Pakistani Pre-School Children's Social and Emotional Skills:

Longitudinal Associations with Classroom Quality and Academic Skills



Anushay Mazhar

Department of Education, University of Oxford

Supervisors: Professor Iram Siraj & Dr Katharina Ereky-Stevens

Thesis submitted for the Degree of Doctor of Philosophy in Education

June 2025

Acknowledgements

I would like to take this opportunity to acknowledge the many people who have played a vital role – not just during the course of this doctorate, but in helping me reach this point in the first place. This thesis would not have been possible without the support, guidance, and encouragement of so many individuals, to whom I am deeply and sincerely grateful.

First and foremost, I owe my deepest thanks to my supervisors, Professor Iram Siraj and Dr Katharina Ereky-Stevens. Their expertise, thoughtful feedback, and unwavering support have shaped this work in countless ways and helped me grow as a researcher and professional. Iram has consistently gone above and beyond – offering invaluable opportunities to work alongside her and to develop holistically across all aspects of academic life. Katharina has taken great care in offering detailed and constructive feedback, always making time for thoughtful discussion and guidance. I am profoundly grateful to both of them, for believing in me from the start and for helping me see this through.

I would also like to thank Professors Kathy Sylva, Lars-Erik Malmberg, and Edward Melhuish for serving as my Transfer and Confirmation of Status examiners. Their insights and suggestions on my literature review, research design, and analysis strengthened this work in important ways. I am especially thankful to Dr Sandra Mathers for agreeing to examine my thesis – not once, but twice – and to Professor Sara Baker for serving as my viva examiner. It is an honour to have had such thoughtful scholars engage with my work.

To my colleagues and friends – Dr Seema Lasi, Dr Sarah White, Minha, and many others – thank you for your intellectual generosity and encouragement over the years. Your ideas and solidarity have been a constant source of inspiration, and I look forward to continuing to learn from you.

I am grateful to the Society for Research in Child Development for the Engle Grant, which enabled me to carry out this project at scale. I also wish to thank the research assistants and field team I trained during this journey, your contributions made the data collection possible. Above all, I am indebted to the schools, teachers, parents, and children who participated in this research. I know this was, for many, an unfamiliar process, and I remain deeply grateful for the openness, generosity, and trust you extended to me. I am grateful to the Directorate of Education, Sindh, for granting permission to work in government schools; having access to a diverse range of school types was essential to the breadth and depth of this study. I am also especially thankful to The Citizens Foundation for opening their doors and allowing me to include their schools in my research. I have long admired the work they do, and it is a privilege to include their efforts in this thesis.

To my partner, Khizar – thank you for your love, patience, and steady belief in me. You have been my rock through moments of uncertainty and my greatest cheerleader in moments of joy. I could not have done this without you. To my parents – thank you for your unwavering support, your quiet strength, and your deep commitment to education. Your sacrifices, encouragement, and belief in me have carried me through more than you know. You helped me realise two dreams I didn't even know I had, earning a PhD and studying at Oxford. I am grateful beyond words.

Abstract

This thesis examines Pakistani children's social-emotional development and the quality of early childhood education in Pakistan, by investigating how demographic factors relate to children's emotion knowledge, social skills, pre-literacy, and pre-numeracy; how early social skills and emotional knowledge predict later academic outcomes; the overall quality of early childhood education in Pakistan; and how provision type, structural quality, global classroom quality, and teacher-child interactions associate with change in children's learning. 4- to 6-year-olds attending preschool were assessed at two timepoints (N_{T1} = 607, N_{T2} = 453) and classrooms were observed on global environment and interactional quality halfway through.

Multi-level modelling revealed that maternal education positively predicted all four outcomes, while household size was negatively associated with social skills. Boys outperformed girls in pre-numeracy but performed similarly on other outcomes. Multi-level structural equation modelling showed that children's early emotion knowledge significantly predicted later pre-literacy and pre-numeracy skills, while associations with later social skills were weak and inconsistent. Classroom observations revealed generally low global process quality, but stronger teacher-child interaction quality. Structural indicators (teacher education, class size, duration, etc.) showed moderate associations with process quality, though analyses were limited by sample size. Non-profit classrooms generally outperformed both private and public schools on measures of process quality and child outcomes, whereas public schools performed the lowest and private schools demonstrated substantial variation. Lastly, global classroom quality predicted positive change in all four child outcomes (non-significant for pre-numeracy), whereas teacher-child interactions and structural indicators had limited predictive value.

Taken together, these findings underscore the importance of maternal education, early emotion knowledge, and overall classroom quality in supporting children's development, and

offer evidence-based insights for improving early childhood education policy and practice in Pakistan.

Contents

Acknowledgements 2

Abstract 4

List of Tables 13

List of Figures 14

List of Abbreviations 16

Chapter 1: Introduction 18

Thesis Overview 18

Rationale for the Thesis 21

Research Contributions 23

Practical Contributions: Strengthening Effective Teaching and Learning 23

Empirical Contributions: Filling Key Knowledge Gaps 23

Methodological Contributions: Adapting and Trialling Measures in Pakistan 24

Policy Contributions: Informing Early Childhood Education Reforms in Pakistan 25

Theoretical Contributions: Advancing Understanding of SEL in LMICs 25

Advocacy Contributions: Promoting a Research Culture in Pakistan 26

Thesis Structure 27

Chapter 2: Literature Review 31

Social Emotional Development in the Early Years 31

Conceptualisation of Social and Emotional Skills 32

Social-Emotional Development in LMICs 35

Research on Social-Emotional Skills in Low- and Middle-Income Countries 36

Relevance of Social-Emotional Skills to the Pakistani Context 38
Demographic Correlates of Social-Emotional Skills 41
Child's Age and Gender 42
Bilingualism 44
Maternal Education 45
Parental Age 46
Household Size & Siblings 46
Home Learning Environment 48
Association between Children's Social-Emotional and Academic Skills 49
Pre-Literacy 49
Pre-Numeracy 50
Differential Direct Pathways from Social and Emotional Skills 52
Mediation Pathways 53
Schools and Classrooms as a Place of Social-Emotional Learning 55
Aspects of Quality in ECE 57
Operationalisation of Quality 59
Quality of ECE in LMICs 60
How is Quality Associated with Children's Development 62
The Citizens Foundation's Early Childhood Education Model 72
Chapter 3: Methodology 74
Design 74

Ethical Considerations 75
Power Calculations for Sample Size 76
Recruitment 78
Participants 79
Measures 81
Family Demographics 81
Child Outcomes 83
Classroom Quality 91
Procedure 100
Pilot 100
Funding 102
Fieldworker Recruitment and Training 102
Initial School Visits and Collecting Demographic Information 105
Conducting Child Assessments at T1 106
Conducting Classroom Observations 107
Conducting Child Assessments at T2 107
Data Cleaning and Preparation 108
Chapter 4: Demographic Factors Predicting Pakistani Preschoolers' Social, Emotional, and Academic Skills (RQ1) 111
Analytic Approach 112
Addressing Missing Data 112
Assessing the Nested Structure of the Data 113

Analytic Approach 114
Results 116
Descriptive Statistics of Child Outcomes and Demographic Factors 116
Associations between variables 119
Multi-Level Model Analyses 122
Comparing the Four Models 124
Conclusion 127
Chapter 5: Associations between Pakistani Children's Social-Emotional Skills and their Academic Development (RQ2) 128
Analytic Approach 128
Results 134
Descriptive Statistics 134
Inferential Statistics 135
Mediation Analysis 137
Conclusion 140
Chapter 6: Exploring the Structural and Process Quality of Pakistani ECE Classrooms and Associations for Child Outcomes (RQ3) 141
Analytic Approach 141
Descriptive Statistics and Group Comparisons 142
Predicting Classroom Quality: Multivariate Regression 142
Results 145
Research Question 3A: What is the average quality of Pakistani ECE classrooms? 145

Research Question 3B: How does quality differ by provision type? 150
Research Question 3C: How do quality indicators relate to each other? 156
Research Question 3D: How do quality indicators predict child outcomes? 161
Conclusion 170
Chapter 7: Discussion 171
RQ1 – Demographic Correlates of Children's Social, Emotional, and Academic Outcomes 172
Maternal Education 172
Household and Siblings 173
Gender 176
Parental Age 179
Home Learning Environment 180
Child's Age 182
Bilingualism 183
RQ2 – How Early Social and Emotional Skills Predict Later Academic Outcomes 185
Direct Associations with Emotion Knowledge and Social Skills 186
Mediation Models 188
RQ3 – Quality of ECE in Pakistan and How it Relates to Children's Outcomes 190
Process Quality Patterns: Low Global Classroom Quality, High Interactional Quality 192
Exploring the Relationship Between Structural and Process Quality 197
Exploring Process Quality and Child Outcomes Across Three Provision Types 202
Classroom Quality and Child Outcomes 206

Structural Quality Indicators 209
Chapter 8: Conclusion 214
Rethinking ECE Quality in the Pakistani Context 215
Conceptualisation of Social and Emotional Skills in LMICs 218
Limitations 220
Validity of Measures and Variables 221
Sample 223
Analyses 225
Policy Implications 226
Future Research 229
Final Reflections 232
References 234
Appendix A 295
Appendix B 297
Appendix C 299
Appendix D 301
Appendix E 303
Appendix F 304
Appendix G 306
Appendix H 307
Appendix I 310

Appendix J 311

Appendix K 313

Appendix L 314

List of Tables

Table 1 Sample Schools by Provision 79

Table 2 School Provision Type Across Two Timepoints 80

Table 3 Summary of Measures and Corresponding Variables 81

Table 4 Internal Consistency of IDELA Subscales 88

Table 5 Internal Consistency of AKT 90

Table 6 Internal Consistency of ECERS-R Subscales 95

Table 7 Internal Consistency of CIS Subscales 98

Table 8 Variable Missingness 109

Table 9 Teacher Data Decisions 110

Table 10 RQ1 Outcome ICCs 113

Table 11 RQ1 Variable Descriptive Statistics 118

Table 12 Correlations between Predictor Variables 119

Table 13 Results of Parental Education ANOVAs 120

Table 14 Correlations between Predictor and Outcome Variables 121

Table 15 Effect Sizes of Parental Education on Outcome Variables 121

Table 16 RQ1 Multilevel Modelling Results 126

Table 17 RQ2 Descriptive Analysis 135

Table 18 RQ2 Model Fit Indices 136

Table 19 RQ3 Outcome ICCs 144

Table 20 RQ3 Variable Descriptive Statistics 147

Table 21 Bi-variate Correlations between Structural and Process Indicators 157

Table 22 Regression Models Predicting Process Quality using Structural Quality Indicators 160

Table 23 Bivariate correlations between T2 child outcomes and classroom quality indicators 164

Table 24 RQ3 Multilevel Modelling Results 166

List of Figures

Figure 1 Emotion Knowledge Mediation Model 53

Figure 2 Social Skills Mediation Model 54

Figure 3 Pakistani School System 70

Figure 4 Timeline of Research Activities 74

Figure 5 IDELA Domains and Subtasks 85

Figure 6 Number Identification Item from IDELA 86

Figure 7 Letter Identification Item from IDELA 87

Figure 8 AKT Emotion Faces 89

Figure 9 Sample Item from ECERS-R 92

Figure 10 Corresponding Item on Score Sheet 92

Figure 11 Child Assessment Training Schedule 103

Figure 12 Pre-Literacy Multilevel Model for RQ1 116

Figure 13 Visual Depiction of initial M1 130

Figure 14 M1 – Additive Model 131

Figure 15 M2 – Emotion Knowledge Mediation Model 132

Figure 16 M3 – Social Skills Mediation Model 133

Figure 17 Results of M1 – Additive Model 137

Figure 18 Results of M2 – Emotion Knowledge Mediation Model 138

Figure 19 Results of M3 – Social Skills Mediation Model 139

Figure 20 Process Quality Indicator Distribution 149

Figure 21 Teacher Education and ECE Training by provision type 150

Figure 22 Teacher Age and Experience by Provision Type 151

Figure 23 Teacher Language Status by Provision Type 152

Figure 24 Hours of Operation by Provision Type 153

Figure 25 Class Size and Teacher-Child Ratio by Provision Type 154
Figure 26 Process Quality Scores by Provision Type 155
Figure 27 T2 Child Outcomes by Provision Type 163
Figure 28 Visual Depiction of Findings from the Four Models 169
Figure 29 M2 - Emotion Knowledge Mediation 188
Figure 30 M3 - Social Skills Mediation 189

List of Abbreviations

AKT	Affect Knowledge Test
ASQ	Ages and Stages Questionnaire
CASEL	Collaborative for Academic, Social, and Emotional Learning
CFI	Comparative Fit Index
CI	Confidence Interval
CIS	Caregiver Interaction Scale
CLASS	Classroom Assessment Scoring System
CUREC	Central University Research Ethics Committee
ECDI	Early Childhood Development Index
ECE	Early Childhood Education
ECERS-R	Early Childhood Education Rating Scale – Revised
EDI	Early Development Instrument
EPPSE	Effective Pre-school, Primary, and Secondary Education
FIML	Full Information Maximum Likelihood
HIC	High Income Country
HLE	Home Learning Environment
ICC	Intra Class Correlations
IDELA	International Development and Early Learning Assessment
LMIC	Low- and Middle-Income Country
MELE	Measuring Early Learning Environment
MELQO	Measuring Early Learning Quality and Outcomes
ML-SEM	Multi-Level Structural Equation Modelling

MLM	Multi-Level Modelling
NICHD	National Institute of Child Health and Human Development
RMSEA	Root-Mean Square Error of Approximation
SDQ	Strength and Difficulties Questionnaire
SEL	Social-Emotional Learning
SEM	Structural Equation Modelling
SSTEW	Sustained Shared Thinking and Emotional Wellbeing
TCF	The Citizens Foundation
TIPPS	Teacher Instructional Practices and Processes System
TLI	Tucker-Lewis Index
VIF	Variance Inflation Factor

Chapter 1: Introduction

Thesis Overview

This thesis investigates the development of social, emotional, and academic skills among preschoolers in Karachi, Pakistan and explores how individual and environmental factors shape these outcomes. In recognition of the growing emphasis on early childhood education (ECE) as a foundation for lifelong learning and wellbeing, this research provides new insights into the interplay between Pakistani children's characteristics, their early skill development, and the quality of the classrooms they attend. The thesis is structured around three core research questions:

1. **How do Pakistani children's demographic characteristics relate to their social-emotional and academic outcomes?**

   This question examines how factors such as child age, gender, family background, and home learning environment are associated with children's early literacy, numeracy, social skills, and emotion knowledge. Understanding these relationships helps to identify potential risk and protective factors that can inform future programming.

2. **How do Pakistani children's early social-emotional skills predict their later academic outcomes?**

   Building on the growing evidence base from low- and middle-income contexts (LMICs) that social-emotional skills are foundational to learning, this question explores the longitudinal associations between Pakistani children's social and emotional skills and their subsequent literacy and numeracy skills. It aims to provide empirical evidence on whether fostering social-emotional development can support academic achievement in the Pakistani context.

3. **What is the quality of ECE classrooms in Pakistan, and how does it relate to children's academic and social-emotional outcomes?**

The final research question shifts focus to the classroom environment, assessing ECE quality using standardised observation tools and exploring how different indicators of structural and process quality relate to each other and to child outcomes. This analysis also compares the quality of provision and child outcomes across three different types of provision in Pakistan to better understand the early years education landscape in the country.

The study draws on longitudinal data collected from a sample of 4- to 6-year-old children attending 52 ECE classrooms across three provision types (public, private, and non-profit) in Pakistan. Non-profit schools in the present study consist of schools managed by The Citizen's Foundation (TCF), a non-profit organisation in Pakistan. Children's literacy, numeracy, and social skills were assessed using the International Development and Early Learning Assessment (IDELA), whereas their emotion knowledge was assessed using the Affect Knowledge Test (AKT). All four outcomes were assessed at two timepoints, approximately six months apart. Demographic information, including children's age, gender, maternal education, and home learning environment, was collected via caregiver surveys. Global classroom quality was assessed using the Early Childhood Environment Rating Scale-Revised (ECERS-R) and the quality of teacher-child interactions were assessed using the Caregiver-Interaction Scale (CIS), alongside data on teacher qualifications and classroom characteristics, which was collected using a teacher questionnaire.

Analytically, the thesis employs various approaches, including multilevel modelling (MLM) to account for the nested structure of the data (children within classrooms) and structural equation modelling (SEM) to examine predictive pathways between social, emotional and academic skills. Key findings from the study include:

- **Demographic predictors of child outcomes:** Maternal education was the strongest and only consistent predictor of all four child outcomes. Household size was negatively associated with children's social skills, and boys showed higher pre-numeracy skills than girls. Other demographic factors like bilingualism, number of siblings, and the home learning environment did not appear to predict any child outcome. Overall, demographic predictors explained only a small proportion of the variance in children's social-emotional and academic skills.
- **Social-emotional skills and academic development:** Children's emotion knowledge at Time 1 significantly predicted both pre-literacy and pre-numeracy skills at Time 2 (six months later), after controlling for those skills at Time 1. In contrast, social skills at Time 1 were negatively and weakly associated with later pre-literacy skills and showed no significant relationship with later pre-numeracy skills. Mediation analysis revealed that early emotion knowledge also had an indirect effect on children's academic outcomes, through their later social skills. However, an indirect effect of social skills was not observed, suggesting social skills may be of more importance towards the end of the preschool period. Together, these findings emphasise the key role that emotion knowledge plays in Pakistani children's learning.
- **Classroom quality and its relation to child outcomes:** Global classroom quality was generally low across the sample, but the quality of teacher-child interactions was higher. Findings on structural indicators were mixed: although teachers generally had higher levels of formal education, only about half had received specialised ECE training, and many classrooms had a large number of children and high teacher-child ratios. Structural features showed moderate-to-strong associations with global classroom quality and teacher-child interactions, but analyses were limited by the small number of classrooms in the sample. Comparisons across provision types revealed that non-profit schools consistently outperformed both private and public schools on measures of

process quality and child outcomes (except for emotion knowledge, in which students from private schools did better), while public schools consistently underperformed and private schools demonstrated high levels of variation. Findings also revealed that, after controlling for initial skill level, structural characteristics were not consistently linked to children's outcomes, only partially to pre-literacy; however, the global classroom environment was a meaningful predictor of both children's social-emotional and academic development, albeit non-significantly for pre-numeracy skills. In contrast, the quality of teacher–child interactions was not significantly associated with child outcomes.

Rationale for the Thesis

Early childhood is increasingly recognised as a critical period for the development of foundational skills that shape lifelong academic, social, and emotional trajectories. Growing global attention has been directed toward the development of social-emotional skills in early childhood. These skills – including emotion knowledge, self-regulation, empathy, and social competence – are increasingly recognised as essential for school readiness (S. Wolf et al., 2021), and have been found to relate to various outcomes, including children's academic performance (Arnold et al., 2012; Torres et al., 2015), executive functioning (Ferrier et al., 2014), and school adjustment (Denham, Bassett, Thayer, et al., 2012). In LMICs such as Pakistan, where children may face multiple adversities – including limited resources, variability in school quality, and socio-economic disparities – strengthening social-emotional competencies in the early years could play a protective role by helping children navigate challenging environments. Despite this, there is limited empirical evidence from Pakistan on how social-emotional skills develop in relation to children's demographic and family characteristics and how they relate to academic outcomes.

In addition to understanding the development of social-emotional skills and their impact on other outcomes, there is also a need to understand the context in which SEL programmes

can be implemented. Decades of research from high-income countries has demonstrated that early investments in high-quality ECE yield substantial benefits for children's learning and wellbeing (Camilli et al., 2010; Yoshikawa et al., 2013). Central to these benefits is the quality of the classroom environment, including both structural features – such as teacher qualifications, class size, and classroom resources – and process features, such as the quality of teacher-child interactions, emotional climate, and instructional practices (Melhuish et al., 2015). However, most of this evidence originates from Western contexts, with relatively little known about how these dimensions of classroom quality manifest in low- and middle-income countries (LMICs), including Pakistan. In Pakistan, access to ECE is expanding, yet the quality of provision remains highly variable and largely under-researched (M. A. Khan, 2018). Existing studies often rely on limited samples, unvalidated measures, and cross-sectional designs, and tend to focus on older children. As such, there is a pressing need to understand what high-quality ECE looks like in the Pakistani context, and how both structural and process quality indicators relate to children's development. Without these insights, it is difficult to design effective intervention and programmes to improve children's outcomes.

This thesis responds to these gaps by investigating three interrelated strands: (1) how demographic and family factors relate to 4- to 6-year-old Pakistani children's social-emotional and academic skills; (2) how early emotion knowledge and later social skills predict later literacy and numeracy skills; and (3) what do structural and process quality characteristics look like in Pakistani ECE classrooms and how they relate to children's development. By integrating child-level data with observations of public, private, and non-profit ECE classrooms, this research aims to provide a comprehensive picture of SEL in Pakistan's early learning environment.

Research Contributions

This research makes several important contributions across practical, empirical, theoretical, and policy domains, with implications for child development and ECE in Pakistan and beyond.

Practical Contributions: Strengthening Effective Teaching and Learning

By examining the quality of ECE classrooms in Pakistan and their association with children's social-emotional and academic outcomes, the findings offer clear implications for improving early learning experiences in Pakistan, providing actionable insights for educators and practitioners. The study points to the urgent need to strengthen global classroom quality, such as creating more stimulating learning environments, adopting a whole-child approach, and promoting child-centred pedagogy, potentially by leaning into the warm and positive interactions that already exist in this context or drawing on TCF's play-based model. Furthermore, the evidence that children's emotion knowledge is a strong predictor of later academic success suggests that incorporating strategies that target children's emotion knowledge may serve as a lever to improve their overall social-emotional development, and their academic outcomes. Lastly, the findings highlight that children with lower levels of maternal education and larger household sizes may be potential risk factors for children's optimal development.

Empirical Contributions: Filling Key Knowledge Gaps

This study addresses a significant gap in research on SEL in LMICs, particularly in Pakistan, where limited empirical evidence exists on how social-emotional skills evolve in early childhood and how they relate to later academic outcomes. By using longitudinal data, this research contributes to a deeper understanding of the developmental trajectories of social-emotional and academic skills, moving beyond cross-sectional analyses. Additionally, the study draws on a large sample of children that were assessed through objective and standardised assessments, rather than relying on teacher and parent reports which are often used in

Pakistan and are subject to many biases. Furthermore, the study empirically examines the ECE classroom environment, across three different types of provision, using a rigorous research design. By linking classroom quality to children's outcomes, the study sheds light on an area that remains underexamined in the Pakistani context.

Moreover, by applying multilevel and structural equation modelling techniques to data from a LMIC context, the thesis demonstrates how these approaches can be used to rigorously analyse child-, family-, and classroom-level influences and interactions on development. The careful attention to model fit, handling of missing data, and addressing the nested data structures offers a blueprint for future research in similar settings where hierarchical data and longitudinal designs are often under-utilised.

Methodological Contributions: Adapting and Trialling Measures in Pakistan

Given the scarcity of rigorously tested SEL and ECE quality assessment tools in LMICs, a key contribution of this research is its adaptation and validation of measures assessing SEL and classroom quality for use in the Pakistani context. The research not only ensures that these measures are culturally and contextually appropriate but also provides insights into their applicability across diverse educational settings in Pakistan. For example, the thesis discusses issues in scoring global classroom quality whilst using the ECERS-R, which was not able to detect variation across different classrooms. The thesis also outlines reliability issues with the child assessment, IDELA, which could potentially impact interpretability of findings. Additionally, the study also highlights the need for a more rigorous and culturally valid measure of teacher-child interactions. These nuanced insights into the utility of these tools, generated through deep contextual knowledge and considerable use, has the potential to inform future research efforts in Pakistan and LMICs more broadly.

Policy Contributions: Informing Early Childhood Education Reforms in Pakistan

From a policy perspective, this thesis offers timely and context-specific evidence to inform regional and national efforts to expand and improve ECE in Pakistan. The clear disparities observed across public, private, and non-profit schools underscore the need for targeted investments in public sector ECE provision to reduce inequalities in quality and child outcomes. By identifying key predictors of high-quality ECE classrooms and their impact on child development, this study offers actionable recommendations for designing more effective and equitable early learning programmes in Pakistan. Specifically, it highlights that the focus needs to be on process quality, i.e., children's everyday experiences, and not solely structural quality indicators such as the number of teachers or their qualifications. Therefore, efforts to improve ECE needed to include more targeted training that equips teachers with skills to engage in more responsive and child-centred pedagogy. Additionally, insights into the importance of emotion knowledge for early academic success emphasises that SEL is not only about children's wellbeing or mental health, but has a direct impact on their academic outcomes, and therefore needs to be explicitly integrated into national early childhood education frameworks. Overall, this study urges a shift in policy focus towards pedagogical quality, teacher-child interactions, and the inclusion of SEL, all tailored to the realities of Pakistani classrooms.

Theoretical Contributions: Advancing Understanding of SEL in LMICs

Theoretically, this research contributes to discussions on how social-emotional skills develop in diverse socio-cultural contexts and how they interact with academic skills over time. Much of the existing literature on SEL is grounded in research from high-income countries, where the structure of early education systems, teacher training, and classroom environments differ considerably from those in LMICs. By situating SEL development within the Pakistani context, this study provides a broader and more culturally inclusive understanding of the factors

shaping children's social-emotional growth. This thesis makes a broader conceptual contribution by challenging the norm of considering SEL skills as single composite outcome. Instead, the thesis treats social and emotional skills as distinct but related constructs, allowing for a more nuanced examination of how each domain contributes to children's emerging literacy and numeracy.

Furthermore, findings from the second research question call for a more developmentally appropriate conceptualisation of SEL in early childhood, moving beyond the widely used CASEL framework, which was not designed specifically for young children, and instead encouraging frameworks that reflect the needs, capacities, and lived experiences of children in early years settings. Finally, the study highlights the need for greater transparency and contextual sensitivity in how ECE quality is operationalised and measured, especially in LMICs. Current definitions and metrics often rely heavily on tools and assumptions developed in Western contexts, which may not adequately capture what quality looks like or how it functions in resource-constrained environments. By addressing these gaps, the thesis not only advances academic discourse but also encourages more contextually grounded, equity-focused approaches to early childhood research and practice.

Advocacy Contributions: Promoting a Research Culture in Pakistan

This thesis also contributes to the broader goal of strengthening a research culture and capacity within Pakistan – an endeavour that remains both urgent and challenging. In many LMICs, including Pakistan, research is often perceived as disconnected from practice, limited in its local relevance, or overly driven by external agendas (S. Siddiqui, 2007). These perceptions, compounded by limited institutional support, inadequate research training, and a lack of investment in knowledge production, have contributed to a landscape in which rigorous, contextually grounded research is relatively scarce and undervalued (UNESCO, 2021). By upskilling individuals from Pakistan and modelling highly ethical practices, this project

exemplified that research can be both locally rooted and methodologically rigorous. Moreover, by investigating new domains of learning, the thesis reminds policymakers, educators, and the wider public that research can generate actionable insights to enhance children's learning experiences and lay the foundations for long-term success. In doing so, this work also seeks to foster a more positive narrative around research, one that views research not as an abstract or elite pursuit, but as a practical and essential tool for improving the lives of children, families, and educators. It is hoped that such efforts will inspire other researchers, practitioners, and policymakers to invest in data-driven decision-making and local knowledge generation, thereby contributing to a more robust and sustainable research ecosystem in Pakistan.

Thesis Structure

Chapter 1: Thesis Overview

The current chapter provides an overview of the thesis, its main research questions, and key findings. The chapter then provides the rationale behind the thesis, followed by an overview of the different contributions of this thesis, and concludes with an outline of the thesis structure that lays out the sequence of chapters, explaining how each contributes to the overall narrative.

Chapter 2: Literature Review

Chapter 2 provides a comprehensive review of relevant literature, beginning with an introduction to social-emotional development in early childhood and its associations with other outcomes. It critically explores major frameworks of SEL, such as the CASEL framework, and considers how SEL is conceptualised across the globe, which informs the conceptualisation of SEL in the current thesis. It then turns to research on SEL in LMICs, where different conceptualisations of social-emotional development arise due to cultural and socio-economic contexts, specifically that of Pakistan. It further explores previous research on social-emotional skills and their associations with demographic characteristics and academic outcomes. Furthermore, this chapter explores how classroom environments serve as settings for social-

emotional learning, with particular focus on the conceptualisation and operationalisation of ECE quality in LMICs and its relation to child outcomes. The chapter concludes with an overview of Pakistan's educational landscape, including the context of the Sindh province and Karachi. This literature review provides the theoretical backdrop for the subsequent chapters, identifying gaps that this thesis seeks to address.

Chapter 3: Methodology

The methodology chapter outlines the research design used to investigate the relationship between demographic factors, social-emotional skills, academic outcomes, and ECE quality in Pakistan. The first sub-section describes the participants, sample size calculations, and the recruitment process. The chapter then discusses the measures used to assess demographic factors, child outcomes, and classroom quality, including the IDELA, AKT, ECERS-R, and CIS, highlighting evidence of their validity and potential limitations. The data collection procedures, ranging from initial school visits to child assessments and classroom observations, are detailed. The chapter ends with a section on the steps taken to compute variables and clean data. By setting out the research design and analysis strategy, this chapter provides the methodological framework within which the subsequent chapters will present their findings.

Chapter 4: Demographic Factors Predicting Pakistani 4- to 6-year-olds' Social, Emotional, and Academic Skills (RQ1)

Chapter 4 examines how demographic factors – child age, gender, bilingualism, maternal education, parental age, household composition, and home learning environment – predict Pakistani children's social-emotional and academic skills, addressing Research Question 1. It begins by outlining the analytical approach, it then presents descriptive statistics of child outcomes and demographic factors, followed by a preliminary analysis of the associations between these variables. Multi-level models are employed to explore how these demographic

factors predict pre-numeracy, pre-literacy, social-emotional skills, and emotion knowledge. Findings reveal that maternal education is the most consistent and strongest predictor of children's outcomes, household size is negatively related to social skills, and boys have higher pre-numeracy skills.

Chapter 5: Associations between Pakistani Children's Social-Emotional Skills and their Academic Development (RQ2)

This chapter explores the associations between children's initial social and emotional skills and their later academic outcomes, addressing Research Question 2. It investigates how early social skills and emotion knowledge relate to pre-literacy and pre-numeracy outcomes, using multi-level structural equation modelling that controlled for demographic variables and children's early academic scores. Findings revealed that emotion knowledge was a significant predictor of children's academic skills, whereas social skills had a weak and negative association with children's pre-literacy skills. Mediation analyses were also conducted which revealed that social skills at timepoint two may mediate the association between emotion knowledge at time 1 and academic outcomes at time 2. This chapter adds to the narrative by demonstrating how children's emotional and social competencies interact with their academic skills, offering insights into the mechanisms through which social-emotional skills contribute to school readiness in LMICs.

Chapter 6: Classroom Quality in Pakistani ECE Classrooms and Associations with Child Outcomes (RQ3)

This chapter explores the structural and process quality of ECE classrooms in Pakistan, and how they relate to children's outcomes. Using descriptive statistics, ANOVAs, and multilevel models, this chapter investigates structural and process quality indicators of the classrooms in our sample, how they differ by provision type, and the how they relate to child outcomes. Findings revealed that process quality was generally low across the sample, but TCF (non-

profit) schools generally outperformed both private and public schools on measures of process quality and child outcomes, while public schools consistently underperformed. Structural indicators were moderately related to global classroom and interactional quality. Moreover, the global classroom quality was significantly associated with changes in child outcomes, but interactional quality was not, and only a few structural indicators predicted pre-literacy. Overall, the findings of this chapter offer important insights into what ECE looks like in Pakistan and how quality can be understood and strengthened in the context.

Chapter 7: Discussion

This chapter reviews findings from analyses done Chapters 4, 5, and 6, discussing how they address the research questions posed at the start of the thesis. Findings are discussed in relation to previous literature and the socio-cultural context of Pakistan. Potential explanations and considerations are outlined.

Chapter 8: Conclusion

The final chapter reviews key findings from the three research questions and what they mean for how ECE and SEL are conceptualised in Pakistan, and LMICs more broadly. The limitations of the study are acknowledged, implications for policy are outlined, and suggestions for future research are proposed. The thesis concludes with some final reflections on the research process and findings.

Chapter 2: Literature Review

Social Emotional Development in the Early Years

Social-Emotional Learning (SEL) is a broad term that refers to the process through which children acquire the skills to understand and manage emotions, establish positive relationships, and navigate social environments. It encompasses a range of competencies, such as emotional regulation, empathy, self-awareness, inter-personal skills, and responsible decision making (Borowski, 2019). Such skills enable individuals, especially children, to engage meaningfully with others, participate in group settings, and manage challenges in emotionally and socially appropriate ways (Denham, 2006).

These skills are especially critical in early childhood, a developmental period characterised by rapid growth in emotional understanding, self-regulation, and social interaction (Shonkoff & Phillips, 2000). The early years provide a unique and sensitive window of opportunity during which social and emotional competencies begin to take shape and are highly malleable in response to environmental input (Denham et al., 2002; Mondi et al., 2021). As such, supporting social-emotional development during the early years may provide high returns on investments into these skills. During this time, children are also entering new social settings, most notably preschool classrooms, where they must navigate peer relationships, respond to adult guidance, and participate in group routines. SEL in the early years helps equip children with the necessary tools to engage meaningfully with others, resolve conflicts, and adapt to new learning environments from a young age, so they can benefit for years ahead (Denham, 2006).

These competencies not only contribute to children's immediate adjustment and wellbeing in educational settings but also underpin their capacity to benefit from formal instruction. Indeed, preschoolers' social-emotional skills are related to their academic performance (Arnold et al., 2012; Torres et al., 2015) and can uniquely predict future academic performance when other variables, even earlier academic success, are controlled for (e.g., Izard

et al., 2001; McClelland et al., 2006; Nix et al., 2013). Moreover, studies have found that social-emotional skills in the early years predict adult outcomes such as physical and mental health, employment, educational attainment, and criminal activity, approximately 13-19 years later (D. E. Jones et al., 2015). Collectively, these findings suggest that social-emotional development during the early years provides a foundational platform not only for academic success, but for lifelong wellbeing and societal participation.

Conceptualisation of Social and Emotional Skills

There are a large number of skills that fall under the social-emotional umbrella, with little consensus between different frameworks on the "essential" skills (McCoy, 2022). CASEL's framework separates these skills into five core competencies: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (Borowski, 2019). While the framework has been influential in mobilising work on SEL and informing many interventions, the evidence in support of this framework for the early years is limited, primarily because the framework was designed for school-aged children and comprises of complex skills that are not relevant in early childhood. Indeed, researchers argue that competencies like relationship skills and responsible decision-making that develop later in life are not developmentally appropriate for children. Instead, skills such as initiating peer relationships or recognising emotions are better suited to this age group (Denham, 2018; Rose-Krasnor, 1997).

Moreover, it can be argued that CASEL's five core competencies focus more on social competencies, neglecting the emotion-focused competencies. While social skills like self-regulation, empathy, and problem-solving have been found to relate to children's developmental outcomes (McClelland et al., 2007; Moffitt et al., 2011; Ramani & Brownell, 2014; Sebanc, 2003; Spinrad & Eisenberg, 2014), children's emotion knowledge, regulation, and expression also play an important role in their development (Denham et al., 2002). Emotion knowledge, the ability to understand and recognise one's own and others' emotions (Denham et al., 2003), is one of the

most frequently examined emotion skill and has been linked to children's academic outcomes cross-sectionally (Denham, Bassett, Way, et al., 2012; Garner & Waajid, 2012; Leerkes et al., 2008; Voltmer & von Salisch, 2017), longitudinally (Rhoades et al., 2011), and experimentally (Nix et al., 2013). Moreover, a meta-analysis found a strong effect between emotion knowledge and academic performance, with medium effects for peer acceptance and school adjustment (Voltmer & von Salisch, 2017). In terms of other emotion-focused skills, there is evidence that children's emotion regulation is related to their development (Eisenberg et al., 2005; Moffitt et al., 2011; Raver, 2002; Raver et al., 2007). However, research on emotion competencies besides emotion knowledge is limited, due to the difficulty in reliably measuring these skills in early childhood.

Nonetheless, these findings suggest that emotion knowledge plays an important role in children's development, with research highlighting that both social and emotional skills work in tandem (Torres et al., 2015). Moreover, there is evidence that children's cognitive development is more strongly predicted by emotional competencies compared to CASEL's more behaviourally oriented competencies like self-regulation (Garner & Waajid, 2012). Additionally, Denham et al. (2003) further argue that emotion competencies lay the foundation for children's emerging social competencies, therefore they may be more important to study in preschool-aged children. Therefore, when examining preschoolers' SEL, it is critical to include emotion-specific skills, as CASEL's framework alone may not fully capture what matters most during this period.

In this thesis, social and emotional skills are conceptualised as distinct but interconnected domains of early childhood development, each contributing uniquely to children's broader social, emotional, and academic adjustment. Emotion skills typically begin to emerge in the early years, with basic emotion recognition skills developing in infancy and becoming increasingly sophisticated during the preschool period (Leppänen & Nelson, 2006; Pons et al.,

2004). Given this early emergence of emotion recognition, the present study thus treats emotion skills, specifically emotion knowledge, as a set of internalised, cognitive-affective abilities that children possess relatively early, providing the foundation for later interpersonal functioning.

In contrast, social skills are conceptualised as external, observable behaviours that reflect children's ability to interact effectively and appropriately with others. These behaviours include sharing, cooperating, resolving conflicts, initiating interactions, and responding to social cues (Rose-Krasnor, 1997; K. H. Rubin et al., 2009). While emerging emotion skills support the development of social skills by allowing children to interpret and respond to social situations appropriately, social skills typically become more consistently observable later in childhood as children gain more experience navigating peer and adult relationships. Social skills require not only emotional understanding but also the ability to apply this understanding in real-time interactions, involving elements of behavioural regulation, perspective-taking, and social problem-solving (Denham, Bassett, Thayer, et al., 2012).

Thus, in the present study, emotion and social skills are treated as separate but related constructs. Emotion skills are considered to be foundational skills that children “possess”, whereas social skills are seen as behaviours that children “demonstrate”. Moreover, the thesis posits that emotion skills, especially emotion knowledge, develop earlier and are the building blocks for children’s later developing social skills.

This conceptual distinction aligns with developmental frameworks that view social-emotional competence as a multidimensional construct composed of related but distinct elements (Denham et al., 2003; Torres et al., 2015). It also reflects process models of social competence, which propose that understanding emotions is a prerequisite for successfully engaging in social interactions (Lemerise & Arsenio, 2000). Moreover, the distinction allows for a more nuanced investigation into how different aspects of early social-emotional development contribute independently and interactively to children's academic outcomes, an approach that is

particularly critical in cross-cultural contexts where developmental trajectories may differ from those documented in high-income settings.

Social-Emotional Development in LMICs

Most research on children's social-emotional development in early childhood has been conducted in Western high-income countries employing samples from a very specific population, which can be described as Western, Educated, Industrialised, Rich, and Democratic (WEIRD; Henrich et al., 2010). This had led to a Eurocentric and Anglocentric understanding of social-emotional skill development, which cannot be generalised to other populations because the way in which children learn skills and the way certain skills are utilised are tied to one's culture and resources (Brush et al., 2022; Rogoff et al., 2018). For example, using qualitative interviews, Jukes et al. (2018) found that in comparison to predominant SEL frameworks, teachers and parents of pre-schoolers in Tanzania placed more importance on developing aspects of social responsibility such as obedience and discipline rather than CASEL competencies like self-awareness.

While children in LMICs have been suggested to have poorer social-emotional development (McCoy et al., 2016), social-emotional skills in LMICs can serve as critical protective factors against prevalent stressors like political instability, exposure to violence, and inadequate healthcare systems (M. M. Black et al., 2017). More socially and emotionally competent children may be better equipped to deal with such stressors, therefore having more positive outcomes, e.g., performing better academically, than their peers (Raver, 2002). Moreover, it has been argued that social-emotional skills like responsible decision-making, conflict resolution, self-management, and empathy would put individuals in LMICs in a better position to maximise the resources and opportunities available to them (Brush et al., 2022). Therefore, laying the foundation for SEL skills early on for children in LMICs can support their optimal development, despite the everyday challenges they experience.

Despite these benefits of SEL, there is a lack of research investigating what SEL looks like in these countries. Until recently, research on children's non-academic development had focused on negative outcomes, like behavioural problems and deficits (McCoy, 2022). In an effort to shift towards examining children's positive social-emotional skills and get a better understanding of what social-emotional development looks like in LMICs, researchers have developed early years assessments specific to these contexts. One notable measure is Save the Children's IDELA (International Development and Early Learning Assessment; Pisani et al., 2018), which is a measure of holistic development, including social-emotional, for 3.5- to 6-year old children. The measure was developed after consulting experts and practitioners from different cultural backgrounds and was validated using an iterative process that involved piloting in 12 LMICs (Bangladesh, Bhutan, Egypt, Ethiopia, India, Indonesia, Mali, Malawi, Mozambique, Pakistan, Rwanda, and Zambia). The social-emotional items included in the assessment tapped into five skills: self-awareness, relationship skills, empathy, emotion regulation, and conflict resolution. However, it could be argued that the measure still does not assess all potentially relevant skills, only a sub-set that were found to be important across the pilot contexts, limiting the comprehensiveness of the measure. Moreover, the measure uses a composite measure of social-emotional skills, instead of separating the social and emotional competencies, and focuses primarily on social skills, leaving a gap in measuring children's emotion-focused skills that are arguably more important in the early years. Nonetheless, the measure is the first of its kind and lays the groundwork to better understand social-emotional skills in LMICs.

Research on Social-Emotional Skills in Low- and Middle-Income Countries

As discussed, research on social-emotional development in LMICs is still in its early stages. Emerging evidence suggests that children's social-emotional development – typically measured using composite indicators – is positively associated with their school readiness and academic achievement (Arslan et al., 2011; Halpin et al., 2019a; Pisani et al., 2022; Wang et al.,

2019; S. Wolf et al., 2021). These findings indicate that the developmental benefits of SEL documented in high-income countries (HICs) may also extend to LMIC settings. However, the limited number of studies, along with inconsistencies in how SEL is conceptualised and measured, mean that our understanding remains partial and fragmented.

A growing but still modest body of research has begun to examine specific social-emotional skills in LMIC contexts. For instance, self-regulation has been linked to foundational cognitive outcomes such as children's early language and numeracy development (von Suchodoletz et al., 2015), peer acceptance (Liman, 2024), and social competence (Orta et al., 2013). Emotion regulation, though less frequently studied in LMICs, has been linked to Turkish preschoolers' negative and positive outcomes (Dagal, 2017; Ersan & Tok, 2020; Orta et al., 2013), echoing findings from HICs that suggest emotion regulation is critical to both learning and peer interactions.

Other SEL domains – such as empathy, self-awareness, problem-solving, and emotion knowledge – are even less frequently studied in LMICs. While some efforts have been made to assess these constructs (Celikel & Çoban, 2022; Ekerim-Akbulut et al., 2020; Hussein, 2008), these studies often focus on descriptive findings rather than exploring how these individual skills relate to key developmental outcomes like academic achievement, school adjustment, or long-term wellbeing. As a result, the mechanisms through which these discrete SEL components contribute to early development in LMICs remain largely unknown.

Altogether, there is some evidence highlighting the importance of children's social and emotional skills in LMICs, but the evidence is scant. This had often led to social-emotional development being under-prioritised in these contexts. Consequently, there is instead a need to investigate children's social-emotional skills within the specific context or country of interest and explore whether skills prioritised in the West matter for children's development. Expanding this research will shed light on the importance of children's social-emotional development and allow

educators, parents, and policymakers to make more informed decisions about which skills to prioritise in promoting children's development.

Relevance of Social-Emotional Skills to the Pakistani Context

Pakistan, a lower-middle-income country in South Asia, presents a unique context for understanding ECE and child development. With a population of over 240 million people (World Bank, 2023), Pakistan is the fifth most populous country in the world, with 13.4% of its population being younger than five years, amounting to approximately 32 million young children (International Labour Office, 2023; Pakistan Bureau of Statistics, 2017). This demographic reality alone makes investment in ECE not just a policy priority but a developmental imperative.

The country's socio-economic, cultural, and institutional conditions present both opportunities and significant challenges to optimal child development. Pakistan faces high levels of poverty, malnutrition, gender inequality, and disparities in access to quality services – all of which have implications for young children's developmental outcomes (M. M. Black et al., 2017; UNICEF, 2021). In many parts of the country, traditional gender roles and hierarchical family structures shape the caregiving environment, while large family sizes and multigenerational households influence how children are socialised and supported in their early years. Against this backdrop, the need for contextually relevant research on child development and ECE is urgent. Understanding how social, emotional, and cognitive skills develop in Pakistani children – and how the early learning environment can best support them – is key to designing equitable and effective policies and interventions. This is particularly critical given Pakistan's demographic momentum, where today's young children represent the future of a nation grappling with both development challenges and potential.

