper respect for the importance of what I do and I feel that my peers are aware of this. We share our knowledge and skills through staff meetings and modelling and staff are implementing this throughout our service. Although it may take some time I feel that we have already commenced a change within our centre as more staff are included and share the FEEL study. (Cert III, Assistant)
Collaborative goals and vision	44	Provided a clear direction in facilitating play. It gave us great examples and goals to work on as a team and brought us all together in our vision for teaching and implementing new strategies. We have assessed our observation/programming practices and have made them more inclusive of assessing learning to provide a more overall picture of where the child sits within their development. (Educational Leader and ECT)

Theme	Number	Examples
Confidence and motivation	41	They have become "playful pedagogues", embedding learning into everyday experiences and offering engaging environments and opportunities that are both meaningful and deeply interesting to the individuals in their care. Confidence in their roles as educators and knowledge of children's learning and development, and best practice. Of particular interest has been the information gained around self-regulation and how we can support its development. Focus. Now that they know what is truly important, they can focus time, energy and resources in ways that maximise children's potentials and support deeper learning. Intentional teaching - a greater focus on thoughtful planning informed by reflection and best-practice. Also, the expansion of their "intentional teaching toolkit" - they have more strategies to draw on and feel more confident in selecting the best tool for the job. A greater understanding of extending thinking: Extending learning rather than just extending activities. Using SST to build on child-initiated activities to extend knowledge, skills and understandings Reinvigorated educators! (Educational Leader and Assistant Director)
Reflective Practice	34	Great to see the commitment and passion ignited amongst the team. Watching the educators with less experience critically reflect upon themselves and gain support within their individual rooms and whole team. (Director)
Improvement as the goal	30	They are motivated to try new experiences and practices. Help reflect on the impact of the FEEL study within our preschool. All striving to achieve the highest quality education. (Educator)
Pedagogy	26	Our practice has changed in slight and subtle ways but the impact has been immense. All staff now seen the benefit of engaging in small group experiences. This has now become second to nature where staff will see a spark of interest in a group of children and run with it. It might be as easy as adding a book, posing a I wonder question, It has been through these changes that we have built strong relationships and with these strong relationships we see strong foundations for learning - life long learning. (ECT)
Intentional teaching	23	Staff are more deliberate about every element of the learning experiences set up indoors and outdoors. They are also more keen to extend children's thinking and learning during group times, rather than just 'entertaining' the children. (Director/Nominated Supervisor/ECT)

Theme	Number	Examples
Staff management and team characteristics	20	The enthusiasm I have brought back from the PD has been infectious! Its great to see how one person's attitude can affect others. Staff working together to complete the RAPIE. Staff are happy to work to change when they have input into the changes. (2IC/Room Leader)
Improved knowledge and understanding	19	As educational leader, I can offer greater support, reflective questioning and role modelling. My colleagues feel more supported in their role, and educational practices have changes to suit. Educators who participated in the learning now show greater understanding of the skills their colleagues possess in relational and intentional teaching and the balance that is required for effective teaching. As a result of the PD, educators respect the diversity of other teaching methods and values. Educators have researched own experiences to extend children's learning, especially in science where our experiences were limited (due to staff knowledge and experiences), and discussing new terminology in teaching (i.e cooking- weight, space, numeracy, dissolving) (Director, Educational Leader, ECT, Nominated supervisor, owner)
Question-asking	19	One educator improved the quality of her interactions/ relationship with children and used open-ended questioning techniques during her interactions. Educators more readily supported children through direct engagement in the pedagogical choices they make; following up intentional and spontaneous teaching/learning educational experiences became timely and critically important moments. (Educational/Team Leader)

Table L.3. Top 10 Themes Identified By Practitioners with respect to Changes seen amongst Children in the Centre/Preschool