Culturally, Pakistani society places a strong emphasis on respect for authority, interpersonal harmony, and obedience to elders – values which are reflected in both parenting styles and classroom practices (Juma, 2004; Zaman, 2014). These norms may influence how

social-emotional skills are expressed, taught, and interpreted in early childhood (McCoy, 2022), and highlight the importance of developing culturally grounded frameworks for understanding SEL in this context. In terms of education, Pakistani schools and parents place strong emphasis on children's academic outcomes, primarily through rote learning, focusing on literacy and numeracy skills, while overlooking their social-emotional development (Barlas et al., 2021). However, these skills are important for Pakistani children. Not only are they linked to positive outcomes such as resilience (Durlak et al., 2011; D. E. Jones et al., 2015; LaBelle, 2023), which is essential to thrive in a country plagued by poverty and instability in the country, but also because these skills can also support children in navigating the country's collectivist culture (Zaman et al., 2006).

Despite this higher need to understand and develop social-emotional skills for the Pakistani population, there are only a handful of studies that have explored links between Pakistanis' social-emotional skills and other outcomes. Studies conducted with older children have shown that emotional intelligence and self-regulation are linked to academic achievement (Akbar et al., 2011), while interpersonal and emotion regulation skills are tied to mental health and wellbeing (Kathawala & Bhamani, 2015; Malik & Shujja, 2013; Zafar et al., 2021a; Zahra & Saleem, 2022). While these studies offer insight into social-emotional skills in Pakistan, they focus solely on older children, leaving a gap in our understanding of how these skills develop in early childhood, a critical developmental period. Many also lack controls for key demographic factors like parental education, overlook potential gender differences shaped by cultural norms, and rely heavily on self-report measures and descriptive statistics, with little use of objective learning data.

There have been some studies that have investigated Pakistani preschool-aged children's social-emotional development, however most of these have focused on understanding the impact of an intervention on children's development (Inam et al., 2022;

Rathore et al., 2023; Yousafzai et al., 2018). While these studies have taken the step of assessing preschool-aged children's social-emotional skills, they have done so within the context of an intervention, without having a comprehensive understanding of children's social-emotional skills and how they relate to children's own or family characteristics, or their other outcomes, outside the context of an intervention.

There are some studies that have attempted to broaden the evidence base on Pakistani preschool-aged children's social-emotional skills without an intervention. Using an adapted version of the Strengths and Difficulties Questionnaire (SDQ), Finch et al. (2018) investigated 3- to 4-year-old Pakistanis' social-emotional behaviours. They found that children's social-emotional skills at two years predicted their prosocial behaviours, as well as their cognitive and language skills, at four years. However, similar to research with older children, this study employed no direct assessments or observations of children's social-emotional development, and instead relied on parent report. Owing to this, the study focused on parents' perceptions of children's social-emotional behaviours as opposed to the skills children possess. Nonetheless, this study is important in highlighting that Pakistani children's academic performance is affected by non-academic skills and lays the groundwork for other studies to understand this using objective task-based measures.

Siraj et al. (2021) attempted to address the lack of objective task-based early childhood research in Pakistan by adapting a popular tool used to measure children's emotion knowledge, the Affect Knowledge Test (Denham, 1998), for the Pakistani context. In their preliminary evaluation, they found that the adapted AKT administered with 227 Pakistani pre-schoolers held the same factor structure as that which has been found in the US. Moreover, they found that children's emotion knowledge was correlated with children's teacher-reported social competence scores. This study highlights that Pakistani children's emotion knowledge skills are linked to aspects of their social functioning; however, the study did not examine associations

with children's pre-academic skills, which are considered crucial in the Pakistani culture (Barlas et al., 2021), and may be necessary to do in order to build a case for the importance of social-emotional skills for Pakistani children.

This is addressed by another cross-sectional study of 1300 Pakistani children, which found that 4-year-olds' self-regulation was associated with their pre-academic skills, executive functioning, prosocial behaviours and problem behaviours (Obradović et al., 2022). Although the study controlled for demographic covariates, it would also have been useful to explore these demographic associations to understand how social-emotional skills associate with age, gender, family socio-economic status, etc., which would give insight into any risk or protective factors of children's skills. Furthermore, the study focuses solely on self-regulation, necessitating future research to investigate additional skills, especially in the emotion domain. Moreover, doing so longitudinally would control for children's pre-existing skills and would allow for understanding which skills are related to children's development over time. Although such a study would not establish causality, it would give in-depth information on Pakistani children's development.

Overall, social-emotional skills have been studied in Pakistan to a limited extent, primarily within older children, using weak research designs, and focusing on one social-emotional skill, necessitating additional research in order to provide evidence of its importance and to inform the design of effective programmes.

Demographic Correlates of Social-Emotional Skills

Given the importance of social-emotional skills for young children, it is important to understand how children's own and family characteristics might be affecting the development of those skills. This would give educators and policymakers an understanding of what children already come to school with, while uncovering potential risk or protective factors.

Child's Age and Gender

It is well known that the period of early childhood is a time of rapid social and emotional development (Denham et al., 2002), partly owing to the increased development of brain regions underlying these skills (M. D. Lewis & Granic, 2010) and partly due to the increased exposure when attending preschool (Denham et al., 2009). Consequently, older children have been found to show higher levels of social-emotion skills (Denham, Bassett, Thayer, et al., 2012; Shavitt et al., 2022; S. Wolf et al., 2017; Xie & Li, 2022). Indeed, with increasing age, children have better self-regulation (Montroy et al., 2016; Orta et al., 2013), empathy (Simon & Nader-Grosbois, 2023), conflict resolution (Chen et al., 2010; Zhu et al., 2021), emotion knowledge (Denham, Bassett, Way, et al., 2012; Ekerim-Akbulut et al., 2020), and emotion recognition (Izard et al., 2001; Mazhar & Bailey, 2024; Schultz et al., 2000).

However, some studies have failed to find significant associations between age and overall social-emotional development in the early years (Orta et al., 2013) as well as specific social-emotional skills like empathy (Ekerim-Akbulut et al., 2020; Findlay et al., 2006) and emotion regulation (Orta et al., 2013). These findings suggest that children in these samples were not developing their social-emotional skills as they were growing, which is possible given that most of these studies were conducted in low-resource contexts. However, these studies did not have large sample sizes ($N < 250$) and may have been under-powered to pick up on age effects. Alternatively, as age differences were not the focus of these studies, the samples employed in the study may not have varied much in age (e.g., in Orta et al., 2013 $SD_{age} = 0.92$), leaving little age-related variance to pick up on. Despite these conflicting findings, age is an important variable to control for when examining child outcomes.

While there is strong theoretical reasoning supporting the association between children's development and age, the same is not true for gender differences. Girls have been reported to be better at recognising (McClure, 2000) and regulating their emotions (Else-Quest et al., 2006;

Epstein et al., 2009; Fantuzzo et al., 2007). Girls have also been found to display higher levels of conflict resolution (Zhu, Xiao, et al., 2021) and social competence (Mazhar & Bailey, 2024). On the other hand, boys have been found to be more aggressive (Mazhar & Bailey, 2024) and display more behaviour problems (Owens, 2016). However, these gender differences have not been consistently replicated (Fine et al., 2004; Herba et al., 2006; Ogelman et al., 2013; Zhu, Fu, et al., 2021).

In terms of academic outcomes, the findings are not straightforward – research suggests that during the early years girls have better literacy skills, whereas boys have better numeracy skills (Cobb-Clark & Moschion, 2017), with some findings suggesting these gender differences grow stronger as children grow older (Borgonovi et al., 2021; Gambell & Hunter, 1999). However, other research suggests that girls are better in both but the effect sizes are larger for literacy (Brandlistuen et al., 2021; Shavitt et al., 2022). Some studies have also found there to be no gender differences in children's academic skills (Draper et al., 2023; Lim et al., 2024).

These conflicting findings may be explained by a review examining data from 71 LMICs (Rey-Guerra et al., 2024), which found that for approximately half the countries, there were no gender differences in children's literacy, numeracy, or social-emotional skills. For the other half of the countries that had differences, they tended to favour girls, and the effect sizes were largest in the social-emotional domain. These findings suggest that gender differences in children's development are not consistent and may vary by country and domain, as well as in effect sizes.

Gender differences in children's social-emotional development, or the lack thereof, may be explained by how girls and boys are socialised (Denham et al., 2010; Root & Denham, 2010). Some parents have reported responding differentially to their preschool-aged sons' and daughters' emotions (Root & Rubin, 2010), such that parents might explicitly teach or discuss emotions with girls or ignore boys' early problem behaviours (Chaplin et al., 2005). Relatedly,

parents might also be more acceptable of girls' emotions (Cherry & Gerstein, 2021), which has been linked to better emotion development (Denham et al., 2015). These differences in how parents react to and teach their children about emotions and prosocial behaviour may impact the development of their skills.

Given the contextualised nature of emotion socialisation (G. L. Brown et al., 2015; Espinosa & Kovářík, 2015), gender differences due to socialisation may be stronger in a gendered society like that of Pakistan, in which parents may differently teach or respond to their sons' or daughters' emotions. Indeed, Pakistani parents report more behavioural problems and lower social skills in both preschool- and school-aged boys than girls (Finch et al., 2018; Hussein, 2008). However, a direct assessment of Pakistani children's social-emotional skills found no gender differences (Finch et al., 2018), suggesting the gender differences observed may be due to reporter bias. Overall, there is a need to understand how boys and girls develop social-emotional skills differently, which can help educators understand their students better, and tailor their teaching practices and interactions to meet the distinct needs of each gender.

Bilingualism

Bilingualism, i.e., the ability to speak additional language(s), is another child-specific characteristic in relation to children's development, but it is often left out of studies because most of the research employs monolingual samples. Bilingualism is an important aspect to consider as research indicates that bilingual children may have an advantage over their monolingual counterparts in many cognitive skills, including working memory (Morales et al., 2013), spatial reasoning (Greenberg et al., 2013), executive functioning (Bialystok, 2015; Morales et al., 2013), and attention (Yang et al., 2011) – all of which play an important part in children's academic performance (Bull et al., 2008; Montoya et al., 2019; Obradović et al., 2022; S. Wolf & McCoy, 2019) and social-emotional development (Ferrier et al., 2014; McClelland et al., 2007).

While there are multiple findings that suggest that bilingual children have stronger social-emotional and academic development (Han, 2010; Oades-Sese et al., 2011; H. Sun et al., 2021), this has not been consistently replicated (Farver et al., 2006; Gunnerud et al., 2020; Lehtonen et al., 2018; McLeod et al., 2016; Shokrkon & Nicoladis, 2021). It must be noted that majority of the studies exploring bi-/multilingualism have employed samples from Western countries, which are predominantly monolingual. In these contexts, children may not have sufficient opportunities to fully leverage the advantages of speaking multiple languages as others around them are likely to be monolingual. In contrast, in a country like Pakistan, where bilingualism and multilingualism are widespread, children may have greater opportunities to benefit from their linguistic diversity (Firdous et al., 2024). Nevertheless, this potential remains unclear and warrants further investigation.

Maternal Education

Research has shown that children's socioeconomic status is consistently linked to their social-emotional skills, even in LMICs (Denham et al., 2012; McCoy et al., 2016; Raver et al., 2016; Wolf et al., 2021). Maternal education, a commonly-used proxy for socioeconomic status, has also been found to be predictive of children's social-emotional development in LMICs (Grantham-McGregor et al., 2007; Paxson & Schady, 2007; Shavitt et al., 2022; S. P. Walker et al., 2007; Zhu, Xiao, et al., 2021), including in Pakistan (Finch et al., 2018). This may be because more highly educated mothers have greater knowledge of child development (Ertem et al., 2007), use more complex language and vocabulary with their children (Magnuson et al., 2009), and have more learning materials at home (Magnuson et al., 2009). Moreover, mothers with higher levels of education use more warm and positive parenting strategies with their children (Carr & Pike, 2011), which can enhance children's cognitive (Harding, 2015; Mistry et al., 2008) and social-emotional outcomes (X. Chen et al., 2000; Denham et al., 2015; Landry et al., 2006; von Suchodoletz et al., 2011). Additionally, mothers with higher levels of education

have also been noted to provide more appropriate scaffolding to children, which has been shown to predict various aspects of children's development including their self-regulation (J. Sun & Tang, 2019). Indeed, a study conducted in Pakistan (Obradović et al., 2016) found that maternal education was strongly related to levels of scaffolding mothers provided, which predicted children's executive functioning. Together, these findings provide evidence that more highly educated mothers provide more responsive caregiving, which is in turn related to positive child development outcomes.

Parental Age

Much of health research suggests that increased maternal age at childbirth is associated with adverse outcomes for children, including higher risk of autism, depression, and anxiety (B. K. Lee & McGrath, 2015; Tearne, 2015; Tearne et al., 2016), as well as poor social functioning (Weiser et al., 2008). However, economists argue that higher parental age has a positive effect on development due to increased resources being provided to the children (Powell et al., 2006), with others reporting that increased parental age is associated with reduced externalising behaviours but has no impact on internalising problems (Zondervan-Zwijnenburg et al., 2020). There is little research on this in the educational field but it may be important in Pakistan where there is a higher proportion of children with younger mothers and/or older fathers, which can influence parenting styles and support for children (Hadjicharalambous & Dimitriou, 2020), therefore impacting their development.

Household Size & Siblings

When evaluating factors influencing children's early development, it is crucial to consider family characteristics. Families in Pakistan, and LMICs more broadly, often have joint family structures with grandparents, uncles, aunts, and/or cousins living together. Living in larger families may expose children to a wider range of social interactions, providing them with valuable opportunities to observe and practice social-emotional skills, receive feedback, and

navigate complex social dynamics (Bandura, 1997; Denham et al., 2015; Grusec, 2011). Consequently, larger household size should have a positive effect on children's development, however research from Western countries does not support this. Instead, Black et al. (2005) found a negative correlation between family size and children's educational attainment, whereas Vandell and Corasaniti (1990) found no impact on children's social-emotional skills. However, these studies reflect development in high-income, Western settings, where the importance and role of extended family members is different from that in the collectivist cultures found in LMICs, especially Pakistan. Consequently, there is a need to examine how household size affects children's social-emotional development in the Pakistani context.

While the evidence on household size is not substantial, there is more evidence on the impact of siblings on children's development. Siblings play an important role in children's development, often serving as companions, role models, and sources of emotional support (Kramer, 2014). The presence of siblings introduces unique socialisation experiences, often being the first similar-age relationships that children make, making sibling bonds an important factor in the development of a wide range of social and emotional competencies (Dunn, 2002). Yet, the number of siblings is often associated with negative effects on cognitive and academic development (Downey & Condron, 2004; Finch et al., 2018; Muñez et al., 2022; Rathore et al., 2023), as parents' resources like time and attention are divided among more children – a concept known as the resource dilution hypothesis (Downey, 2001).

However, research on children's social-emotional behaviours paints another picture. Downey and Condron (2004) found that while having more siblings was linked to lower cognitive outcomes, it was associated with better social skills. Given the importance of the sibling relationship, siblings can be argued to serve as resources for children's development, giving children the chance to practice social interactions before entering school (Downey & Condron, 2004). Extending this, Finch et al. (2018) found that in Pakistan, a higher number of siblings was

associated with better parent-reported prosocial behaviours and lower externalising behaviours. However, they also reported a negative association between the number of siblings and children's social-emotional skills, which were measured using direct assessment. While the reason for this discrepancy is unclear, research on siblings in LMICs is limited in an additional way – studies often investigate the number of siblings, and not the number of similar-age children in the house, which may be different in Pakistan due to the presence of cousins in extended households. Cousins can be argued to provide similar input, perhaps more appropriate than adult-age siblings. To this end, it is important to clarify the relation between children in the household and children's development.

Home Learning Environment

Another factor that might impact children's development is their early home learning environment (HLE), which includes activities like reading, storytelling, number- or alphabet-related games, and arts or craft. The importance of different home learning activities for children's development has been supported by research utilising self-reports (M. A. Foster et al., 2005; T. D. Foster et al., 2016; Melhuish et al., 2008; Niklas & Schneider, 2017; Wirth et al., 2023) and observations (Baker, 2013; Çetin, 2021; Cuartas et al., 2023; Henderson, 2023; Rana, 2022; Tassopoulou, 2017; Wong et al., 2022). Additionally, the number of books at home, which can be considered a proxy for stimulating environments (Kalb & van Ours, 2014), is associated with children's academic outcomes, as evidenced by a study conducted in 27 countries, including multiple LMICs (Evans et al., 2010). The importance of the HLE has also been reported by studies conducted in Pakistan. Rathore et al., (2023) assessed home stimulation in a sample of Pakistani families and found it to be significantly related to children's cognitive skills, suggesting that the HLE is crucial for Pakistani children's development also; however its role in Pakistani children's social-emotional development remains unclear.

Association between Children's Social-Emotional and Academic Skills

In addition to exploring how children's demographic and family characteristics relate to their outcomes, there is also merit in investigating how these outcomes are related to and predict each other. While children's social-emotional skills are related to numerous outcomes, this thesis focuses on children's academic outcomes, i.e. early literacy and numeracy, given their importance in the Pakistani culture.

Pre-Literacy

Pre-literacy refers to the foundational skills that support later reading and writing, and includes skills such as phonological awareness, alphabet/print knowledge, comprehension skills, and vocabulary-oral knowledge. These competencies emerge through language-rich interactions and are critical for school readiness and long-term academic success (Duncan et al., 2007a). Early years have been shown to be critical for developing pre-literacy skills, with individual differences in early literacy showing to remain stable overtime (e.g., Bleses et al., 2016; Hoff, 2013).

There is increasing recognition of the developmental link between pre-literacy and social-emotional skills. Many social-emotional competencies—such as emotion understanding, self-regulation, and perspective-taking—draw on cognitive and linguistic processes that overlap with those involved in literacy development (Bailey et al., 2023). For instance, understanding others' emotions and mental states requires children to interpret verbal and non-verbal cues and to reason about others' motives and feelings – skills that also enhance narrative comprehension and inferencing during reading. Moreover, many pedagogical strategies designed to promote SEL are rooted in language-rich interactions. For example, the Feeling Thinking Talking intervention (Voltmer & von Salisch, 2022) aims to improve both children's emotion knowledge and language skills by encouraging teachers to use language-supporting strategies whilst talking about emotions. Similarly, storybook reading is a common strategy to teach emotional

vocabulary, encourage children to reflect on characters' feelings, or promote turn-taking during discussions, all of which inherently support both SEL and pre-literacy skills. There is also indirect link between these sets of skills: children who can manage their emotions and communicate effectively are more likely to participate in classroom discussions, attend to shared reading activities, and benefit from teacher feedback, all of which would support the development of pre-literacy skills (Denham, Bassett, Mincic, et al., 2012). In contrast, children with limited emotional regulation or social difficulties may struggle with the sustained attention and cooperative behaviour required for literacy-rich activities, and may consequently have lower levels of pre-literacy skills.

Empirical research offers further insights into this relation. Curby et al. (2015) found that preschoolers' emotional expressiveness, regulation abilities, and emotion knowledge were positively associated with early literacy skills. Moreover, Bailey et al. (2023) found that an SEL intervention also had significant positive impacts on preschool-aged children's pre-literacy skills, providing experimental evidence for this relation. However, findings are not entirely consistent. Some large-scale longitudinal studies have reported weak or non-significant associations between early social-emotional behaviours and later literacy outcomes (Duncan et al., 2007a; Romano et al., 2010), with there being limited evidence from LMICs.

Pre-Numeracy

Early numeracy encompasses a range of foundational mathematical skills developed during the preschool years, including number recognition, counting, quantity comparison, basic operations, and spatial awareness. These competencies are strong predictors of later academic achievement and are shaped by both cognitive and socio-contextual factors (Duncan et al., 2007a). Similar to pre-literacy, there is growing evidence that social-emotional skills are linked to the development of early numeracy (Dobbs et al., 2006; Doctoroff et al., 2016; D. E. Jones et al., 2015; Mackintosh & McCoy, 2019). However, unlike pre-literacy skills, most of the evidence

linking SEL to pre-numeracy skill has focused on indirect mechanisms like improve attention, self-regulation, and classroom engagement (Blair & Razza, 2007; McClelland et al., 2014). For example, children who can manage frustration and sustain attention are more likely to persist through challenging number tasks, benefit from instructional support, and participate in group activities where mathematical ideas are developed collaboratively (Denham, Bassett, Thayer, et al., 2012). SEL may also have direct links to children's pre-numeracy development since many early numeracy tasks are embedded in social stories, e.g., "If Ali has 2 apples and gives 1 to Sara…". Consequently, children with better social-emotional skills may be better equipped to interpret and solve such problems accurately. Despite multiple pathways supporting the association between SEL and pre-numeracy skills, some studies have reported weaker or non-significant associations (Duncan et al., 2007; Romano et al., 2010). Notably, these same studies also found limited links between SEL skills and pre-literacy, suggesting that differences in study design, sample characteristics, or measurement approaches may partially explain these inconsistencies.

Overall, findings from the West suggest that preschoolers' social-emotional skills are related to both their pre-literacy and pre-numeracy. However, these findings have not always been replicated in studies from LMICs. For example, Wolf and McCoy (2019) found that Ghanian children's early social-emotional skills did not predict their subsequent pre-literacy and -numeracy outcomes. These findings indicate that the importance of SEL skills put forward by work in the West may not stand true for LMICs, at least in the Ghanian context. There is a need to examine how these associations manifest in the Pakistani context as the risk and protective factors experienced by the children in different LMICs also vary. Moreover, the study used a composite measure of children's social-emotional skills, grouping together various competencies like self-regulation, emotion knowledge, and relationship skills. As outlined in the thesis' conceptual model, this approach overlooks the unique contributions of emotion and social skills, which may relate differently to key outcomes.

Differential Direct Pathways from Social and Emotional Skills

While the previous section discussed differential pathways *to* pre-literacy and pre-numeracy, it is also important to consider the differential pathways *from* emotion knowledge and social skills. The 'direct' mechanism through which emotion knowledge may impact children's academic outcomes, may be by encouraging children to label, interpret, and express emotions, which in turn strengthens their verbal vocabulary (Denham & Liverette, 2019). Similarly, the ability to categorise distinct emotions may support children in developing other skills that involve categorising, like shapes, numbers, and alphabets (Garner & Waajid, 2012). Some researchers also argue that there is overlap between emotion knowledge and academic competence, with both being part of a similar intellectual competency (Cavadini et al., 2021; MacCann et al., 2020).

While specific emotion skills, such as emotion knowledge, have been studied in preschoolers, social skills have still largely been studied collectively, as social behaviour, in relation to children's academic outcomes (e.g., Arnold et al., 2012). There is some research that has found specific social skills like conflict resolution (O. L. Walker & Henderson, 2012) and self-regulation (Robson et al., 2020) to be related to children's academic outcomes. These skills enable children to navigate social interactions effectively, manage frustration, and remain engaged in learning tasks. As previously discussed, children with stronger social skills tend to be viewed more favourably by teachers and peers, which can lead to more positive classroom relationships and increased access to collaborative learning opportunities (Denham & Brown, 2010). Socially competent children are also more likely to participate actively in classroom discussions, work cooperatively in groups, and receive constructive feedback – experiences that directly support the development of academic skills.

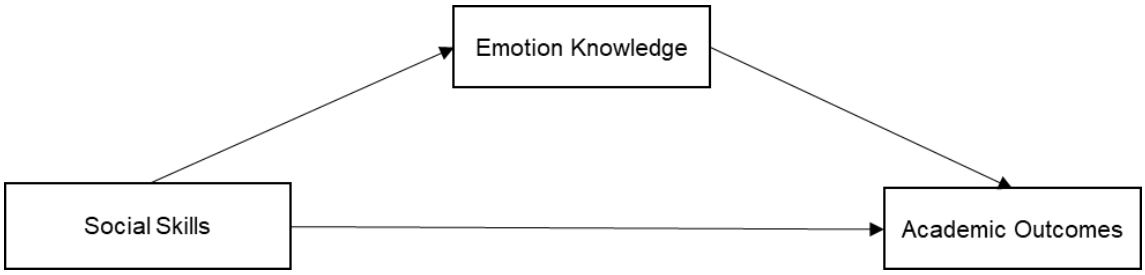
Overall, social skills appear to support both pre-literacy and pre-numeracy development through similar mechanisms. In contrast, emotion knowledge may support academic outcomes

through more domain-specific pathways. Its association with pre-literacy appears tied to pedagogical practices, whereas it may support pre-numeracy by developing categorisation skills. These distinctions underscore the importance of considering both the shared and unique mechanisms through which different dimensions of social-emotional competence influence early academic development.

Mediation Pathways

In addition to separating out both social and emotional skills, there is merit in understanding how one might mediate the other's association with academic skills. Some studies have examined these mediation models (Denham, Bassett, Mincic, et al., 2012; Denham et al., 2003; Franco et al., 2017; Garner & Waajid, 2012; Torres et al., 2015; Trentacosta & Izard, 2007). Torres et al. (2015) found that emotion knowledge mediated the relationship between social skills and academic outcomes. Similarly, Garner and Waajid (2008) found that emotion knowledge mediated the relationship between teacher-child closeness and academic competence. It is plausible that children with strong social skills often engage in more positive and quality social interactions, providing them with opportunities to develop emotional awareness and knowledge (Denham et al., 2013), which, in turn, may facilitate academic learning, as shown in Figure 1.

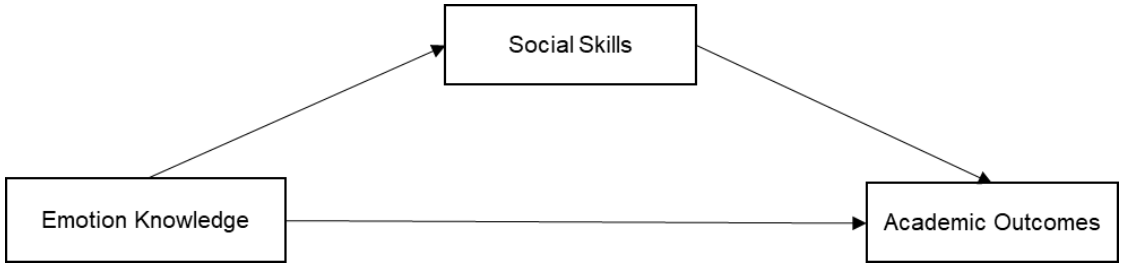
Figure 1
Emotion Knowledge Mediation Model



While Torres et al. (2015) and Garner and Wajid (2008) found that emotion knowledge mediated the relationship between social skills and academic outcomes, it is also possible that

social skills mediate the relation between emotion knowledge and academic outcomes, as shown Figure 2. Indeed, recognising others' emotions provides essential information about social situations, and children who are better at recognising others' emotions are better suited to using that information to understand the situation and respond appropriately (Denham et al., 2003). For example, children with strong emotion knowledge can perceive emotional shifts in their peers and teachers and are more likely to adjust their behaviour to respond more appropriately, thus being viewed more favourably by others. Consequently, better emotion recognition paves the way for meaningful social exchanges, which helps children build relationships with their teachers and peers and puts them in a better position to learn (Cavadini et al., 2021). These findings suggest that emotion knowledge may not only have a direct impact on children's academic achievement, but also an indirect impact through supporting children's social skill development.

Figure 2
Social Skills Mediation Model



The mediating effect of social skills is in line with the thesis's conceptual model, which posits that emotion knowledge is a more foundational skill that helps them develop their social skills. Indeed, Denham et al. (2003) and Denham, Bassett, Way, et al. (2012) found that early emotion knowledge predicted later social skills, suggesting that emotion knowledge may be the main predictor, being related to academic outcomes directly and indirectly through children's social skills. Similarly, a study with Portuguese children found that the relationship between emotion understanding and school performance was mediated by social competence (Franco et al., 2017). There is also longitudinal evidence in support of this mediation model – a study found

that the relationship between emotion understanding at age 5 and academic achievement at age 8 was mediated by social competence at age 7 (Lecce et al., 2017).

However, Trentacosta and Izard (2007) examined this mediation model and found that although emotion knowledge predicted children's academic achievement, this relationship was not mediated by teacher-child closeness and peer acceptance, a proxy for social competence. One reason for this may be that the study looked at multiple specific social skills rather than children's overall social behaviour. Indeed, other studies that have found evidence in support of the social skills mediation model have used a more broad measure of social skills (Bassett et al., 2012; Denham et al., 2003; Franco et al., 2017). It is possible that children's emotion knowledge indirectly impacts their academic skills through their overall social skills, rather than specific skills like peer acceptance, which may not take into account the interrelated nature of social skills.

There is no research that examines how Pakistani preschoolers' social and emotional skills are linked to their development, much less the unique contributions of the social and emotional aspects and their mediating roles. Given the various potential mechanisms through which social and emotional skills can impact development and the dearth of research on this in Pakistan, it is important to examine different models and compare their findings. Understanding how these aspects uniquely contribute to Pakistani children's academic development can help develop a framework for the Pakistani context, which can be used to inform curriculum, programmes, and policy. Moreover, establishing links between social, emotional, and academic outcomes, will also highlight importance of children's social and emotional competencies that are often overlooked within the Pakistani context (Barlas et al., 2021).

Schools and Classrooms as a Place of Social-Emotional Learning

While children's demographic characteristics and individual skills are important predictors of developmental outcomes, they represent only part of the developmental picture.

Increasingly, research highlights the importance of the classroom environment as a key contextual factor influencing early development. As children spend substantial time in ECE settings, the quality of teacher-child interactions, classroom organisation, and instructional support can significantly affect both social-emotional and academic outcomes. The following section examines key features of the classroom environment that contribute to children's development, reviews existing evidence on the impact of classroom quality in LMICs, and situates these findings within the context of the Pakistani ECE landscape.

Research has consistently shown that the classroom environment is related to children's development (Brunsek et al., 2017; Campbell et al., 2001; Gormley Jr. et al., 2005; Perlman et al., 2016; Suchodoletz et al., 2023), including their social-emotional development (Côté et al., 2007; Vandell et al., 2010). Experimental studies have also found that improving the classroom environment can have long term benefits on children's development (Belsky et al., 2007; Vandell et al., 2010). However, these benefits are not without a caveat – studies have found that positive effects of ECE settings are reliant on the provision of a high-quality environment (Lehrl et al., 2016), with children attending settings with low-quality environment having similar, and in some cases more negative, outcomes compared to those who never attended any early education setting (Sylva et al., 2011; Sylva & Wiltshire, 1993).

Given that the classroom environment plays an important role in children's development, including their social-emotional skills, many SEL programmes have sought to enhance children's outcomes by improving classroom quality, (e.g., RULER Approach, Brackett et al., 2019; and the Incredible Years Programme, Posthumus et al., 2012). However, these programmes have been designed and, for the most part, evaluated in Western high-income countries, limiting their applicability to LMICs. While the recent years have seen an increase in SEL programmes being evaluated in LMICs (e.g., L. E. Brown et al., 2023; McCoy et al., 2024; Miller-Graff et al., 2024), this increase has been slower in Pakistan, especially for the early

years. One exception to this was the PATHS programme, which was adapted to the Pakistani context (Inam et al., 2015). A pilot revealed that although the programme reduced preschool children's problem behaviours, it did not have a significant impact on children's social and academic skills (Inam et al., 2022). One reason for this may be that developing or adapting an effective SEL programme for Pakistan requires an understanding of how different aspects of the classroom environment influence children's social-emotional development within that context so that the programme can target those aspects. This ensures that programmes are more focused, sustainable, and ultimately more effective (Blewitt et al., 2018; Corcoran et al., 2018; Gershon & Pellitteri, 2018; Goldberg et al., 2019). To address this, the following section examines key dimensions of ECE quality, how they are operationalised, their relationship with child development, and existing research in LMICs.

Aspects of Quality in ECE

The quality of ECE settings is commonly conceptualised in terms of structural quality and process quality (Slot, 2018). Structural quality of ECE can be defined as characteristics of a programme's design or infrastructure, and it is comprised of regulable aspects, including length of the school day, teachers' qualifications, group size, and the teacher-child ratio (Pianta et al., 2016). On the other hand, process quality refers to children's direct everyday experiences in classrooms such as the teaching practices, the student-teacher interactions, and classroom routines, pedagogy, and management (Pianta et al., 2016). Process quality in ECE has been identified as a key predictor of different aspects of early childhood development including school readiness (Hatfield et al., 2016) as well as social-emotional competence (I. Siraj et al., 2018), arguably more so than structural quality. Specifically, the CARE project which looked to understand and improve quality of ECE in 9 European countries found that process quality has stronger correlates with children's learning and development than aspects of structural quality (Slot, 2018; Slot et al., 2018).

Some researchers also argue that indicators of structural quality are not directly related to children's development, instead they impact the everyday classroom environment and the interactions that children have within those, which impact children's development (Betancur et al., 2021; Mashburn et al., 2008). For example, while having a well-trained teacher (structural quality) is beneficial, the impact on children's social-emotional development is maximised when that teacher engages in warm, responsive interactions (process quality). Indeed, higher levels of teacher education have been associated with more effective instructional practices and greater responsiveness to children's developmental needs (Early et al., 2007; Pianta et al., 2005). Similarly, specialised training in ECE is linked to improved classroom organisation, more stimulating learning environments, and more developmentally appropriate interactions (M. Burchinal et al., 2002; S. B. Neuman & Cunningham, 2009). Teacher age and experience may also play a role, with some studies suggesting that more experienced or older teachers are better equipped to manage classrooms and support children's learning through established routines and richer pedagogical strategies (Slot, 2018) (Slot, 2018; Manning et al., 2017). In terms of classroom characteristics, smaller child-to-teacher ratios and smaller group sizes have been found to be associated with higher overall process quality (Barros & Aguiar, 2010; Mashburn et al., 2008; Phillipsen et al., 1997). However, other studies have found only weak relations or no relations at all between structural and process quality characteristics (Blau, 2000; Hanno et al., 2020; Pianta et al., 2005), suggesting that in some contexts, these two aspects of quality may in fact not be related.

Taken together, these findings suggest that while structural features set the stage for learning, it is the process quality – children's everyday experiences in the classroom – that directly shapes children's learning and development.

Operationalisation of Quality

Despite its centrality in ECE research, and the broad distinction between structural and process indicators, quality remains a conceptually vague and inconsistently defined construct. Scholars have yet to reach a consensus on its precise dimensions, and different frameworks prioritise different aspects of quality, especially within process quality (M. Burchinal, 2018). Given this conceptual fragmentation, researchers and policymakers often adopt different indicators of process quality, leading to inconsistencies in how it is assessed across studies and cultural contexts (Layzer & Goodson, 2006).

For instance, the Teaching Through Interactions framework (B. K. Hamre et al., 2013) focuses on emotional support, classroom organisation, and instructional support, whereas the Sustained Shared Thinking and Emotional Well-Being (SSTEW) Scale (I. Siraj et al., 2015)emphasises the depth of teacher-child conversations, emotional engagement, and scaffolding of children's thinking. Some definitions of process quality prioritise warm, responsive teacher-child relationships (Pianta et al., 2005), while others highlight the structure and organisation of daily activities that facilitate children's engagement and learning (Slot, 2018). While these frameworks differ in focus, they each capture essential aspects of children’s everyday classroom experiences, reflecting the multifaceted nature of process quality. It could be argued that there is a need to develop a more comprehensive model of quality that integrates these different frameworks; however, doing so may risk diluting the distinct yet valid dimensions of quality. Instead, I argue that there is a need for greater transparency in how quality is conceptualised and measured, with researchers explicitly defining what aspects of classroom quality they assess and acknowledge that any given measure captures only some aspects of a much broader construct.

In light of this conceptual ambiguity, this thesis adopts a pragmatic and transparent approach to operationalising classroom quality, drawing on established conceptualisations while

acknowledging their limitations. Rather than aiming to capture all possible dimensions of process quality, the study focuses on two core components: the global classroom environment and the quality of teacher-child interactions. These components are operationalised as complementary but distinct elements that, together, offer a meaningful picture of children's everyday classroom experiences. This dual focus aligns with widely accepted theoretical perspectives that view process quality as both embedded in the broader learning environment and enacted through moment-to-moment interactions (Mashburn et al., 2008; Thomason & La Paro, 2009). Moreover, having one component that provides a more comprehensive understanding of quality is particularly useful in the Pakistani context as there is no empirical evidence of what ECE classrooms look like.

Quality of ECE in LMICs

While there is abundant evidence establishing a link between characteristics of ECE quality and numerous child-development outcomes in high-income countries (e.g., Brunsek et al., 2017; Campbell et al., 2001; Suchodoletz et al., 2023; Vandell et al., 2010), the same cannot be said about LMICs. Most of the research on ECE programme quality in LMICs has been for the purpose of programme evaluation (Betancur et al., 2021; Campos et al., 2011; Gol-Guven, 2009; Malmberg et al., 2011; Mariano et al., 2019; Moore et al., 2008; Rao & Sun, 2015). Studies conducted as part of programme evaluations often assess the impact of externally designed interventions, which may introduce structured improvements in teacher training, classroom resources, or pedagogy that do not necessarily reflect typical ECE environments (Raikes et al., 2020). As a result, the findings from such studies may not generalise to everyday classroom settings. Research from naturalistic studies have described ECE programmes in LMICs as not being as intense or holistic as those typically studied in high-income countries (Rao et al., 2021), with many studies reporting low quality ECE in multiple LMICs (Aboud, 2006; Betancur et al., 2021; Campos et al., 2011; Gol-Guven, 2009; Mariano et al., 2019; Moore et al.,

2008; Rao & Sun, 2015). While there is some evidence that even lower quality ECE programmes can be beneficial than not attending any programme (Rao et al., 2012), there is also evidence that poor quality programmes can hamper development (Sylva et al., 2011; Sylva & Wiltshire, 1993). Therefore, the benefits of ECE on children's early development in LMICs is not taken for granted.

While quality is an important aspect to consider when understanding the impact of the classroom on children's development, structural constraints, cultural beliefs about education, and contextual realities shape both the provision and the conceptualisation of quality (Yoshikawa et al., 2018). Traditional conceptualisations of 'high quality' practice have been established through the lens of high-income western countries and may be less valid predictors of children's development, if at all, in LMICs (S. Chen & Wolf, 2021; Jukes et al., 2018). This is primarily due to two reasons – firstly, 'high quality' practice often involves personalised learning and small group interactions, which is not a feasible policy option in most LMICs due to teacher shortages, limited funding, and high student enrolment rates (UNESCO, 2020). Secondly, there are significant cultural differences between western and LMICs, which have impacted how ECE programmes are designed. For example, while programmes in western HICs promote child independence, programmes in LMICs instead emphasise obedience and social responsibility, in line with the countries' cultural values (S. Chen & Wolf, 2018). Therefore, it is crucial to assess whether established associations between ECE quality and child outcomes apply within LMIC contexts and how findings diverge from those in high-resource settings, which may reflect alternative conceptualisations of quality that better capture the realities of LMIC classrooms. Ultimately, this would allow for a more contextually grounded understanding of what constitutes 'high-quality' ECE in diverse settings and inform policies and interventions that support child development in a locally-grounded way.

How is Quality Associated with Children's Development

Structural Indicators. Empirical studies suggest that teachers with higher *levels of education* and *ECE training* tend to exhibit more responsive, emotionally supportive, and developmentally appropriate teaching practices, which is in turn related to better child outcomes (NICHD Early Child Care Research Network, 2002). Literature from non-Western countries is in line with this. For example, Wolf et al., (2018) found that teachers' qualifications and training in ECE predicted how well teachers supported students' ideas and problem-solving. A study conducted in Pakistan found similar findings of teachers' qualifications having an impact on the performance of ECE schools (Bhutta et al., 2019). However, a meta-analysis of studies examining the direct association between teacher's education and children's outcomes found that while some datasets showed small positive effects of higher teacher education, having a bachelor's degree was not a strong or reliable predictor of better child outcomes (Early et al., 2007). Indeed, most of the evidence of the benefits of teacher education and training has been in the form of indirect associations, with teacher education predicting aspects of classroom or instructional quality, which then predicts child outcomes (M. Burchinal et al., 2002; Pianta et al., 2005; Sylva et al., 2004).

Another key structural indicator is the *child-to-teacher ratio*. Lower ratios are associated with more individualised attention, reduced teacher stress, and higher-quality interactions, all of which contribute to better child outcomes (NICHD Early Child Care Research Network, 2002; Slot et al., 2018). In contrast, high child-to-teacher ratios have been linked to increased teacher workload and stress, leading to less responsive and nurturing interactions (M. Burchinal et al., 2010). Similarly, classroom size plays a role in shaping children's engagement and peer interactions, with smaller class sizes generally providing more opportunities for positive teacher-child and peer relationships (Slot, 2018). However, these associations have not always been reported by studies in the West (e.g., Mashburn, 2008; Sylva et al., 2004), with more

contradictory evidence coming from non-Western countries that report no association between class size or ratios with children's outcomes (Aboud, 2006; Brinkman et al., 2017; S. Wolf et al., 2018). Moreover, some non-western countries like Japan choose to maintain large student-teacher ratios as they believe it supports collaborative learning structures, strong teacher authority, and well-established classroom routines (Burke, 2013; C. C. Lewis, 1995). Similarly, research in China suggests that large class sizes do not negatively impact student outcomes because of a strong culture of peer learning and structured whole-class engagement (Zhao & Akiba, 2009).

Findings on the impact of *number of hours* children spend in preschool on their developmental outcomes have been mixed. In high-income countries, studies have found that full-day preschool can enhance early literacy and numeracy skills, particularly for children from disadvantaged backgrounds (Reynolds et al., 2014). However, beyond 30–35 hours per week, additional hours show diminishing returns and, in some cases, are linked to increased externalising behaviours (McCartney et al., 2010; Zachrisson et al., 2013). In LMICs, evidence is mixed; studies from India, Chile, and Uruguay suggest that longer preschool hours can yield meaningful cognitive and language gains (Kaul et al., 2015; Berlinski et al., 2008). However, research from Ethiopia and Bangladesh suggest that longer hours do not necessarily translate to better outcomes (Wolf et al., 2019; Aboud, 2006). It is possible that longer preschool hours provide critical learning opportunities for children from LMICs, but the benefits are contingent on classroom quality (Berlinski et al., 2008; Yoshikawa et al., 2018). Importantly, however, findings from LMICs do not report adverse effects of longer preschool hours on children's development.

Overall, structural indicators such as teacher qualifications, child-to-teacher ratios, class size, and preschool hours of operation play an important role in shaping the classroom environment and children's developmental outcomes, but their impact is highly context-dependent with findings varying across different contexts, necessitating research in Pakistan.

Process Quality. Research investigating process quality and children's outcomes in LMICs has been growing over the past few years, with a specific focus on child-centred, stimulating learning environments. For example, using the Indonesian (Brinkman et al., 2017), Chinese (Li et al., 2014), and Tamil Nadu (Rao, 2010) versions of the ECERS, researchers have found that the global classroom quality in ECE classrooms significantly predicts pre-schoolers' academic and social-emotional outcomes. This is in line with findings from a systematic review, utilising studies predominantly from Western HICs, which found small but significant associations between the ECERS and children's outcomes (Brunsek et al., 2017). Herrera et al. (2005) also found that classroom quality was strongly related to Chilean children's vocabulary, social development, and adaptive behaviour, with this association persisting three years later.

In addition to global classroom quality, specific indicators of process quality have also been examined, with high-quality *teacher-child interactions* being one of the most important and frequently studied indicators (Melhuish et al., 2015). Emotionally supportive interactions involve caregivers who are warm and affectionate creating a secure environment that fosters trust and confidence (Curby et al., 2009; B. K. Hamre & Pianta, 2001). This is in line with attachment theory which suggests that such interactions make children feel safe and secure, therefore putting them in a better position to learn (Harlow, 2021). Moreover, responsive and sensitive interactions that are attuned to children's needs are also linked to children's academic and social-emotional skills (M. Burchinal et al., 2008). In contrast, harsh or critical interactions, where teachers use punitive discipline, display impatience, or negativity, can increase children's stress responses and hinder their emotional and cognitive development (Obradović et al., 2010; Phillips et al., 2022). Similarly, detached or disengaged caregiving, where adults show little interest in children's activities or limit meaningful engagement, can lead to lower motivation, weaker relationships with teachers, and reduced learning outcomes (B. K. Hamre & Pianta, 2005).

Moreover, high quality teacher-child interactions are even more important for children's social-emotional development as they provide teachers with the opportunity to model the social-emotional skills, including emotion- and self-regulation, collaborative problem-solving, and relationship skills (Jennings & Greenberg, 2009). The relationship between warm and responsive teacher-child interactions and positive developmental outcomes has been strengthened by longitudinal research (NICHD, 2006; Vandell et al., 2010) and experimental studies that aimed to improve teacher-child interactions and found that this in turn improved child outcomes (Rudasill et al., 2020).

Teacher-child interactions have been found to predict child outcomes including cognitive and pre-academic skills in LMICs such Chile and Ecuador (Araujo et al., 2016; Leyva et al., 2015). Similar findings have been reported with a Chinese sample (Li et al., 2016), using the Chinese ECERS (CECRS) (Li et al., 2014) and with a Colombian sample (Betancur et al., 2021). However, Aboud's (2006) study in Bangladesh offers partial support of these findings. The study found that students' interactions did not significantly predict children's vocabulary, but they predicted children's reasoning and school readiness. Raikes et al.'s (2020) findings further contradict the previous two. They found student-teacher interactions did not relate to any developmental outcome in the sub-Saharan African regions. One reason for this may be the different measures used to investigate process quality – Betancur et al. (2021) and Aboud (2006) employed a subscale of ECERS-R which has student-teacher interactions subsumed within the broader category of interactions that also include peer-to-peer interactions. On the other hand, Raikes et al. (2020) employed the Classroom Assessment Scoring System (CLASS) (Pianta et al., 2008) which has three domains, and student-teacher interactions are subsumed within the emotional climate domain. These inconsistencies in categorisation may capture different aspects of interactions, leading to differences in findings. Additionally, very few studies examine the association between social-emotional skills and specific student-teacher

interactions in LMICs. One exception to this is Acar et al. (2019), who found that student-teacher closeness is significantly associated with Turkish children's self-regulation.

The importance of warm and positive teacher-child interactions may be even greater in LMICs, where children often face higher levels of adversity, including economic hardship, food insecurity, and limited access to high-quality early learning experiences (Britto et al., 2017). Indeed, in resource-constrained contexts, where children may have fewer opportunities for structured learning at home, positive teacher-child interactions can be particularly influential in promoting both social-emotional and cognitive development by providing children with a sense of emotional stability and encouragement to engage in learning (Morris et al., 2013). Alternatively, it could be argued that teacher-child relationships are traditionally more hierarchical in LMICs and collectivist cultures, with greater emphasis on respect and discipline (Tobin et al., 2009). Consequently, it is possible that these interactions do not have a strong impact on children's development. Nonetheless, given the strong theoretical foundation for this indicator, it is important to investigate how teacher-child interactions may impact Pakistani children's development.

In addition to teachers' relationship with children, the instructional *practices* they employ are also of importance to children's development. Research consistently shows that when teachers provide rich language input, open-ended questioning, and opportunities for problem-solving, children demonstrate higher gains in language, literacy, and numeracy skills (Clements & Sarama, 2014; Justice et al., 2008). Conversely, overly didactic, rote-based, or unstructured approaches can limit children's ability to develop higher-order thinking skills. Teaching practices have also been shown to relate to children's development in some LMICs. McCoy and Wolf (2018) found that teachers' instructional practices were the strongest predictor of gains in Ghanian children's academic and social-emotional skills. Similarly, Li et al. (2014) found

moderate correlations between teachers' language and reasoning practices and children's language, numeracy, and social outcomes.

Process quality in early childhood education also encompasses the classroom's physical environment, daily structure, and types of activities children engage in. A well-designed physical environment – adequate space, age-appropriate furniture, access to play areas, and stimulating materials – supports cognitive, social-emotional, and physical development (Inan, 2009), aligning with Piaget's theory that learning requires an enabling environment. While some studies find no link between physical space and children's skills (Mashburn, 2008), Berti et al.'s (2019) review suggests otherwise, with mixed findings in LMICs (Aboud, 2006; Betancur et al., 2021; Li et al., 2016; Su et al., 2021). Predictably, well-structured daily routines with minimal disruptions reduce stress and support self-regulation (Rimm-Kaufman et al., 2009), and structured instruction – particularly small-group learning – has been linked to cognitive and literacy gains (Camilli et al., 2010; Piasta & Wagner, 2010; Roberts & Neal, 2004). Additionally, activities like art, block play, and dramatic play foster emotional expression, motor coordination, spatial reasoning, and social skills (Eisner, 2002; Singer & Singer, 2013; Wolfgang et al., 2001). However, such activities remain underutilised in LMICs due to resource constraints and didactic teaching, raising the question of their relevance and impact on Pakistani children's development.

Taken together, there is much heterogeneity in research on the associations between characteristics of quality and child outcomes in LMICs. However, there is a need to explore the relationships between the indicators of structural and process quality and children's development in LMICs, especially Pakistan. Doing so will bring the field closer towards defining and operationalising quality in a meaningful and culturally sensitive way, while also identifying potential avenues of change to improve children's social-emotional development.

Quality of ECE in Pakistan

Early childhood education in Pakistan has undergone gradual policy development, with growing recognition of its role in improving children's developmental outcomes. Historically, formal ECE was limited to private institutions, with minimal state intervention. However, over the past two decades, the government has made efforts to integrate ECE into national education policies. The 2009 National Education Policy (Ministry of Education, Government of Pakistan, 2009) formally acknowledged the need to expand access to early education, and the National Education Policy 2017 further reinforced this commitment, emphasising play-based learning, teacher training, and structured curricula (Ministry of Education, Government of Pakistan, 2017). Additionally, Pakistan's commitment to Sustainable Development Goal (SDG) 4.2 underscores the objective of ensuring universal access to high-quality early childhood education by 2030 (UNESCO, 2020).

Despite there being a general increase in school enrolment and completion rates in Pakistan, it is still behind other South Asian countries in expanding education (Barón et al., 2024). Moreover, there are significant disparities between urban and rural areas, with the later having lower enrolment rates (38%), compared to urban areas (47%) (ASER & ITA, 2022). Among the four provinces, Sindh and Balochistan have the lowest enrolment rates at 30% (Barón et al., 2024). In terms of children's skills, 77% of children have been deemed to have poor foundational skills by the age of 10 (World Bank, 2022a), painting a dire picture for the state of young children's development, while also emphasising the need for quality ECE.

Education in Pakistan is managed at the provincial rather than federal level, leading to variations in policies and implementation across regions. Sindh, where the current research is based, has introduced notable reforms in ECE. The province's Early Childhood Care and Education Policy (School Education & Literacy Department, 2024) emphasises child-centred learning, teacher capacity-building, and improved access to early education. The Sindh

Education Sector Plan (2019–2023) further prioritises expanding ECE provision in public schools, which serve around four million children, integrating it into the broader education system. However, despite this advancement in policy, very little public funding is allocated to the education sector in Pakistan, with ECE getting the smallest percentage of it (Barón et al., 2024). Consequently, challenges such as limited resources, inadequate infrastructure, and teacher shortages continue to hinder effective implementation (School Education & Literacy Department, 2020).

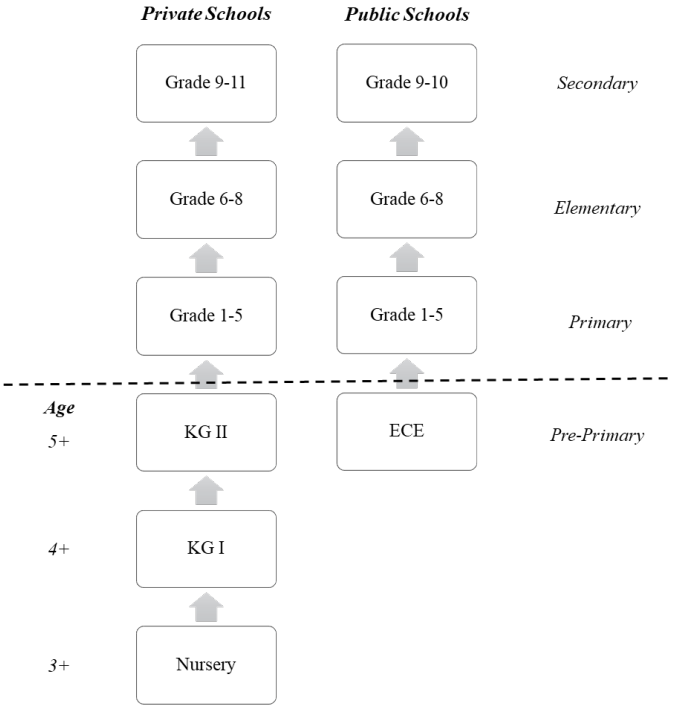
In contrast, private schools – comprising both elite institutions and low-cost providers – offer more structured ECE programs, typically spanning three years, although quality varies due to a lack of regulation (Bhutta et al., 2019). Non-governmental organisations (NGOs) also play a significant role, particularly in underserved rural areas, helping bridge gaps in access and potentially quality (Rizwan et al., 2022; World Bank, 2018). While public and private schools have roughly equal enrolment shares (44.3% of enrolled children attend private schools; Rizwan et al., 2022), ECE remains predominantly provided by the private sector. Public schools traditionally offer only a single pre-primary year, known as "*katchi*," for children aged 3 to 5, whereas private institutions provide up to a three-year ECE program, as shown in Figure 3.

Beyond limited access and enrolment, the quality of ECE in Pakistan remains a significant concern, particularly in public schools. Many educators lack specialised training in ECE, resulting in the use of outdated pedagogies and classrooms that do not meet children's developmental needs (Hunzai, 2006; Hussain & Sultan, 2010; M. A. Khan, 2018). A large-scale study in the province of South Punjab assessed 1,395 classrooms and found that the physical environment and learning materials were inadequate for fostering effective early learning experiences (Seiden et al., 2024). Similarly, a process evaluation of ECE implementation in Punjab identified poor teacher training, insufficient resources, and weak community engagement as key barriers to effective ECE delivery. In terms of structural indicators, reports

from Sindh public schools indicate that 35% of teachers hold a Bachelor's and 27% a Master's, while only 1% are trained specifically in ECE (School Education & Literacy Department, 2020).

Figure 3

Pakistani School System



Note. This is the depiction of the general system adopted by private and public schools in Pakistan, however there is still variation in the breakdown of these classes. The pre-primary years have been broken down to provide additional details. Public schools only offer one year of ECE, whereas private schools offer between one to three. Names for these classes vary between sectors and schools.

While the private sector has been considered to provide better quality education, their standards vary widely due to the lack of regulatory oversight (Rizwan et al., 2022). Approximately 50% of teachers in non-elite private schools lack professional qualifications, and the average student-teacher ratio is around 1:30 (Lynd, 2007). Elite private schools however are considered to provide quality ECE, with a 1:12 student-teacher ratio on average (International Crisis Group, 2014) and maintained classroom facilities and resources. Although the number of children enrolled in elite and not-for-profit private schools is unknown, the non-elite private

schools in themselves cater to four million pre-schoolers (Khan, 2018). Despite these large numbers of children, the private sector has no system of accountability or standardisation, therefore resulting in much variation in quality even within the different sectors (Pardhan, 2012; Wasi et al., 2018).

Research assessing the process quality of ECE in Pakistan suggests that teaching remains predominantly didactic, with limited focus on children's holistic development beyond academic skills (Ahmad, 2011; Khan, 2018; Khan et al., 2017). Bhutta et al. (2019) found that, in Punjab's public schools, teachers' qualifications and availability of facilities were the most important factors affecting parents' satisfaction, which they used as a proxy for preschool quality (Bhutta et al., 2019). However, the study did not measure any child outcomes, and instead focused on parents' self-reported satisfaction, which is not an objective, or arguably valid, metric of quality. Another study based in the same province of Punjab found that lack of training, facilities, mentoring, and awareness were all related to the efficacy of ECE (Nawaz et al., 2021). However, this study also employed a questionnaire and used that to measure teachers' perceived levels of ECE efficacy and students' performance, which would be subject to reporting bias. Another limitation of this study was that they only focused on very few characteristics of quality using a self-designed questionnaire that was not adapted from a previously well-established tool and had not been validated itself.

Findings from Sindh align with these broader national trends. Chachar and Almani (2022) report that public ECE classrooms in Sindh are of poor quality, with inadequate learning environments and untrained teachers, indicating low levels of both process and structural quality. However, most of this research and statistics have been based on public schools in rural areas, with minimal investigation into urban or private schools, which, as previously discussed, make up a large percentage of ECE classrooms in Pakistan (Khan, 2018; Wasi et al., 2018). Given the significant variability in ECE provision across public, private, and NGO-led schools, it

is crucial to systematically assess what quality looks like within each type of setting. Understanding how structural and process indicators interact can provide deeper insights into the mechanisms shaping early learning experiences. In particular, examining how aspects of ECE quality – including structural indicators, classroom, environmental factors and student-teacher interactions – predict children's academic and social-emotional outcomes will help identify key levers for improvement.

The Citizens Foundation's Early Childhood Education Model

The Citizens Foundation (TCF) is a non-profit organisation that operates one of the largest networks of independently run schools in Pakistan, serving children from underserved communities (Noman, 2023). Within its education system, TCF has developed a structured ECE curriculum that is grounded in principles of play-based, developmentally appropriate pedagogy. The programme aims to foster foundational cognitive, social-emotional, and language skills among children in low-income communities in Pakistan (TCF, 2021). Central to the model is a deliberate shift away from rote memorisation towards experiential learning, reflecting international best practices in early years education.

The TCF early years model is built on the premise that young children learn most effectively through interaction, exploration, and meaningful engagement with their environment (TCF, 2021). Learning is structured around play-based methodologies that are designed to promote agency, curiosity, and self-regulation. Daily activities are intentionally crafted to develop skills such as collaboration, problem-solving, and oral language through a balance of structured and open-ended tasks. These include story time, guided free play, imaginative role play, and hands-on exploration of materials. The emphasis on emotional safety and positive classroom relationships further supports children's social development and readiness to learn.

Language and literacy development is supported through the use of culturally relevant learning materials, including a curated set of over 150 Urdu storybooks created specifically for

the programme. These storybooks are contextually grounded in children's everyday realities and are designed to promote both language development and personal identification with the content. The integration of these locally relevant resources enhances engagement, vocabulary acquisition, and emergent literacy. The curriculum is designed to support the development of 21st-century competencies, such as creativity, critical thinking, and adaptability, in recognition of the increasingly complex demands of the modern world. Rather than prioritising early academic attainment in isolation, the model places equal value on the development of non-academic domains essential for lifelong learning and wellbeing. In addition to a strong curriculum, TCF also operates with high institutional oversight and rigorous teacher training and regular monitoring (Lall, 2009).

Investigating how children in TCF classrooms develop cognitively and socio-emotionally offers valuable insights into whether such a curriculum, rooted in experiential learning and cultural relevance, can effectively support holistic development in Pakistani children. Evaluating this model allows for a deeper understanding of how international best practices in early education translate within local systems, and whether they contribute meaningfully to improving children's readiness for school and long-term learning trajectories.

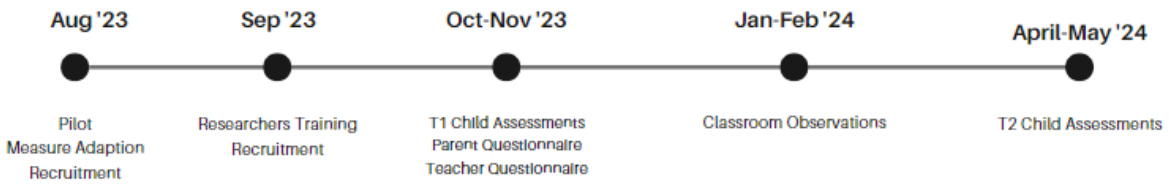
Chapter 3: Methodology

Design

This study employed a longitudinal design in which 4- to 6-year-old children's academic and social-emotional skills were measured at two timepoints, 6 months apart, and the indicators of classrooms' process and structural quality were measured halfway through i.e., three months after the first timepoint, as shown in Figure 4. Information on children's demographic characteristics, including their age, gender, and home learning environment, were collected to understand their social-emotional skills at the first timepoint, and to control as covariates in additional analysis.

Figure 4

Timeline of Research Activities



Employing a longitudinal design offers multiple benefits for exploring the complex relationships between children's social-emotional and academic development, as well as their associations with aspects of the structural quality and process quality of the classroom as measured by the ECERS-R and the CIS. Unlike intervention studies, that focus on short-term effects of a programme and may not generalise well to natural settings, longitudinal research captures the natural progression of development (Duncan et al., 2014), which is needed as no such studies have been undertaken for Pakistani children. Although causality cannot be established without manipulating variables, measuring children's skills at two time points

provides more confidence in the relation between variables. Moreover, measuring variables at different points allows for the analysis of how early social-emotional skills influence later academic outcomes, which is critical for understanding the long-term impacts of early social-emotional skills (Schafer & Graham, 2002). Most importantly, a longitudinal design mitigates the confounding effects of individual differences that often plague cross-sectional studies, as it controls for unobserved heterogeneity by examining within-person variation over time (Fitzmaurice et al., 2012). This is essential in providing us with an unbiased understanding of the factors impacting children's development.

Ethical Considerations

A Fieldwork Safety and Risk Assessment was completed before the study to ensure researcher safety. Ethical approval was obtained through the University of Oxford's Central University Research Ethics Committee (CUREC) (Ref no.: EDUC_C1A_23_247). The full research ethics application was also shared with the Directorate of Sindh Education and the TCF Board, who approved the project. No additional local ethics application was necessary (see Appendix A).

Participation was entirely voluntary, and all participants were informed of their rights and privacy protection regulations during recruitment and prior to taking consent. Children, parents, and teachers were reminded they can withdraw from the study at any point before the end of the task and/or observation and their data would be removed. Fieldworkers were trained to be alert to verbal and non-verbal signs of a child's wish to withdraw from the study and were instructed to terminate the assessment immediately if a child became distressed. Throughout the child assessments, a staff member was close by and able to monitor if the children showed signs of discomfort or distress. Parents were also informed that they may reach out to researchers or teachers to inform them that they would like to withdraw their child. After data collection, teachers and parents had 20 days to withdraw data by contacting the researchers.

Prior to data collection, the primary researcher visited participating schools and briefed principals and teachers on the research study's aim, data collection procedures, and participant rights. Subsequently, principals, teachers, and parents received detailed information that outlined the research information, researchers' responsibility, and participants' rights. Teachers were assured no information would be shared with other staff or the school management. All participants acknowledged their right to withdraw from the study at any time and were informed that all data would be pseudonymised. All fieldworkers were trained according to the CUREC guidelines and signed a confidentiality agreement at the start of the project.

Data were gathered using traditional, paper-based methods, and fieldworkers were instructed to input the data online to surveys set up on Qualtrics within 3 days of collection. Only the researcher (myself) had access to the data on Qualtrics. After data collection, the data were pseudo-anonymised, all identifiers were removed from research data and an ID was assigned to each child and school. Only the researcher and supervisors have access to the document linking ID and personal information, which will be destroyed three years after submitting the DPhil. The pseudo-anonymised data are secured safely on Oxford's Nexus OneDrive. All physical research materials, including completed questionnaires and child assessment, are securely stored in a locked cabinet. Paper records will be destroyed at the end of the DPhil. Access to the pseudo-anonymised data is limited to the researcher and the supervisors at the moment, but this will be made publicly available after the end of the DPhil.

Power Calculations for Sample Size

The required sample size was determined using guidance for multi-level modelling and structural equation modelling as they were the main analyses to be conducted. There are no clear recommendations for sample sizes in studies using structural equation modelling with the initial suggestion of having around 5-10 cases per free parameter being disregarded by contemporary researchers (e.g., E. J. Wolf et al., 2013). E. J. Wolf et al. (2013) argue that there

is no one number that will work for every model, and the sample size depends on the complexity of the model. Additionally, for multi-level modelling, Hox (2013) recommends having a sample of 60 at the higher level, highlighting that even a sample size of 20 would be sufficient if main interest is in regression coefficients.

In addition to these recommendations, a power analysis for the main classroom-level predictor variable, student-teacher interactions, was conducted. Given that child outcomes were out main dependent variables of focus, correlation coefficients and effect sizes to child outcomes from previous related work were used. This included Burchinal et al. (2008), who found that the ECERS Interactions subscale had a .19 correlation with children's language skills, .09 with maths skills, and .09 with social competence. (Howes et al., 2008) found that teachers' self-reported closeness with their students also had similar associations with children's language (0.16), maths (-0.05), and social competence (0.20). Arajua et al. (2016) found similar associations between the CLASS scores and children's maths (0.18) and language skills (0.14). Li et al.'s (2016) study that used the Chinese version of the ECERS also found small effect sizes for associations between the Interactions subscale and children's language (0.15), maths (0.16) and social skills (0.13). Given that Li et al. (2016) had provided the regression coefficients, standardised error, and effect size, results from this study were used to run power analysis. G*Power's linear multiple regression function was used, which found that a sample size of 414 is required to detect a 0.13 effect with a .05 alpha level and .80 power.

Keeping in mind the multilevel nature of the data, the multiple variables, power analysis, and attrition, we aimed to recruit approximately 500 four- to six-year-olds from 60 pre-schools in Karachi, an urban city in the Sindh province of Pakistan (~8 students per class). As Karachi has seven districts, we aimed to have 7-8 schools per district in the sample. Given that there is approximately equal enrolment in privately- and publicly funded schools in Pakistan (44% in private schools; Pakistan Institute of Education, 2024; Rizwan et al., 2022), the aim was to recruit an equal number of both school types to ensure a representative sample as well as a

representation of the variation in ECE quality. Moreover, Pakistan also has non-profit schools that aim to provide low-cost education to those belonging to low-income families (Saud & Ashfaq, 2022). Given the growing number of non-profit schools, we also planned to include them in the sample. Therefore, the aim was to recruit 3 public, 3 private, and 1-2 non-profit schools from each district. Information on the characteristics of the different types of schools can be found in Appendix B.

Recruitment

Recruitment for public schools was conducted by reaching out to the Directorate of Sindh Education, Karachi Region. After receiving permission to conduct the research in schools, a database of schools in Sindh, the Sindh Education Management Information System (SEMIS), was used to randomly select four schools from each district. This list was then passed to the Directorate who assisted with liaising with the school principals. Inclusion criteria for all schools included: (1) their teachers being willing to commit to the duration of the study, and (2) no involvement in any other research project. Inclusion criteria for the children included (1) having no special needs, (2) speaking Urdu or English as their first language, and (3) being between 45 and 80 months.

For private schools, schools in the areas neighbouring the public schools were approached via. calls and emails. If they were interested, additional information, including an invitation letter (Appendix C), ethical approval (Appendix A), parent and teacher information (Appendix D), and consent sheets (Appendix E) were sent. Approximately 15% of the invited private schools agreed to participate. Some private schools (N = 3) were recruited through personal contacts due to insufficient number of private schools agreeing to participate. For non-profit schools, The Citizen's Foundation (TCF), an organisation that has built around 2,000 charity schools across the country, was approached through a contact. After approval was

obtained from the organisation, a district-wise list of their schools was requested, and 1-2 schools per district were randomly selected.

Participants

In total, there were 52 schools, with one preschool classroom per school, in the initial sample in October and January timepoints. A school-type and district-wise breakdown of schools is shown in Table 1. Seven schools dropped out in the April timepoint, which left 45 schools at the second timepoint. There were multiple reasons for attrition: three of the schools ended the ECE classes early for the year, two of the schools were unreachable, one school was a centre for national exams and did not have capacity to accommodate us, and one school had a new head who no longer wished to participate. A breakdown of schools by school-type from the two timepoints is shown in Table 2. Three of the schools from the West district dropped out, 2 from the Central district, 1 from the East district, and 1 from the Malir District. There were no dropouts from the South, Korangi and Keamari districts.

Table 1

Sample Schools by Provision

District	Public	Private	Non-Profit	Total
Malir	3	2	2	7
Korangi	3	2	2	7
Keamari	3	3	1	7
South	4	4	1	9
East	3	3	1	7
West	4	2	2	8
Central	4	2	1	7
	24	18	10	52

Table 2
School Provision Type Across Two Timepoints

School Type	T1 No. of Schools	T2 No. of Schools	Dropouts
Public	24	20*	4
Private	18	15	3
Non-Profit	10	10	0
	52	45*	7

The sample in October (T1) included 607 children M_{age}= 59 months, SD_{age} = 8.5, 51% female, with an average of 11.4 per school (*SD* = 2.8). Majority of the children were monolingual Urdu speakers (63.1%), with the rest being bilingual or multilingual. The additional languages that children spoke included English, Sindhi, Pashto, and Balochi. The remaining sample in April included 453 number of children, M_{age}= 60 months, SD_{age} = 8.2, 55% female. Compared to those who remained in both the timepoints, children who dropped out in the second timepoint were younger (M_{T1} = 58.34, M_{T1+2} = 60.04, p = .014), had more males (M_{T1} = 53.3%, M_{T1+2} = 44.3%, p = .048), and scored lower on the IDELA (M_{T1} = 0.39, M_{T1+2} = 0.46, p < .001) and AKT (M_{T1} = 0.52, M_{T1+2} = 0.61, p < .001). However, they did not differ in terms of maternal education, number of siblings, languages spoken, and the HLE (p > .05). Most of the student attrition was due to the schools dropping out; however, some student attrition was due to children being absent on the day of the second visit.

In addition to children, the sample also included 80 teachers, M_{age}= 33.7 years, SD_{age} = 11.0, 100% female, 27.5% monolingual. Majority of the schools had one teacher (65.4%), one school had three teachers, and the remaining had two teachers. From the 80, by January, 8 teachers had left the school and 7 teachers were new. This is unsurprising given the high teacher mobility and turnover in Pakistan (N. Siddiqui & Shaukat, 2021). Details for how teacher data was processed for these classrooms can be found in the *Data Cleaning and Preparation* section.

Measures

Table 3 indicates the measures used to operationalise different variables, which will be detailed in the forthcoming sections.

Table 3

Summary of Measures and Corresponding Variables

Measure	Variables in Analyses	Domain
Parent Demographic Questionnaire	Children's age, gender, maternal and paternal education, maternal and paternal age, bilingualism, household size, siblings, and HLE Index	Child and Family Demographics
IDELA	Children's T1 and T2 pre-numeracy, pre-literacy, and social skills	Child Outcomes
AKT	Children's T1 and T2 emotion knowledge scores	Child Outcomes
Teacher & School Questionnaire	Teachers' age, gender, highest level of education, ECE training, years of experience, and languages spoken and school type, student-teacher ratios, number of students and hours of operation	Teacher Demographics, School Characteristics, Structural Indicators
ECERS-R	ECERS-R Total Score	Global Process Quality
CIS	CIS score	Teacher-Child Relationship

Family Demographics

Children's age, gender, maternal and paternal education, maternal and paternal age, number of languages spoken, household size, and number of siblings was collected using a parent questionnaire (Appendix F). Parental education was assessed through these categories: none/not completed primary, completed primary (5 years of formal schooling), secondary (8

years of formal schooling), O Levels/Metric (11 years of formal schooling), A Levels/Inter (13 years of formal schooling), Undergraduate, Masters, Doctorate, Don't Know, Other.

The questionnaire also contained five questions on the home learning environment (HLE), based on a measure used in the Effective Pre-school, Primary and Secondary Education Project (EPPSE) conducted in England (Melhuish et al., 2008). The EPPSE measure assessed the frequency of specific activities involving the child and parents, which included teaching the child the alphabets, playing with letters and numbers, taking the child to the library, reading to the child, teaching the child songs or nursery rhymes, etc. Frequency of activities was initially coded on an 8-point scale (0 = not at all; 1 = Occasionally or less than once a week, 2 = Once a week, 3 = Twice a week, 4 = 3 or 4 times a week, 5 = 5 or 6 times a week, 6 = 7 times a week / once a day, 7 = More than once a day). After piloting the measure for the present study, some items were removed or modified. Specifically, the item about taking children to the library was removed as this is not something that is common in Pakistan. Additionally, the item regarding number and/or letter activities was removed as this was covered in two separate questions that followed. A question regarding songs, poems, and nursery rhymes was replaced with a question about oral storytelling as the original had floor effects and storytelling is a more culturally relevant activity that was brought up by parents during the pilot. Lastly, the response categories were collapsed to have a 4-point response scale (0 = not at all, 1 = once a week, 2 = several times a week, 3 = almost every day) as the original 8-point scale was found to be difficult to administer. A composite HLE score was calculated by averaging ratings across the five items, therefore each child would have an HLE score between 0 to 3. The internal reliability of this scale was sufficient in the present study ($\alpha = .74$).

In addition to the HLE questions, we also enquired about the number of books at home, if any. The questionnaire ended with two brief questions on disability ("Do you suspect or know that the child has any disabilities?" and "If so, what type?") to ensure that children met the inclusion criteria.

Child Outcomes

IDELA. The International Development and Early Learning Assessment (IDELA; Pisani et al., 2018) is a direct child assessment designed by Save the Children that assesses 3.5- to 6-year-old children's holistic school readiness. In the present work it was used as a measure of children's *pre-literacy, pre-numeracy,* and *social skills*. The assessment also consists of a section on motor skill development; however, it was not used as that was not a focus of the present work. The IDELA was chosen as it was specifically designed for LMICs like Pakistan and its items and scoring criteria was normed for non-Western LMICs (Pisani et al., 2018). While there has been an increase in measures aiming to understand early childhood development in LMICs, they are not without criticisms. For example, The Early Childhood Development Index (ECDI), created by UNICEF (McCoy et al., 2016), aims to capture general information about literacy, numeracy, social-emotional, and physical development for 3–4 year olds; however this is a parent-reported assessment and thus it does not offer the same detailed and objective data that a direct assessment would. Moreover, this measure targets younger children; whereas the present study required an assessment that catered to a wider age range, given the broad age range of children that can be found in Pakistan's ECE classrooms.

Similar limitations are also found in other popular measures of early childhood that are being adapted to non-Western contexts, such as the Early Development Instrument (EDI; Janus & Offord, 2007), which is a teacher-reported assessment. Teacher-reported data is also subject to low reliability, especially in countries like Pakistan, where the student-teacher ratios are higher preventing teachers from having a strong understanding of each student's development. Moreover, it is uncommon for teachers in Pakistan to provide holistic assessments of children, given the main measure of progress even in early childhood is academic assessment (M. Ahmad, 2011b; Iqbal et al., 2021; M. A. Khan, 2018). Therefore, there were likely to be challenges around getting valid data on children's social-emotional skills. Moreover, such data

may also be susceptible to a social desirability bias with teachers enhancing their students' performance to individuals affiliated with foreign institutions.

The most promising option for child assessments for this study, besides the IDELA, was the Measuring Early Learning Quality and Outcomes (MELQO; UNESCO et al., 2017). The tool has three different components: a parent-report, a teacher-report, and a direct assessment that assess four domains: executive function, social-emotional skills, pre-numeracy, and pre-literacy. Similar to the IDELA, the tool has been designed specifically for LMIC and non-Western contexts; however, the tool is in its early stages of development. Validity and reliability studies were limited (Gomez et al., 2022), as well as its associations with children's outcomes in different countries had not yet been established, with a study also showing that scores are not comparable across countries (Raikes et al., 2019). On the contrary, the reliability of the IDELA has been established repeatedly. Pisani et al. (2018)'s study using samples from 12 countries found the measure having internal consistency of 0.86, inter-rater reliability of 0.93 to 0.97, and test-retest reliability of 0.79. Its convergent validity with another tool, the Ages and Stages Questionnaire (ASQ), was also established using a Bangladeshi sample (Pisani et al., 2018). Additional studies have also found good internal consistencies within the subdomains (Shavitt et al., 2022). Its measurement invariance has also been established across several countries (Halpin et al., 2019b; S. Wolf et al., 2017). More recent work has also established IDELA's predictive validity – Pisani et al. (2022) found that the Ghanian children's IDELA scores in ECE were predictive of their early primary school academic skills.

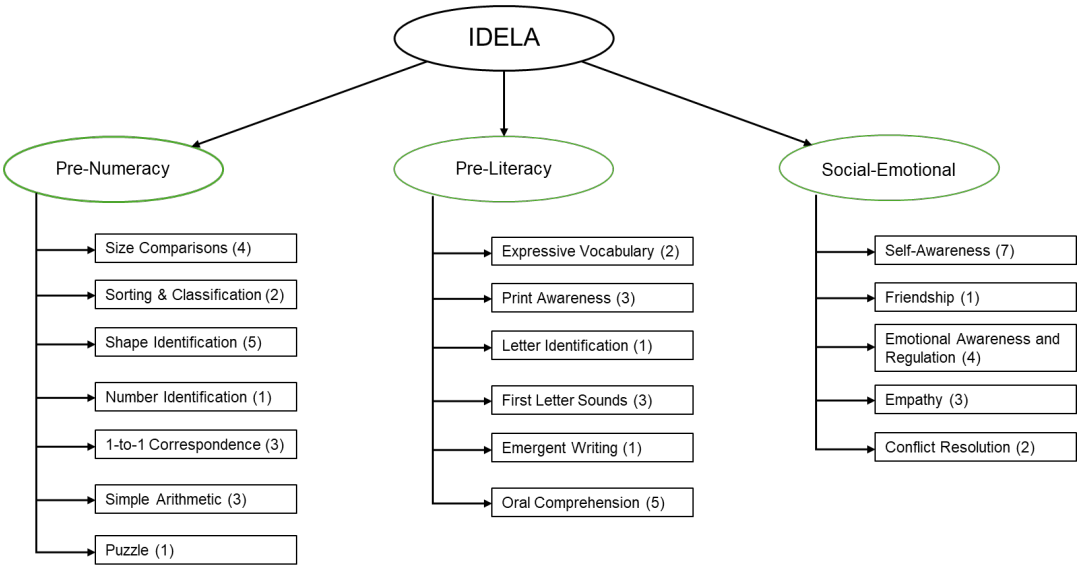
In addition to being validated across several LMIC contexts, the IDELA has also been used in Pakistan, including in a large-scale ECE intervention study in Pakistan (Yousafzai et al., 2018). As Pakistan was one of the 12 pilot countries for the IDELA, an Urdu translation of the assessment also existed on the IDELA. Lastly, the researcher was able to speak to individuals from Aga Khan University and Harvard University who had previously used the IDELA in Pakistan (Yousafzai et al., 2018) and engaged in detailed discussions about adaptions they

made, the problems they encountered and how they navigated those. Moreover, IDELA is an open-source instrument with extensive training materials for researchers and fieldworkers, which was especially important in the present study. Together, these factors contributed to the selection of IDELA as the measure of children's development for the current project. The pilot confirmed the IDELA's appropriateness for the study context. Minor adaptions were needed in the delivery of the assessment (e.g., simplifying the instructions by removing excessive and/or formal words), and these adaptions have been carried out in other contexts also (e.g., Wolf et al., 2021).

In terms of the tool itself, it contains 22 subtasks, which are made up of additional items, across four developmental domains: motor, literacy, numeracy and social-emotional. Since the present study did not include motor subtasks, there were 18 IDELA subtasks in the child assessment, as shown in Figure 5.

Figure 5

IDELA Domains and Subtasks



Note. The green ellipses indicate the three domains, while the boxes indicate the specific sub-tasks within each domain. Each subtask is composed of individual items, with the number of items shown in parentheses within the corresponding box.

Pre-numeracy. This domain consisted of seven subtasks. Each of the subtasks tapped into different skills: size comparison, sorting, shape identification, number identification, one-to-one correspondence, addition and subtraction, and puzzle completion. Most of the items were scored a 0 (incorrect) or correct (1), except the puzzle and number identification items. The former was scored on a 0-4 scale, depending on the number of puzzle pieces in the correct position and orientation. In the number identification item, children were showed numbers from 1 to 20 in a random order (see Figure 6), and the number of correct responses was recorded, therefore this task was scored on a 0-20 scale. The score for each subtask was initially calculated by averaging the scores on the items so that each subtask had a score between 0 to 1. After this, the subtask scores were averaged to get the domain score, which was also on a 0 to 1 scale.

Figure 6
Number Identification Item from IDELA

2	4	10	5	7
9	6	8	3	1
13	17	14	19	16
15	18	11	12	20

Pre-Literacy. This domain consisted of 6 literacy subtasks that assessed children's expressive vocabulary, print awareness, letter identification, first letter sounds, emergent writing, and oral comprehension. The expressive vocabulary subtask had two items, each of which were scored on a 0-10 scale, depending on the number of words the child spoke. The letter identification task involved 20 letters in a random order (see Figure 7), and the number of correct responses was recorded. Additionally, children were also required to write their names for the 'emergent writing' subtask, which was then scored on a 0-4 scale according to the

marking criteria. The remaining three items were scored a 0 or 1. Similar to pre-numeracy, the score for each subtask was initially calculated by averaging the scores on the items so that each subtask had a score between 0 to 1. After this, the subtask scores were averaged to get the domain score.

Figure 7

Letter Identification Item from IDELA

(a)

E	T	A	N	I
O	S	H	R	D
L	C	U	M	F
G	W	B	Y	P

(b)

ج	ن	ع	ت	ا
ر	ح	س	و	ڈ
ل	ص	ک	م	ف
گ	ر	ب	ی	پ

Note. (a) English letters, and (b) Urdu letters that were presented according to the language of assessment.

Social skills. The five subtasks in the social-emotional domain assess children's self-awareness, relationship skills, emotional awareness and regulation, empathy/perspective taking, and conflict resolution. Most items were scored a 0 or 1, except the relationship skills subtask in which children could name up to 10 friends they like to play with and were accordingly scored on a 0-10 scale. The subtask and domain scores were calculated in a similar way to pre-numeracy and pre-literacy and are on a 0 to 1 range. Although the domain in the IDELA manual is "Social-Emotional", in the present study it is used as a measure of social skills as there isn't sufficient focus on emotion competencies.

Internal consistency for the IDELA was calculated in both rounds of child assessments for the current study, as shown in Table 4. At both timepoints, internal consistency was good for pre-numeracy and pre-literacy; however, it was lower for social domain items (Cronbach's alpha = .64). Nonetheless, this is similar to the internal consistency for social items found in Pisani et

al. (2018)'s study (minimum Cronbach's alpha = .68), as well as a study with Ghanian preschoolers (McCoy & Wolf, 2018). It is not surprising that the internal consistency within the subdomains is not very high, as they measure related but distinct skills within each domain. Moreover, these tasks are meant to be of increasing difficulty, so children are not expected to perform uniformly across all subtasks within a domain. This is supported by the high internal consistency for the overall measure in the present study at both timepoints, as it indicates that the assessment reliably captures children's holistic developmental progress.

Table 4
Internal Consistency of IDELA Subscales

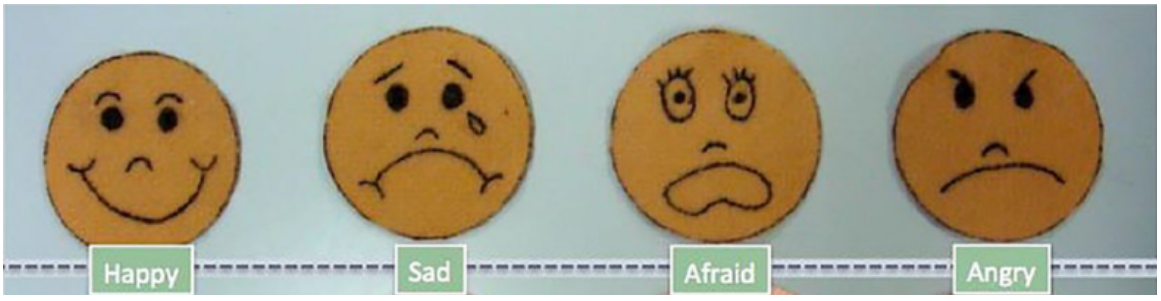
Scale	T1 Internal Consistency	T2 Internal Consistency
Pre-Numeracy	.78	.75
Pre-Literacy	.74	.73
Social	.64	.65
IDELA Total	.88	.87

Affect Knowledge Test. Children's *emotion knowledge* was assessed using the Affect Knowledge Test (AKT; Denham, 1998), a direct child assessment that investigates children's recognition and understanding of emotions. The AKT has four parts – in the first part, expressive emotion recognition, children are shown four emotion faces, angry, sad, happy, and scared (drawn on felt paper, see Figure 8) and are asked to label each of the emotions ("*How is he/she feeling?*"). In the receptive emotion recognition, the same faces are shuffled, and children are asked to point to a face that matches the label provided by the researcher ("*Point to the _____ face.*"). The order of faces and labels is standardised for all children. In the third part, the researchers act out brief scenarios using two puppets, the main character and a sibling. One puppet is a male and the other female. If the child was a girl, the main character would be female, and the sibling would be male, or vice versa if the child was a male. Using

these puppets, the researchers depict eight short scenarios, and the child is asked after each scenario to identify the main character's emotion ("*How is Nancy/John feeling?*"). Children could respond verbally with the emotion label or point to the four faces laid out in front of them.

In the fourth part, the researchers act out scenarios using puppets, but in this the character's emotional response is different from what the child would typically display in such a scenario. For example, the character is sad about coming to school, for a child who is usually quite happy to do so. The child's unlikely response is determined using a Parent or Teacher Questionnaire which asks the caregiver to assess how the child would typically respond to a number of situations. However, when the task was piloted with Pakistani parents, it was found that parents often left these questions blank or expressed uncertainty in their responses. Due to this, the fourth part of the AKT was dropped in the present study. Additionally, the characters' names were modified to Sara and Ahmed, and instead of using puppets, the researchers used dolls to depict the scenarios as these are more familiar to Pakistani children.

Figure 8
AKT Emotion Faces



Note. Figure has been taken from Watanabe et al. (2019)

Children's responses were scored on a scale of 0 to 2. A score of 2 was given when the child responds with the target emotion. A score of 1 was given if the child responds with an incorrect emotion, but one that is of the same valence as the target emotion (e.g., a response of

angry for a sad face). A score of 0 was given if the child responds with an incorrect emotion of the opposite valence (e.g., a response of happy for a sad face) or does not know the answer. The items within each part were averaged to get scores for the three parts, which were then averaged to get the total emotion knowledge score.

The two-structure model of AKT (emotion recognition consisting of the first two parts and situation knowledge consisting of the last 2 parts) has been replicated in different cultures (Bassett et al., 2012; Sette et al., 2015). Good internal consistency has also been established for both of the factors (Watanabe et al., 2019). The test has been shown to have good convergent validity with other measures of emotion knowledge, such as the Emotion Matching Task (Morgan et al., 2010). Scores on the AKT have been found to relate to children's age, verbal ability, academic success, and social competence (Bassett et al., 2012; Denham, Bassett, Way, et al., 2012), establishing the measure's criterion validity. The AKT has also been used in Pakistan (A. Siraj et al., 2021) and children's scores were shown to be significantly related to teachers' ratings of children's social competence. The internal consistency of the measure was 0.79, whereas the internal consistency of the first two parts was .66 and the second two parts was 0.73. In the present study, as shown in Table 5, the receptive emotion recognition had lower internal consistency than expressive recognition and situation knowledge parts. Nevertheless, the overall assessment had internal consistency of 0.85 in both rounds of child assessments.

Table 5
Internal Consistency of AKT

Scale	T1 Internal Consistency	T2 Internal Consistency
Expressive Recognition	.81	.74
Receptive Recognition	.62	.64
Situation Knowledge	.70	.75
Emotion Knowledge (Total AKT)	.85	.85

Classroom Quality

Teacher and School Demographic Questionnaire. Information on teachers' age, gender, highest level of education (none, primary, secondary, O levels, A Levels, Undergraduate, Masters, Doctorate, Other), ECE training (yes/no), years of experience, and languages spoken was collected using a written questionnaire (Appendix G). The provision type (public, private, non-profit), hours of operation, and the number of students and teachers in each classroom was also collected in the form.

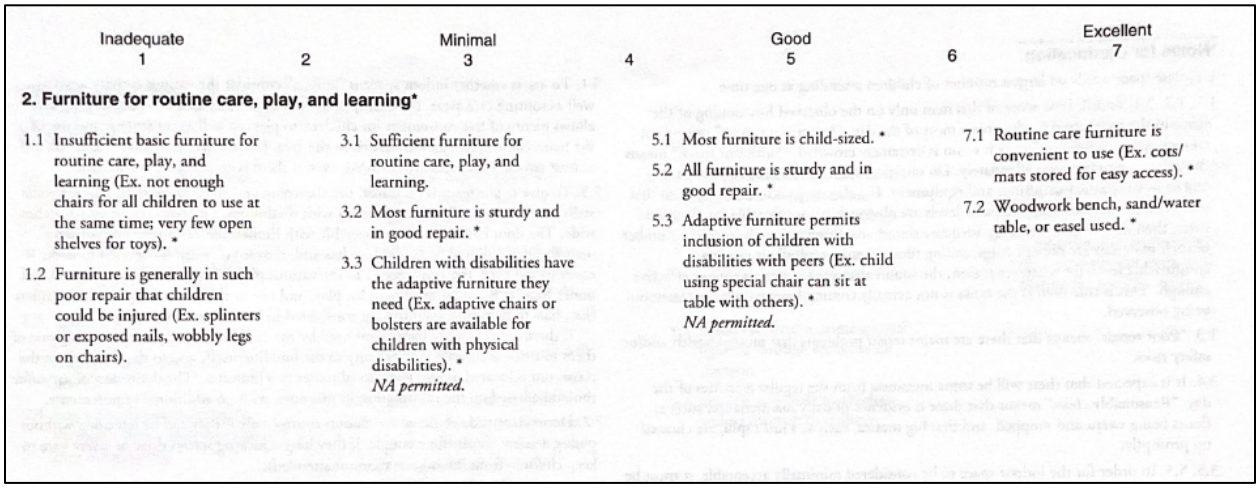
Early Childhood Environment Rating Scale – Revised Version (ECERS-R). The ECERS-R (Harms et al., 1998) is a widely-used measure of overall early childhood education programme quality, and it was used to measure the global classroom quality in the present study. The tool has 43 items which are divided into seven subscales: space and furnishing, personal care routines, language and reasoning, activities, interaction, programme structure, and parents and staff. Items are rated on a 1 to 7 scale, with scores at 1 indicating dangerous practices and 7 indicating excellent practices. ECERS-R reflects the ECE field's concept of developmentally appropriate practice, which includes a predominance of child-initiated activities selected from a wide array of options, a "whole child" approach that integrates physical, emotional, social, and cognitive development and highly trained teachers who facilitate development by being responsive to children's age-related and individual needs (Harms et al., 1998; Soliday Hong et al., 2019).