Theme	Number	Examples
Children's learning	68	The children are so much more involved in their learning, more engaged and interested in discovering new things and even extending upon their prior knowledge. They have taken their learning to a new level that is deeper, where they are eager to use trial error with things and investigate without being worried about being wrong or right. They show a sense of being proud of their achievements and really want to share these achievements with others. Having the Educator facilitate their learning they are thinking more for themselves and wanting to do things and discover things for themselves. They are able to think more about their own behaviour and be accountable for their behaviour and how this might influence others. (ECT - Supervisor)
Experiences and opportunities (for learning)	60	I believe the children feel more empowered to join in experiences and 'have a go' at things as they are more involved in planning, discussing and hypothesising. Often the simplest activity becomes amazing opportunities for shared learning through one careful question! (Room Leader)
Engagement or involvement	59	I have a number of children asking what experiments we will be doing today as they arrive, they are enthusiastic to participate everyday and really feel empowered when we repeat experiences where they can teach each other and know the answers. (ECT)
Small groups	49	Smaller groups = calmer, more relaxed children, greater engagement and relationships. They've loved the opportunity to revisit the morning story in our new literacy extension area too. (Director/Nominated Supervisor/ECT)
Questions	42	Children are asking more questions. They are getting used to solving problems themselves. They are talking, chatting more e.g. 4:30pm 'Late afternoon tea', four children at the table about to start - child said "can we have a conversation?" I replied "Sure, what would you like to talk about?" Child went on to talk about his game in the sandpit, and how he used a large tool to repair the broken read. All the children followed with their talk. (Outdoor Leader)
Knowledge or skills	31	More variety of learning experiences and richer experiences for the children. Maths and Numeracy was noted to be the biggest improvement as more concrete experiences where available in the room and educators engaged in more SST which was really evident in the children's knowledge and skills well beyond previous years. (Director and Nominated Supervisor)

Theme	Number	Examples
Sustained shared thinking	29	Sustained shared thinking-Wow! I shouldn't be surprised but I really am. The other day while I am involved in a small group activity about measurement I had the thought "is this really happening?" through my initial question the children began supporting and extending each other and when they were asking me to lie down on the ground so they could compare and measure objects against my height before they began ordering them to determine which would be most suitable to retrieve a toy over the fence, I was delighted by the way they worked together in their thinking. As problems arose all children were utilised and listened to within the group.(ECT)
Extension of children's learning	24	Educators have really worked on our questioning techniques which has allowed children to extend off their own knowledge and answer in context. Building resilience and independence children are more confident in taking ownership of their own environment and learning. Children regularly work along side of educators to co-program. More of an awareness and appreciation of numeracy and literacy. A permanent area has been established within our play-works curriculum and the children's skill and confidence levels have really developed well. (Educator, Educational Leader, Room Leader)
Confident	19	The children are 'slowly' becoming more engaged/willing to participate in new/challenging experiences. Their confidence has been the biggest change, which is a huge thing! They are proud of their new found knowledge/skills and want to share this. (2IC, ECT)
Improvements	18	I've seen a lot of improvements with a few children at the centre, having more interest with what we are doing and having a go themselves (Cert III, Assistant)

Table L.4. Top 10 Themes Identified By Practitioners with respect to Changes seen amongst Families

Theme	Number	Examples
Distribution of information and sharing	47	Sharing information with families through kinderloop, newsletters and through game bags which go home every week. During parent teacher meetings we have also included discussions about the importance of self-regulation on children's ability to succeed at school and in life. Families have also enjoyed the new 'Yarning Bags', which we started as a way of linking home and preschool, and giving children an opportunity to extend knowledge, thinking and language in small group situation. (Director/Nominated Supervisor/ECT)
Involvement and connection with family	38	Families are commenting on how much their children are involved in their learning and discussing it at home and how children are even investigating concepts further at home with them. Some families have also asked for strategies in self-regulation as they have noticed positive changes in their children. (ECT, Supervisor)
Parents noticing changes	31	Children really involved in learning and craving more knowledge. Family feedback "- they won't stop talking now" and "they won't stop asking questions". Children are really noticeably ready for big school. (Nominated Supervisor)
Positive feedback from families	27	One specific example: I went through the '6 steps' with two children, in front of a parent I didn't realise was listening. They later approached me in amazement, saying how patient and 'good' I am with the children. I showed her the '6 steps' we have displayed in the staff room and she was amazed at how simple yet effective it was and that each interaction is 'worth it'. (ECT, Team Leader)
Greater understanding by parents	22	Families are beginning to realise how this teaching within the centre is affecting questioning at home. We have changed communication practices with parents to show them more about what we do with our children each day this year as well, so parents are more responsive and communicate more easily in the afternoon. (Director, Educational Leader, ECT, Nominated supervisor, owner)
Role as educators	15	I think that educators were able to validate parent's decisions to place their child in the service and understand the life long benefits for them and they were also under our guidance also able to better support their children's learning. The PD and learning that we have been able to share with families has made them further understand that educators are professionals and it is more than babysitting and day care. (Director and Nominated Supervisor)