Each of the 43 items has individual indicators that are used to determine a classroom's score for that item. As shown in Figure 9, the indicators (e.g., 1.1, 1.2) are grouped under four rating levels or 'anchors': 1 (Inadequate), 3 (Minimal), 5 (Good), and 7 (excellent). All the indicators are positively worded except those under the "Inadequate" anchor. Marking "yes" for any indicator under "1" is equivalent to checking "no" for any of the indicators under "3", "5", or

"7". The observer scored each indicator as present or not (Yes/No) on the score sheet (see Figure 10).

Figure 9

Sample Item from ECERS-R



Inadequate 1 | 2 | Minimal 3 | 4 | Good 5 | 6 | Excellent 7

2. Furniture for routine care, play, and learning*

1.1 Insufficient basic furniture for routine care, play, and learning (Ex. not enough chairs for all children to use at the same time; very few open shelves for toys). *

1.2 Furniture is generally in such poor repair that children could be injured (Ex. splinters or exposed nails, wobbly legs on chairs).

3.1 Sufficient furniture for routine care, play, and learning.

3.2 Most furniture is sturdy and in good repair. *

3.3 Children with disabilities have the adaptive furniture they need (Ex. adaptive chairs or bolsters are available for children with physical disabilities). *
NA permitted.

5.1 Most furniture is child-sized. *

5.2 All furniture is sturdy and in good repair. *

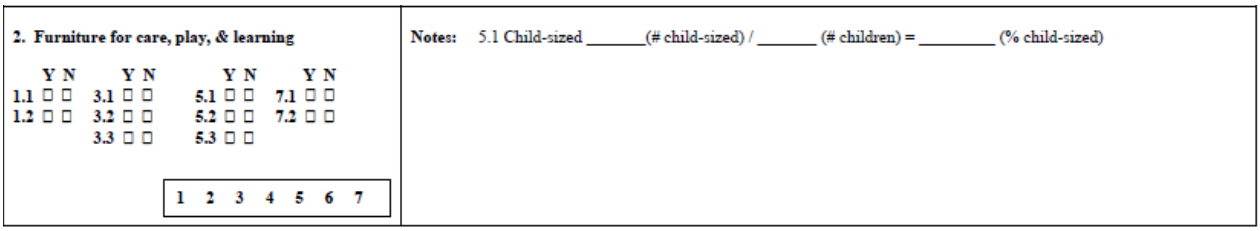
5.3 Adaptive furniture permits inclusion of children with disabilities with peers (Ex. child using special chair can sit at table with others). *
NA permitted.

7.1 Routine care furniture is convenient to use (Ex. cots/mats stored for easy access). *

7.2 Woodwork bench, sand/water table, or easel used. *

Figure 10

Corresponding Item on Score Sheet



2. Furniture for care, play, & learning

	Y	N		Y	N		Y	N		Y	N
1.1	☐	☐	3.1	☐	☐	5.1	☐	☐	7.1	☐	☐
1.2	☐	☐	3.2	☐	☐	5.2	☐	☐	7.2	☐	☐
			3.3	☐	☐	5.3	☐	☐			

1 2 3 4 5 6 7

Notes: 5.1 Child-sized _____(# child-sized) / _____ (# children) = _____ (% child-sized)

In the traditional scoring method, known as the "stop-rule", the observer stops scoring an item at the anchor where the first negative indicator appears (or positive if it is under the 'Inadequate' anchor) and higher anchors' indicators are not scored. A classroom's score on an item is based on the anchor under which the first negative indicator appears. If at least half of the indicators under an anchor are positively marked, the item receives the even-numbered rating just below that anchor point. If fewer than half of the indicators are positively marked, the

classroom receives the next lowest odd-numbered rating (i.e., dropping back two points). For example, if all of the indicators under “1” are absent and all of the indicators under “3” are present but only half of the indicators under “5” are present, the classroom gets a score of 4 for that item. However, if only one out of four indicators under “5” was present, the classroom would get a score of 3 for that item. In both these cases, according to the traditional scoring system indicators under anchor 7 will not get scored.

This scoring system has received some critique (Gordon et al., 2013; Isely, 2001) as it assumes order in anchor scores, which may be violated in practice (Gordon et al., 2013) because items often cover various dimensions (Betancur et al., 2021; Isely, 2001). For example, Item 10 (Meals/snacks) includes indicators of nutrition (‘food served of unacceptable nutritional value’), caregiver-child interactions (‘nonpunitive atmosphere during meals’), language (‘meals and snacks are times for conversation’), and sanitation (‘sanitary conditions not usually maintained’), among others. If a setting is high on some of these dimensions but low on others, the higher quality of the centre on other domains is missed and the setting would still get a low score. This limits the scales’ ability to capture variation in classrooms. Keeping this in mind, the stop-rule was not observed in the present study and every indicator was scored. However, the traditional method was used to decide the score for that item as there is no consensus on using an alternative scoring method and its validity is unknown. Item scores under each subscale are averaged for subscale scores, which are then averaged for the global classroom quality scores that range on an interval scale from one to seven.

ECERS-R has played a monumental role in informing research and policy across several countries. It has been adapted for use in numerous LMICs like India, China, and Bangladesh (Aboud, 2006; Isely, 2001; Li et al., 2014) and has provided useful insights into what aspects of children’s environment are important for their development. The tool has found positive, albeit small, associations between ECE quality and child development (Brunsek et al., 2018; Early et al., 2006; Mashburn et al., 2008; Sylva et al., 2006). It’s criterion validity is further

strengthen by its small but statistically significant associations with indicators of structural quality like teacher qualifications, group size, and teacher-child ratios (Gordon et al., 2013). While some researchers argue that most of the associations between ECERS-R scores and child outcomes are small, this issue is not unique to ECERS-R. It has also been found in other measures of quality, and is argued to be characteristic of research in the field of education (Burchinal et al., 2011; Suchodoletz et al., 2023).

The internal consistency of the scale has been found to be good to high (Bull et al., 2017; Cassidy et al., 2005; Hadeed, 2014; Harms et al., 1998; Lambert et al., 2008). In the present study, the internal consistency of each of the subscales varied from low to high; however, the overall scale had high internal consistency (Cronbach's alpha = .89) (see Table 6). The original reliability studies found the inter-rater reliability to be 86.1% within 1 point, with no item having an indicator agreement level below 70% (Harms et al., 1998). Later studies have also found inter-rater reliability to be over 80% (Hadeed, 2014; Lambert et al., 2008). In the present study, 10% of the observations were double-coded and the inter-rater reliability was calculated using two approaches to ensure robustness. First, percentage agreement was calculated by determining the proportion of items where the second assessor's score fell within one point of the primary assessor's (myself) score. Agreement ranged from 80.5% to 95.1%, exceeding the commonly used 80% threshold for acceptable reliability (Gordon et al., 2013). Second, inter-rater reliability was assessed using the intraclass correlation coefficient (ICC), employing a two-way random-effects model for absolute agreement (Hallgren, 2012). Results indicated good to excellent agreement among raters (Koo & Li, 2016), with ICC values ranging from 0.76 to 0.96, all statistically significant (ps < .001), indicating that the observed level of agreement between raters is unlikely to be due to chance (Bobak et al., 2018).

Table 6

Internal Consistency of ECERS-R Subscales

Scale	*N*	Internal Consistency
Space and Furnishing	8	.64
Personal Care Routines	5	.43
Language and Reasoning	4	.81
Activities	10	.81
Interaction	5	.89
Programme Structure	3	.76
Parents and Staff	6	.54
ECERS-R Total		.89

Despite the ECER-S's criterion validity, inter-rater reliability, and internal consistency being well-documented, its structural validity is not well-established. Indeed, no study has replicated the seven-factor model the original subscales purported. Some studies have found evidence that a one-factor model fit the data well (Hestenes et al., 2007; Perlman et al., 2004). Other studies found evidence for two or three underlying factors (Cassidy et al., 2005; Clifford et al., 2005; Hadeed, 2014; Perlman et al., 2004; Sakai et al., 2003). Using exploratory factor analysis, Gordon et al. (2013) found that a 6-factor structure (they did not collect data on the 7th subscale) fit the data best; however, the factor loading did not exactly match up to the original subscales. More importantly, the study did not find evidence of a single global aspect of quality, as the single-factor solution did not fit the data well. This has been supported by other studies, including a meta-analysis (Suchodoletz et al., 2023) which found that a single global indicator of quality does not have significant associations with children's development. However, the study was not powered to conduct factor analysis, with the minimum requirement being about 100 schools (Mundfrom et al., 2005). Given that the total ECERS-R had high internal consistency, it was decided that the total ECERS-R score would be used for this study.

Several other tools were considered for this study. One alternative was the Classroom Assessment Scoring System (CLASS; R. C. Pianta et al., 2008), a widely used tool to assess early childhood classroom quality. Similar to the ECERS-R, it has shown associations with multiple child outcomes (Hu et al., 2017; Mashburn et al., 2008; Veraksa et al., 2020); however, the ECERS-R was chosen because it provides a more holistic evaluation of the classroom environment and activities, whereas CLASS focuses specifically on the quality of teacher-child interactions. Since this is the first study to empirically examine process quality in Pakistani early years classrooms, a more global assessment like the ECERS-R better suited the study's needs. Although using both CLASS and ECERS-R was also considered, since ECERS-R only had one item on teacher-child interactions, it was not pursued due to the high costs for acquiring and using CLASS, as well as the extensive training required for both tools, which only allowed for one of them to be used.

Another tool that was considered for the study was the Teacher Instructional Practices and Processes System (TIPPS; Seidman et al., 2018), which was specifically designed to assess teacher-child interactions in LMICs. However, similar to the CLASS, TIPPS has a narrow focus on instructional practices and student-teacher interactions. Moreover, it was designed for later stages of schooling. Although an early years' version of TIPPS has been developed, its use has been limited; therefore, its reliability is unknown (McCoy & Wolf, 2018). Similarly, World Bank (2022b)'s Teach ECE was developed for monitoring teacher practices in LMICs. However, its primary purpose is to encourage self-assessment by ECE settings rather than to support research, and as such, it has not been utilised in empirical studies.

Another alternative considered was the Measuring Early Learning Environments (MELE), which was designed by UNICEF to assess global quality of early learning environments in LMICs and non-Western contexts. However, this is also a relatively new tool, the reliability and validity of which has not yet been examined thoroughly. The only study to examine the validity of this tool, Raikes et al. (2020), found that although the tool adhered to the

hypothesised factor structure, it did not demonstrate strong associations with child outcomes – only one of the nine associations between classroom quality and child outcomes was significant. Similar findings were also found for associations between the MELE sub-scores and teacher characteristics; therefore, suggesting that the tool may have low criterion validity.

Given the relatively premature research base supporting TIPPS, Teach ECE, and MELE, and concerns about their psychometric properties, a more established and thoroughly validated tool was selected for use in the present study.

Caregiver Interaction Scale (CIS). Although the ECERS-R has an 'Interaction' subscale, there is only one item that investigates student-teacher interactions. Specifically, given that teacher-child interactions are well-documented to be associated with children's development, a tool with a focus on teacher-child interactions was needed to assess this in the current study's sample. For this reason, the Caregiver Interaction Scale (Arnett, 1989) was used to assess teachers' interactions with their students. The CIS is an observational measure of caregiver-child interactions modelled after four well-established parenting styles: authoritarian, authoritative, permissive, and uninvolved (Arnett, 1989; Baumrind, 1967). The 26 items in this scale are coded on a 4-point Likert scale based on how true they were 1 = Not at all, 2 = Somewhat, 3 = Quite a bit, or 4 = Very much (see Appendix H). These items make up four subscales: sensitivity, harshness, detachment, and permissiveness. Fourteen of the statements were negative and therefore were reverse coded.

Although Arnett organised the scale into four subscales based on a principal components analysis, the factors have not been replicated by later studies (Layzer et al., 1993; Love et al., 2004; van IJzendoorn et al., 1998; Whitebook et al., 1989); therefore, more recent studies have opted to using the total sum of the items as a composite measure of interactions (Burchinal & Cryer, 2003; Gordon et al., 2013; Hindman et al., 2010; Lisonbee et al., 2008) or an average of the item scores (Helmerhorst et al., 2014; Love et al., 2004; Zill et al., 2006). Other studies have also opted to conduct factor analyses and use their resulting dimensions'

factor scores (Howes et al., 1998; Whitebook et al., 1989). Moreover, the internal consistency of the measure remains unclear. While several researchers have reported an average internal consistency of .94, using the original factor structure (Bracken & Fischel, 2006; Maxwell et al., 2001), others have highlighted that not all subscales perform consistently well (Colwell et al., 2013). In the present study, as shown in Table 7, the internal consistency of these subscales was strong for three out of the four subscales (Cronbach's alpha = .83 - .93). The lowest internal consistency was found for the permissiveness scale (Cronbach's alpha = .64), which is in line with previous research (Colwell et al., 2013). This is most likely owing to the fact that the subscale contains only three items. Consequently, many researchers have used a three-factor structure that removed the items under permissiveness (Cryer et al., 1999; Tietze et al., 1996; Whitebook et al., 1989). The overall internal consistency of the CIS scale was also high (Cronbach's alpha = .93), indicating that a composite score can be used. Therefore, the present study uses an overall CIS score which is calculated by summing scores across all 26 items and is on a scale of 26-104.

Table 7
Internal Consistency of CIS Subscales

Scale	*N*	Internal Consistency
Sensitivity	10	.93
Harshness	9	.83
Detachment	4	.85
Permissiveness	3	.64
Total CIS	26	.93

Although there are inconsistencies in the structural validity of the scale, it is found to have good concurrent validity. Burchinal and Cryer (2003) found that the CIS scores are strongly related to scores on two quality rating scales. Loeb et al. (2007) also found modest association between CIS scores and children's reading readiness (β = .14) and social problems

(β = −.18). More recently, Colwell et al. (2013) found that CIS scores were modestly associated with caregiver's level of education and the class group size. Moreover, they found similar associations with child outcomes, including children's cognitive and social-emotional skills, and these child outcomes related more strongly to CIS scores than to other indicators of quality like caregiver education, group size, and child-caregiver ratio. Similar findings of the CIS's concurrent validity have been reported by Hindman et al. (2016). Taken together, there is strong evidence in support of the measure's concurrent validity.

Other measures that focus on teacher-child interactions include the Student-Teacher Relationship Scale (STRS; Pianta, 1991). The instrument assesses three elements: Closeness, Conflict and Dependency, which define the behaviour patterns that characterise the relationship between teacher and pupil (Pianta, 1994). While the STRS is widely used, it relies on self-reporting, with teachers completing the scale for each student individually. This has several limitations. Firstly, self-reports often lack objectivity and standardisation. Secondly, teachers in Pakistan tend to be over worked and lack the capacity to fill out lengthy forms for each student. Having such a measure may have also made schools reluctant to participate in the project. Thirdly, given the large class sizes in Pakistan, it is unlikely that teachers have meaningful relationships with each of the students. For these reasons, an observational measure like the CIS was found to be more appropriate.

Another observational measure considered was the Sustained Shared Thinking and Wellbeing Scale (SSTEW; Howard et al., 2020). Although the tool is relatively new, it has been shown to associate with children's development (Howard et al., 2020) and gives a deeper understanding of the nature of student-teacher interactions, and particularly investigates sustained shared thinking – an advanced interactional practice indicative of high-quality teaching. However, the advanced teaching practices it assesses are less prevalent in Pakistani classrooms, raising concerns about potential floor effects. Additionally, the SSTEW is a detailed observational tool, also requiring extensive training and a full day to observe and code, which

exceeded the time and resource constraints of the study. Moreover, the study's need was for a supplementary tool to complement the ECERS-R, and the CIS was considered to meet this requirement more effectively.

Although the CIS's structural validity remains unclear, in the present study, the scale and its subscales demonstrated good internal consistency. Moreover, the CIS exhibits high concurrent validity, which can be argued to take precedence here given that the study's focus is to understand children's development rather than exploring underlying theoretical constructs in student-teacher relationships. This, combined with the practical fit of the CIS within the study's design, made it a suitable choice for this project.

Procedure

Pilot

Prior to piloting, I received training on the ECERS-R from an expert trainer. The training involved reviewing the concept of quality, discussing reliability, and coding sample videos. I also trained myself on the IDELA and AKT using the developer's resources.

To ensure that the measures above could be reliably used in Pakistan, two classrooms were selected for piloting in August. These classrooms were selected as they were deemed to be of higher quality according to the resources available, the student-teacher ratios, and the strong parental involvement. One of the classrooms was from a school catering to high-income families, where the medium of instruction was English. The second was from a non-profit school that catered to low-income families but was known to have a strong ECE curriculum and well-trained teachers. English and Urdu were used interchangeably for instruction, but children and their parents were more fluent in Urdu. Having different types of classrooms in the pilot ensured that our measures were suitable for the diverse sample population.

For the pilot, the researcher conducted 8 child assessments from each school, 4 girls and 4 boys who were between 4- to 6-years-old. The child assessments took approximately 30

minutes to administer. The parent demographic questionnaire was given in a paper format to the higher-income classroom, whereas the non-profit school indicated that it would be better to administer the questionnaire orally as not all parents were literate. Additionally, the home learning environment section on the parent demographic questionnaire was found to be difficult to administer orally due to the multiple response categories, due to which the response categories were further reduced from 6 to 4. The language of IDELA Urdu script was found to be too formal, and after conversing with researchers who had used the Urdu script, some instructions were simplified. Many of the AKT questions for the fourth part were omitted by parents completing the questionnaire in a written format, and for those who completed it orally, many expressed uncertainty on their responses. Consequently, this was dropped from the full study, as previously discussed.

After the assessments, the researcher conducted full day observations in each school, to understand the cultural validity of the ECERS-R and CIS. Overall, similar to previous studies conducted in LMICs (Aboud, 2006; Betancur et al., 2021; Isely, 2001; Rao & Pearson, 2007), it was found that the ECERS-R had a stronger emphasis on material availability and free play, which isn't found in many low-resource settings or LMICs like Pakistan. Indeed, even the high-income school had limited access to materials and rarely took part in free play. For this reason, we adapted the definition of two key terms in the ECERS-R: "accessible", which was originally defined as children having access to a certain material or activity for at least 30 minutes per day, was modified to one hour per week. Similarly, "substantial portion of the *day*" was modified to substantial portion of the *week*. Both these modifications allowed us to capture a wider range of practice, avoiding floor effects. Additionally, Item 37 (Disabilities) was removed due to the absence of children with physical disabilities in the classrooms we visited, Item 11 (Nap/Rest) was excluded as short class durations made it inapplicable, and indicators related to school-provided food were excluded from item 10 (Meal/Snacks) as children brought their own meals.

Funding

The Patrice L. Engle Dissertation Grant for Global Early Child Development by the Society for Research in Child Development (SRCD), worth $5000, was competitively won by the researcher and was used to recruit, train, and pay the fieldworkers and fund transport and material cost for the field visits.

Fieldworker Recruitment and Training

Fieldworkers were recruited through an online advert in August that was sent to universities and non-profit organisations to share with their students and alumni. Nine applicants were selected based on their academic background and their experience conducting research or working with children.

The two-week training schedule for child assessments is detailed in Figure 11. The lecture-based sessions were held in person at Aga Khan University, beginning with an overview of the project's goals and methodology. Key research concepts such as safeguarding practices when working with children, standardisation, biases, and inter-rater reliability were then covered. The training for the IDELA followed guidelines provided by the IDELA team, with each item reviewed in depth. Discussions focused on the administration process, required materials, and scoring criteria. Over three days, all 18 items across three subscales were covered, after which fieldworkers paired up for roleplaying exercises to practice assessments.

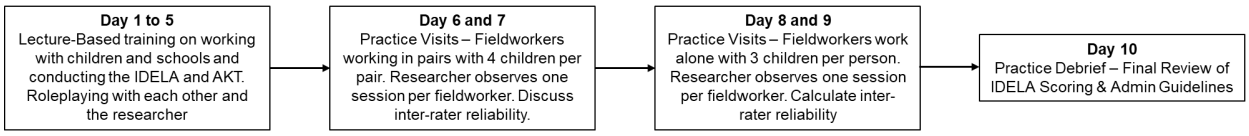
Following these IDELA sessions, a similar approach was used for training on the AKT, emphasising item review, scoring procedures, and practice. The final day of the lecture-based training involved one-on-one roleplays with the researcher, where fieldworkers practiced administering the assessment and scoring while the researcher roleplayed as the child. This practice allowed them to familiarise themselves with the assessment process, materials, and scoring before interacting with children in real-world settings. Individual and group feedback

sessions were conducted to address common challenges and clarify doubts. One fieldworker, who did not meet the required standards during roleplays, mutually agreed not to continue.

The second week of training focused on practice visits at a pilot school. It was divided into two phases: in the first phase, the eight fieldworkers were paired to assess four children, with each fieldworker assessing two children while their partner simultaneously double-scored. The researcher observed and scored two assessments per pair, one for each fieldworker, providing feedback during or after the sessions as needed. At the end of the day, scores were compared by the pairs and any disagreements were discussed with the researcher. In the second phase, fieldworkers conducted individual assessments, with the researcher observing and double-coding one session per fieldworker. Inter-rater reliability was calculated for these sessions.

Figure 11

Child Assessment Training Schedule



Training for classroom observations took place in November, following the first round of child assessments. Four fieldworkers were selected for the classroom observations, as a smaller team was deemed more effective for ensuring reliability. The training began in person at Aga Khan University, combining lectures and discussions. The sessions covered concepts of classroom quality, key terms in the ECERS-R, and the scoring process, with a strong emphasis on standardisation and reliability in observational methods. For the ECERS-R, the researcher went through each item and indicator in detail, defining important terms and providing examples for different indicator levels. Training also included guidance on interviewing teachers to score

specific ECERS-R items, emphasising the importance of open-ended questions and a non-judgmental tone.

After the review of all items, fieldworkers engaged in training activities, including arranging indicators across levels of quality, from minimal to high. This exercise helped them recognise what characterises increasingly better practices. Next, fieldworkers were given four classroom scenarios and tasked with scoring specific items. The assigned scores and their rationale were then discussed. On the final day, they watched six videos of ECE classrooms, scoring them on select items. Although the videos were from Western classrooms, they provided the fieldworkers with a chance to rate higher-quality practice. Following the ECERS-R, training shifted to the CIS, where the scoring system, individual items, and key scoring indicators were reviewed.

After the in-person training, fieldworkers conducted practice visits to three schools. Higher-quality schools were chosen to ensure that fieldworkers had exposure to a broad range of practices. As it is generally easier to score lower-quality environments using the ECERS-R, these visits aimed to provide a more challenging and comprehensive training experience. During these visits, fieldworkers scored the same classrooms in pairs, then compared their scores and discussed discrepancies. Additional notes were provided for items with more frequent disagreements and fieldworkers were encouraged to document supporting evidence for their scores whenever possible. Before the official classroom observations began in January, each fieldworker conducted an observation alongside the researcher in one of the sample schools to assess inter-rater reliability (see Measures section for details). The researcher was in contact with primary supervisor, who is experienced in using ECERS-R, throughout the pilot period. A follow-up session was held with the fieldworkers to address any remaining issues and provide additional feedback to further improve reliability before starting the formal observations.

Initial School Visits and Collecting Demographic Information

After obtaining the necessary approvals, we conducted introductory visits to all participating schools. These visits aimed to discuss the project with school principals and teachers, and to drop off or collect any necessary documents. Additionally, these visits helped us get familiarised with the school environments, including identifying potential spaces for conducting child assessments. Some shortlisted schools were inaccessible due to being in remote areas and were consequently excluded from the study. Additionally, two schools opted out after the initial visit, citing limited capacity.

During the initial visits, we provided teachers with a consent form and a demographic questionnaire. For schools where parents were literate in Urdu or English, we distributed physical copies of consent forms and demographic questionnaires. In cases where oral communication was more suitable, schools informed parents about the study and invited interested parents or guardians to visit the school on the day of our visit. On these occasions, a fieldworker orally reviewed the information sheet and consent form with each parent/guardian. If they agreed to participate, we collected demographic information from them. This took approximately 5-10 minutes. Some caregivers who were interested in participating but were unable to visit the school on the day of the visit, were contacted through phone calls prior to the visit. Ultimately, we collected consent and demographic information through written forms (40.2%), in-person interview (40.7%), and occasionally over the phone (19.1%). Majority of children's information was provided by their mothers (68.4%), followed by their fathers (21.8%) and occasionally by an older sibling (2.5%), a grandparent (1.8%), or another relative (5.5%). Often the parents/guardians were unsure of the child's age and/or date of birth, in which case we got this information from the schools' records (17.9%). There was a small number of children whose demographic information was not completed due to demographic forms not being returned (5.6%).

Conducting Child Assessments at T1

The fieldworkers were divided into two groups based on geographic location. One group covered schools in the southern part of the city, while the other group covered schools in the northern part. This arrangement allowed us to visit two schools per day, completing data collection within 30 calendar days for both time points. Each group comprised of four full-time assessors. There was one part-time assessor, who assisted on days when additional demographic information needed to be collected or a large number of children required assessment. Each visit was led by a lead fieldworker responsible for ensuring the completion of all data collection and child assessments.

The first round of child assessments, using the IDELA and AKT, were conducted from October to November. On the day of the visit, fieldworkers collected demographic information if needed and introduced themselves to the class. They then set up for the assessments, typically in a courtyard, library, or an empty classroom nearby. We ensured that the chosen space was open, and the children were familiar with it. We initially planned to randomly select six boys and six girls from the consenting children. However, due to a limited number of consenting children within the target age range or too little children in the classroom, all consenting children were assessed. Fieldworkers individually invited the children to be assessed, each assessment lasting for 20-25 minutes.

The sessions began with assessors introducing themselves and engaging in casual conversation to ensure that the child was comfortable. As schools in the sample reported using a mixture of English and Urdu for instruction, this initial introduction served to help the assessor gauge the child's linguistic preference. The assessor then proceeded to use the language they seemed most suitable for the child (Urdu = 88.3%, English = 11.7%). They explained the assessment process, which included games, storytelling, and questions, after which children were explicitly informed that participation was voluntary, and they could take breaks or stop the

session at any time. Before the session began, the assessor took the child's assent. Each assessor typically assessed 3-4 children per visit, depending on the number of participating children. Within three days of each visit, fieldworkers entered the data into an online system on Qualtrics. The lead fieldworker ensured the accuracy and completeness of the data entry.

Conducting Classroom Observations

Visits to conduct the classroom quality assessments using the ECERS-R and CIS were conducted from mid-January to early February. One assessor conducted the classroom observation, and this was typically the lead fieldworker to ensure familiarity with the school and the staff. The ECERS-R was completed once for each classroom, whereas the CIS was completed once for each teacher. The assessor arrived 15 minutes before the children and stayed for 30-45 minutes after they left. Following the ECERS-R guidelines, they observed the class for the first 30 minutes, scoring initial items about the physical space. They continued scoring various items and indicators based on observed activities and behaviours throughout the day. Midway through the day, they switched to the CIS, and then back to the ECERS-R after completing the CIS; however, this was not prescriptive, and the assessor could revisit the CIS as felt appropriate. Assessors positioned themselves unobtrusively in a classroom corner, moving around as necessary to observe materials and activities. After the children left, assessors conducted brief interviews with teachers to score items not observed directly, following ECERS-R guidelines. In some classes, there were new teachers, whose consent and demographic information was also collected before the observation.

Conducting Child Assessments at T2

After conducting refresher training for the fieldworkers in early April, which included reviewing the initial material and roleplaying the assessment with the researcher, the second round of child assessment visits started in April and were completed by May. Children who completed the sessions in the first round were reassessed using the same assessments.

Absent children were not replaced. The same procedure as the first child assessment visits was followed, with the same teams visiting the schools they did in the first round. The lead fieldworker ensured that all information from that school was collected and schools were debriefed on the project.

Data Cleaning and Preparation

Several steps were taken to ensure that the data was accurate and reliable. For the child assessment variables, according to IDELA guidelines, any variable with over 20% missing data is deemed problematic; however, the highest level of missingness in the IDELA items was 8%, therefore no variable needed to be removed. Children who had completed fewer than eight items on the child assessment were excluded (N = 3, 0.01%). The dataset was examined for outlying values, any identified outliers determined to be errors were corrected or removed. To ensure the accuracy of data entry, 20% of the children's data were randomly selected and rechecked. After these checks, the domain scores for each of the three IDELA subscales and the AKT were calculated. The AKT scores were transformed from a 0-2 to 0-1 scale, to be on the same scale as the IDELA subscale scores.

All ECERS-R scores were double-checked, involving a thorough review of data entries and calculations. The subscale scores for the ECERS-R were computed by summing the items within each of the seven subscales, and the overall ECERS-R score was determined by summing the subscale scores. For the CIS, negatively worded items (N = 14) were reverse-scored so that a higher score indicates better caregiving practices. The overall CIS score was derived by summing the scores across all CIS items.

Parent demographic data for children who were not assessed, either due to absence or refusal to participate, was removed from the dataset. The remaining demographic data was assessed for outliers and missingness. Percentage of missingness for the demographic variables is shown in Table 8, with missingness being below 15%, except for the HLE index

(35.2%). This was primarily because some parents got an older version of the questionnaire which did not contain the HLE questions. Missingness in other variables was due to respondents leaving the field blank in the form or not knowing the answer. Since there was no specific pattern to this, missingness was assumed to be missing at random. Details of how this was dealt with will be found in Chapter 4's Analytic Approach section.

Some maternal and paternal education levels were merged to have four education levels: no formal education, completed primary schooling (i.e., 5-8 years of formal schooling), completed secondary schooling (i.e., 9-13 years of formal schooling), and completed higher education. These levels were then dummy-coded, with the "no formal education" category as the reference. Most children were monolingual or bilingual, with 3% of children speaking more than two languages – these were combined with bilingual children for analyses. The distribution of household size was skewed so the variables was categorised to reflect the distinction between nuclear and joint families (0 = 1-5 members, 1 = 6+ members).

Table 8
Variable Missingness

Variable	**Missingness (%)**
Child Age	12.2%
Child Gender	0.0%
Mother Age	9.3%
Maternal Education	5.6%
Father Age	10.0%
Paternal Education	5.6%
Household size	7.3%
Number of Siblings	6.0%
Number of Languages spoken by Child	0.0%
Number of Books in the house	5.7%
HLE Composite score	35.2%

For classrooms with more than one teacher, teacher data (age, highest level of education, ECE training, years of teaching, number of languages spoken, and CIS scores) had to be merged for each of the variables for analysis. To this end, decisions were made to reflect the overall experience provided to children and the distinct roles of different teachers. The most relevant and consistent data were selected to maintain accuracy and relevance in the analyses. Table 9 details the decisions made for each scenario and teacher variable. For instance, in cases with a main teacher and an assistant teacher, a weighted average was calculated for continuous variables such as age, years of experience, and CIS scores, with the main teacher receiving double weight to reflect their greater influence on children's experiences. The main teacher's level of education and ECE qualification were used, while for the number of languages, the higher value between the two teachers was chosen, acknowledging that children had access to the additional language(s).

Table 9

Teacher Data Decisions

	Age	Years of Experience	Highest Level of Education	ECE Qualification	Number of Languages Spoken	CIS Score
All Teachers Equal	Average	Average	Highest	Yes, if any	Highest	Average
1 Main & 1 Assistant	2:1	2:1	Main	Main	Highest	2:1
1 Teacher left	Main	Main	Main	Main	Main	Main
1 Teacher replaced	2:1	2:1	Original	Original	Highest	2:1
Teacher replaced	New teacher	New teacher	New teacher	New teacher	New teacher	New teacher

Note. All Teachers Equal = there was no main or assistant teacher. 1 Teacher left = There were two teachers, only one left and was not replaced. 1 Teacher replaced = There were two teachers, one left and was replaced by another teacher. Teacher replaced = There was only one teacher, who was replaced.

Once all the data had been prepared, schools, students, and teachers, were randomly assigned an ID. Using this, all school-level and child-level data was merged into a single file.

Chapter 4: Demographic Factors Predicting Pakistani Preschoolers' Social, Emotional, and Academic Skills (RQ1)

There is abundant evidence that social-emotional learning is an important aspect of children's development, however high-quality research on Pakistani preschool-aged children's social-emotional skills is limited. To better support children's social-emotional development, it is important to investigate potential risk and protective factors such as children's own and family characteristics. Using a sample of 607 4- to 6-year-old children, the analysis in this chapter focuses on investigating how demographic characteristics relate to their social-emotional development. The associations between these demographic characteristics and children's academic outcomes will also be examined to replicate previous findings and help contextualise the associations between children's demographic characteristics and social-emotional skills. In doing so, the thesis aims to extend the SEL research base to an under-represented population in an under-represented context.

To this end, four multi-level models were run to investigate how children's demographic characteristics (age, gender, bilingualism, parental age, maternal education, household size, number of siblings, and home learning environment) predicted their pre-numeracy, pre-literacy, social skills, and emotion knowledge. My hypotheses are:

- H1: Age will be positively related to all four child outcomes.
- H2: Girls will be better than boys on all four outcomes and the effect sizes will be larger for social skills and emotion knowledge.
- H3: Bilingual children will outperform monolinguals on all four outcomes.
- H4: Higher levels of maternal education will be related to better child outcomes.
- H5: Increased parental age will be positively associated to child outcomes.
- H6: Household size will be positively related to children's social skills and emotion knowledge, but not their academic outcomes.

- H7: Number of siblings will be positively related to children's social-emotional skills and emotion knowledge, but not their academic outcomes.
- H8: Scores on the HLE Index and the number of books will be positively related to all four child outcomes.

While most of these hypotheses are confirmatory, H3, H5, and H6 are exploratory due to the limited research on these.

Analytic Approach

Addressing Missing Data

While most of the variables had low missingness (Table 8), the high missingness value for the HLE composite score variable needed to be addressed to maximise the data for RQ1. Consequently, missing data was addressed through multiple imputation using the 'mice' package in R (van Buuren & Groothuis-Oudshoorn, 2011). This method was chosen for its ability to generate multiple imputed datasets by predicting missing values based on observed data, thereby preserving the inherent variability of the data (D. B. Rubin, 2004). Predictive mean matching (PMM) was selected as the imputation method, due to its effectiveness in maintaining the distributional properties of the data. Twenty imputations were carried out across ten iterations to ensure robust results (van Buuren & Groothuis-Oudshoorn, 2011; White et al., 2011).

The results of the modelling (detailed in the next section) across the imputed datasets were pooled using the 'pool' function from the 'mice' package, which combined the estimates from each imputation to produce a single set of parameter estimates. This approach ensures that the uncertainty associated with missing data is accurately reflected in the final results (D. B. Rubin, 2004). The pooled results were then summarised to provide the final estimates of the relationships of interest.

Assessing the Nested Structure of the Data

Since groups of children were assessed from a classroom in a school, the dataset has a hierarchical structure in which children are nested within schools/classrooms. The Intraclass Correlation Coefficient (ICC) can be used to assess the proportion of total variance in a dataset that is attributable to the grouping structure (i.e., students within schools). Multi-level Modelling (MLM) is typically used to analyse data with such a structure as it partitions the variance in the dependent variables into within-group (child-level) and between-group (school-level) components, providing a more nuanced understanding of the data (Snijders & Bosker, 2011). MLM also handles unbalanced data, which is common in educational research where the number of children per school can vary widely, allowing for the inclusion of all available data without resorting to listwise deletion or other imputation techniques that can reduce statistical power (J. Hox et al., 2017). Additionally, using traditional regression techniques when the data has a hierarchical structure may lead to inflated Type I error rates and biased estimates of standard errors (Raudenbush & Bryk, 2002).

Although the dataset is theoretically hierarchical, ICCs can be used to determine the necessity and appropriateness of MLMs. The ‘lme4’ package in R was used to calculate the ICCs for all the dependant variables in the dataset. As shown in Table 10, these range between 0.20 to 0.50. ICCs between 0.1 and 0.3 are considered moderate and justify the use of MLM to analyse data, whereas ICCs above 0.3 are often taken as evidence of a strong nested structure and necessitate the use of MLM (V. E. Lee, 2000). Given the moderate to high ICCs for our variables, multi-level modelling will be used for all inferential analyses.

Table 10

RQ1 Outcome ICCs

Outcome Variable	ICC
Pre-Numeracy T1	.50
Pre-Literacy T1	.48
Social-Emotional T1	.25
Emotion Knowledge T1	.44

Analytic Approach

To investigate the demographic correlates of children's skills, descriptive statistics (means, SDs, range, frequency and percentages) were calculated for the following child outcome variables: pre-numeracy skills, pre-literacy skills, social skills, and emotion knowledge at T1, as well as demographic variables collected from the parent demographic questionnaires: children's age, gender, maternal and paternal age, maternal and paternal education, number of languages spoken, household size, and home learning environment (HLE index).

Inferential analyses were conducted using R with the 'lme4' package (Bates et al., 2015) for MLM. Two-level models in which children (level 1) were nested within schools (level 2) was used for analysis (see Figure 12 for pre-literacy model). The predictor variables were children's age in months, their gender (1 = female), maternal age, paternal age, language status (1 = bilingual), household size (1 = 6+ family members), number of siblings, number of books, HLE index, and maternal education dummy variables (ME primary school, secondary school, higher education completed, with no education as the reference category). Although paternal education was recorded, it was not included in the models given the high overlap with maternal education (as shown later) and the stronger research base for the later. The outcome variables for each of the models were children's pre-literacy, pre-numeracy, social skills, and emotion knowledge scores. The significance of the predictor variables (fixed effects in the model) was evaluated

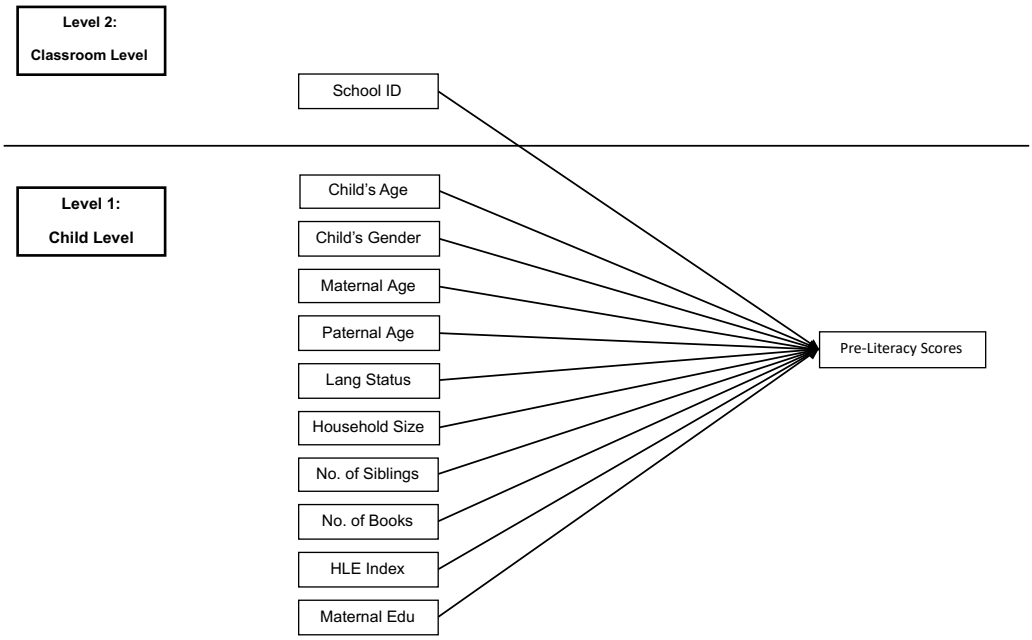
using Wald tests. To assess the normality of the residuals, Q-Q plots were generated for all four models, and the Shapiro-Wilk test for normality was conducted. Additionally, a Residuals vs. Fitted plot was also generated for all four models to confirm for homoscedasticity and VIF values were generated to check for multicollinearity between the predictor variables.

The models were specified as follows:

1. Numeracy T1 ~ Child Gender + Child Age + Mother Age + Father Age + ME primary + ME secondary + ME higher ed + Household Size + Siblings + Languages Spoken + Books at Home + HLE Index + (1|School ID)
2. Literacy T1 ~ Child Gender + Child Age + Mother Age + Father Age + ME primary + ME secondary + ME higher ed + Household Size + Siblings + Languages Spoken + Books at Home + HLE Index + (1|School ID)
3. Social Skills T1 ~ Child Gender + Child Age + Mother Age + Father Age + ME primary + ME secondary + ME higher ed + Household Size + Siblings + Languages Spoken + Books at Home + HLE Index + (1|School ID)
4. Emotion Knowledge T1 ~ Child Gender + Child Age + Mother Age + Father Age + ME primary + ME secondary + ME higher ed + Household Size + Siblings + Languages Spoken + Books at Home + HLE Index + (1|School ID)

Figure 12

Pre-Literacy Multilevel Model for RQ1



Note. Residuals and variance not shown. Maternal education had 3 dummy coded variables.

Results

Descriptive Statistics of Child Outcomes and Demographic Factors

Descriptive statistics were calculated for the predictor and outcome variables, as shown in Table 11. Children had an average age of 59.57 months (*SD* = 7.56, range = 45–79 months, 48.1% male), with 36.9% being bilingual. The mothers had a mean age of 31.37 years (*SD* = 5.50, range = 18–54 years), while fathers tended to be older and had an average age of 36.98 years (*SD* = 7.08, range = 20–75 years). Maternal and paternal education showed similar patterns – the largest proportion of mothers and fathers had completed secondary school, with the lowest proportion having completed higher education. The mean household size was 8.47 members (SD = 4.91), and the mean number of siblings was 4.25 (*SD* = 2.85). On average,

parents reported having 3.97 books (SD = 10.79) and the HLE index had a mean score of 2.21 (SD = 1.13).

In terms of the IDELA subscales, children's mean pre-literacy scores were the highest (*M* = 0.51, SD = 0.21, range = 0–0.94), followed closely by their mean pre-numeracy score (*M* = 0.49, SD = 0.21, range = 0–1). Children's social skill scores were the lowest, with a mean of 0.32 (SD = 0.17, range = 0–0.92). Lastly, although children had a higher proportion of correct responses on the AKT (*M* = 0.59, SD = 0.22, range = 0–1), their emotion knowledge score cannot be directly compared to their other scores due to different measures being used.

Table 11

RQ1 Variable Descriptive Statistics

Variables	*N*	%	Mean	SD	Min	Max
Child's Age	605		59.57	7.59	45	79
Gender (% Male)	607	48.1				
Languages spoken	607					
Monolingual		63.1				
Bi-/Multi-lingual		36.9				
Mother's Age	583		31.37	5.50	18	54
Maternal Education	601					
None/Not completed Primary		28.0				
Completed Primary school		25.0				
Completed Secondary school		30.0				
Completed higher education		17.0				
Father's Age	578		36.98	7.08	20	75
Paternal Education	599					
None/Not completed Primary		24.5				
Completed Primary school		26.2				
Completed Secondary school		30.6				
Completed higher education		18.7				
Household Size	604		8.47	4.91	2	32
Number of Siblings	604		4.25	2.85	0	22
Number of Books at Home	453		3.97	10.79	0	120
HLE Index	418		2.21	1.13	0	4
Pre-Numeracy T1 Scores	607		.49	.21	0	1
Pre-Literacy T1 Scores	607		.51	.21	0	.94
Social Skills T1 Scores	607		.33	.17	0	.92
Emotion Knowledge T1 Scores	607		.59	.22	0	1

Associations between variables

Correlations between the continuous and binary predictor variables were calculated (see Table 12). Most of the correlations were small and not statistically significant. Number of books in the house was significantly related to maternal age (r = .18), children's language status (r = .25), and the HLE score (r = .13). Maternal and paternal age were significantly correlated (r = .71), and children's age and language status were weakly correlated (r = -.09). All four outcome variables were strongly and significantly correlated with each other (rs = .54 - .78).

Table 12

Correlations between Predictor Variables

	Child Age	Mat. Age	Pat. Age	House. Size	Siblings	Lang. Status	No. of Books	HLE Score
Child Gender	.02	-.04	.00	.05	.04	.03	-.06	-.02
Child Age		.04	.04	-.02	.05	-.09*	.06	-.09
Maternal Age			.71**	-.06	.02	.03	.18**	-.01
Paternal Age				-.03	.08	.02	.08	.01
Household size					.86**	-.07	-.06	-.05
No. of Siblings						-.08	-.12**	-.22**
Lang. Status							.25**	.04
No. of Books								.13*

To understand how categorical variables (maternal and paternal education) related to other continuous demographic factors, one-way ANOVAs were conducted. As shown in Table 13, there was a significant association of maternal and paternal education on child's age, maternal age, household size, number of books, and HLE scores (p < .01), but not on paternal age (p > .05). The effect size of most of these differences was negligible (η^2 < .05) except for

number of books (η^2 = .23–.25) and HLE score (η^2 = .13–.19), highlighting that indicators of the home learning environment were strongly associated with parental education.

Table 13
Results of Parental Education ANOVAs

	Maternal Education		Paternal Education	
	p	η^2	*p*	η^2
Child Age	<.001	.03	.006	.02
Maternal Age	<.001	.04	<.001	.05
Paternal Age	.481	.00	.093	.01
Household size	.002	.03	.004	.02
No. of Books	<.001	.25	<.001	.23
HLE	<.001	.19	<.001	.13

To explore how maternal and paternal education related to children's gender, Chi-Square test was conducted, which revealed a significant difference in children's gender according to maternal education ($\chi^2(3) = 9.37$, $p = .025$). Examining the crosstabs revealed that this may be due to the higher number of girls ($N = 94$) compared to boys ($N = 56$) for mothers who had only completed primary school. There were no significant differences in children's gender according to their father's education ($\chi^2(3) = 3.76$, $p = .288$). Children's language status differed significantly by both maternal ($\chi^2(3) = 48.89$, $p <.001$) and paternal education levels ($\chi^2(3) = 56.20$, $p < .001$). A similar pattern was observed for both maternal and paternal education – there were more monolingual children for parents who had not completed higher education, and more bi-/multi-lingual children for parents who had completed higher education. Lastly, Chi-Square tests to assess the relationship between maternal and paternal education revealed a significant strong relationship between the two variables ($\chi^2(9) = 423.89$, $p <.001$, $\rho = .62$).

Correlations between the continuous and binary predictor variables and children's skills were also calculated. As shown in Table 14, children's age, maternal age, household size, number of siblings, HLE index and number of books in the house were significantly associated with all four skills. Children's emotion knowledge also had a significant positive relationship to their language status, suggesting that bilingual/multi-lingual children had better emotion knowledge. There were no significant gender differences in children's four outcomes ($p > .05$).

Table 14

Correlations between Predictor and Outcome Variables

	Child Gender	Child Age	Mat. Age	Pat. Age	House. Size	Siblings	Lang. Status	No. of Books	HLE Score
Pre-Numeracy	-.06	.31**	.10*	.01	-.10*	-.15**	.07	.31**	.31**
Pre-Literacy	.02	.31**	.11*	.08	-.09*	-.13**	.03	.27**	.30**
Social Skills	-.05	.21**	.11*	.06	-.13**	-.18**	.07	.27**	.23**
Emotion Know.	-.03	.15**	.19**	.06	-.11**	-.18**	.11**	.34**	.38**

To understand the relationship between parental education on the four skills, one-way ANOVAs were conducted. Both maternal and paternal education had an impact on all four outcomes (ps < .001), with effect sizes shown in Table 15. Emotion knowledge had the biggest difference across both maternal and paternal education, while social skills had the lowest.

Table 15

Effect Sizes of Parental Education on Outcome Variables

	Maternal Education		Paternal Education	
	p	η^2	p	η^2
Pre-Numeracy	<.001	.12	<.001	.15
Pre-Literacy	<.001	.10	<.001	.10
Social-Emotional	<.001	.08	<.001	.05
Emotion Knowledge	<.001	.20	<.001	.20

In summary, the descriptive statistics, along with correlational analyses, and ANOVAs provide an overview of the sample's demographic characteristics and their associations with each other and children's developmental outcomes. These findings highlight the complex relationships between parental education, household environment, and children's early skills, emphasising the need to consider them when looking at early childhood outcomes.

Multi-Level Model Analyses

While correlations and ANOVAs are useful in providing an overview of the relationships between different variables, these analyses do not control for other variables or the hierarchical data structure; necessitating research that considers all demographic variables simultaneously. To this end, four MLMs were run, predicting children's t1 emotion knowledge, social skills, pre-literacy, pre-numeracy skills.

Q-Q plots indicated that the residuals for all four models closely followed the expected line, suggesting normality. Although the Shapiro-Wilk test for the Pre-Numeracy ($W = 0.99$, $p = .014$) and Social Skills ($W = 0.98$, $p < .001$) models was significant, suggesting deviations from normality, these deviations are not considered problematic, as the Shapiro-Wilk test tends to be conservative, especially in large samples like that in the present study (Razali & Wah, 2011). Moreover, MLMs have been considered to be robust against deviations from normality, especially with larger sample sizes (Gelman & Hill, 2007). Examining the histogram of residuals (Appendix I) indicates that the residuals are normally distributed. Keeping this in mind, it can be argued that the assumption of normality is met for all four models.

Furthermore, the Residuals vs. Fitted plots for all four models showed that the residuals were randomly scattered around the horizontal line at zero and the spread appears to be constant across the range, with no increasing or decreasing spread, or a systematic pattern, indicating that the assumption for homoscedasticity was met. Additionally, Variance Inflation Factor (VIF) values across all models ranged from 1.02 to 1.62. Since values higher than 5 are

considered to indicate a problematic amount of collinearity (James et al., 2023), no further steps were needed.

Social Skills. The multi-level model explained 25.9% of the variance in children's social skill scores; however, the child-level predictors accounted for only 7.3% of that variance. Model fit statistics and predictor beta coefficients are shown in Table 16.

The strongest predictor of children's social skills was the household size, with children who lived in households of more than 5 members scoring 0.10 standard deviation lower than children who lived in households of 1 to 5 members. Maternal and paternal age were also significant predictors of children's social skills; however, the standardised coefficients were negligible for both (βs = 0.00). Additionally, the 'secondary' and 'higher education' categories from maternal education were also a significant predictors of children's social-emotional scores (βs = 0.07 - 0.08, ps = .004) indicating that children whose mothers had completed secondary schooling or higher education scored 0.07-0.08 standard deviations higher than children whose mothers had not completed any formal education, whereas children whose mothers had only completed primary education, performed the same as children whose mothers had no formal education. Moreover, no gender differences were found and age, bilingualism, number of siblings, number of books, and the HLE had no impact on children's social skills.

Emotion Knowledge. The multi-level model fit the data well, explaining 40.8% of the variance in children's emotion knowledge scores, while the child-level predictors accounted for 6.9% of that variance, as shown in Table 16. Maternal education was the only significant predictor of children's emotion knowledge score. Specifically, children whose mothers had completed secondary school (β = 0.17, p < .001) or higher education (β = 0.25, p < .001) scored higher than children whose mothers had not completed any formal education. Similar to social skills, there was no difference between children whose mothers had no formal education and those whose mothers had completed only primary school. No gender or age differences were

found and parental ages, household size, number of siblings, number of books, and the HLE had no impact on children's emotion knowledge.

Pre-Numeracy Skills. The multi-level model fit the data well, explaining 49.4% of the variance in children's pre-numeracy scores and the child-level predictors accounted for 3.7% of the variance, as shown in Table 16. Gender was a significant predictor of numeracy scores (β = -.09, *p* = .002), with girls scoring 0.09 standard deviations lower on the pre-numeracy scale than boys. Additionally, the secondary school and higher education categories from maternal education were also a significant predictors of children's pre-numeracy scores (β = 0.10-0.12, *p*s = .011) indicating that children whose mothers had completed secondary school or higher education scored 0.10-0.12 standard deviations higher than children whose mothers had not completed any formal education. Father's age was also significantly associated with children's pre-numeracy scores; however, the beta coefficients were very small (β = 0.00) indicating that while children with older fathers had higher pre-numeracy scores, the effect size for this is negligible.

Pre-Literacy Skills. The multi-level model for pre-literacy explained 45.4% of the variance in children's pre-literacy scores; however, the child-level predictors only accounted for 3.2% of that variance, as shown in Table 16. Similar to emotion knowledge, only the secondary school (β = 0.10, *p* = .018) and higher education (β = 0.15, *p* = .001) categories from maternal education were significant predictors of children's pre-literacy scores. Additionally, the number of books was marginally significantly associated with children's pre-literacy scores (*p* = .055); however, the standardised beta coefficient was negligible (β = 0.00).

Comparing the Four Models

Although the child level demographic variables did not account for a substantial variance in children's outcomes, the marginal R^2 values were higher for the social-emotional outcomes (7.3% and 6.9%) compared to the academic outcomes (3.7% and 3.2%), despite the pre-

numeracy and pre-literacy outcomes having higher conditional R^2. Moreover, the MLM for social skills has the lowest AIC and BIC values, indicating that it fits the data better than the other models.

Table 16

RQ1 Multilevel Modelling Results

	Social			Emotion Knowledge			Pre-Numeracy			Pre-Literacy		
Conditional R^2	25.9%			40.8%			49.4%			45.4%		
Marginal R^2	7.2%			6.9%			3.7%			3.2%		
AIC	-417			-206			-341			-298		
BIC	-350			-140			-275			-232		
RMSE	0.135			0.157			0.137			0.143		
	β	SE	*p*	β	SE	*p*	β	SE	*p*	β	SE	*p*
Child Gender	-0.03	0.01	.120	-0.03	0.01	.344	-0.09	0.01	.002	0.00	0.01	.959
Child Age	0.00	0.00	.438	0.00	0.00	.358	0.00	0.00	.556	0.00	0.00	.376
Maternal Age	0.00	0.00	.013	0.00	0.00	.742	0.00	0.00	.133	0.00	0.00	.131
Paternal Age	0.00	0.00	.014	0.00	0.00	.499	0.00	0.00	.043	0.00	0.00	.130
Maternal Edu.												
ME 5-8 years	0.03	0.02	.188	0.06	0.02	.147	0.03	0.02	.370	0.05	0.02	.143
ME 9-13 years	0.07	0.02	.004	0.17	0.02	<.001	0.10	0.02	.011	0.08	0.02	.044
ME Higher Ed	0.08	0.02	.004	0.25	0.03	<.001	0.12	0.03	.011	0.14	0.03	.002
Household Size	-0.10	0.01	<.001	0.00	0.02	.975	-0.03	0.01	.477	-0.06	0.02	.236
Number of Siblings	0.00	0.00	.431	0.00	0.00	.761	0.00	0.00	.644	0.00	0.00	.220
Languages	0.01	0.01	.603	-0.02	0.02	.655	0.00	0.02	.909	0.01	0.02	.849
Books	0.00	0.00	.459	0.00	0.00	.283	0.00	0.00	.103	0.00	0.00	.055
HLE Index	0.00	0.00	.438	0.00	0.00	.907	0.00	0.00	.795	0.00	0.00	.185

Note. Gender (1 = Female), Languages (1 = Bilingual), Household Size (0 = 1-5 members, 1 = 6+ members), ME = maternal education, reference category for maternal education = no formal education, β = standardised coefficient, SE = standard error.

Conclusion

This chapter focuses on investigating how children's demographic characteristics (age, gender, bilingualism, parental age, maternal education, household size, number of siblings, number of books, and home learning environment) relate to their pre-numeracy, pre-literacy, social, and emotion knowledge skills. Using the sample of 607 children, four MLMs for social skills, emotion knowledge, pre-literacy and pre-numeracy at T1 were carried out. The hypotheses were only partially supported. After controlling for classroom-level variance, it was found that age was not related to any of the child outcomes (H1), there were no gender differences, except for pre-numeracy skills in which boys were better (H2), there was no discernible effect of bilingualism on any of the outcomes (H3) and parental age was significantly related to children's social skills and pre-numeracy; but the effect sizes were negligible (H5). However, maternal education was significantly related to all four outcomes (H4) and household size was negatively related to children's social skills and unrelated to the other three outcomes (H6). The HLE index was unrelated to all four outcomes, and the number of books was only marginally related to pre-literacy (H7). Altogether, not a lot of variance in children's outcomes was accounted for by their demographic variables (3.2 - 7.3%).

Chapter 5: Associations between Pakistani Children's Social-Emotional Skills and their Academic Development (RQ2)

Children's social and emotional skills impact various aspects of their development, through various mechanisms; however, these have not been examined in the Pakistani context. Using a sample of 453 preschool-aged children, this chapter focuses on understanding how children's early emotion knowledge and social skills impact their later academic outcomes, specifically their pre-literacy and pre-numeracy measured 6 months later. Since there are various potential mechanisms through which emotion knowledge and social skills may impact children's pre-literacy and pre-numeracy, multiple models were run and compared to understand the most dominant mechanism. The different multi-level structural equation models used in this chapter are:

- (M1) additive model – both emotion knowledge and social skills at T1 are used to predict pre-literacy and pre-numeracy at T2
- (M2) emotion knowledge mediation model – emotion knowledge at T2 mediates the relationship between social skills at T1 and pre-literacy and pre-numeracy at T2
- (M3) social skills mediation model – social skills at T2 mediate the relationship between emotion knowledge at T1 and pre-literacy and pre-numeracy at T2.

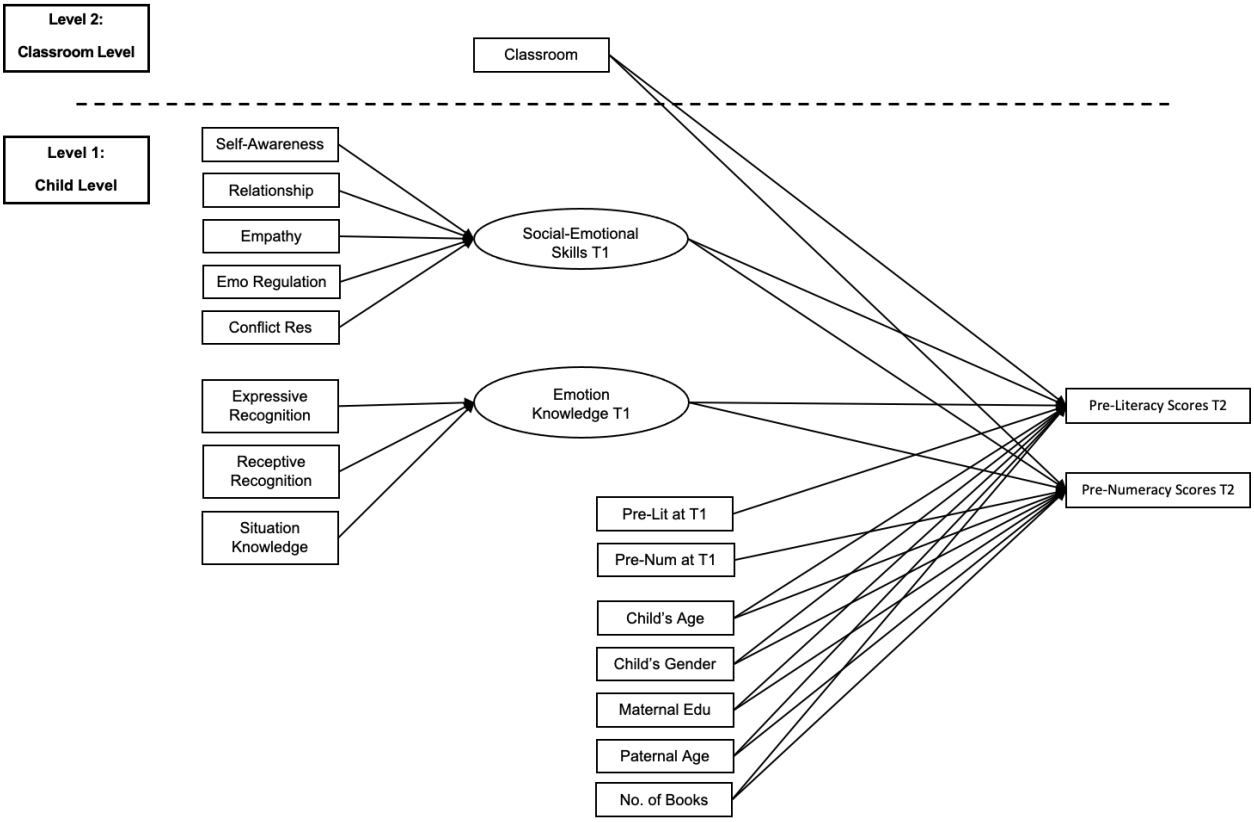
Analytic Approach

To assess if children's social skills and emotional knowledge predict their pre-numeracy and pre-literacy skills, children who completed the assessments at T1 and T2 were included (*N* = 453). Multi-level structural equation modelling (ML-SEM) was used to simultaneously estimate multiple dependent variables and the relationships between them, enabling the modelling of both changes in pre-numeracy and pre-literacy skills within a single framework, reducing the risk of Type I errors (Kline, 2023). The 'lavaan' package in R was used to conduct the analysis which is well-suited for ML-SEM and provides robust options for handling complex data and

hierarchical structures effectively (Rosseel, 2012). The missingness for variables in this analysis is low (< 8%) and Full Information Maximum Likelihood (FIML) was used to handling any remaining missing data, which is considered a robust technique for ML-SEM (Schminkey et al., 2016).

ML-SEM was also chosen as it allows for integrating measurement models for the latent constructs (social skills and emotion knowledge), accounting for measurement error and leading to more accurate and reliable estimates of the relationships between constructs (T. A. Brown, 2015). As shown in Figure 13, a two-level model with children at Level 1 and the classroom at Level 2 was run to examine the additive model (M1). Both predictors, emotion knowledge and social skills at T1, were modelled as latent variables using their respective subtasks. While the model converged, the results did not seem reliable due to a non-positive definite variance-covariance matrix, suggesting problems with model identification. Additionally, the variance of one latent variable was implausibly large, raising concerns about the robustness of the latent constructs.

Figure 13
Visual Depiction of initial M1



Note. Residuals and variance not shown. This model was ultimately not used.

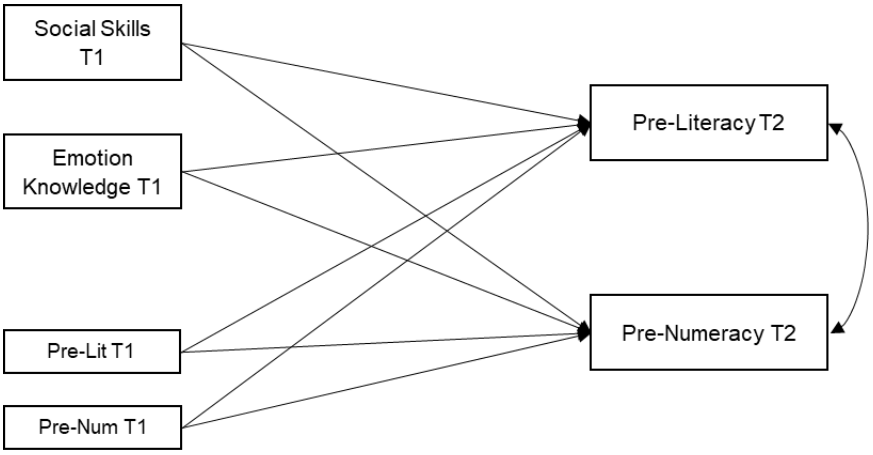
Consequently, it was decided that all models will treat both emotion knowledge and social skills as observed variables. Model 1 (with a simplified version shown in Figure 14), was specified as follows:

T2 literacy ~ T1 social skills + T1 emotion knowledge + T1 literacy + T1 numeracy + child age + maternal primary education + maternal primary education + maternal higher education + (1 | School_ID)

T2 *numeracy* ~ T1 social skills + T1 emotion knowledge + T1 literacy + T1 numeracy + child age + child gender + father age + maternal primary education + maternal primary education + maternal higher education + (1 | School_ID)

Figure 14

M1 – Additive Model



Model 2, in which emotion knowledge mediated the association between T1 social skills and the academic skills, as shown in Figure 15, was specified as follows:

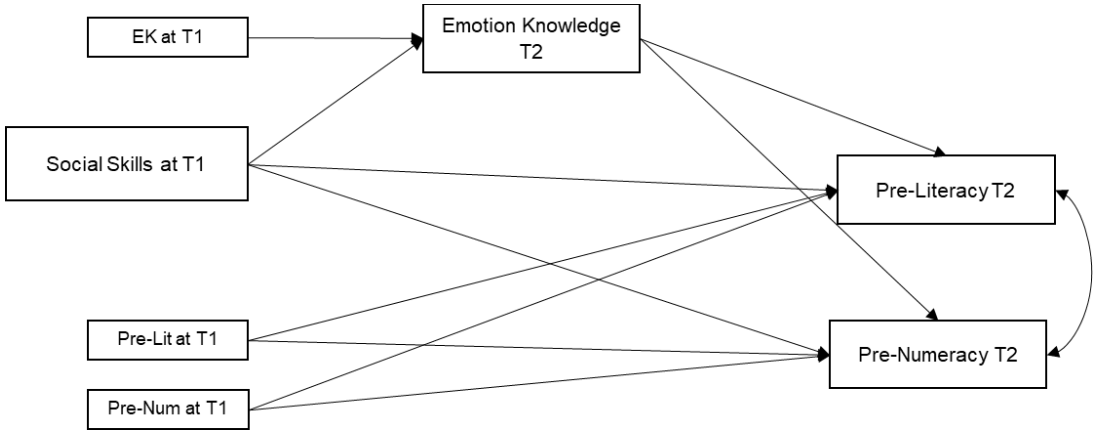
T2 emotion knowledge ~ T1 social skills + T1 emotion knowledge + child age + maternal primary education + maternal primary education + maternal higher education + (1 | School_ID)

T2 literacy ~ T1 social skills + T2 emotion knowledge + T1 literacy + T1 numeracy + child age + maternal primary education + maternal primary education + maternal higher education + (1 | School_ID)

T2 *numeracy* ~ T1 social skills + T2 emotion knowledge + T1 literacy + T1 numeracy + child age + child gender + father age + maternal primary education + maternal primary education + maternal higher education + (1 | School_ID)

Figure 15

M2 – Emotion Knowledge Mediation Model



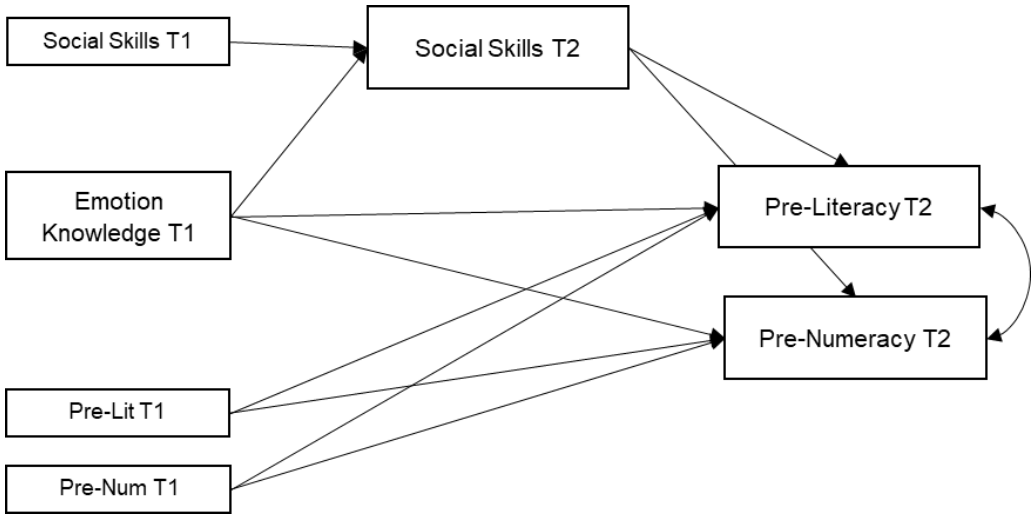
Finally, Model 3 (as shown in Figure 16), in which early emotion knowledge predicted later academic outcomes and T2 social skills mediated this relationship, was specified as follows:

T2 *social skills* ~ T1 social skills + T1 emotion knowledge + child age + maternal primary education + maternal primary education + maternal higher education

T2 literacy ~ T2 social skills + T1 emotion knowledge + T1 literacy + T1 numeracy + child age + maternal primary education + maternal primary education + maternal higher education

T2 *numeracy* ~ T2 social skills + T1 emotion knowledge + T1 literacy + T1 numeracy + child age + child gender + father age + maternal primary education + maternal primary education + maternal higher education

Figure 16
M3 – Social Skills Mediation Model



VIF values across all models ranged from 1.2 to 2.3. ICCs for the academic outcomes were high (.42 - .48), validating the use of MLM. The model fits were evaluated using standard indices (Chi-square, RMSEA, CFI, AIC, and BIC) and significance of fixed effects was evaluated using Wald tests. The chi-square test is a goodness of fit measure used to assess whether a model significantly differs from the data, with a non-significant result suggesting that the model adequately fits the data. Indirect effects were tested using the product of coefficients method,

where the path from the independent variable to the mediator (β_a) was multiplied by the path from the mediator to the outcome (β_β) to estimate the mediation effect (MacKinnon et al., 2007). To assess the statistical significance of these indirect effects, asymmetric bootstrap confidence intervals were computed based on 1,000 bootstrap samples (MacKinnon et al., 2002; Preacher & Hayes, 2008; Tofighi & MacKinnon, 2011). This approach is well suited to test mediation in complex models and is robust to non-normality in the sampling distribution of the indirect effect. An indirect effect was considered statistically significant if the 95% asymmetric bootstrap confidence interval did not contain zero.

Results

Descriptive Statistics

As shown in Table 17, for the 453 children included in this analysis, their scores increased from timepoint 1 to timepoint two, with gains of .10 and .11 points in pre-numeracy, pre-literacy, and emotion knowledge and the smallest in social skills (0.06). Children's emotion knowledge accuracy continued to be the highest, whilst their social skills remained the lowest.

Table 17
RQ2 Descriptive Analysis

Variables	*N*	%	Mean	SD	Min	Max
Child's Age	449		60.15	7.47	45	79
Gender (% Male)		45.0				
Bilingual		38.4				
Maternal Education						
None/Not completed Primary		24.0				
Completed 5-8 years of school		25.2				
Completed 9-13 years of school		31.6				
Completed higher education		19.2				
Father's Age	418		37.33	6.86	20	62
Pre-Numeracy T1 Scores	453		.51	.21	.00	1.00
Pre-Literacy T1 Scores	453		.54	.21	.03	0.94
Social Skills T1 Scores	453		.34	.17	.00	0.92
Emotion Knowledge T1 Scores	453		.62	.22	.08	1.00
Pre-Numeracy T2 Scores	453		.61	.20	.15	1.00
Pre-Literacy T2 Scores	453		.65	.19	.00	1.00
Social Skills T2 Scores	453		.40	.19	.02	0.96
Emotion Knowledge T2 Scores	453		.72	.20	.00	1.00

Inferential Statistics

ML-SEM analysis was conducted to explore how children's initial social skills and emotion knowledge scores predicted their later pre-literacy and pre-numeracy scores, while controlling for children's prior academic skills, age and other demographic variables found as significant predictors in Chapter 4 (child age, gender, maternal education, and paternal age), and school-level clustering effects. Table 18 shows the model fit indexes for all three models.

Table 18

RQ2 Model Fit Indices

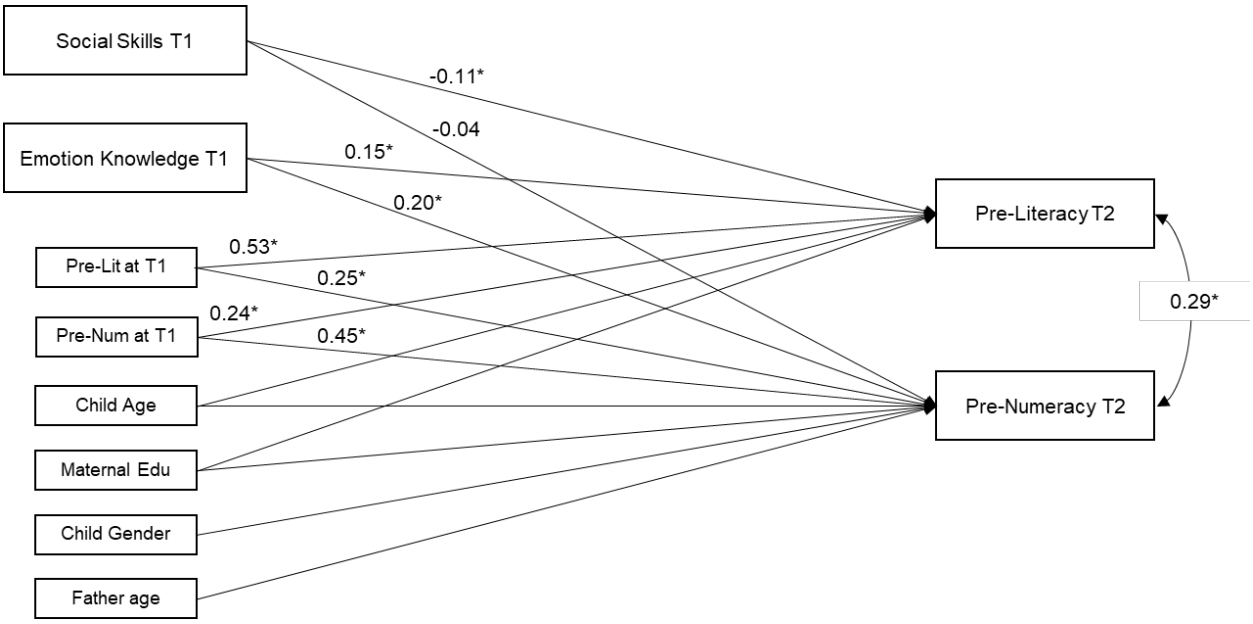
	χ^2(df)	*p*	CFI	TLI	RMSEA	AIC	BIC
M1	2.74 (2)	0.254	0.99	0.99	0.03	-1224	-1132
M2	27.02 (6)	< .001	0.98	0.92	0.09	-1854	-1732
M3	11.29 (6)	0.023	0.99	0.95	0.07	-1718	-1587

M1. The additive model fit the data well, $\chi^2(4) = 2.74$, $p = .254$, Figure 17. The Comparative Fit Index (CFI) was 0.99, and the Tucker-Lewis Index (TLI) was 0.99, both indicating a very good fit. The Root Mean Square Error of Approximation (RMSEA) was 0.03, well below the common threshold of 0.08 (Awang, 2012), suggesting a close fit. These results suggest that the predictors captured meaningful variance in pre-literacy and pre-numeracy outcomes at T2 while accounting for outcomes at T1 and clustering effects at the classroom level.

Emotion knowledge at T1 was positively associated with both pre-literacy (β = 0.15, $p < .001$) and pre-numeracy (β = 0.20, $p < .001$) at T2. Social skills at T1 showed a significant, however, negative association with pre-literacy at T2 (β = -0.11, $p < .001$) and no association with pre-numeracy at T2 (β = -0.04, $p = .388$). Both T1 academic skills had strong associations with the corresponding skill at T2, and moderate associations with the other academic skill, all four of which were stronger than the associations with emotion knowledge and social skills. Demographic characteristics did not have any significant associations.

Figure 17

Results of M1 – Additive Model



Note. * = p <.05. Associations between demographic variables (child age, gender, maternal education, and paternal age) not shown. Residuals not shown. Children were clustered in their classrooms.

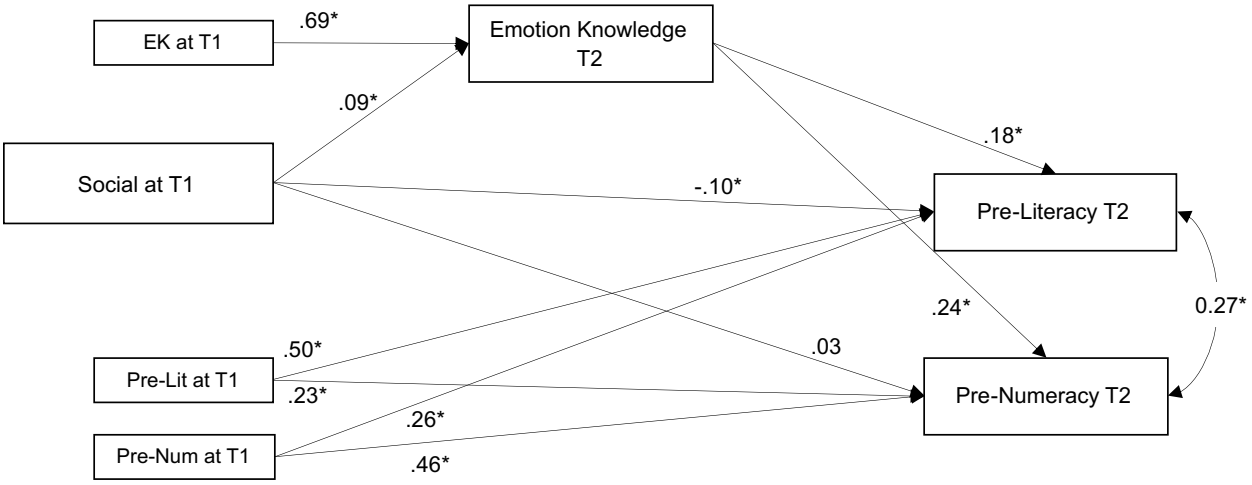
Mediation Analysis

M2. To further explore how social skills and emotional knowledge related to children's academic outcomes, a mediation model was conducted to test the indirect effects of T1 social skills on T2 literacy and numeracy, with T2 emotion knowledge serving as the mediator (Figure 18). In this model, pre-literacy, pre-numeracy, and emotion knowledge at T1 were included as covariates, along with children's age, gender, and maternal education. The goodness of fit test was significant for this model indicating that the model did not fit the data well, $\chi^2(6) = 86.86$, p < .001. However, researchers argue that this test is susceptible to large sample sizes (Sathyanarayana & Thangamuthu, 2024); therefore other statistics also need to be considered when deciding model fit. In this case, other test statistics revealed mixed findings: while CFI =

0.98 and TLI = 0.92, demonstrate a good fit, the RMSEA value (0.09) is higher than the threshold of 0.08, demonstrating poorer fit.

Figure 18

Results of M2 – Emotion Knowledge Mediation Model



Note. * = p <.05. Associations between demographic variables (child age, gender, maternal education, and paternal age not shown. Residuals not shown. Children were clustered in their classrooms.

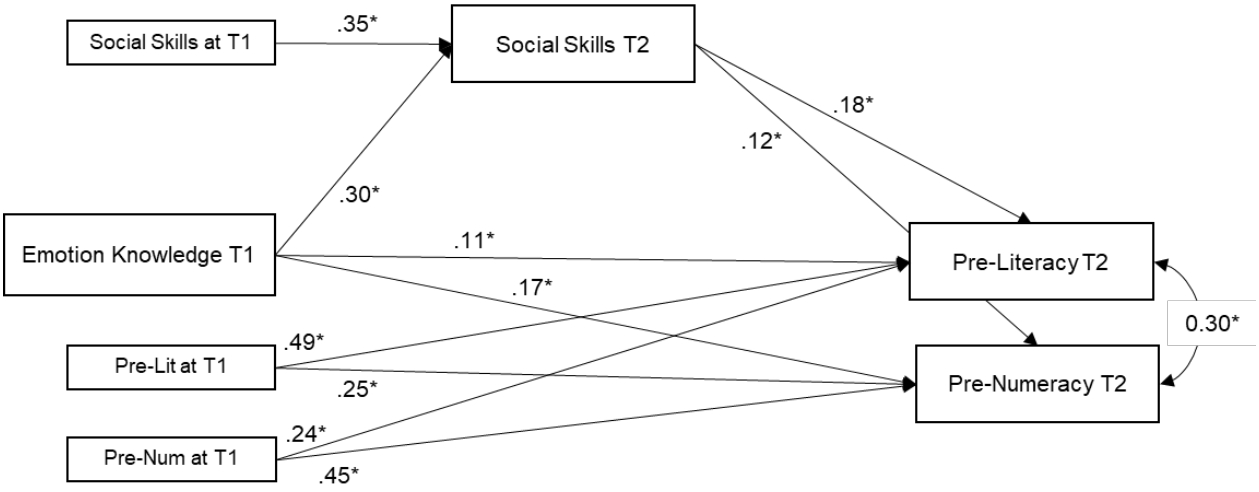
Children's social skills at T1 significantly predicted their emotion knowledge (β_a = 0.09, p < .001) and pre-literacy (β = -.10, p < .001) at T2 but not their pre-numeracy at T2 (β = 0.03, p = .440). The direct associations between children's emotion knowledge at T2 and their pre-literacy (β_b = 0.18, p < .001) and pre-numeracy (β_b = 0.24, p < .001) skills were also significant. The estimate of indirect effect of social skills on pre-literacy (β = .02, 95% CI: [0.00, 0.03]) and pre-numeracy (β = .02, 95% CI: [0.00, 0.05]) was weak. As the CI contains zero, this indirect effect is statistically non-significant.

M3. The last model was run to test the indirect effect of T1 emotion knowledge on T2 literacy and numeracy, with T2 social competence serving as the mediator (Figure 19). Pre-literacy, pre-numeracy, and social skills at T1 were included as covariates, along with children's

age, gender, and maternal education. Similar to M2, the M3 also demonstrated a significant chi-square test, $\chi^2(4) = 11.29$, $p < .023$. However, other fit indices were considered, which demonstrated good model fit, CFI = 0.99, TLI = 0.95, RMSEA = 0.07.

Figure 19

Results of M3 – Social Skills Mediation Model



Note. * = p <.05. Associations between demographic variables (child age, gender, maternal education, and paternal age not shown. Residuals not shown. Children were clustered in their classrooms.

The association between T1 emotion knowledge and T2 social skills was significant (β_a = 0.31, $p < .001$). The direct associations between emotion knowledge at T1 and children's pre-literacy and pre-numeracy at T2 continued to be significant (β = 0.11-0.17, $p < .001$). Additionally, the direct associations between social skills at T2 and pre-literacy (β_b = .18, $p < .001$) and pre-numeracy skills (β_b = .12, p = .001) were also significant.

The estimates of indirect effects were significant for both pre-literacy, β = 0.05 (95% CI: [0.02, 0.08]), and pre-numeracy, β = 0.04 (95% CI: [0.01, 0.07]), suggesting that T1 emotion knowledge influences both academic outcomes at T2 through social skills at T2, where greater social skills are associated with better academic outcomes.

Conclusion

This chapter examined competing models to investigate the mechanisms linking Pakistani children's early social and emotional skills to their later academic outcomes. Three multilevel structural equation models were specified and compared: an additive model in which both emotion knowledge and social skills predicted later academic outcomes (M1), a model in which emotion knowledge mediated the effect of early social skills on academic outcomes (M2), and a model in which later social skills mediated the effect of early emotion knowledge (M3).

Of the three, the additive model (M1) provided the best fit to the data, as evidenced by a non-significant chi-square test, excellent CFI and TLI values (both = .99), and a low RMSEA (.03). While M2 showed the lowest AIC and BIC, its poor absolute fit ($\chi^2 = 27.02$, $p < .001$; RMSEA = .09) suggests that the added complexity did not yield a better-fitting model. Model 3 performed better than Model 2 and had significant indirect effects. Taken together, these results support the additive model as the most appropriate representation of the data and suggest that in terms of mediation, early social skills do not have indirect effects on children's academic performance, but early emotion knowledge does. Across all models, emotion knowledge emerged as the most robust predictor of both pre-literacy and pre-numeracy skills at T2, exerting significant direct and indirect effects. Interestingly, early social skills showed a negative association with later academic skills, suggesting that their contribution may depend on how they develop or are reinforced over time. Social skills at T2, however, played a meaningful mediating role, helping to bridge the effects of early emotion knowledge on academic outcomes.

These findings underscore the importance of fostering emotion knowledge in early childhood as a foundational skill that can support later social functioning and academic development. Moreover, they highlight the dynamic and evolving nature of social-emotional competencies, suggesting that the timing and trajectory of skill development matter for children's learning.

Chapter 6: Exploring the Structural and Process Quality of Pakistani ECE Classrooms and Associations for Child Outcomes (RQ3)

Research on ECE is scarce in Pakistan, with no empirical evidence on its quality and how it varies across different types of provisions. This chapter explores the structural and process quality of public, private, and non-profit ECE classrooms in Pakistan, examines how structural indicators of quality predict global classroom quality and teacher-child interactions, how child outcomes vary by different types of provision, and how indicators of quality predict children's outcomes. The sub-research questions are:

A. What is the average quality of Pakistani ECE classrooms, as measured through the ECERS-R, CIS, and structural indicators (teachers' age, education, ECE qualification, years of teaching, and languages spoken, as well as class size, teacher-child ratio, and hours of teaching)?
B. How do quality indicators differ across the different types of provision (public, private, and non-profit)?
C. How do structural quality indicators and process quality (ECERS-R and CIS) relate to each other?
D. How do provision type, structural quality indicators, global classroom quality, and teacher-child interactions predict children's academic and social-emotional outcomes?

Analytic Approach

This study employed a multi-stage analytic strategy to investigate classroom quality in Pakistani ECE settings and its associations with children's emotion knowledge, pre-literacy, pre-numeracy, and social skills. The analytic plan was informed by both theoretical considerations and practical constraints related to data structure and sample size.

Descriptive Statistics and Group Comparisons

To begin with, descriptive statistics (means, standard deviations, ranges, and frequencies) were computed to provide an overview of classroom quality across the sample. This initial step was important for understanding the overall quality of ECE classrooms in Pakistan and to benchmark against international findings using the ECERS-R and CIS.

Following this, differences between private, public, and non-profit schools were examined to identify structural and process quality patterns across provision types. One-way ANOVAs were conducted for continuous variables (e.g., ECERS-R total scores, teacher age), and chi-square tests were used for categorical indicators (e.g., teacher education, ECE training). These comparisons aimed to explore potential inequalities or strengths in quality provisions by school management type, reflecting broader systemic trends.

Predicting Classroom Quality: Multivariate Regression

To understand which teacher and classroom characteristics predict global classroom quality, two multivariate linear regression models were conducted with ECERS-R total score as the outcome variable in one and CIS total score as the outcome variable in the other. Predictors were: teacher age, teacher education (bachelor's degree or not), ECE training (yes/no), years of teaching experience, number of languages spoken by the teacher, class size, teacher-child ratio, and daily hours of operation. This approach allowed for simultaneously assessing the unique contribution of each factor, while adjusting for others.

A post hoc power analysis conducted using G*Power 3.1 (Faul et al., 2009) indicated that the regression analysis at the classroom-level was underpowered (power = .75) to detect medium effect sizes ($\beta = 0.35$), increasing the chances of Type II error. Therefore effect sizes should be considered along the p-values when interpreting these findings (Cumming, 2014).

Predicting Child Outcomes: Multilevel Modelling

To examine how classroom quality and structural indicators predict child-level outcomes, I originally intended to use a ML-SEM to simultaneously model all four outcomes (numeracy, literacy, social skills, and emotion knowledge), with ECERS-R subscales, the CIS total score, and structural indicators as predictors. However, the model did not converge. Another ML-SEM model was run in which the ECERS-R subscales were observed variables, informing an ECERS-R latent variable; however, this model also did not converge. A final SEM model was run in which the total ECERS-R score was used instead. This model also demonstrated poor model fit indices (CFI < .80, RMSEA > .10). These issues were likely due to the model complexity and correlation between the outcomes.

Consequently, a multilevel modelling approach was adopted, in which each of the outcome variables was investigated separated. Four two-level models were estimated using the 'lmer()' function from the 'lme4' package in R (Bates et al., 2015), with child outcomes as dependent variables and classroom-level predictors at Level 2 and child covariates at level 1. The four outcome models were specified as:

1. **Numeracy at T2**
   numeracy t2 ~ ECERS-R + CIS + teacher age + teacher education + teacher ECE training + teacher experience + teacher languages + number of students + teacher-child ratio + duration + numeracy t1 + child age + maternal education primary + maternal education secondary + maternal education higher + (1 | school_ID)

2. **Literacy at T2**
   literacy t2 ~ ECERS-R + CIS + teacher age + teacher education + teacher ECE training + teacher experience + teacher languages + number of students + teacher-child ratio + duration + literacy t1 + child age + maternal education primary + maternal education secondary + maternal education higher + (1 | school_ID)

3. **Social Skills at T2**
   socialskills_t2 ~ ECERS-R + CIS + teacher age + teacher education + teacher ECE training + teacher experience + teacher languages + number of students + teacher-child

ratio + duration + social skills t1 + child age + maternal education primary + maternal education secondary + maternal education higher + (1 | school_ID)

4. **Emotion Knowledge at T2**
   emotionknowledge_t2 ~ ECERS-R + CIS + teacher age + teacher education + teacher ECE training + teacher experience + teacher languages + number of students + teacher-child ratio + duration + emotion knowledge t1 + child age + maternal education primary + maternal education secondary + maternal education higher + (1 | school_ID)

Multicollinearity was assessed using VIFs, which ranged from 1.11 to 2.75, indicating low risk of multicollinearity among predictors (Hair, 2011). ICCs for child outcomes ranged from .20 to .48 (see Table 19), suggesting moderate to strong clustering of outcomes at the school level. This justified the use of multilevel modelling, as ICCs above .10 typically indicate a need for MLM, and those above .30 reflect substantial nesting effects (J. Hox et al., 2017; V. E. Lee, 2000).

Significance was assessed using Wald tests. Standardised beta coefficients were reported for interpretation. Missing data were minimal (<5%, see Table 8) and handled using Full Information Maximum Likelihood (FIML), which provides unbiased parameter estimates under the assumption of data missing at random (Enders, 2011). Model diagnostics were performed to check for assumptions such as normality of residuals and homoscedasticity. Robust standard errors were used to address violations of these assumptions.

Table 19
RQ3 Outcome ICCs

Outcome Variable	ICC
Pre-Numeracy T2	.42
Pre-Literacy T2	.48
Social-Emotional T2	.20
Emotion Knowledge T2	.36

Results

Research Question 3A: What is the average quality of Pakistani ECE classrooms?

To understand the nature of ECE classrooms in Pakistan, descriptive statistics were calculated for both process quality indicators – namely, the overall ECERS-R and CIS scores – and structural quality indicators, including teachers' age, level of education, years of experience, ECE training, class size, student-teacher ratio, and hours of teaching, as presented in Table 20. There was a large variation in teachers' age, with the highest percentage of the teachers being in their 20s (32.5%) and a similar number in their 30s (25.3%) and 40s (22.7%). The presence of predominantly young teachers suggests a relatively new and potentially inexperienced workforce. This is further supported by the finding that 70% of teachers had five years of experience or less, indicating limited professional tenure in the sector. However, a small group of veteran teachers (N = 8) had over 20 years of experience, showing that retention in ECE is possible, even if rare.