Theme	Number	Examples
Quality in the early years and later development	14	Families have started seeing what we do as important, being able to have the interest as they ask where we were on the Friday or Wednesday has opened doors to educate families on the importance of the early years. And all of the learning that takes place. Why we have the resources we have out and what they can learn through using them. (ECT)

Table L.5. Top 10 Themes Identified By Practitioners with respect to Perceived Supports/ Facilitators to achieving Practice Change

Theme	Number	Examples
The presenters	70	I rated each element as "extremely" supportive... I believe that all the elements could not be without each other it was very holistic and I also believe that the human component to the phases and elements that were presented and cannot be over looked, without the presenters and their infectious motivation and enthusiasm I question if I would have rated the elements as highly. Yes the knowledge was there but without effective engagers some of the knowledge could well have been missed. So I do believe that it was the presenters that created the success and the "support"... I also believe that the value of the opportunity to talk with other educators from other centres and to hear their stories and see their examples etc. cannot be under estimated in helping the elements to "support". (ECT and Educational Leader, Nominated Supervisor)
Staff who did attend the PD	50	It was great to have three educators from our service participate in the PD. This meant that it wasn't only the Director (me) driving the changes. I have found that other educators have taken on a leadership role in setting up learning experiences and sharing their knowledge with the rest of the team. All staff were keen to be an 'excellent centre' and to achieve the best outcomes for children. Trying to implement changes after going to a one day seminar is often difficult as the staff member is also still processing the information and doesn't feel like an 'expert'. Having ongoing training and other staff to share and discuss with means that change can be implemented in a more reflective and collaborative manner. (Director/Nominated Supervisor/ECT)
Handouts and readings	45	Throughout the study we received a lot of paper work. We have been given a lot of information to take in, so I really value having this information that I can revisit and will continue to reread." (Educator)

Theme	Number	Examples
Practical examples and activities	45	I loved the hands on activities and demonstrations, I really think they were important for bringing together everything we were learning and showing how they can be practically implemented – this is something that a lot of PD and other resources fail to do. This was achieved while still maintaining the flexibility to remain relevant and applicable to the different contexts/settings. (Educational Leader and Assistant Director)
Environmental assessments: ECERS-E and SSTEW	44	I personally have appreciated the pathways that the ECERS-E and SSTEW provide. After teaching for 23 plus years their hasn't been one clear document that supports practice and improvement in such a consistent manner. We have really been able to measure quality and practice within our service and look at clear strategies and implementation to support change and improvement. (Educator, Educational Leader, Room Leader)
Staff management and team characteristics	44	Our committee have been informed well and value the importance for growth and development. So much so that specific funds were used to provide time every Tuesday for educators to have sustained shared thinking time (2 hours per pair). Overall attitudes and expectations have changed. Self-reflection and assessment isn't such a chore now and seen as a more valued process. Lots of individual and professional growth - all educators have set and established individual KPI's and attended 30+ hours in development. (Educator, Educational Leader, Room Leader)
Confidence and motivation	42	My confidence as an educator has grown and I have enjoyed sharing and learning with my colleagues. We all have so much to offer and so many good ideas to try to implement into our practice. It has been exciting to see how well our changes have been included into our service. It has been a great success for our professional development and our ongoing development. (ECT)
Collaborative goals and vision	41	The major change that we made was combing two rooms that operated independently of one another into one learning space and also moving to an indoor/outdoor program. The catalyst was the information and research that we were provided with that supported and validated that idea that burns away in the back of your head. We just didn't have the confidence to take the big leap with research that we now had on hand to support us. The decision was initially made by the Directors and then presented to the staff with the information to support it, then as a team we worked through it. The whole team was behind the change and invigorated by it. We had some teething issues to address but on the whole it has been exciting. (ECT/Director, Nominated Supervisor)

Theme	Number	Examples
Improvement as the goal	32	My Resolve... I always knew I had an important job but when Cathrine repeated "...we can make such a difference to children's lives..." it really made it seem all the more worthwhile. The statistics show it - My colleagues know it and; the training proved it. This had to effect my motivation positively... especially after over 30 years. It is an old analogy. Most of us say we "feel younger than our age". I know I am a "younger teacher", even though I've been one for over 30 years. Precision - using the checklists has given us something to use that we really understand. If training for NQS and EYLF was provided as thoroughly and as usefully as the FEEL Study training, we would have more high quality services. (Nominated Supervisor)
Other services (networking)	32	Being able to discuss with other like-minded educators was a bonus, but it also showed that we all were getting different ideas from this PD depending on the services we came from. The presenter made a huge impact on whether I got a lot out of the sessions. Catherine just has a passion that can make anything exciting, and this was a key component of the learning for me. I realised what areas I already was doing well, eg. literacy, so this didn't excite me as much as science where I struggle with. (Director/teacher/Nominated supervisor)

Table L.6. Top 10 Themes Identified By Practitioners with respect to Perceived Challenges/ Barriers to achieving Practice Change

Theme	Number	Examples
Time	66	There were a lot of issues within the workplace that were distracting (centre being in administration and being put up for sale, the owner making spiteful comments to other staff about other staff about their jobs etc) There was no time available to be off the floor to access the online learning during work hours. Running tightly on ratio. (ECT and Educational Leader, Nominated Supervisor)
Distribution of information and sharing	56	I feel as though I wasn't able to communicate and teach the PD to my team in a way in which they would find it useful. (Nominated Supervisor)
Concerns about the Moodle	54	TIME! A few complications which consumed even more time! At the service there is NO time to access all this information, so it was done at home, and despite setting up access for all staff at the service, I do not think they were able to make use of all the information. (Teacher, Educational leader, temporary acting director)

Theme	Number	Examples
Staff management and team characteristics	48	We have had a year of challenging events. Staff have been away due to personal or loved ones illnesses and bereavement. We have operated with a high level of casuals due to this and have been trying to implement many changes. Considering what we have endured, we have done well. I have no doubt that next year we will continue to implement improvements and reflectivity share as a team. (ECT)
Staff who did not attend PD	26	Transference of training/knowledge, time constraints and the fact that others in my team have not been on this journey. (Director/Educational Leader)
Staff reluctance to change	28	Confidence is improving over time, and was the main issue to making changes within our service. Small changes at the beginning, and now we are more inclined to make huge changes across each room. We had educators resistant to change and eventually lost two of our 26, as a direct result to the changes made. Three others did not initially see the value in improving the educational practices of educators, but have seen good results over time and heard good feedback, which has resulted in them changing practices and even promoting them now. (Director, Educational Leader, ECT, Nominated supervisor, owner)
Amount and difficulty of information and content	28	I don't think there is really a way around it in this context, but in some of the sessions the sheer amount of information to take in was a little overwhelming. (ECT, Team Leader)
Staff presence in centre	28	The challenge I feel is time to disseminate to staff. I feel I take on the knowledge and build my own foundations, but due to my part time work, share and part time staff, it is difficult to get all staff on board. (ECT/Director, Nominated Supervisor)
Staff meeting	20.	Not being able to have team meetings when everyone can attend, and then being restricted to one hour as it is already late and staff have families they need to get home for (ECT and Educational Leader, Nominated Supervisor)

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