All teachers in the sample were female, reflecting prevailing gender norms in Pakistan, where early education is a female-dominated domain, while male educators typically enter the profession at secondary levels or assume leadership roles. Given that all teachers were female, the variable was excluded from all additional analyses. In terms of teachers' language status, approximately half of the classes had bilingual teachers (45%), whereas a quarter had only monolingual teachers (27.5%), and the remaining quarter had at least one multi-lingual teachers (27.4%). Whilst the questionnaire asked teachers to report how many languages they spoke, it is unclear whether these languages were used within the classroom also.

Teacher qualifications showed some promising trends: most had completed higher education (60%), and just over half (51%) had received some form of ECE training. However, the absence of ECE training among nearly half the sample raises concerns, particularly given the strong evidence base linking such training to improved teaching quality and child outcomes.

Classroom-level characteristics painted a similarly challenging picture. Class sizes were large, averaging 33 students per room, with only 15% of classrooms serving fewer than 20 children. These high enrolment figures, coupled with poor adult-child ratios – averaging 27 children per teacher and peaking at 58:1 – point to a significant structural barrier to quality. Only four classrooms met the recommended ratio of 1:8–10, severely limiting opportunities for individualised instruction, meaningful interactions, and effective classroom management. Additionally, the average number of classroom instructional hours was approximately four hours per day, which is consistent with LMIC patterns but shorter than what is typically observed in high-income countries that often provide full-day preschool (6–8 hours) (OECD, 2017).

Table 20

RQ3 Variable Descriptive Statistics

Variables	*N*	%	Mean	SD	Min	Max
Teacher's Age	50		34.24	10.44	16	56
Teacher's Gender (% Female)	51	100				
Years of Teaching	51		5.63	6.14	0	28
Languages spoken	51					
Monolingual		27.5				
Bilingual		45.1				
Multi-lingual		27.4				
Education (% completed HE)	51					
Completed 8 years of school		4.0				
Completed 11 years of school		10.0				
Completed A Levels/equivalent		26.0				
Completed higher education		60.0				
ECE Training (% Yes)	51	51				
Class size	50		33.04	13.11	11	63
Teacher-Child Ratio	50		27.00	12.56	5.50	58.00
Hours of Teaching	51		4.13	0.71		
School Type						
Public		47.1				
Private		33.3				
Non-Profit		19.6				
ECERS-R Overall	51		1.97	0.75	1.09	4.06
Space and Furnishing	51		2.15	0.71	1.00	3.63
Personal Care Routines	51		1.59	0.69	1.00	3.75
Language and Reasoning	51		2.04	1.18	1.00	5.50
Activities	51		1.46	0.56	1.00	3.20
Interactions	51		2.38	1.51	1.00	5.80
Programme Structure	51		1.62	0.94	1.00	4.67
Parents and Staff	51		2.57	0.84	1.30	5.00
CIS Overall	51		70.04	14.21	39.5	90.00

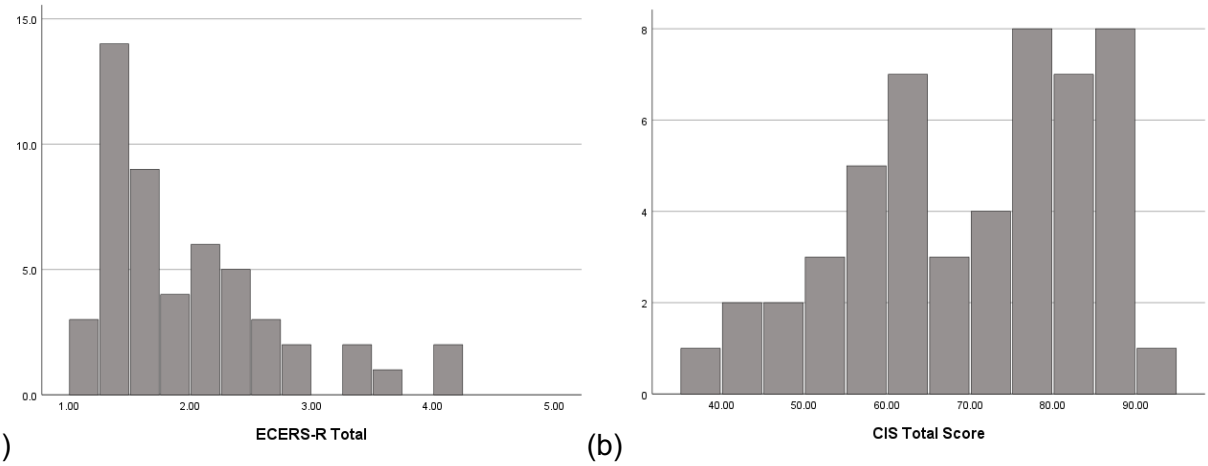
In terms of process quality, ECERS-R scores were strikingly low, with an overall mean of just 1.97 out of 7.00 (see Appendix J for descriptive statistics for each item). This suggests that many classrooms may not be providing the types of stimulating, child-centred environments that promote early learning and development. The distribution of scores was skewed toward the lower end, with only five classrooms scoring above 3 (see Figure 20a). This may underscore the systemic nature of the quality challenges rather than isolated underperformance. This pattern continued to be echoed in the subscales. Mean scores across all seven domains were below the midpoint of the 7-point scale. The Activities subscale scored the lowest (M = 1.46) and had the least variation compared to all subscales (SD = 0.56), indicating that classrooms in the sample generally had floor effects on this subscale. Personal Care Routines scored the second lowest (M = 1.59), followed closely by Programme Structure (M = 1.62). The other four scales had comparatively better mean scores – specifically higher scores and more variance on the Language and Reasoning (M = 2.04, SD = 1.18) and Interaction (M = 2.38, SD = 1.51) subscales suggests that some classrooms in the sample did display higher levels of interactional quality, with both having a maximum score of over 5. The Space and Furnishings subscale had a mean score of 2.15 (SD = 0.71), primarily due to two items (furnishings for relaxation and space for privacy) that scored lower (see Appendix J), most likely due to cultural differences. Interestingly, the Parents and Staff (M = 2.57, SD = 0.84) subscale scored the second highest, indicating strengths on items regarding provisions of the staff and staff interaction.

In contrast to the low levels of global classroom quality, the CIS, which focuses on teacher-child interactions, yielded a more positive average score of 70.04 out of 104. Although no teacher reached the maximum, the overall skew towards higher scores (Figure 20b) suggests that some aspects of teacher-child interactions may be more resilient or less resource-dependent than the broader classroom environment. Interestingly, despite these differing distributions, ECERS-R and CIS scores were strongly correlated (r = .68, p < .001), indicating

that classrooms that scored higher on global quality were also more likely to demonstrate stronger teacher-child interactions. This finding aligns with theoretical models suggesting that aspects of process quality are interrelated – supportive, well-organised environments tend to foster better relationships, and vice versa.

Figure 20

Process Quality Indicator Distribution



(a) (b)

Note. (a) ECERS-R Total Score Distribution (b) CIS Total Score Distribution

In summary, these findings offer a mixed picture of ECE classroom quality in Pakistan. While there are encouraging signs – such as relatively high levels of general education among teachers and strengths in some teacher-child interactions – the overall quality landscape is characterised by overcrowded classrooms, limited ECE training, and low global classroom quality. The structural conditions of classrooms, particularly the high child-to-teacher ratios, may pose significant challenges for delivering developmentally appropriate and responsive education.

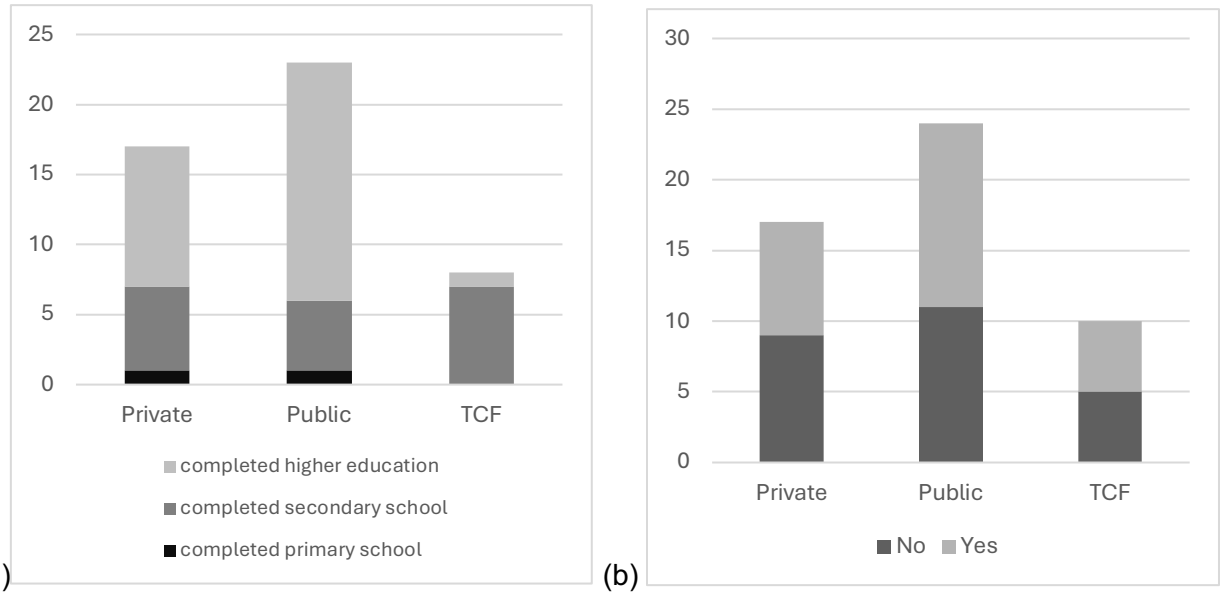
Research Question 3B: How does quality differ by provision type?

To examine differences in quality across the three main types of early childhood education provision in Pakistan – public, private, and non-profit (represented by TCF) – a series of analyses were conducted on both structural and process quality indicators.

Teacher Characteristics. As previously noted, 60% of the overall sample of teachers held a university degree. Disaggregating this by provision type revealed that public schools were significantly more likely to have teachers with higher education qualifications than either TCF or private schools, $\chi^2(8) = 19.60$, $p = .012$ (Figure 21a). This is likely linked to higher salaries and stricter hiring criteria in the government sector. Over half of the private school teachers also held university degrees, suggesting moderate investment in teacher qualifications. In contrast, the majority of TCF teachers had not completed university education – although notably, none had only primary-level education, which was observed in both public and private schools. This reflects TCF's baseline hiring standards, which still ensure a minimum level of teacher education

Figure 21

Teacher Education and ECE Training by provision type

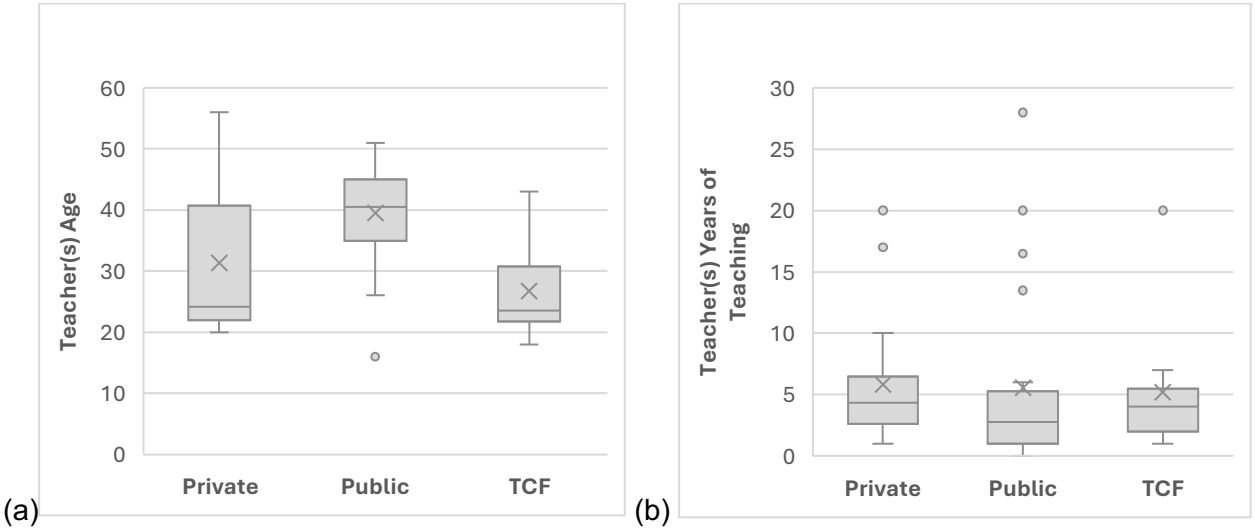


With regards to teachers' ECE training, there were no significant differences by provision type, χ^2 (2) = 0.21, p = .902 (Figure 21b). Roughly half the teachers across all settings reported having received some form of ECE-specific training. This even split underscores a widespread lack of specialised preparation for working with young children, regardless of school type.

Further comparisons revealed that teachers in public schools tended to be significantly older on average than those in TCF and private schools, F = 7.82, p = .001, η^2 = .25 (Figure 22a). There was substantial variation in private school teachers' age, with the oldest ones being 56 years old, whereas TCF schools tended to employ younger teachers. While older age might be assumed to correlate with greater experience, this was not the case. Teachers across the three provision types had similar years of experience, F = 0.03, p = .970, η^2 = .00 (Figure 22b). In fact, public school teachers, despite being older, tended to have less classroom experience, albeit non-significantly, perhaps reflecting late entry into the teaching profession or administrative transfers from other roles.

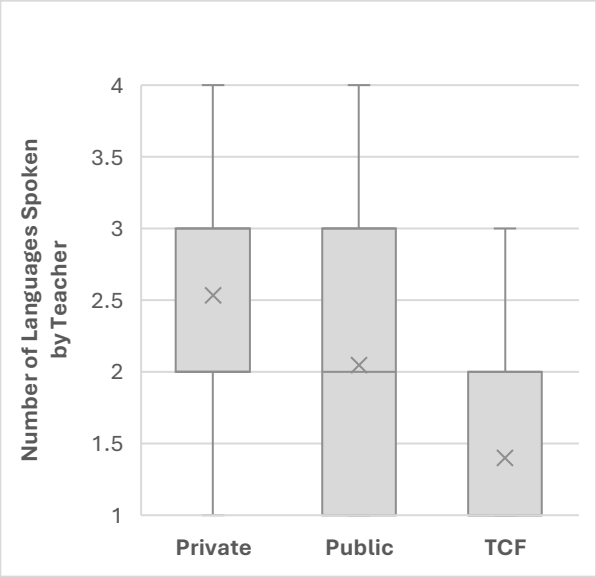
Figure 22

Teacher Age and Experience by Provision Type



Linguistic diversity among teachers also varied significantly by provision type, $F = 5.86$, $p = .005$, $\eta^2 = .20$, Figure 23. Private school teachers tended to speak more languages, potentially enhancing their ability to connect with linguistically diverse classrooms. In contrast, TCF teachers spoke fewer languages, which may reflect more localised hiring practices. Public school teachers showed high variability in the number of languages spoken, suggesting broader recruitment geographies or more diverse communities served.

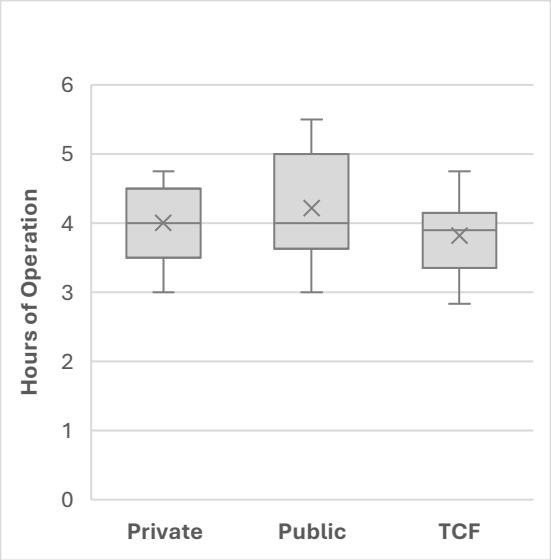
Figure 23
Teacher Language Status by Provision Type



Classroom Characteristics. When considering classroom characteristics, it was found that provision types did not differ in terms of their hours of operation, $F = 1.75$, $p = .184$, $\eta^2 = .07$. All schools provided at least three hours of ECE, with public schools occasionally extending up to 5.5 hours (Figure 24).

Figure 24

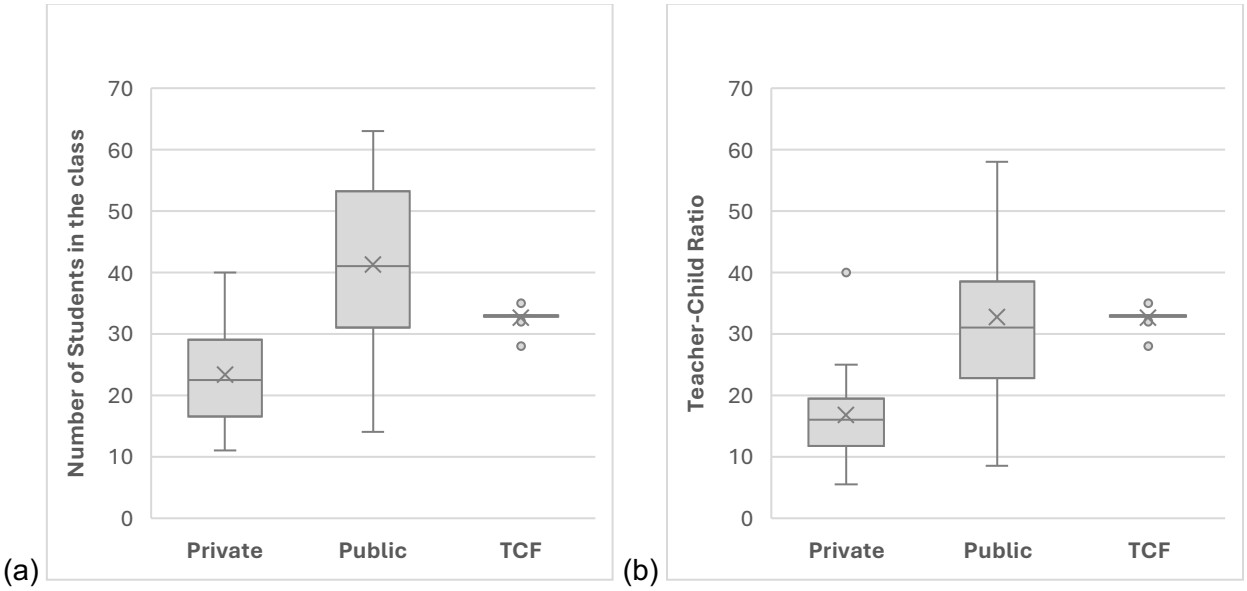
Hours of Operation by Provision Type



However, significant disparities emerged in class size, $F = 13.10$, $p < .001$, $\eta^2 = .36$, and teacher-child ratios, $F = 14.44$, $p < .001$, $\eta^2 = .38$ (Figure 25). TCF classrooms were the most consistent in both indicators, with almost all classrooms comprising 33 children and a single teacher – suggesting a regulated model with little variation. Public schools, by contrast, showed substantial variation, with class sizes ranging from 13 to 60 and a mean of 40 students per classroom. Teacher-child ratios followed a similar pattern, averaging 30:1. Private schools fell between the two: while more variable than TCF, their average class size was lower than public schools (around 25), and they maintained slightly better teacher-child ratios (around 17:1), although one outlier had 40 children per teacher. These findings suggest that while TCF classrooms offer predictability and consistency, they may be over-enrolled relative to international standards. Public schools appear to suffer from significant overcrowding and inconsistency, while private schools provide a mix of both favourable and less ideal structural conditions.

Figure 25

Class Size and Teacher-Child Ratio by Provision Type

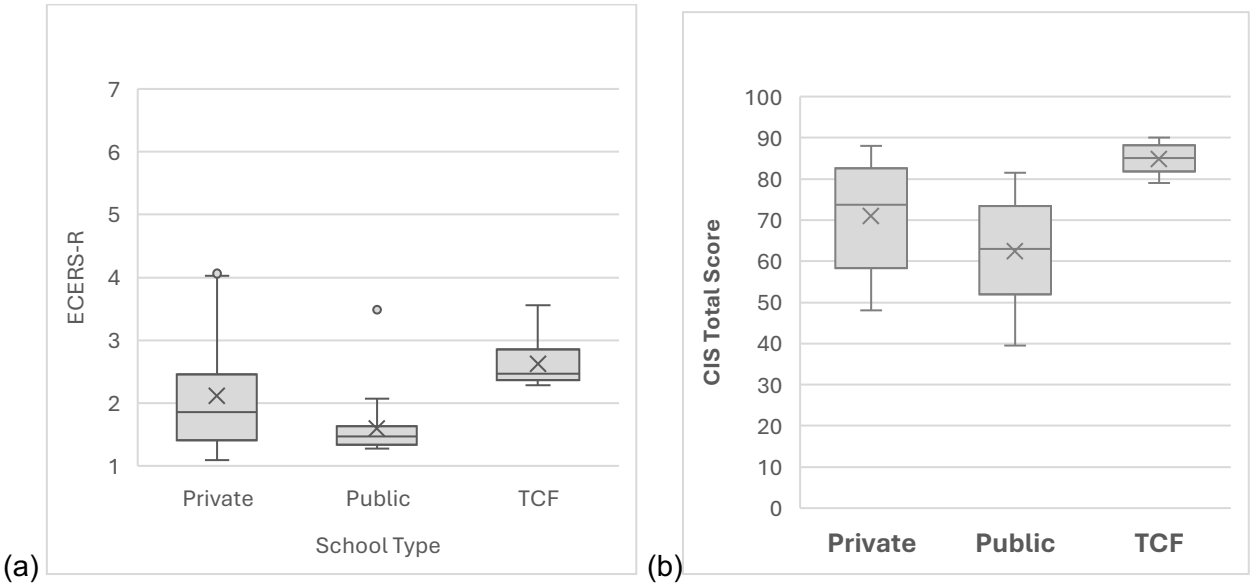


Process Quality: Global Classroom Quality and Teacher-Child Interactions.

Turning to process quality, significant differences were found between the three different provision types for both the ECERS-R total score ($F = 9.75$, $p < .001$, $\eta^2 = .29$, Figure 26a) and the CIS scores ($F = 13.54$, $p < .001$, $\eta^2 = .36$, Figure 26b). On average, TCF schools ($M = 2.63$) had higher global classroom quality than private ($M = 2.12$) and public ($M = 1.59$) schools. However, notable exceptions were observed: the two highest-scoring classrooms in the entire sample were private schools, highlighting substantial variability within that sector. One public school also emerged as an outlier, performing at par with higher level TCF classrooms, indicating that high-quality provision is possible in the public system, though rare.

Figure 26

Process Quality Scores by Provision Type



Note. Boxplots for (a) global classroom quality as measured by the ECERS-R, and (b) interactional quality as measured by the CIS.

Teacher-child interactions, as measured by the CIS, followed a similar pattern: TCF schools had significantly higher interactional quality (M = 84.80) than both private (M = 71.70) and public schools (M = 61.30). Private schools also significantly outperformed public schools. The narrow distribution of CIS scores in TCF schools suggests greater consistency in interactional quality, potentially due to stronger institutional oversight or training. In contrast, the wider spread in public and private schools suggests inconsistent practice, with some classrooms performing well and others very poorly. Interestingly, public schools displayed little variation in their ECERS-R scores, which may reflect systemic challenges – such as rigid curricula, resource constraints, and limited teacher autonomy – that constrain improvements in physical environments and learning materials across public ECE settings. However, greater variation was observed in CIS scores, indicating that despite broader structural limitations, individual teachers differed in the quality of their interactions with children.

These findings highlight substantial and meaningful differences in both structural and process quality across school types in Pakistan. Public schools benefit from higher teacher qualifications and longer instructional hours but are undermined by overcrowded classrooms, inconsistent staff experience, and the lowest observed levels of process quality. TCF schools, while limited in terms of teacher education and language diversity, appear to offer the most consistent classroom environments and highest average process quality – suggesting a tightly standardised approach that may compensate for some structural limitations. Private schools present a mixed picture: they vary widely in all domains, with some offering high-quality environments and others struggling with poor ratios and underqualified staff, reflecting the limited oversight and regulations in the sector.

Research Question 3C: How do quality indicators relate to each other?

To examine how structural quality indicators predicted indicators of process quality, bivariate correlations were first calculated, followed by two separate regression models – one for each of the process quality indicators (ECERS-R and CIS). Teacher education was coded as a binary variable, with teachers classified as either having (60%) or not having (40%) higher education. The remaining variables were used in the same way as previous parts of the chapter.

As shown in Table 21, correlations between teacher characteristics and ECERS-R scores revealed no statistically significant associations. Teachers' age had a small negative relationship with ECERS-R scores (r = -0.20, p = .167), suggesting a potential trend where older teachers may be associated with slightly lower global classroom quality, although this was not significant. Non-significant patterns were also observed for teachers with ECE training (r = 0.13, p = .364) and years of teaching experience (r = 0.10, p = .513), suggesting that teachers with ECE training and more experience are associated with higher quality classrooms. Notably, the number of languages spoken and teacher education were entirely uncorrelated with ECERS-R scores. In contrast, classroom-level structural characteristics showed slightly stronger

associations with ECERS-R scores. Class size had a modest non-significant negative correlation (r = -0.23, p = .112), while the teacher-child ratio had a slightly stronger negative association (r = -0.27, p = .054), narrowly missing statistical significance. These results tentatively suggest that larger class sizes and less favourable ratios may detract from classroom quality.

In terms of CIS scores, a few noteworthy patterns emerged. Teachers' age again showed a marginally significant negative correlation (r = -0.27, p = .063), hinting at the possibility that younger teachers may engage more positively with children. Class size had a statistically significant negative correlation with CIS scores (r = -0.37, p = .008), offering stronger evidence that larger classrooms compromise interaction quality. Other variables, including teacher-child ratio (r = -0.23, p = .114) and duration (r = -0.16, p = .255), were negatively correlated to CIS but did not reach significance.

Table 21
Bi-variate Correlations between Structural and Process Indicators

	ECERS-R		**CIS**	
	r	***p***	***r***	***p***
Teachers' Age	-.20	.167	-.27	*.063*
Teachers' Education	.01	.930	.09	.543
ECE Training	.13	.364	.13	.364
Years of Teaching	.10	.513	.03	.823
No. of Languages	.00	.990	-.03	.849
No. of Students	-.23	.112	-.37	*.008*
T-C Ratio	-.27	*.054*	-.23	.114
Duration	-.14	.332	-.16	.255

Interestingly, a one-way ANOVA revealed that the number of languages spoken by teachers had a significant impact on the overall ECERS-R score. Post hoc tests revealed that classroom with teachers who spoke 3 languages had the highest quality scores (M = 15.01), significantly outperforming those who spoke one (M = 14.28, t = -.281, p = .004), two languages (M = 12.53, t = 1.125, p <.001), or even four languages (M = 12.46, t =.61, p = .004). This curvilinear pattern suggests that multilingualism may confer benefits for classroom quality up to a certain point, beyond which the complexity of managing multiple languages might present challenges. Notably, teachers who spoke four languages had the lowest ECERS-R scores, highlighting a sharp decline.

Regression Findings. In addition to the correlations, two regression models were conducted to examine how structural classroom quality indicators (teachers' age, education, ECE training, years of teaching, number of languages, number of students, teacher-child ratio, and class duration) predicted global classroom and interactional quality.

The model predicting ECERS-R scores was not statistically significant overall (F = 1.32, p = .261, R^2 = 21.8%), indicating that structural characteristics did not robustly explain variation in global classroom quality. However, several predictors showed moderate effect sizes, suggesting underlying trends worth exploring further, given the low power in the study. For instance, teachers' age negatively predicted ECERS-R scores (β = -0.33, p = .055), with the effect nearing significance. Teachers with a higher education degree (β = 0.26), more years of experience (β = 0.23), and those speaking fewer languages (β = -0.26) also tended to have classrooms with higher ECERS-R scores, although these effects were not statistically significant. These patterns suggest that certain teacher attributes – particularly related to professional background and language use – could play an important role in shaping how Pakistani early year classroom environments are structured and maintained. Given the effect

sizes, the lack of statistical significance may reflect sample size constraints more than a true absence of relationship.

In contrast, the regression model predicting CIS scores was statistically significant (F = 2.56, p = .025, R^2 = 35.0%), indicating that structural characteristics do matter when it comes to interactional quality in Pakistan. Three key predictors emerged. First, teachers' age negatively predicted CIS scores (β = -0.41, p = .011), reinforcing the trend seen in the correlational analysis, suggesting that younger teachers tend to engage in more positive, responsive, and developmentally supportive interactions with children. This may reflect generational differences in pedagogical training, attitudes, or comfort with child-centred approaches, with younger teachers perhaps more attuned to recent shifts in early childhood pedagogy. Second, class size was a significant negative predictor (β = -0.47, p = .032), highlighting that teachers working in larger classrooms had more difficulty maintaining high-quality interactions, likely due to the challenges of managing many children at once and providing individualised attention. Third, teachers with higher education had significantly higher CIS scores (β = 0.45, p = .020), suggesting that teachers who have completed tertiary education are better equipped to foster emotionally supportive and instructionally rich interactions. Similar to the ECERS-R regression model, other predictors in the CIS model also displayed moderate associations. Teachers' years of experience (β = 0.20) had a weak positive relationship with interaction quality, while the number of languages spoken (β = -0.33) had a moderate negative association. Although these findings did not reach significance, they raise important questions about how multilingual demands might dilute instructional focus, or how experience may help teachers in improving their interaction quality.

Table 22

Regression Models Predicting Process Quality using Structural Quality Indicators

	ECERS-R		CIS	
Model R^2	21.8		35.0	
F	1.32		2.56	
p	.261		.025	
	r	***p***	***r***	**p**
Teachers' Age	-.33	.055	-.41	.**011**
Teachers' Education	.26	.208	.45	.**020**
ECE Training	.08	.635	.05	.756
Years of Teaching	.23	.171	.20	.191
No. of Langs	-.26.	.189	-.33	.074
No. of Students	-.11	.650	-.47	.**032**
T-C Ratio	-.25	.265	.05	.789
Duration	-.12	.459	-.17	.243

Note. ECE training was coded 0 = No, 1 = Yes. Teachers' Education was coded 0 = no higher education degree, 1 = higher education completed.

Overall, the correlation and regression analyses revealed that several structural characteristics of classrooms and teachers were associated with variations in observed process quality, though patterns differed between the ECERS-R and CIS measures. Correlation analyses showed that younger teachers, smaller class sizes, and higher teacher qualifications were moderately to strongly associated with higher quality scores, particularly on the CIS. Regression analyses revealed that teachers' age, experience, and language status had moderate-to-strong associations with both global classroom and interactional quality. Interestingly, they also revealed that the teacher-child ratio played a more important role for global classroom quality, whereas the number of students emerged as a stronger predictor for international quality. ECE qualifications and the hours of operation did not emerge as strong predictors for either process quality indicator. Taken together, these findings highlight the

important role that teachers' characteristics play in predicting process quality, and suggests that structural features may explain more variance in interactional quality than in global classroom quality.

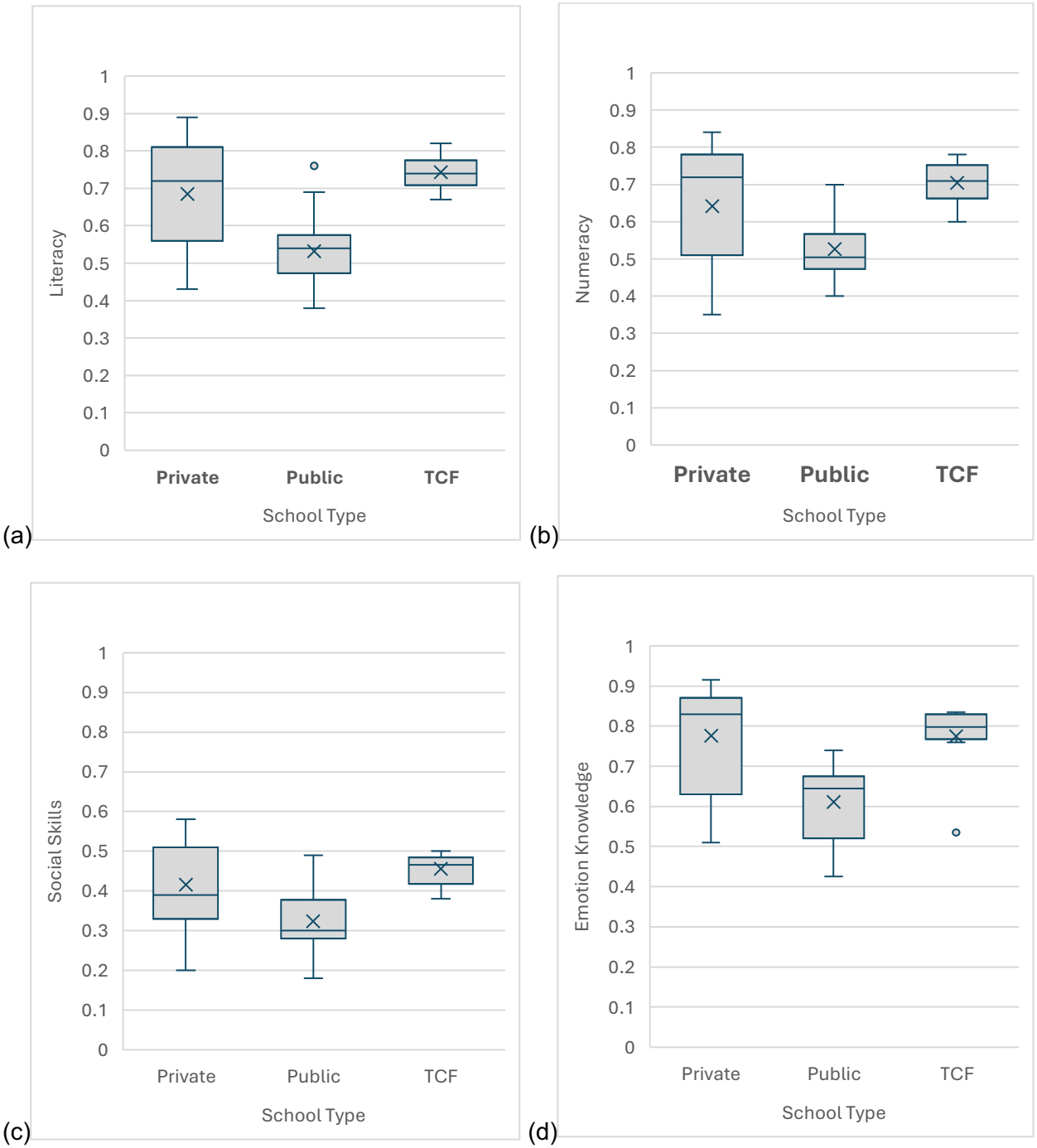
Research Question 3D: How do quality indicators predict child outcomes?

ANOVAs by Provision Type. To understand how children's outcomes differed across the three provision types, four one-way ANOVAs were conducted. For this analysis, data for 45 of the 51 schools was used as there was no child-level data at the second timepoint for six schools. The initial analysis was weighted by schools, such that having more or fewer children in a certain school did not bias the results. Results showed that there were significant differences in all four child outcomes by school type (*p*s < .001), with a small effect size for social skills (η^2 = .09) and medium effect sizes for the remaining outcomes (η^2 = .17–.24). These differences remained significant even when children's T1 score for that skill was accounted for (*p*s < .001) indicating that these findings do not reflect differences in intake per sector. Post-hoc comparisons (Tukey HSD) indicated that public, private, and TCF schools differed significantly from one another on nearly all outcomes, except for social skills, where private and TCF schools did not differ. Figure 27 a-d give a visual depiction of these differences.

The patterns observed in the outcomes were striking: public schools consistently had the lowest scores across all domains, while TCF schools performed slightly better than private schools on most outcomes, except for emotion knowledge, where private school students slightly outperformed those in TCF schools. The boxplots in Figure 27 a–d show substantial variability within private schools, whereas TCF schools showed relatively tight clustering around the higher mean scores, mirroring the patterns observed for process quality indicators. This limited variability within TCF classrooms may reflect more standardised global classroom and interactional quality that was observed in previous subsections, also in line with TCF's centralised model that employs consistent teacher training and monitoring mechanisms. By

contrast, the high variation among private schools likely reflects the heterogeneity of the sector, which includes both low-fee private institutions and better-resourced private schools, leading to a broader distribution of child outcomes. Moreover, TCF schools, having children from low-income families that consistently perform better or at the level of private schools, which are considered to offer better quality, highlights that lower outcomes are not always related to lack of resources or socioeconomic status, and optimal learning outcomes can be achieved in resource-constrained settings.

Figure 27
T2 Child Outcomes by Provision Type



Note. Boxplots for (a) literacy, (b) numeracy, (c) social-skills, and (d) emotion knowledge.

Descriptive Statistics. To understand how children's outcomes associated with classroom quality indicators, bivariate correlations were calculated, as shown in Table 23. The correlation analysis revealed that indicators of classroom process quality – ECERS-R and CIS scores – were consistently and positively associated with all four child outcomes, with the strongest associations observed for emotion knowledge (r = .35 and r = .29, respectively). In contrast, several structural characteristics such as teacher age, years of experience, and ECE training showed weak or negative associations with child outcomes. For instance, teacher age was negatively correlated with both academic and emotion outcomes (e.g., r = –.13 with emotion knowledge), suggesting that older teachers may be less aligned with developmentally appropriate practices. Notably, class size indicators such as number of students and teacher–child ratio were strongly negatively associated with all outcomes, especially emotion knowledge (r = –.34 and r = –.31), highlighting the potential impact of overcrowded classrooms on children's learning and socio-emotional growth. Overall. Effect sizes were larger for emotion knowledge scores suggesting these are more susceptible to classroom level influences.

Table 23

Bivariate correlations between T2 child outcomes and classroom quality indicators

	Pre-Numeracy	Pre-Literacy	Social Skills	Emotion Knowledge
Teachers' Age	-.04*	-.13*	-.05*	-.13*
Teachers' Education	-.01	.00	.02*	.10*
ECE Training	-.04*	-.07*	-.09*	-.08*
Years of Teaching	-.02	-.08*	-.03*	-.07*
No. of Langs	.06*	.04*	.10*	.20*
No. of Students	-.32*	-.32*	-.21*	-.34*
T-C Ratio	-.16*	-.14*	-.10*	-.31*
Duration	.01	.02	-.02*	.05*
ECERS-R	.30*	.31*	.27*	.35*
CIS	.23*	.27*	.15*	.29*

Note. * = p < .05

Predicting Child Outcomes using Multi-Level Models. To understand how the different classroom quality indicators predicted children's outcomes, four multilevel models were run, predicting each of the outcomes at T2 using the overall ECERS-R score, the CIS total score, and the teacher and classroom characteristics, while controlling for the corresponding skill at T1, children's age, and maternal education.

As shown in Table 24, the model fit the data well (AIC = -275, BIC = 222. R^2 conditional = 35.5%, R^2 marginal = 30.6%, RMSE = 0.146). The residuals were normally distributed, and there was no evidence of heteroscedasticity. Notably, after controlling for social skills at T1, children's social skills at T2 were significantly predicted only by the ECERS-R score (β = .24). Interestingly, the CIS score had a moderate negative (β = -.13), albeit non-significant, effect on children's social skills, suggesting that classrooms in which teachers displayed more warmth and positive interactions had children whose social skills reduced overtime. Two other non-significant associations were also of note: the number of students in the classroom (β = -.11) was negatively related to social skills but the teacher-child ratio was positively related (β = .11). While it is difficult to unpack what these conflicting findings mean, it is possible that both variables tap into different aspects of the classroom structure. Class size is more related to the peer environment, whereas the teacher-child ratio reflects staffing adequacy. Although larger class sizes were associated with lower child social skills – perhaps due to overcrowding and/or excessive noise – a higher teacher-child ratio predicted higher social skills. This suggests that when classroom size is accounted for, having more adults may hamper children's development, perhaps due to limited interactions with other peers.

Table 24

RQ3 Multilevel Modelling Results

	Social			Emotion Knowledge			Pre-Literacy			Pre-Numeracy		
Conditional R^2	35.5%			60.4%			65.6%			63.1%		
Marginal R^2	30.6%			58.3%			60.9%			59.4%		
AIC	-275			-386			-516			-470		
BIC	-222			-318			-464			-417		
RMSE	0.146			0.118			0.107			0.114		
	β	SE	*p*	β	SE	*p*	β	SE	*p*	β	SE	*p*
ECERS-R Score	0.24	0.02	**.009**	0.12	0.01	**.044**	0.17	0.02	**.028**	0.11	0.02	.160
CIS Total Score	-0.13	0.03	.170	-0.05	0.03	.579	-0.07	0.03	.364	-0.06	0.03	.494
Teacher Age	-0.05	0.00	.471	0.01	0.00	.891	0.00	0.00	.957	0.04	0.00	.544
Teacher Education	0.05	0.00	.478	0.02	0.02	.716	0.00	0.02	.979	0.00	0.03	.944
ECE Training	-0.04	0.02	.506	0.01	0.02	.846	0.03	0.02	.591	0.05	0.02	.327
Years of Teaching	-0.05	0.00	.410	-0.11	0.00	.123	-0.14	0.00	**.011**	-0.04	0.00	.441
No. of Languages	-0.05	0.01	.498	-0.04	0.01	.561	-0.06	0.01	.210	-0.06	0.01	.303
Number of Students	-0.11	0.00	.152	-0.09	0.00	.179	-0.22	0.00	**.002**	-0.11	0.00	.110
T-C Ratio	0.11	0.00	.171	-0.05	0.00	.386	0.08	0.00	.210	0.03	0.00	.676
Hours of Operation	0.07	0.02	.241	0.03	0.02	.608	0.14	0.02	**.006**	0.04	0.02	.397
T1 Skills	0.42	0.05	**<.001**	0.67	0.04	**<.001**	0.64	0.03	**<.001**	0.68	0.04	**<.001**

Note. Children's age and maternal education were also included in the model as covariates

For children's emotion knowledge skills, the model also fit the data well (AIC = -386, BIC = -318. R^2 conditional = 60.4%, R^2 marginal = 58.3%, RMSE = 0.118); however, the residuals plot for the model for emotion knowledge showed a funnel shape (Appendix K), indicating that the assumption of heteroscedasticity was violated.

To address this, parameters were calculated using robust standard errors (Astivia & Zumbo, 2019). Again, ECERS-R emerged as the only significant predictor (β = .12), but interestingly, years of teaching experience showed a small *negative* association with emotion knowledge (β = –.11), though not statistically significant. This pattern, which was also found for quality indicators, may reflect outdated training or more traditional teaching styles among more experienced educators, who may rely more on didactic instruction and less on emotionally responsive or play-based approaches that could support children's emotional understanding. In low-resource settings like Pakistan, where professional development is often infrequent and curriculum guidance on social-emotional learning is limited, longer tenure may not necessarily indicate greater skill in supporting children's socio-emotional competencies. The consistent predictive value of ECERS-R across both social-emotional outcomes suggests that availability of learning opportunities, a whole-child approach, and responsive pedagogy may support children's understanding of emotions and social competence.

The model predicting children's pre-literacy scores also fit the data well (AIC = -516, BIC = 464. R^2 conditional = 65.6%, R^2 marginal = 60.9%, RMSE = 0.107), the residuals were normally distributed, and there was no evidence of heteroscedasticity. As shown in Table 24, children's pre-literacy scores were significantly predicted by the ECERS-R score (β = .17), as well as teachers' years of teaching (β = -.14), number of students in the classroom (β = -.22), and the hours of operation (β = .14). Although the positive influence of ECERS-R echoes earlier findings of the importance of global classroom quality, the number of students in the classroom was the strongest predictor of children's pre-literacy skills, suggesting that overcrowded

classrooms may significantly hinder children's ability to develop literacy skills, possibly due to limited opportunities to engage in meaningful literacy activities. Teachers' years of teaching was also negatively related to children's T2 literacy scores, potentially due to the outdated practices used by longer tenured teachers. Lastly, longer hours of operation were associated with better outcomes, likely reflecting greater opportunities for language instruction and/or increased exposure to literacy activities. These findings are particularly salient in Pakistan, where, as shown in earlier findings, class sizes are often large and instructional time is shorter than international contexts.

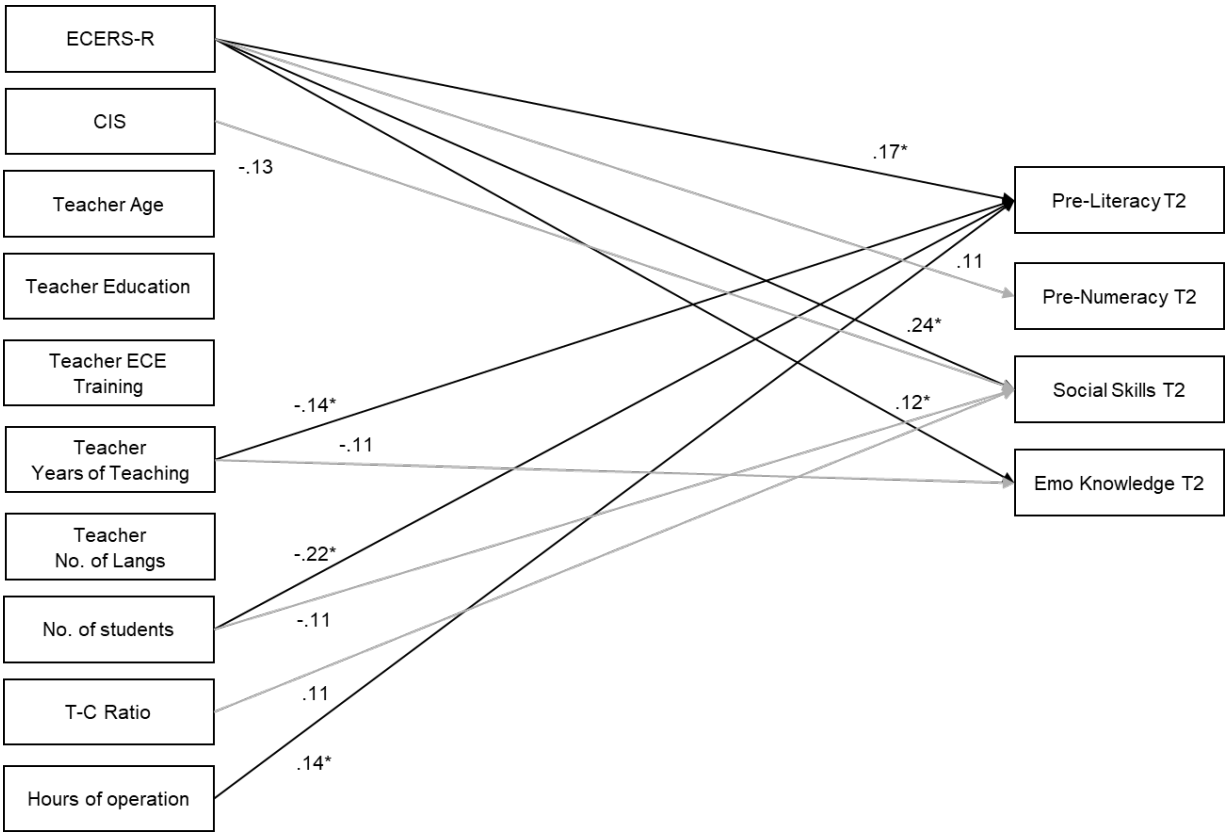
In the case of pre-numeracy, none of the predictors reached significance, though the ECERS-R showed a small, non-significant positive trend (β = .11). The model fit the data well (AIC = -470, BIC = -417. R^2 conditional = 63.1%, R^2 marginal = 59.4%, RMSE = 0.114), the residuals were normally distributed, and there was no evidence of heteroscedasticity. The absence of strong predictors for numeracy may reflect broader instructional limitations in how early maths is taught in Pakistan. Numeracy content is often introduced through rote methods with limited use of manipulatives or play-based exploration, regardless of classroom quality or teacher characteristics. As such, even high-quality classrooms or experienced teachers may not be delivering the type of pedagogical input that drives gains in early numeracy skills.

Overall, as shown in Figure 28, the ECERS-R score emerged as the most robust predictor of gains across three of the four child outcomes (social skills, emotion knowledge, and pre-literacy), underscoring the importance of a stimulating and child-centred classroom environment. CIS scores did not significantly predict any outcome and even showed a weak negative relationship with social skills – raising questions about the relevance and variability of teacher-child interaction quality in this context. This may be due to limited training on responsive pedagogy, high teacher-child ratios, and a focus on rote instruction, which constrain the potential for warmth, sensitivity, or child-centred dialogue to emerge as distinguishing features

across classrooms. Structural indicators (e.g., years of experience, classroom size, hours of operation) had selective associations, particularly for literacy, but showed no consistent pattern across outcomes. Notably, teachers' age, language status, education and ECE training had no meaningful associations with any of the outcomes. These results suggest that improving the global classroom quality – as captured by ECERS-R – may be a more immediately impactful and scalable target for enhancing young children's learning and development in Pakistan's early years settings.

Figure 28

Visual Depiction of Findings from the Four Models



Note. Models were conducted separately for each of the four outcomes but have been put together for the purpose of visualising findings. Only associations > .10 shown. Associations with demographic covariates (child age and maternal education) and T1 scores not shown. Grey line indicated non-significant associations, * = significant at $p < .05$

Conclusion

This chapter offers a nuanced picture of ECE quality in Pakistan by examining both structural and process-level indicators across a diverse sample of classrooms. Findings revealed that while global classroom quality was generally low across the sample, interactional quality was comparatively higher. However, substantial differences emerged by school provision type: non-profit schools, particularly those run by TCF, consistently outperformed public and private schools across both process quality and child outcomes. These differences suggest that institutional factors and implementation models play a significant role in shaping the quality of ECE environments.

Among structural indicators, several were meaningfully associated with process quality. Specifically, teacher characteristics such as age, years of experience, education level, and number of languages spoken showed consistent relationships with both global classroom and interactional quality scores. However, ECE training and the duration of the classroom were not associated with process quality, pointing to limitations in how such structural inputs are currently implemented.

When considered together in multilevel models, global classroom quality emerged as the most consistent and robust predictor of children's outcomes across academic and social-emotional domains. This finding highlights the central importance of improving children's daily learning environments and experiences, rather than relying solely on teacher qualifications or infrastructure. Overall, the results underscore the need for a more contextually grounded understanding of what quality looks like in Pakistani classrooms, one that prioritises meaningful teacher–child interactions and developmentally appropriate practices as levers for improving early learning and development.

Chapter 7: Discussion

The present thesis is the first to examine Pakistani children's social skills and emotion knowledge as distinct phenomena alongside the quality of ECE, using standardised direct assessments, sophisticated analytical techniques, and a relatively large sample of preschoolers drawn from public, private, and non-profit classrooms. The thesis aimed to explore questions around Pakistani children's social-emotional skills, how they relate to their demographic characteristics, and how they develop in relation to the classroom environment, comparing academic skills alongside to contextualise these associations. The thesis also investigated how early social and emotional skills might predict development of academic outcomes through various mechanisms. Lastly, the thesis explored what ECE quality looked like in Pakistan and how different aspects of quality related to each other.

Findings revealed that children's *social skills* were positively associated with maternal education and global classroom quality but negatively related to household size and marginally to teacher-child interactions. Early emotion knowledge predicted children's later social skills, even after controlling for earlier social skills. *Emotion knowledge*, in turn, was predicted by maternal education and global classroom quality only. Children's *pre-literacy* skills were shaped by a combination of home and school factors, including maternal education, global classroom quality, teachers' years of experience, class size, and hours of classroom operation. In addition, both early and late measures of emotion knowledge positively predicted pre-literacy skills, while early social skills showed a negative association. *Pre-numeracy* skills were predicted by maternal education, both early and later emotion knowledge, and later social skills. They were not related to early social skills, and only marginally to global classroom quality. Boys were also found to have stronger pre-numeracy skills, compared to girls.

This chapter will discuss these findings in relation to each of the research questions, offering potential explanations and highlighting some limitations.

RQ1 – Demographic Correlates of Children's Social, Emotional, and Academic Outcomes

The thesis's first research question focused on identifying demographic characteristics which may serve as potential protective or risk factors to Pakistani children's optimal development. Using a sample of 607 preschoolers, we found that maternal education was the only consistent predictor of all four outcomes. It was most strongly related to children's emotion knowledge skills and weakest to social skills. In terms of each of the outcomes, we found that household size had a negative relation with children's social skills, boys had higher pre-numeracy skills than girls, and the number of books in the house was marginally related to pre-literacy skills. Overall, the predictors did not account for a lot of variance in children's skills suggesting that other factors such as the classroom environment may be better predictors.

Maternal Education

One the main findings from these analyses is that maternal education was the only consistent predictor of children's outcomes in the present study. Specifically, the two higher levels of maternal education (secondary and higher education) had significantly different outcomes than the comparison group (no formal education). Therefore, children whose mothers had only completed elementary education (i.e., up to 8 years of formal schooling) did not differ significantly from children whose mothers had no formal education. These findings highlight that for the benefits of maternal education to be seen on children's development, mothers need to be educated to the secondary level at the minimum.

The overall positive impact of maternal education confirms the abundant previous research literature showing a significant association between maternal education and children's development, especially in LMICs (Finch et al., 2018; Grantham-McGregor et al., 2007; Paxson & Schady, 2007; Shavitt et al., 2022; S. P. Walker et al., 2007; Zhu, Xiao, et al., 2021). This is likely because more highly educated mothers have greater knowledge of child development (Ertem et al., 2007), use more complex language and vocabulary with their children (Magnuson

et al., 2009), and have more learning materials at home (Magnuson et al., 2009). Moreover, mothers with higher levels of education use more warm and positive parenting strategies with their children (Carr & Pike, 2011), which can enhance children's cognitive (Harding, 2015; Mistry et al., 2008) and social-emotional outcomes (X. Chen et al., 2000; Denham et al., 2015; Landry et al., 2006; von Suchodoletz et al., 2011). Additionally, mothers with higher levels of education have also been noted to provide more appropriate scaffolding to children, which has been shown to predict various aspects of children's development including their self-regulation (J. Sun & Tang, 2019). While most of these are Western studies, a study conducted in Pakistan (Obradović et al., 2016) found that maternal education was strongly related to levels of scaffolding mothers provided, which predicted children's executive functioning. While the present study does not explore the pathways through which maternal education impacts children's outcomes, there are likely to be multiple inter-related mechanisms. Taken together, these findings suggest that children whose mothers have lower levels of education may be at risk of having poorer development.

Household and Siblings

Another finding of note is the negative association between children's social skills and household size. Previous studies found a negative or no association between household size and children's academic and social-emotional outcomes (S. E. Black et al., 2005; Reynolds-Salmon et al., 2024; Vandell & Corasaniti, 1990). However, it was hypothesised that there may be a positive association between household size and Pakistani children's social and emotional outcomes because in Pakistan, where joint family structures and communal child-rearing are common, larger households may expose children to more frequent and varied social interactions, enhancing their development of prosocial behaviours, empathy, and conflict resolution skills (Kagitcibasi, 2017). Moreover, research from similar collectivist cultures

suggests that children in larger households may develop stronger social skills due to frequent peer interactions and shared responsibilities (Kagitcibasi, 2017).

Nonetheless, the current study found that children who had fewer than six members in the household had better social skills. There are several potential explanations for this – the most apparent one being that caregivers in larger households are likely to have increased competition for time and attention, due to the number of individuals in the household, resulting in less time and effort dedicated to supporting children's development. This is supported by the resource dilution hypothesis (Downey, 2001); which although focuses on the number of siblings, can also be used to understand the effect of the number of household members. It can also be argued that this association may be a result of household being associated with other variables, e.g., more educated parents may live in smaller households. However, using a multi-level model gave the opportunity to enter all these variables in a single model; therefore, this finding suggests that this effect is irrespective of other variables.

Another explanation of the negative association between household size and social-emotional skills may be conflicting socialisation practices. As Akhtar et al. (2017) highlight, each family consists of multiple dyadic relationships, including parent-child, grandparent-child, uncle-child, aunt-child, etc. Therefore, children living in larger households have various socialisation opportunities and may receive contradictory guidance from different family members. For example, one of the skills assessed in the social skills measure included conflict resolution, asking the child what they would do if another child wanted their toy. It is possible that one family member might encourage sharing and cooperation, while another might prioritise assertiveness. Similarly, children might also receive conflicting responses to negative behaviour, e.g., while parents may ignore a child's tantrum, other household members like grandparents might give into the child's demands. This inconsistency can make it harder for children to learn appropriate social responses. Whilst this explanation cannot be validated in the

present study, future research can look into conducting detailed observations of children and their dyads, as well as more focused studies on the socialisation practices in relation to children's social skills.

It is also worth noting that no other outcome besides social skills was associated with household size. This may be due to the specific nature of social skill development and its reliance on children's everyday socialisation practices. On the other hand, emotion knowledge might be more influenced by explicit opportunities to label and discuss emotions, and pre-literacy and pre-numeracy skills may depend on direct teaching practices, the availability of learning resources, or exposure to structured learning activities. These outcomes may therefore be less directly affected by the complex and potentially inconsistent socialisation practices characteristic of larger households, and more from the classroom environment. Therefore, these findings indicate that living in large households does not hinder Pakistani children's academic development, unlike previous findings from other countries.

The number of siblings in the household was not related to any of children's outcomes, contradicting previous research which has found a negative association between number of siblings and academic outcomes (Downey & Condron, 2004; Finch et al., 2018; Muñez et al., 2022; Rathore et al., 2023) and a positive association between number of siblings and social-emotional development (Downey & Condron, 2004). One reason for the lack of associations may be that the association between the number of siblings and children's outcomes, is non-linear, such that having 2-3 siblings may be better than 0-1 and 4-6 siblings. It is also possible that the sibling effect is more pronounced when comparing outcomes of children with and without siblings; however, this was not possible in the present study as only three children in our sample had no siblings.

Another explanation to the lack of sibling effects may be that the exact number of siblings is not that important, but rather the order of birth (e.g., Black et al., 2005). This similarly

could be explained by the resource dilution hypothesis (Downey, 2001) – first-born children often receive undivided parental attention in their early years, which may provide them with a cognitive and emotional advantage, whereas later-born children have to share parental resources with other siblings. However, in countries like Pakistan, older siblings are involved in childcare responsibilities (e.g., Bhamani et al., 2023), therefore, it could also be argued that later-born children have the added resource of an older sibling, which may potentially offset the disadvantages due to parents having limited resources, resulting in the appearance that there is no association between number of siblings and child outcomes. There is some research that also suggests the gender of the sibling may moderate the impact of siblings on children's development (Jakiela et al., 2020), highlighting that it may be necessary to take other factors into account when investigating the influence of children's siblings on their development.

Overall, these findings suggest family composition may not play a large role in children's development when other factors like maternal education are accounted for. Additionally, when household size is considered along with children's siblings, the former emerges as a better predictor, suggesting that in Pakistan, adults may have a stronger influence on children's development, especially their social competence, rather than similar-aged siblings and cousins. This is unsurprising given the adult-led development often found in collectivist and authoritarian cultures. However, it is also important not to disregard the impact of siblings and instead adopt more nuanced and focused approaches when exploring these relationships.

Gender

Gender differences in children's development have been of great interest in the field; especially in South Asian populations where women and girls are often considered to be oppressed or have fewer rights. Despite these widespread notions, there is no consensus within research on the existence of these differences, with most studies reporting either null findings or a benefit for girls. The present study only found gender differences in children's pre-numeracy

skills, with boys outperforming girls. This is interesting as most of the research that has found gender differences, especially in LMICs, has reported that girls perform better than boys (Brandlistuen et al., 2021; Shavitt et al., 2022). Therefore the finding that boys score higher than the girls was unexpected, but has been reported previously (Borgonovi et al., 2021; Cobb-Clark & Moschion, 2017).

One reason for this may be that the development of pre-numeracy skills often depends on exposure to specific learning experiences, such as counting games, number recognition activities, or simple measurement tasks (Clements & Sarama, 2014). In the Pakistani context, it is possible that boys are more frequently encouraged or given opportunities to engage in such activities, contributing to their stronger performance in numeracy. Research has shown that parents and teachers tend to hold higher expectations for boys' mathematical abilities (Gunderson et al., 2012), even in early childhood, which can influence the types of learning opportunities children receive and the value they attach to development of these skills. These gendered expectations may be particularly pronounced in Pakistan, where cultural stereotypes often position boys as more capable in mathematics and girls face broader patterns of discrimination (Asif, 2021; Firdoos et al., 2023; Gul et al., 2012). Importantly, these findings should not be interpreted as evidence of innate gender differences in numeracy skills. Rather, they likely reflect sociocultural influences that currently lead to greater numeracy-related input and support for boys in the Pakistani context.

The absence of gender differences in pre-literacy skills in this study is noteworthy, particularly as it contrasts with a substantial body of international research showing that girls typically outperform boys in early language and literacy development (e.g., Cobb-Clark & Moschion, 2017). One possible explanation is that pre-literacy skills – such as vocabulary development, letter recognition, and narrative understanding – often emerge through informal, everyday interactions, including shared storytelling, conversations, and exposure to print. These

activities may be less directly shaped by gendered expectations, potentially resulting in more equal opportunities for boys and girls in this domain. However, it is also important to consider contextual cultural factors. In Pakistan, prevailing gender norms often discourage girls from speaking freely and participating actively in public or classroom discourse (Firdoos et al., 2023; Gul et al., 2012). While these practices may not be explicit in the early years, they may implicitly bias how parents and teachers interact with girls, suppressing the advantage typically observed for girls in pre-literacy skills. Thus, the lack of gender differences may reflect not the absence of bias, but rather a cultural dynamic in which girls' verbal development is constrained by social norms.

Given these gendered norms in Pakistan, it was expected that parents would differently teach or respond to their sons' or daughters' emotions and have differing expectations of social behaviour. Therefore, the lack of gender differences in children's social skills and emotion knowledge may suggest that Pakistani parents are encouraging emotional expression and social engagement equally across genders. This is unexpected given the Pakistani context, where there are high levels of gender discrimination against females and expressions of assertiveness are discouraged for females due to cultural expectations of modesty (Ali et al., 2011; Zafar et al., 2021a). While the absence of these gender differences can be taken as an encouraging sign, it is possible that Pakistani girls' social and emotional skills, similar to their pre-literacy skills, are not being optimally supported. Specifically, research has shown that girls tend to outperform boys on social and emotional skills (Epstein et al., 2009; Mazhar & Bailey, 2024; McClure, 2000; Rey-Guerra et al., 2024); but this advantage has not been found in the current study. It is possible that, Pakistani caregivers' socialisation of children, which is likely influenced by cultural norms, might suppress girls', arguably, "natural" inclination toward emotional awareness and expression (Brody & Hall, 2009), which often gives them an advantage in social-emotional domains. Thus, the absence of girls' typical advantage in our

findings could reflect limitations placed on their emotional expression or development rather than a true equivalence in social-emotional competencies.

Lastly, it is also possible that children in the current sample may be too young to have enough exposure to sociocultural gender norms to have a strong influence on their social behaviours, emotion knowledge, or pre-literacy skills. It is possible that as children grow older, they are more likely to be exposed to and internalise gendered expectations from caregivers and broader societal influences, which may lead to more pronounced gender differences. Indeed, some research has found significant gender differences in Pakistani adolescents' social and emotional competencies (R. Ahmad et al., 2013; Akbar et al., 2011; Zafar et al., 2021b), suggesting that they may develop later in life.

While it is difficult to validate these explanations, our findings highlight that both girls and boys are developing their social and emotional skills equally, at least in early childhood, in Pakistan. In terms of interventions, these findings justify the use of SEL interventions that continue fostering equitable social and emotional development for both genders; however, addressing teachers gendered expectations, especially in relation to pre-numeracy, might be needed to ensure equal academic experiences for boys and girls.

Parental Age

The present study also found that maternal and paternal age was significantly associated with children's social skills, and the later with children's pre-numeracy skills. While this may be due to higher parental age being related to higher emotional maturity, increased parental experience and knowledge, and better socio-economic stability, the standardised effect sizes for all three associations were near zero (βs = 0.00). This indicates that the magnitude of these relationships is negligible when considered in the context of the variability within the sample and the influence of other predictors. Parental age may have a subtle influence on children's development by contributing to factors like parenting style, household stability, or access to

resources, but these effects might be overshadowed by stronger predictors, such as maternal education. From a statistical perspective, significant results with minimal effect sizes could result from a large sample size, where even very small relationships can achieve statistical significance due to the high power of the analysis. Nonetheless, these findings suggest that SEL or ECE programmes may want to target younger parents or their children, who may be at a higher risk of poorer social or emotional development.

Home Learning Environment

The home learning environment has been found to be an important predictor of children's development (Baker, 2013; Cuartas et al., 2023; M. A. Foster et al., 2005; T. D. Foster et al., 2016; Melhuish et al., 2008; Niklas & Schneider, 2017; Wirth et al., 2023; Wong et al., 2022); however, the present study did not find a significant impact of the HLE on any of the four outcomes. These findings suggest that in Pakistan, the classroom environment may play a bigger role in children's development, especially in the academic domains. In regards to children's social-emotional outcomes, it is possible that the measure used in the study to capture the home learning environment had a stronger focus on activities related to literacy and numeracy. Indeed, the measure did not assess specific aspects of parent-child interactions, such as conversations about emotions and socialisation practices, that may play a more direct role in fostering social and emotional development in young children (Denham et al., 1991). Consequently, it is possible that the measure was not able to pick up on aspects of HLE that more directly relate to children's social-emotional development.

Lastly, the measure used may not have adequately captured its quality, consistency, or specific components most relevant to these developmental outcomes. The frequency of learning activities may not directly reflect the richness of interactions or the extent to which these practices are developmentally appropriate and engaging for the child, explaining the null findings in the present study.

In additional to the conceptual limitations of the measure, it is also possible that reliance on self-reported data from parents about the frequency of various activities may have impacted the findings. While self-reports are a commonly used method for assessing the HLE (M. A. Foster et al., 2005; T. D. Foster et al., 2016; Melhuish et al., 2008; Niklas & Schneider, 2017; Wirth et al., 2023), they are subject to several limitations, including social desirability bias, recall bias, and variability in parents' interpretations of the questions. Parents may overestimate the frequency of activities to present themselves in a more favourable light, or they may struggle to accurately recall how often such activities occurred over a specific period. These biases could lead to inaccuracies in the reported data, potentially obscuring true associations with children's social, emotional, or academic outcomes.

Another important aspect to consider is the nature of the sample and the analytical approach. Although our sample included children from a range of socio-economic backgrounds, these were often clustered within schools, meaning that children from similar backgrounds tended to attend the same schools. Consequently, there may be little variability in HLE within the classrooms. Since we used multilevel models, the HLE variability between classrooms may have been absorbed by the model, leaving little variation to be detected. To further investigate this, single-level regression models including all the predictor variables were run (Appendix L), which revealed that HLE was significantly associated with all four of children's outcomes. While it is possible that this approach may artificially inflate the impact of HLE by conflating within- and between-classroom variation, it suggests that some of the HLE variation could have been absorbed by the multilevel model. Nonetheless, within the context of the present study, the role of the HLE on children's outcomes remains inconclusive.

Additionally, the influence of the HLE may be moderated by other factors, such as parental education levels, which was found to be a significant predictor of all outcomes and was moderately associated with the number of books and the HLE index in the current study.

Parental education is often associated with a range of other factors that can shape the HLE, such as the availability of resources, the value placed on education, and the types of learning activities parents engage in with their children (Carr & Pike, 2011; Harding, 2015; Magnuson et al., 2009). Moreover, the impact of HLE may differ depending on the educational background of the parents (Davis-Kean, 2005; T. D. Foster et al., 2016). In families where parents have higher levels of education, there may be a greater emphasis on structured learning activities, which could complement or enhance the child's development. For example, parents with higher education levels may be more likely to engage in cognitively stimulating activities and high quality interactions with their children (Carr & Pike, 2011; Obradović et al., 2016). These, in turn, can foster both academic and social-emotional development. Thus, it is possible that the home learning environment is important to children's development, but when maternal education is controlled for, it does not account for additional variance.

Child's Age

Despite assessing children from a broad age range, the current study found no significant association between children's age and their outcomes. This was unexpected given the strong theoretical and evidence behind it (Denham, Bassett, Thayer, et al., 2012; Shavitt et al., 2022; S. Wolf et al., 2017; Xie & Li, 2022). Nonetheless, there are some studies from Turkey that found no association between age and children's outcomes (Ekerim-Akbulut et al., 2020; Orta et al., 2013). These findings, along with present findings, suggest that 4- to 6-year-old children from LMICs may not have strong age-related differences in their social, emotional, or academic skills. Indeed, it is possible that while children varied in their chronological age, they had a similar 'developmental' age. Since all children were sampled from the last year of preschool, they may have been performing similarly due to their shared experiences in an educational setting. This may be especially true in Pakistan where educational settings typically provide a standardised level of support, regardless of children's abilities (N. Khan et al., 2017).

This could lead to a convergence of developmental trajectories, such that even though some children are chronologically older or younger than the average age, they are at the same developmental level.

Alternatively, it is also possible that, similar to HLE, there was little within-class variation in children's age, and more between class. Indeed, the range of mean classroom ages varied from 48 to 71 months. Therefore, it is possible that the impact of age on children's outcomes is absorbed by the multilevel model. This possibility is supported by the strong correlations between age and children's pre-literacy, pre-numeracy, and social skills, as well as the significant associations in the single level regressions (Appendix L). Taken together, these findings highlight the complexity of age-related differences, particularly in LMIC contexts. While older children have better social, emotional, and academic skills, the effect of age may be less pronounced in settings where educational experiences are standardised, and developmental trajectories converge. Moreover, these findings also highlight that while MLM is statistically rigorous technique, it may also distribute variance in ways that obscure individual-level effects. Therefore, data should be comprehensively examined before making strong conclusions.

Bilingualism

Contrary to the study's exploratory hypothesis, bilingualism did not have a significant positive impact on children's outcomes. This suggests that, similar to findings from Western countries (Farver et al., 2006; Gunnerud et al., 2020; Lehtonen et al., 2018; McLeod et al., 2016; Shokrkon & Nicoladis, 2021), Pakistani children who spoke two or more languages do not have better academic or social-emotional outcomes compared to their monolingual counterparts. One reason for this may be that bilingualism only renders benefits in the cognitive domains such as executive function or self-regulation, as has been reported in previous studies (Gunnerud et al., 2020; Yang et al., 2011). However, a systematic review of the impact of bilingualism on Pakistani children's language development found that bilingualism did have a

beneficial effect on children's language and social skills (Firdous et al., 2024). One reason for the discrepancy in findings may be that the systematic review only included studies in which the bilingual sample spoke Urdu and English; however, in the present study, children spoke a wide range of languages, with English or Urdu being at least one of them. It is possible that bilingualism confers developmental advantages with certain language pairs (e.g., English and Urdu) but not others (e.g., Urdu and Punjabi). Indeed, Blom et al. (2017) suggest that when individuals speak similar languages, like Urdu and other regional languages, switching between languages requires little cognitive effort and control, and as a result, does not lead to the supposed training effect.

Another explanation may be that bilingual children in the present may have limited exposure to one or both languages, potentially due to factors such as lack of parental fluency or an environment where one language is used predominantly over the other. This limited exposure can result in children not receiving the rich and consistent linguistic input necessary to fully realise the cognitive and social benefits associated with bilingualism (De Houwer, 2018; Unsworth, 2016). Indeed, if the language of instruction at school differs from the primary language spoken at home, children may face challenges in developing proficiency in both languages. This mismatch can lead to incomplete language acquisition, where neither language is fully mastered, which could hinder their ability to excel in domains that depend on strong language skills, such as pre-literacy and emotion knowledge. This may not only be true for the present study's sample but the wider Pakistani population, with the issue of language of instruction being a contentious one since decades (Ahmed, 2011).

Furthermore, bilingualism itself is related to other factors, such as socio-economic status, parental education, and home learning practices. Indeed, in the present sample, parents who had completed higher education had significantly more bilingual children. It is likely that

parents who are more highly educated are fluent in multiple languages and therefore the 'bilingual advantage' observed in other studies may be due to a lack of control of covariates. Nonetheless, our measure of bilingualism only assessed the number of languages spoken in the household, which does not capture the complexities of bilingualism, such as the child's proficiency in each language, the contexts in which the languages were used, or the frequency and quality of exposure to each language. These nuances are crucial, as research suggests that the benefits or disadvantages of bilingualism depend on factors like balanced proficiency, the degree of overlap between languages, and the presence of supportive linguistic environments in both home and school settings (Blom et al., 2017; Unsworth, 2016). While strong conclusions cannot be made regarding the role of bilingualism in shaping children's outcomes without accounting for these complexities, the present findings are important in highlighting that bilingualism does not disadvantage children, like has been traditionally believed (Hakuta, 1996).

RQ2 – How Early Social and Emotional Skills Predict Later Academic Outcomes

The second main research question of this thesis was to examine how Pakistani children's social and emotion skills uniquely predict their later academic outcomes. Using a sample of 453 four- to six-year-olds, analysis revealed that children's early emotion knowledge significantly and positively predicted their later academic outcomes; however, their early social skills negatively related to their later pre-literacy skills and did not relate to their later pre-numeracy skills. Two mediation models were also run to examine if one social-emotional skill mediated the relationship between the other social-emotional skill and academic outcomes. Findings revealed that early emotion knowledge, but not social skills, had indirect effects on children's academic outcomes through supporting their later social skills.

Direct Associations with Emotion Knowledge and Social Skills

The significant direct association between early emotion knowledge and pre-literacy, after controlling for demographic covariates and early academic skills, suggests that children's ability to recognise and understand emotions plays a meaningful role in the development of early literacy skills. This aligns with previous research indicating that emotion knowledge is related to children's language development due to an overlap in pedagogical strategies and linguistic process, and may support in fostering skills such as vocabulary acquisition, narrative comprehension, and inferencing (Garner & Waajid, 2008; Torres et al., 2015). The significant direct association between emotion knowledge and pre-numeracy highlights the broader cognitive benefits of emotion knowledge. While numeracy skills may not seem directly related to emotion knowledge, interestingly, the effect size for this association ($\beta = .20$) was higher than that for pre-literacy ($\beta = .15$). Previous studies suggest that emotion knowledge supports executive function skills, such as working memory and cognitive flexibility, which are critical for mathematical reasoning (Denham, Bassett, Way, et al., 2012). Moreover, emotion knowledge and pre-numeracy skills may have shared cognitive underpinnings, with both relying on cognitive flexibility and categorisation to some extent. This finding adds to the growing evidence that emotion knowledge is not only plays a role in children's social development, but also in shaping their early academic skills, and extends these findings to the Pakistani population.

In contrast to the positive impact of emotion knowledge, early social skills did not predict later pre-numeracy outcomes and were slightly negatively associated with later pre-literacy outcomes suggesting that children with higher social skills at T1 had poorer literacy outcomes later. This finding diverges from some prior research suggesting that social competence supports academic success by fostering classroom engagement, cooperative learning, and positive teacher-child interactions (Denham et al., 2003; Franco et al., 2017). The negative association between social skills and pre-literacy gains may suggest that children with higher

social skills might spend more time engaging in social interactions – helping peers, forming relationships, and participating in group activities – at the expense of dedicating focused time to literacy activities, resulting in poorer skills than their less social peers. Conversely, children with lower social skills may channel more effort into academic activities, leading to greater gains in pre-literacy during early learning stages.

It is also possible that at this early developmental stage, academic gains are driven more by skills such as emotion knowledge than by social behaviour, which might become more influential as children progress to later stages of learning (Cavadini et al., 2021). Indeed, given that emotion knowledge – a variable that robustly predicts both literacy and numeracy – was included in the same model, the unique variance attributed to social skills, especially at this developmental stage, might be limited.

Another aspect to consider is that the IDELA social skills subscale may not have effectively assessed children's overall social competence, as it demonstrated lower internal reliability than the pre-numeracy and pre-literacy subscales in the present study. A previous study using the IDELA to examine the relationship between children's social skills and their academic outcomes also found no significant associations (S. Wolf & McCoy, 2019). Furthermore, the social skills assessed by the measure, which include self-awareness and number of friends, may not align with what is considered as 'pro-social' behaviour in Pakistan's context, which prioritises teacher-led activities and obedience. For example, a child who excels in forming friendships and demonstrates strong relationship skills would score higher on the measure but might be seen as more disruptive by teachers. As a result, such a child may receive less academic support from teachers, which could partly explain the lack of a positive association between social skills and early academic outcomes.

Given the small effect size and potential limitations of the IDELA social skills subscale, strong conclusions cannot be drawn from the negative association between early social skills and later academic outcomes without additional research.

Mediation Models

The present analysis also tested two additional mechanisms through which social and emotional skills might impact children's development using two mediation models – one where emotion knowledge mediated the relationship between social skills and academic outcomes (M2; Figure 29) (Torres et al., 2015; Garner & Waajid, 2012) and another where social skills mediated the relationship between emotion knowledge and academic outcomes (M3; Figure 30) (Denham et al., 2003). The emotion knowledge mediation model (M2) had no significant indirect effects, weaker associations, and a poorer model fit, whereas the social skills mediation model displayed good model statistics and had significant indirect effects from emotion knowledge to both pre-literacy and pre-numeracy. These findings suggest that during this period of early childhood, emotion knowledge plays a stronger role in the development of children's academic skills through direct and indirect pathways, whereas social skills may only play a mediating role.

Figure 29
M2 - Emotion Knowledge Mediation

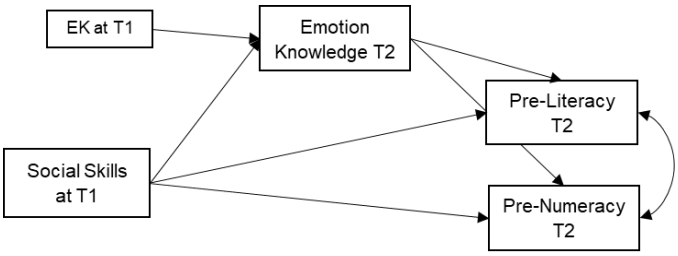
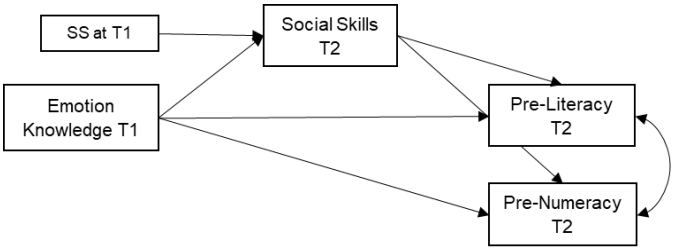


Figure 30
M3 - Social Skills Mediation



Specifically, while emotion knowledge directly predicts academic performance in domains such as pre-literacy and pre-numeracy, the mediation findings further indicate that it indirectly also shapes these outcomes by enhancing later social skills. This dual influence of emotion knowledge on both social and academic outcomes has important implications. It highlights that children with strong emotion knowledge are better equipped to manage interpersonal challenges, form positive relationships with peers and teachers, and navigate the social complexities of the learning environment. This, in turn, creates a positive feedback loop wherein enhanced social interactions further support academic pursuits (Denham, Bassett, Thayer, et al., 2012).

Unlike emotion knowledge, which showed both direct and indirect effects on pre-literacy and pre-numeracy, early social skills had relatively weak predictive power. This again may be due to the low validity of the social skills measure used in the study; however, the associations between children's academic outcomes and later social skills were stronger than with earlier social skills, suggesting that children's that social competence has a stronger influence towards the later part of early childhood. It is also possible that children's social competence may not have been developed enough at the first timepoint to be reliably measured resulting in weaker associations. Future work can consider examining these relationships over extended periods to capture potential delayed effects. Using more nuanced and culturally-valid measures, which may help clarify the specific ways in which Pakistani children's social competencies contribute to their academic development.

The present findings have several practical and theoretical implications. As expected, children's prior academic abilities were the strongest predictors of their later academic outcomes. Pre-literacy and pre-numeracy skills showed significant stability over time, consistent with longitudinal findings from both high- and low-resource settings (e.g., Duncan et al., 2007b; S. Wolf et al., 2019). While these findings underscore the importance of early academic interventions, the added predictive value of emotion knowledge above and beyond these baseline skills highlights the potential for SEL to enhance academic trajectories, particularly in the preschool years when neuroplasticity is high. These findings provide empirical support for the integration of SEL into early childhood education in Pakistan. Emotion knowledge, in particular, emerged as a consistent predictor of academic performance, suggesting that interventions and strategies aimed at enhancing emotion knowledge in early childhood (e.g., the RULER programme, which aims on building children's emotional intelligence and literacy, or more general practices like storytelling, role-play, and teacher-led discussions about feelings) could yield benefits that are both direct – by improving pre-literacy and pre-numeracy skills – and indirect – by bolstering social competencies that are critical for learning. Such approaches would be particularly beneficial in the Pakistani context where preschools often emphasise rote learning and may not explicitly foster social-emotional competencies (M. A. Khan, 2018; Rao & Sun, 2010).

RQ3 – Quality of ECE in Pakistan and How it Relates to Children's Outcomes

The thesis's final research question focused on what ECE classrooms look like in Pakistan, how the classroom quality differs across the three different provision types, how different indicators of quality relate to each other, and how indicators of quality (structural, interactional, and global) relate to children's development. The results reveal a nuanced picture, where classrooms in the sample appeared relatively strong on certain indicators of quality, such as teacher education and interactional quality, while other indicators, such as class size and

global classroom environment, remained areas of concern. Analyses exploring how structural and process quality indicators were related to one another were limited by low power; however, teachers' age, education, and years of experience, as well as the classroom size showed meaningful associations with both the global classroom quality and the teacher-child interactions. Moreover, disaggregating quality indicators by provision type (public, private, and non-profit) highlighted that public school teachers tended to be more educated and older but less experienced. In terms of classroom characteristics, private schools offered smaller class sizes and teacher-child ratios on average, with there being substantial variation in public school classrooms and minimal in TCF classrooms. Despite not having the most favourable structural indicators, TCF schools outperformed both public and private schools on the global classroom quality, measured through the ECERS-R, and teacher-child interactions, measured through the CIS. Moreover, public schools significantly performed worse than both TCF and private schools on both measures but displayed more variation in CIS scores compared to the floor effects on the ECERS-R scores.

When disaggregating child outcomes by provision type, a similar pattern emerged – children in TCF schools tended to outperform those in private and public schools at the second timepoint, with there being little variation in their scores. In contrast, children in public schools tended to perform lower consistently, whereas there was substantial variation in private school children's performance. Lastly, it was found that, after controlling for children's initial scores, global classroom quality predicted all four child outcomes, albeit the association with pre-numeracy was weaker and non-significant. On the contrary, teacher-child interactional quality did not significantly predict any of the child outcomes, with there being a small negative, but non-significant, association with children's social skills. The structural indicators were not found to have a lot of predictive power, except for children's pre-literacy skills which were predicted most strongly by class size, and to a lesser extent by years of experience and hours of operation.

Process Quality Patterns: Low Global Classroom Quality, High Interactional Quality

Classrooms in the sample showed displayed low levels of global classroom quality, measured through the ECERS-R. These findings are consistent with other LMIC studies that have used the ECERS-R and found lower scores, especially in settings with limited resources (Aboud, 2006; Betancur et al., 2021; Campos et al., 2011; Gol-Guven, 2009; Mariano et al., 2019; Moore et al., 2008; Raikes et al., 2019; Rao & Sun, 2015; Wolf et al., 2018). These scores highlight that Pakistani early year's classrooms typically experience limitations in classroom infrastructure and pedagogical resources, such as limited access to diverse learning materials, minimal support for child-initiated play, and have a narrow focus on academic readiness at the expense of holistic development. This is concerning as some evidence suggests that low quality programmes can hamper children's development (Sylva et al., 2011; Sylva & Wiltshire, 1993); however, these findings have mostly been reported in the West, with research from non-Western and LMICs indicating that attending a lower quality ECE programmes is better than not attending any programme (Rao et al., 2012).

At the same time, it is also important to consider whether the ECERS-R was able to adequately capture variability in classroom quality in the Pakistani context. The scoring system that was employed in the current study has been critiqued by others (Gordon et al., 2013; Isely, 2001) for being too restrictive and potentially missing out on meaningful variation. Indeed, during classroom observations, it was frequently noted that within items, some classrooms demonstrated several higher-level indicators of quality; however, they did not receive credit for these because they failed to meet all the lower-level indicators on that item, sometimes resulting in the same item score as classrooms that displayed none of the higher-level practices, therefore missing out on potentially valuable variation.

Additionally, it is also important to consider if the ECERS-R is a valid measure of quality in the Pakistani context. The scale places strong emphasis on children's autonomy, free play,

and availability of resources, with these elements making up the lower-level indicators, and more child-sensitive interactions making up the higher end of the indicators. While autonomy and free play are indeed developmentally appropriate elements, they do not align with prevailing pedagogical beliefs in Pakistan, where more teacher-directed and structured approaches are often the norm (Jamil, 2009; Rao & Pearson, 2007). Expecting rapid shifts in these pedagogical beliefs and practices may be unrealistic without extensive systemic change. Instead, given these contextual realities, measures of quality in ECE may benefit from focusing on child-sensitive and instructional practices, with some items investigating free play and materials, rather than having that incorporated into most items. This approach has been adopted by more recent instruments that have been developed to assess ECE quality in LMICs (e.g., IDELA Classroom Environment Tool; Save the Children, 2023). Moreover, ECERS-R's limited attention to religious or moral education, and multilingual classroom realities may overlook aspects that are highly salient for Pakistani educators and families. For instance, the use of local languages or culturally embedded practices such as storytelling, moral instruction, or group work may not be directly recognised or rewarded within the ECERS-R framework, despite being valued by communities and potentially beneficial for children's development. Nevertheless, the tool is useful in providing an understanding of the global classroom quality in Pakistan, situating it within the global context, and highlighting areas of strength and weakness.

In contrast to the low ECERS-R scores, scores on the CIS, which measured quality of teacher-child interactions, were on the higher end of the scale. This indicates that while the global classroom environments tended to fall short of international benchmarks for global quality, teachers nonetheless displayed relatively warm, supportive, and positive interactions with children. This pattern suggests that even in contexts where material resources, structural conditions, and pedagogical practices may be constrained, relational aspects of quality – particularly emotional warmth and sensitivity – can be strong. Similar findings have been noted

in other LMIC contexts, where relational quality sometimes outpaces environmental or instructional quality (e.g., Aboud, 2006).

This discrepancy between levels of global and interactional quality provides a promising foundation for the improvement of ECE quality in Pakistan. Interventions aiming to enhance ECE quality could build upon the interactional strengths already present in many classrooms. Specifically, professional development programmes could focus on helping teachers extend their existing warmth into more intentionally child-sensitive pedagogies, such as scaffolding children's thinking, promoting active engagement, and supporting social-emotional as well as cognitive development through responsive dialogue (Hamre et al., 2012). Rather than imposing models that may not align with local norms or realities, interventions can leverage teachers' demonstrated capacities for emotional support to introduce structured opportunities for child participation, exploration, and meaningful learning within teacher-directed frameworks (Tobin, 2017). This approach also resonates with a growing consensus in the ECE literature that interactional quality forms the bedrock of effective early learning environments and can be a critical entry point for broader pedagogical reform, particularly in resource-constrained settings (Britto et al., 2011). Thus, while global classroom quality remains important, the relatively higher CIS scores highlight that investing in the emotional and interactional dimensions of teaching could offer a culturally grounded and sustainable pathway for improving children's learning experiences in Pakistan.

Structural Quality Patterns

To understand what structural quality looks like in Pakistani classrooms, teacher characteristics (age, years of teaching, education, ECE training, and languages spoken) and classroom characteristics (class size, teacher-child ratio, and duration) were assessed. It was found that more than half of classrooms (60%) had at least one teacher who had completed university-level education, with public schools having even a larger proportion (74%). This aligns with broader patterns observed in the public sector, where a large percentage of the education

budget goes towards employing more highly educated teachers (Barón et al., 2024). On the other hand, TCF schools mostly had teachers that had only completed secondary education. This may be because TCF schools prioritise hiring teachers from within the local community, which tend to be areas of poverty or deprivation and have fewer individuals who have completed higher education. TCF often aim to offset this by providing them with inhouse training; however, it appears that this training may not be ECE-specific as only half of the TCF classrooms had a teacher with ECE training.

Overall, there has been a growing emphasis on professionalising the ECE workforce through ECE-specific qualifications; however, half of the classrooms in the sample still had no teacher with ECE training. The gap is particularly concerning given evidence from global research demonstrating that specialised ECE training – beyond general education degrees – is associated with more developmentally appropriate pedagogical practices, greater classroom sensitivity, and better child outcomes (Brunsek et al., 2020; Early et al., 2007; Egert et al., 2018). This lack of ECE-specific training among teachers is likely associated with the perception that working with young children requires little specialised knowledge or skill, and is instead seen as a matter of "instinct" or "natural" caregiving (M. A. Khan, 2018; Zada, 2014). Consequently, teaching in ECE classrooms is often relegated to less experienced or lower-status teachers within the education system.

Whilst the numbers on teachers' ECE training are not encouraging per, they are relatively higher than what has been previously reported in previous work from the region. Specifically, Sindh's School Education & Literacy Department (SE&LD; 2020) reported that only 1% of the early years teachers had ECE training. There are several potential explanations for this discrepancy. Firstly, we asked teachers to self-report if they had any training, without any benchmark on what would qualify as training, whereas it is likely that SE&LD's report used more stringent criteria. Another potential reason is that SE&LD's report covered the entire Sindh province, whereas the present study only employed participants and schools based in Karachi,

the biggest and most developed city in Sindh. It is possible that other regions in Sindh, which are rural and less developed may have teachers with fewer qualifications.

This lack of ECE-trained personnel is consistent with broader challenges in Pakistan – most notably, it was found that classrooms in the sample were characterised by high class sizes and unfavourable teacher-child ratios, particularly in public schools. This is consistent with a national education status report that found that public schools, which serve a significant proportion of young children from disadvantaged backgrounds, are especially affected by overcrowding (ASER Pakistan, 2024). Research from around two decades ago found similar ratios as in the present study (1:30, Lynd, 2007), highlighting that this has been a longstanding challenge in Pakistan's education system. Issues regarding large class sizes and high teacher-child ratios are rooted in a complex interplay of demographic, economic, and systemic factors. Pakistan has one of the largest youth populations in the world, with over a third of its population under the age of 15 (UNICEF, 2025). Rapid urbanisation – particularly in cities like Karachi, which has experienced unprecedented population growth – has further strained the education infrastructure, with public sector schools struggling to accommodate the sheer number of children seeking access to education (Lynd, 2007). Chronic underinvestment in the education sector has exacerbated these pressures: Pakistan consistently spends less than the recommended 4–6% of GDP on education, resulting in inadequate numbers of trained teachers, overcrowded classrooms, and poor facilities (M. A. Khan, 2018).

Even within private and non-profit sectors, financial and logistical constraints limit the feasibility of hiring additional teachers or expanding classroom spaces. Indeed, even higher-income private school classrooms in the present sample had teacher-child ratios of 1:13, with TCF classrooms having 1:32. These patterns may also be partly rooted in the broader socio-cultural fabric of Pakistan. Traditionally, education in Pakistan has been conceptualised less around individualised attention and more around collective instruction, often delivered through a more hierarchical, teacher-centred model (Artipah et al., 2024; M. A. Khan, 2018). In such a

model, it is culturally normative for a single teacher to manage a large group of students through direct instruction, with an emphasis on rote learning, discipline, and respect for authority, rather than personalised, child-centred pedagogies that would necessitate smaller ratios.

Overall, the results suggest that improving ECE quality in Pakistan will require targeted strategies tailored to the strengths and challenges of each provision type. For public schools, reforms must focus on reducing class sizes and strengthening classroom interactions. For TCF, enhancing teacher qualifications and expanding language capabilities could further boost outcomes. Meanwhile, private schools may benefit from more robust quality assurance mechanisms and additional continuous professional development to reduce disparity and ensure consistency across settings.

Exploring the Relationship Between Structural and Process Quality

Theory and prior research have long posited that structural quality acts as a foundation for process quality (Howes et al., 2008; Slot, 2018), and findings from the current study provide preliminary evidence that this may be the case in Pakistan also; however, the contribution of different structural indicators varies. Before delving into exploring the specific findings, it is important to note that not all associations reached statistical significance due to the analysis being underpowered.

Teacher age was a significant predictor of interactional quality, with younger teachers associated with more positive teacher-child interactions. A similar trend, though only marginally significant, was observed for global classroom quality, suggesting that younger teachers may be more open to child-centred pedagogies or more familiar with child development and ECE principles. These findings are consistent with prior studies indicating that younger teachers may demonstrate greater flexibility, enthusiasm, or alignment with newer professional development models (Early et al., 2007).

In contrast, results revealed that more experienced teachers tended to create higher-quality global classroom environments and demonstrated more emotionally supportive

interactions with children. Experienced teachers may be more adept at managing classroom routines, responding sensitively to children's needs, and implementing developmentally appropriate activities, all of which are foundational for quality early learning environments (Slot et al., 2015). In the Pakistani context, where ongoing professional development for ECE teachers remains limited (Khan, 2018), experience may serve as a proxy for informal, practice-based learning accumulated over time. Teachers who have spent more years in the classroom may develop effective routines and interpersonal strategies through trial and error, compensating to some extent for gaps in pre-service or in-service training. This may be particularly relevant given the fragmented nature of ECE teacher preparation in Pakistan, where qualifications vary widely and formal training in early childhood pedagogy is not uniformly available or regulated (MoFEPT, 2017; Malik et al., 2020).

Interestingly, the finding that more experienced teachers tend to have classrooms with higher interactional and global quality appears to contrast with the earlier result linking older teacher age to lower classroom quality. One possible explanation is that age and experience may not align neatly – teachers who enter the profession later in life may have less exposure to contemporary pedagogical approaches or may rely more heavily on traditional, less effective practices. In contrast, teachers with more years of experience, regardless of age, may have had greater opportunity to refine their practice, engage in professional development, and adapt to evolving standards of quality. Having these variables as part of the same models provides nuances insights into how different teacher characteristics work in tandem to shape process quality in Pakistan.

Teachers who had completed higher *education* had significantly better instructional quality than those who hadn't. Similar findings have been reported by other studies also (Colwell et al., 2013), highlighting that more educated teachers engage in more emotionally supportive and less harsh or detached interactions with children. Similarly, classrooms with more educated teachers had higher global classroom quality, suggesting that more educated teachers may also

create more child centred and stimulating classroom environments. However, the effect size for global classroom quality was smaller, indicating that teachers' education may have a stronger impact on their interactions rather than the global classroom environment. These findings are broadly consistent with international evidence showing that higher education levels are linked with more effective teaching practices and improved classroom climate, likely because more educated teachers may have stronger communication skills, greater confidence, and better-developed reflective and critical thinking abilities (Burchinal et al., 2002; Slot et al., 2015). In the Pakistani context, where traditional classroom practices often emphasise authority and direct instruction (Jamil, 2009), higher education may expose teachers to alternative pedagogical models that emphasise child development, emotional support, and positive communication. This exposure may not immediately translate into large-scale changes in classroom organisation – particularly given the constraints of large class sizes, limited material resources, and rigid curricula – but it may nonetheless shift the relational dynamics between teachers and children.

Interestingly, having an *ECE qualification* did not significantly predict either measure of process quality. While this finding may suggest that ECE training does not impact the quality of children's learning in Pakistan, it can be argued that it is more of a reflection on the nature and quality of ECE training in the Pakistani context. Indeed, previous studies have found that pre-service ECE programmes and courses in Pakistan vary considerably in content, rigour, and duration, and often lack a strong focus on practical pedagogy or child-centred instructional strategies (S. Tahira et al., 2021; Zada, 2014). As a result, holding an ECE credential or training may not reliably indicate that a teacher has developed the skills or knowledge needed to provide high-quality early education. Similar trends have been observed in other LMICs, where ECE qualifications are sometimes inconsistently regulated or lack alignment with evidence-based standards for early childhood pedagogy (M. J. Neuman et al., 2015). This lack of standardisation of ECE training in Pakistan also relates to how this variable was operationalised. As noted earlier, teachers were asked to self-report whether they had received

any ECE training, without clear criteria or verification regarding the content, duration, or quality of that training. As a result, the variable likely captures a wide range of experiences – from brief, one-hour workshops to comprehensive six-month certification programmes – thereby reducing its reliability. Nonetheless, this finding suggests that while general education may provide a foundation for teacher quality, better ECE training is needed in Pakistan for translating qualifications into meaningful improvements in teacher-child interactions and classroom quality.

Unexpectedly, the *number of languages spoken by teachers* was negatively, albeit non-significantly, associated with both ECERS-R and CIS scores. Initially this may seem counterintuitive – multilingualism is often viewed as an asset, especially in linguistically diverse settings like Pakistan, where classrooms frequently include children who speak a variety of home languages (Rahman, 2004). However, this negative association may reflect the complex realities of multilingual ECE classrooms in under-resourced settings rather than a true disadvantage of multilingualism per se. One possible interpretation is that teachers who speak multiple languages are more likely to be placed in linguistically heterogeneous classrooms, which adds an additional layer of complexity to classroom management and instructional delivery. In such contexts, teachers may struggle to implement consistent routines, maintain engagement, or build strong emotional connections with children, especially if they are not trained in multilingual pedagogical strategies or lack adequate classroom support (Fassler, 2014).

Another possible explanation is that teachers' use of multiple languages may not necessarily equate to fluency or pedagogical confidence in using them. Teachers may speak several languages conversationally but may lack the professional training to integrate them meaningfully into teaching. This could lead to more fragmented instruction or less consistent verbal engagement with children, thereby lowering observed classroom quality (Ball, 2010). Finally, it is worth considering that multilingual classrooms in Pakistan often operate without a clear language-of-instruction policy. Teachers may resort to code-switching or use a dominant

language (such as Urdu or English) without scaffolding children's understanding in their home language, which can compromise both instructional clarity and emotional connection (Coleman, 2010). While multilingual classrooms have rich potential, in this context, multilingualism may inadvertently become a barrier rather than a bridge.

Findings also revealed a moderately negative relationship between *teacher-child ratio* and ECERS-R scores, suggesting that classrooms with fewer children per teacher tended to provide higher global classroom quality in terms of the learning environment, routines, and materials. This is expected, given the focus on small group and individual instruction in the ECERS-R. This finding also aligns with international research that emphasises the importance of low student-teacher ratios in facilitating more responsive teaching, smoother transitions, and more individualised support for young children (Pianta et al., 2005; Slot, 2018). Interestingly, the teacher-child ratio did not predict CIS scores. Instead, *class size* – defined as the absolute number of children in the classroom – was a stronger and significantly negative predictor of CIS scores. This suggests that the sheer number of children, regardless of the number of teachers, plays a critical role in shaping the quality of teacher-child interactions. This distinction between ratio and class size is important: while a classroom may technically have a “reasonable” ratio e.g., by having a teaching assistant, the overall number of children still places demands on the lead teacher's attention, energy, and ability to engage meaningfully with individual students (LoCasale-Crouch et al., 2007). In low-resource environments, large class sizes likely exacerbate challenges related to noise, behaviour management, and emotional support, which are key dimensions captured by the CIS.

Lastly, it was found that *classroom duration* had small and non-significant associations with both ECERS-R and CIS scores, suggesting that longer or shorter classroom hours do not necessarily contribute to higher or lower process quality in ECE settings in Pakistan. This aligns with existing international literature, which emphasises that the quality of children’s experiences during the school day is more critical than the quantity of time spent in classrooms (Slot, 2018;

Yoshikawa et al., 2018). However, it is also possible that Pakistani classrooms have little variation in their hours of duration, resulting in little impact on the classroom quality. Nonetheless, this has policy implications – for Pakistan, where resource constraints are significant, efforts might be better directed towards enriching the content and quality of interactions within the existing instructional time, rather than extending school hours without corresponding support for pedagogical improvement.

In sum, these findings highlight the nuanced ways in which teacher and classroom characteristics relate to indicators of process quality. While teacher age and language status were negatively associated with both global classroom and interactional quality, teaching experience and education level emerged as positive predictors, particularly for the quality of teacher–child interactions. At the classroom level, larger class sizes were linked to lower interactional quality, and higher teacher–child ratios were associated with lower global environmental quality. While these results give some insight into the importance of different structural indicators in the Pakistani context, it is important to remember that the measures of interactional and global classroom quality used in the study have been derived by Western research and understanding. Therefore, they have an inherent preference for small class size and smaller ratios given the focus on individualised attention and small group activities. Examining if they do in fact relate to children's outcomes, as will be done later in this chapter, will shed light on whether they are salient aspects of quality in the Pakistani context or not.

Exploring Process Quality and Child Outcomes Across Three Provision Types

A great advantage of the current study was its diverse sample – ECE research in Pakistan has primarily been limited to private schools with most studies drawing on students from a single school. Having a sample of over fifty schools from different sectors lends itself to ask questions regarding the quality of education provided in these schools. There are substantial preconceived notions of the poor state of public sector education, with private schools considered to offer much higher quality education, resulting in parents spending large

sums of money to send their children there (M. A. Khan, 2018). On the other hand, non-profit schools, are a big unknown with little insight into the quality of education they provide (Rizwan et al., 2022).

To answer these questions, one-way ANOVAs were run to compare how schools from the three different types of provision differed in terms of their process quality and child outcomes. Findings from the study revealed that non-profit TCF schools outperformed both private and public schools on indicators of global classroom and interactional quality. This is striking and highlights that just because parents pay large sums of money to private schools does not ensure that children will receive better education. Moreover, these findings are also interesting because as discussed earlier, TCF schools had larger teacher-child ratios than private schools and lower levels of teacher education compared to public schools. Despite this, TCF schools were able to demonstrate higher levels of process quality, suggesting that it is possible to have provide quality education with limited resources. Moreover, public schools had significantly lower levels of global environment and interactional quality than both TCF and private schools, in line with prevailing assumptions that public schools in Pakistan do not offer quality education. This is even more interesting because public schools had more educated teachers on average, highlighting that while teacher qualifications are important, they are not sufficient on their own to ensure high-quality classroom practices (Burchinal et al., 2002; M. J. Neuman et al., 2015).

It is important, however, to recognise the variation within each provision type, especially in our sample. Private schools exhibited substantial variability in quality, with a standard deviation of 0.92 in ECERS-R scores – more than double than that of TCF (0.39) and public schools (0.46). To put it in context, both the highest and lowest ECERS-R scores were achieved by private school classrooms. This is in line with previous work that has highlighted the variability within the private sector (Rizwan et al., 2022). While some private schools may offer high-quality instruction and favourable learning environments, schools within this sector operate

with minimal oversight, resulting in inconsistent experiences for children. This is particularly concerning given the strong reliance on private provision at the early years level. On a more positive note, two public schools in the sample emerged as outliers, performing significantly above the sector average on quality indicators. These examples demonstrate that good practice is possible within the public sector, even under constrained conditions.

To build on the process quality findings, children's outcomes at the second timepoint were also compared across the three provision types. It was found that there were significant differences by provision type in all four outcomes, with children from TCF schools outperforming those from public and private schools on three of the four outcomes – pre-literacy, pre-numeracy, and social skills. In terms of emotion knowledge, children from private schools outperformed those from TCF and public schools. Similar to process quality findings, children from public schools performed significantly lower than the other two provision types in all outcomes. These findings reveal important disparities in child outcomes across different types of schools in Pakistan, echoing prior concerns about systemic inequities in early childhood education.

The differences between provision types were less pronounced for children's social skills ($\eta^2 = .09$) compared to their academic skills and emotion knowledge ($\eta^2 = .17–.24$). One possible explanation for this pattern relates to the nature of social skills development, which is less dependent on formal instruction and more closely tied to everyday peer interactions and socio-cultural norms. Like literacy and numeracy, which require structured teaching and exposure to specific content, developing emotion knowledge requires more explicit discussion of emotions. Social skills on the other hand often emerge naturally through children's social experiences within and outside of the classroom (Denham et al., 2012). Pakistani classrooms across all types often involve considerable group-based activities and strong adult authority structures, which may equally promote or hamper social development. Therefore, even if pedagogical quality varies, the broader cultural expectations around social conduct and respect

for authority (X. Chen & French, 2008) may scaffold the development of basic social competencies relatively consistently across settings.

More importantly, the consistently strong performance of children in TCF schools, suggests that focused investment in quality and equity can yield positive outcomes. TCF's model, which combines a structured curriculum, teacher training, and a strong emphasis on play-based strategies (Lall, 2009; Noman, 2023), may help explain these results. However, it is worth pointing that TCF students' advantage does not extend to their emotion knowledge, for which children from private schools scored higher. Given the importance of emotion knowledge highlighted in previous analyses, there is potential for TCF schools to employ an emotion-focused SEL programme, which may have the potential to further increase their advantage on all other three outcomes. Importantly, despite serving underprivileged communities, TCF schools appear to deliver both academic and social gains that exceed those in both public and private schools – challenging assumptions that resource constraints necessarily limit quality in low-cost schooling and positioning the TCF model as something that can be adapted or learnt from by the public sector to provide low cost but high-quality education.

Overall, the analysis of process quality and child outcomes across provision types revealed important patterns. TCF schools consistently demonstrated stronger performance across most domains, despite operating in low-resource settings with high student–teacher ratios, suggesting that factors beyond material resources – such as teacher training, organisational support, and consistent pedagogical practices – may play a critical role in driving quality. Public schools, in contrast, generally exhibited lower classroom quality and child outcomes, pointing to systemic challenges within the public sector that may require more targeted investments and reforms. Private schools showed the greatest variability, with some classrooms achieving high levels of quality and outcomes and others performing poorly, reflecting the unregulated and highly heterogeneous nature of the private education market in Pakistan. These findings highlight that provision type alone does not guarantee quality and that

broader systemic, organisational, and pedagogical factors must be considered when designing policies to improve ECE in Pakistan.

Classroom Quality and Child Outcomes

This final sub-section presents findings from analyses examining how indicators of classroom process and structural quality predicted changes in children's social skills, emotion knowledge, pre-literacy, and pre-numeracy skills over a six-month period. The models controlled for children's prior scores on each outcome, as well as key demographic factors, to more accurately isolate the contribution of classroom quality indicators.

Process Quality Indicators. Findings revealed that ECERS-R scores significantly predicted growth in children's social skills, emotion knowledge, and pre-literacy skills over a six-month period, but not their pre-numeracy skills. These results highlight the important role that the global quality of the classroom environment – captured through dimensions such as space and furnishings, personal care routines, activities, interactions, and programme structure – plays in shaping young children's development in the Pakistani context. The significant associations for social skills and emotion knowledge are consistent with prior research showing that richer, more supportive environments promote children's social-emotional competencies by providing opportunities for positive peer and adult interactions, emotional regulation, and cooperative play (Mashburn et al., 2008; Slot, 2018). Similarly, the association with pre-literacy skills aligns with evidence that exposure to a stimulating classroom environment, including access to literacy materials and intentional teaching practices, supports early literacy development (Howes et al., 2008).

The lack of a strong association between ECERS-R and pre-numeracy skills may reflect the ECERS-R's emphasis on overall classroom quality rather than domain-specific instructional quality, which may be more important for pre-numeracy development. As Clements and Sarama (2014) argue, early math development often depends on explicit, intentional teaching practices,

such as guided number games and math talk – elements captured by only one maths-focused item in the ECERS-R. Therefore, classrooms with high global quality, as measured through the ECERS-R, may not necessarily support numeracy learning. Moreover, in the Pakistani ECE context, where numeracy teaching is more didactic or rote-based and less embedded in play-based or interactive activities (S. Tahira et al., 2021), the ECERS-R may not have been able to capture relevant instructional practices.

These findings provide clear evidence that the classroom environment has a meaningful impact on Pakistani children's development and suggest that improving the overall classroom environment can have wide-reaching benefits for children's social-emotional and early literacy development in Pakistan. In contexts where direct instruction dominates, investments in enhancing classroom environments–by promoting a stimulating learning environment, a whole-child approach, and more responsive pedagogy–could meaningfully support children's broader developmental outcomes. At the same time, there may be a need for more focused numeracy interventions that go beyond general improvements in classroom quality to ensure gains in mathematical skills.

Interestingly, CIS scores were not significantly related to any of the child outcomes, and in fact showed a small, negative (albeit non-significant) association with children's social skills. This finding contrasts with prior research in higher-income contexts, where warm, sensitive teacher–child interactions have been found to promote children's social competence, emotional regulation, and learning engagement (Mashburn et al., 2008; Pianta et al., 2005). One explanation for the negative association with children's social skills is that highly warm teacher-child interactions may lead to children becoming more dependent on adult support rather than learning to navigate peer relationships independently. If teachers are overly involved in managing interactions or providing emotional support, children may have fewer opportunities to practise key social skills, such as negotiation, conflict resolution, and empathy with peers (K. H. Rubin et al., 2009). It is also possible that cultural norms around adult–child relationships in

Pakistan, which emphasise respect, affection, and authority simultaneously (Jamil, 2009), may result in warm interactions that are rated highly in the CIS but are hierarchical in nature. Such interactions may offer children limited opportunities for peer interaction, collaboration, and autonomous social problem-solving – key mechanisms through which social skills typically develop (Williford et al., 2013) – resulting in a decrease in children's social skills.

In terms of a lack of association with academic outcomes and emotion knowledge, one possible explanation is that the CIS may not have fully captured the interactional processes most predictive of children's development in the Pakistani context. While the CIS has been found to be associated with children's development (e.g., Colwell et al., 2013; Loeb et al., 2007), it primarily assesses the emotional warmth of teachers' interactions with students but does not explicitly measure the instructional or cognitive stimulation aspects of interactions that are critical for academic growth (Pianta et al., 2008). It is possible that the observed teacher–child interactions may have been warm but not responsive to children's needs or instructionally rich. Another possibility is that the CIS may not have been sensitive enough to differentiate among the levels of emotional support typically seen in Pakistani classrooms. Observations indicated that most teachers scored on the higher end of the scale, consequently, there was limited variation in the quality of interactions, potentially attenuating associations with child outcomes.

Finally, it is also possible that the six-month follow-up period may have been too short to detect the impact of interactional quality on more stable developmental outcomes. While high-quality teacher–child interactions are theorised to support children's social-emotional and academic development through mechanisms such as emotional security, language modelling, and behavioural scaffolding (B. K. Hamre & Pianta, 2007; Howes et al., 2008), the effects of these processes may unfold gradually over time. Several longitudinal studies suggest that the benefits of classroom interaction quality on child outcomes often emerge over longer periods, particularly when measuring outcomes that are more stable or in the absence of an intervention (Hatfield et al., 2016; Pakarinen et al., 2017). In shorter intervals, such as six months, children's

developmental trajectories may be more influenced by prior abilities or the overall classroom environment, potentially masking the longer-term benefits of high-quality interactions. As such, future studies with longer follow-up periods may be better positioned to capture the cumulative effects of interaction quality on children's development.

Overall, the lack of strong associations between interactional quality and child outcomes in this study calls for a more nuanced approach to conceptualising and measuring teacher–child interactions in Pakistan, potentially integrating culturally adapted tools that capture both emotional and instructional dimensions of quality. Moreover, this finding underscores the need to move beyond general emotional support to focus more systematically on child-centred interactional practices. For the Pakistani context, it may be important for future efforts to explicitly build teachers' capacities not just for warm relationships, but for engaging in meaningful dialogue with children and promoting social problem-solving skills within the classroom environment.

Structural Quality Indicators

Findings revealed that most structural characteristics – such as teacher education, age, experience, class size, and student–teacher ratios – did not significantly predict children's social skills, emotion knowledge, or pre-numeracy skills, a pattern observed in both global and local literature. Internationally, a growing body of research suggests that structural features, while foundational, often exert only indirect or weak associations with child-level outcomes (Early et al., 2007; Mashburn et al., 2008). Instead, it is typically the *process quality* – including teacher-child interactions, learning opportunities, and the classroom environment – that more strongly predicts children's development (Slot, 2018), and this appears to be the case in Pakistan also.

That structural characteristics were unrelated to children's social and emotional outcomes is perhaps unsurprising. Developing social-emotional competencies depends heavily on interactional aspects of the classroom environment, such as emotional support, teacher

sensitivity, and opportunities for peer interaction – dimensions less influenced by structural inputs and more by teachers' beliefs, training, and daily practices (Yoshikawa et al., 2013; Wolf et al., 2018).

On the other hand, findings revealed that *pre-literacy skills* were most strongly predicted by class size, which aligns with global evidence suggesting that children in smaller classes are more likely to receive individualised support, more frequent language input, and greater opportunities for participation (Ecalle et al., 2006; Mashburn et al., 2008). A smaller but significant negative association was also found for years of experience suggesting that more experienced teachers may be using outdated teaching methods, consequently, their instructional practices may not be aligned with current early literacy pedagogy.

Notably, classroom *hours of operation* were positively associated with children's pre-literacy development, suggesting that longer instructional time may support early language and literacy skills in this context, in line with studies from other LMICs (Kaul et al., 2015; Berlinski et al., 2008). This contrasts with an earlier finding from the current study that longer hours were negatively (albeit weakly and non-significantly) associated with indicators of classroom process quality. One possible explanation is that after controlling for the process quality, as was done in the current analysis, longer instructional time may increase children's exposure to print and language-rich activities, thereby supporting their literacy development. In Pakistan, where many children have limited access to print or learning resources at home, extended time in school may compensate by offering more consistent exposure to basic literacy instruction. However, this also emphasises the importance of the *quality* of that additional time. If extended hours are not paired with active learning, playful engagement, or teacher support, they may not enhance other critical developmental domains like pre-literacy.

In the current study, neither *teacher education levels* nor the presence of *ECE-specific training* significantly predicted any of the children's outcomes. The lack of associations with teachers' education level was surprising, especially given the strong associations with process

quality observed in this thesis. However such findings have been reported previously, especially in a meta-analysis that suggested higher education is not a strong predictor of children's outcomes (Early et al., 2007). It may be possible that higher teacher education has a more indirect impact on children's development, i.e., by improving process quality (Slot et al., 2018). Teacher training in Pakistan, particularly at the primary and early childhood levels, often remains theoretical and examination-driven, with limited emphasis on child development, classroom practice, or active learning methods (M. Tahira et al., 2020). As a result, simply having ECE training may not necessarily translate into more effective teaching practices that promote children's development. Without high-quality training opportunities or ongoing professional development, the potential benefits of teacher qualifications for child outcomes may not be fully realised. Similarly, *teacher–child ratios* were not associated with children's academic outcomes or emotion knowledge and class sizes only with pre-literacy.

These findings stand in contrast to Western literature, where higher teacher qualifications and lower student–teacher ratios are often seen as critical indicators of quality (M. Burchinal et al., 2008; Perlman et al., 2016). Consequently, in many Western and high-income contexts, professionalising the ECE workforce and maintaining small ratios are central strategies for improving ECE quality.

However, the lack of significant associations with teacher education, ECE training, and teacher-child ratios in the present study, points to important contextual differences in Pakistan. While international frameworks recommend lower teacher–child ratios to enable more individualised attention and responsive teaching, the reality in Pakistan – particularly in urban centres like Karachi – is that large class sizes and higher ratios are often the norm due to rapid population growth, resource constraints, and the relatively low prioritisation of early childhood education within public policy (Naviwala, 2016). In such settings, teachers may develop strategies to manage large groups through highly structured, whole-class instruction, which may mitigate the negative effects of high ratios on observable outcomes, at least in the short term.

These findings highlight that policy strategies from Western contexts cannot be directly transplanted into Pakistan without considering the local realities. While teacher education and ratios are undoubtedly important, improvements in child outcomes in Pakistan may require not only raising the levels of formal education and reducing ratios where possible, but also deeply reforming the content and quality of teacher training, to ultimately improve Pakistan children's everyday classroom experiences, which have been found in the present study to relate strongly to their developmental outcomes.

Overall, the findings of this section offer important insights into how quality can be understood and strengthened in the Pakistani ECE context. While certain structural features traditionally emphasised in global research – such as teacher qualifications and child–teacher ratios – were not consistently associated with children's outcomes, the quality of the global classroom environment, as captured by the ECERS-R, emerged as a meaningful predictor of children's social-emotional and early academic development. Importantly, the results highlight that effective early learning environments in Pakistan may not always mirror the priorities of Western frameworks; rather, they must build on existing strengths – such as teachers' emotionally supportive interactions – while progressively embedding practices that foster child agency, cognitive stimulation, and active learning. The consistent outperformance of TCF schools, despite limited resources and larger class sizes, underscores that systemic investments in teacher support, intentional pedagogy, and organisational culture can drive quality even in low-resource settings. Moving forward, conceptualisations of quality in Pakistan must be both aspirational and realistic: they should align with global principles of effective ECE while remaining firmly grounded in the socio-cultural realities of classrooms, communities, and the wider education system. Only through such a contextually responsive approach can efforts to improve early childhood education truly deliver equitable and lasting benefits for Pakistan's young learners.

Chapter 8: Conclusion

The early years represent a critical period in a child's development, during which foundational cognitive, social, and emotional skills are formed. However, children growing up in LMICs such as Pakistan often face a range of structural and socio-economic stressors – including poverty, gender discrimination, overcrowded classrooms, and limited access to quality education – that hinder their ability to reach their full developmental potential. In this context, SEL offers a powerful avenue not only for helping children cope with these challenges but also for equipping them with the skills needed to thrive. ECE presents one of the most effective platforms for delivering SEL at scale. However, in order to do that, there is a need to understand how Pakistani children's social-emotional skills develop in relation to their individual, family, and classroom characteristics, which would inform the design of SEL programme(s) that fit the needs of children and their context.

To this end, this thesis set out to explore ECE and social-emotional development in Pakistani preschool-aged children, two underexplored areas within the country. By exploring different aspects of children's development and the classroom environment, the thesis sheds light on the early years educational landscape in Pakistan and what matters for Pakistani children. Most importantly, the study found that children's early emotion knowledge plays an important role in their later academic outcomes, emphasising that social-emotional skills are not only important in and of themselves for Pakistani children, but may also have subsequent direct and indirect benefits on other aspects of development, including their academic performance and social behaviour. The second important takeaway from this thesis is that the global classroom environment is perhaps the most important predictor of children's developmental outcomes; however, Pakistani classrooms generally demonstrated poor levels of quality on this.

This chapter aims to bring together findings from the different research questions to understand what they mean about conceptualising two key phenomena that the study focuses

on – ECE quality and SEL in the Pakistani context. The chapter then outlines some of the limitations of the thesis, including measurement issues and generalisability of the sample. The chapter brings together the policy implications of these findings, suggests avenues for future research, and concludes with some final reflections.

Rethinking ECE Quality in the Pakistani Context

The findings of this study contribute to a more contextually grounded understanding of ECE quality in Pakistan. While global definitions of quality frequently emphasise a combination of structural inputs (e.g., teacher qualifications, class size, infrastructure) and process quality (e.g., teacher-child interactions, learning activities), our results indicate that the relationship between these elements and child outcomes is neither straightforward nor uniform in the Pakistani context.

Findings revealed that structural characteristics such as teacher education, ECE training, and child–teacher ratios—commonly treated as proxies for quality in HICs—were not consistently associated with child outcomes. This suggests that such structural features, although desirable in theory, may not be meaningful indicators of quality in Pakistan. Moreover, these findings are in line with those from other LMIC contexts where investments into more qualified teachers and smaller teacher-child ratios did not automatically translate into gains for children unless they are accompanied by meaningful improvements in how teachers engage with children (Rao et al., 2017; Yoshikawa et al., 2018). Relying on these structural inputs as benchmarks of quality risks putting forward a deficit-based view that labels all classrooms as "low quality" without acknowledging the existing variation in effective practice.

While the present study finds that the importance given to structural indicators in HICs does not translate to the Pakistani context, the picture is more nuanced when it comes to process quality. One of the core challenges lies in how process quality is conceptualised and operationalised across contexts. It is a broad, multi-faceted construct that has been defined in

different and often inconsistent ways around the world (e.g., Layzer & Goodson, 2006). The present study adopted a more global operationalisation of process quality using the ECERS-R, which takes a whole-child approach and captures aspects such as child-centred practices, stimulating learning environment, classroom activities, organisation of space, and frequency of daily routines. Using this operationalisation, the results showed that better global classroom quality was positively associated with children's outcomes. These findings suggest that the quality of everyday interactions and experiences plays a crucial role in supporting Pakistani children's development.

However, despite these positive associations, ECERS-R scores across the sample were generally low, yet there was substantial variation in children's developmental outcomes, which could not be strongly attributed to their demographic characteristics as seen in findings for RQ1. This discrepancy raises questions about whether the ECERS-R fully captures the types of practices that are actually supporting children's learning in this context. Having observed the classrooms first-hand, it unlikely that the uniformly low scores reflect uniformly poor learning environments. While the ECERS-R (and its subsequent versions) has been used as a measure of "gold standard quality" many of the elements that the ECERS-R and broader ECE literature identify as critical – such as free play, autonomy, individualised attention, well-resourced learning centres, and an abundance of developmentally appropriate materials – are simply not feasible in most Pakistani classrooms. These constraints apply not only to public and non-profit schools but also to many high-fee private schools.

If high quality continues to be defined in terms that are unachievable in local settings, then such definitions risk becoming not only inapplicable but also demoralising for educators and policymakers. Taken together, these findings underscore the need to rethink what high *process* quality means for early education in Pakistan. It cannot be a direct import from HIC standards. Instead, a more grounded, locally valid definition is required – one that reflects what

is feasible in classrooms, recognises existing strengths and practices, and remains focused on what most effectively supports children's development.

Understanding the case of TCF schools can be particularly instructive in this regard. Despite operating under constrained conditions–including an average class size of 30 children and only one teacher per classroom–TCF students outperformed those in public and private schools on pre-literacy, pre-numeracy, and social skills. These results are especially striking given that the teacher-child ratios in TCF classrooms far exceed internationally recommended standards, and their infrastructure and resources are modest compared to many private schools, reinforcing the earlier point that structural resources matter, but they are not sufficient. What seems to distinguish TCF schools is not smaller class sizes or better ratios, but the quality everyday experiences they are providing their students through their play-based curriculum, strong organisational systems, regular monitoring, and investment in teacher training and mentorship (Lall, 2009; Noorani & Hussain, 2021). Furthermore, TCF schools prioritise community engagement and recruit teachers from local contexts, helping to foster culturally responsive practices. While it is difficult to pinpoint exactly what aspects of TCF's early years model are strongly related to children's outcomes, the important takeaway is that it is possible to have strong child outcomes with limited resources.

Taken together, these findings echo broader critiques of the "one-size-fits-all" approach to improving ECE quality in LMICs. As Pakistan and other LMICs expand access to early education, efforts to improve quality must account for what is feasible, valued, and impactful within local systems. This requires rethinking what constitutes "best practice" by developing approaches that are grounded in both global evidence and local realities (Yoshikawa et al., 2018; Wolf & McCoy, 2019). Ultimately, while tools like the ECERS-R are a useful starting point, a more contextually responsive understanding of quality is essential for designing interventions and policies that are truly effective in improving outcomes for young children in diverse global contexts.

Conceptualisation of Social and Emotional Skills in LMICs

In LMICs, SEL is often conceptualised as the development of "life skills" or basic social behaviours such as cooperation, communication, or conflict resolution (Brush et al., 2022; Torrente et al., 2015). This framing tends to emphasise externally observable behaviours – such as being respectful, following rules, or working in groups – while overlooking more foundational emotional competencies, including the ability to recognise, understand, and manage one's own and others' emotions. As a result, SEL programmes and assessments in LMICs often underrepresent or entirely omit emotion-related skills, despite claims to address "social-emotional" development. This reflects the broader challenge of the jingle-jangle fallacy in SEL research and programming, where the same terms (e.g., "SEL" or "life skills") are used to refer to different constructs, or different terms are used to describe the same underlying skills, leading to conceptual ambiguity (S. Jones et al., 2017). Such inconsistencies hinder efforts to design coherent interventions and valid assessments, especially across cultural contexts. There is a critical need for the field to define and operationalise SEL constructs with greater precision and transparency, ensuring alignment between what is claimed and what is actually targeted. The conceptual framework guiding this thesis responds to these concerns by explicitly positioning emotional competencies – particularly emotion knowledge – as central to SEL in the early years. By doing so, it attempts to bring clarity and depth to the understanding of SEL in Pakistan's early education landscape.

The findings of this study offer important support for, and refinements to, the thesis's conceptual framework that distinguishes between early-emerging emotion knowledge and later-developing social skills. Consistent with the proposition that emotion competencies play an important role in early development, the study found that children's early emotion knowledge significantly predicted their later academic outcomes in both pre-literacy and pre-numeracy domains. In contrast, early social skills did not emerge as strong predictors of later academic

outcomes, and in the case of pre-literacy, they were negatively associated. However, it was found that compared to earlier social skills, later social skills have stronger associations with children's academic skills. While the former finding was unexpected at first glance, these findings align with the conceptualisation of social skills as later-developing, contextually dependent behaviours that may not yet be fully stabilised by the start of the final preschool year and therefore do not meaningfully predict Pakistani children's academic development.

Moreover, these findings help clarify the temporal dimension of social-emotional development. That early emotion knowledge predicted later social skills supports the view that emotional understanding precedes and potentially scaffolds social behavioural competencies acting as a foundational building block not only for academic outcomes but also for social skills (Denham et al., 2003). It also suggests that timing and measurement are critical in research on social-emotional predictors of learning and assessing social skills too early may not fully capture their developmental relevance or stability.

The validity and performance of the measurement tools used in this study also offer meaningful insights into the conceptual distinction between emotion knowledge and social skills, particularly regarding their developmental origins and cultural embeddedness. Emotion knowledge was assessed using the AKT, a measure originally developed in Western contexts. Despite this, the test demonstrated strong internal consistency and functioned as a valid predictor of academic outcomes in the Pakistani context. That young children in Pakistan were able to successfully engage with and perform well on this task suggests that the recognition and understanding of basic emotions may be a more intrinsic, universal capacity that emerges relatively independently of specific cultural contexts, in line with developmental and neuroscience literature (Leppänen & Nelson, 2006; Pons et al., 2004)

In contrast, social skills were assessed using the IDELA, a measure developed specifically for LMICs (Pisani et al., 2018), yet the scale showed relatively low internal reliability

in this sample. This discrepancy may point to the greater cultural specificity and contextual sensitivity of social skills, which are by nature externally expressed and socially negotiated. Behaviours like sharing, turn-taking, or initiating interactions may carry different meanings or expectations across cultures, particularly in collectivist settings where social hierarchies, gender norms, and respect for authority shape social conduct (K. H. Rubin et al., 2009). The lower reliability of the social skills measure may thus reflect the heterogeneity of cultural values surrounding appropriate social behaviour, further reinforcing the idea that social skills are less intrinsic and more context-dependent than emotion knowledge.

In sum, the findings reinforce the value of distinguishing between skills children "possess" (emotion knowledge) and those they "demonstrate" (social behaviours), as was outlined in the thesis's conceptual model. The findings build on the conceptual model also, highlighting that social and emotional skills are not only distinct in nature but also differentially predictive across time, with emotion knowledge playing a direct and indirect role in early learning and social skills coming into play towards the end of preschool. Emotion knowledge, as a relatively stable, intrinsic skill, may be more amenable to standardised measurement and targeted early development efforts across contexts. In contrast, social skills require careful cultural adaptation and locally grounded assessment approaches to ensure validity and reliability. This adds nuance to our understanding of early social and emotional trajectories and underscores the importance of focusing on emotion competencies, especially within the early years.

Limitations

While this thesis provides important insights into the predictors of young children's social-emotional development and ECE in Pakistan, several limitations must be acknowledged. These reflect both methodological constraints and broader conceptual issues that future research should address.

Validity of Measures and Variables

Although the ECERS-R remains one of the most widely used tools for assessing classroom quality internationally, its use in this study presents certain limitations, some of which have been previously discussed. Firstly, the ECERS-R's "stop scoring" method, which assigns a domain's final score based on the lowest-rated indicator, may underrepresent the more nuanced strengths of classrooms, potentially missing out on meaningful variation and resulting in low scores. Secondly, the ECERS-R places heavy emphasis on the provision of free play materials and child-initiated activities, which does not align well with cultural expectations and realities for structured, teacher-directed learning in the Pakistani context (S. Tahira et al., 2021). As such, there is a risk that the tool's Western-centric assumptions may have led to underestimating dimensions of quality valued locally. Thirdly, although the ECERS-R has different subscales that tap into different aspects of quality, its composite score is more typically used, providing limited insight into how different aspects of quality relate to children's development in the Pakistani context.

The study also used the CIS to measure the quality of teacher-child interactions. Although the CIS allowed for more feasible data collection given field constraints, it does not differentiate between types of instructional support or emotional climate with the same rigour as other measures, including the CLASS or Teach ECE. Moreover, the CIS does not explicitly capture the extent to which teachers engage in intentional teaching practices, such as scaffolding learning or promoting metacognitive skills, which emerging research shows to be critical for child outcomes (B. Hamre et al., 2014). Thus, while classroom interactions were assessed, the measure focused on caregiving practices and may have lacked the sensitivity needed to detect more subtle aspects of quality that could drive child development.

The present study also utilised the social-emotional subscale of the IDELA to assess children's social skills. While the IDELA has been widely used across LMICs and is one of the

few available tools for directly assessing social-emotional development in diverse settings, several limitations of the social-emotional subscale warrant consideration in the context of this study. First and most notably, the internal reliability of the IDELA social-emotional subscale was low in the present sample, raising concerns about the consistency and robustness of the measure. This limitation affects confidence in the accuracy of the findings related to social skills and may have contributed to the unexpected and counterintuitive patterns observed, such as the negative association between early social skills and later pre-literacy skills. While such findings could reflect true developmental complexities or trade-offs in children's early competencies, they may also be artefacts of measurement error.

Secondly, the subscale primarily focuses on behaviours such as self-awareness and friendships. Although the measure had been piloted in Pakistan during its development phase and has been used by other Pakistani researchers (e.g., Yousafzai et al., 2018), the skills assessed may not align with the socialisation priorities in collectivist cultures, potentially limiting the cultural validity of the tool. Moreover, the subscale only assesses five social skills, and it is possible that it has missed out on other skills that may be more valued in the Pakistani context, such as respect for elders or obedience. Despite these challenges, it is important to recognise that there are currently no widely available and well-validated alternatives for assessing social skills in young children in low-resource settings, particularly using observation- or task-based approaches that avoid reliance on parent or teacher reports, which can be biased or inconsistent.

Additionally, the HLE questionnaire used had conceptual and methodological limitations. It primarily assessed the frequency of activities like reading or storytelling, overlooking aspects such as the richness of language interactions or the social-emotional focus of parent-child conversations, which may be more strongly related to children's development. Moreover, the data was primarily collected through caregiver self-report. While this approach is common in

large-scale studies, especially in a country like Pakistan where there is no strong research culture, it provides only a partial, and potentially biased, view of the home learning environment. Richer qualitative or observational data – such as direct recordings of parent–child interactions or in-depth interviews – would offer more nuanced insights into the nature and quality of learning practices at home (Melhuish et al., 2008).

The operationalisation of siblings also represents a limitation. In this study, sibling effects were assessed through the number of children living in the home, but research suggests that the impact of siblings on child development may not be captured solely by frequency. Birth order, sibling gender constellation, and the quality of sibling relationships can all meaningfully shape developmental outcomes (S. E. Black et al., 2005; McHale et al., 2012), which were not captured in the present study. Similarly, the study's approach to bilingualism was limited to capturing the number of languages spoken at home. However, language development is shaped by factors such as the age of acquisition, the degree of proficiency in each language, the match between home language and language of instruction at school, and the sociolinguistic status of each language within the community (Hammer et al., 2014). These dimensions can have critical consequences for children's learning trajectories and their comfort navigating educational environments. A more detailed assessment of bilingual or multilingual experience would have offered deeper insight into how linguistic diversity interacts with school readiness and academic achievement.

Sample

The study benefits from a relatively large sample of preschool-aged children drawn from a range of school types – public, private, and non-profit – across diverse neighbourhoods in Karachi; however, several limitations of the sample should be acknowledged.

First, while the sample for the study is diverse in socio-economic backgrounds, it was drawn from a single city in Pakistan and included children attending formal preschools.

Consequently, the findings may not be generalisable to the wider population of Pakistan, particularly to children living in rural areas or those not attending preschool. Nonetheless, this geographic focus also offers certain advantages. A more focused regional approach allows for an in-depth understanding of the developmental and educational realities in one of Pakistan's largest and most complex cities. Given Karachi's size, socioeconomic diversity, and status as a hub of educational experimentation, the insights gained are likely to be valuable for informing urban ECE policy and programming in similar contexts.

Second, the study may be subject to participation bias, such that schools and families who agreed to take part in the project may differ systematically from those who did not. For example, schools that are better resourced or more engaged with development initiatives, may be more likely to participate. Similarly, children's participation in the study was contingent upon parental consent, which may have further skewed the sample toward families with more active engagement in their child's education or those who perceived the research as beneficial. Although the research team worked with schools to engage all parents from the chosen classroom, it is possible that the findings underrepresent children from less advantaged or less engaged households. These differences could skew the findings toward more favourable estimates of children's skills or classroom quality. Moreover, attrition over time – particularly in the longitudinal components of the study – raises additional concerns. It is possible that children, families, or schools who were low-performing, overburdened, or disengaged were more likely to drop out, leading to potential bias in the final analytic sample. Although there were some dropouts in the sample ($N_{children}$ = 198, $N_{schools}$ = 7), school-level drop out tended to be due to external factors. Most of the child-level drop out was because of schools, but other reasons included absence, migration, or withdrawal from school.

Analyses

Although the overall sample of children was sizeable (N_{T1} = 607, N_{T2} = 453), the sample size for the classroom quality analyses (N = 52) was more limited, which likely reduced the statistical power to detect associations between structural features and process indicators. As a result, some associations – particularly weaker or more nuanced ones – may not have been detected, and caution is warranted in generalising these findings.

Another potential limitation of the study is that although analyses employed a longitudinal design, which supports temporal inference and allows us to control for prior skills, causal conclusions cannot be drawn about the impact of children's SEL skills or the classroom environment. This is particularly important to acknowledge in developmental research, where many relationships, such as those between SEL competencies and academic outcomes or between teacher-child interactions and children's behaviour, are likely to be bidirectional (Barnett et al., 2012). For example, while strong instructional practices may foster emotion knowledge over time, emotionally competent children may elicit more responsive teaching. However, the complexity of the analytic models meant that reciprocal pathways could not be modelled. As such, findings should be interpreted as evidence of association rather than causation.

Another key limitation of the present study relates to the treatment of teacher-level data. In several classrooms, data were collected from more than one teacher, reflecting the common reality of multiple educators operating within the same ECE classroom. However, for the purposes of inferential analysis (ANOVAs and MLMs), these data had to be merged to create a single set of classroom-level indicators. This meant that individual-level variation across educators could not be independently modelled or accounted for in the analyses. Instead, summary measures were constructed using either the average score across teachers or, in some cases, the highest reported value, depending on the variable and its theoretical relevance

(see Table 9 for details). While this approach allowed for the inclusion of teacher-level variables in analyses, it inevitably introduced some loss of granularity and may have obscured important within-classroom dynamics.

Taken together, these limitations highlight the need for cautious interpretation of the findings, while also underscoring the importance of contextually grounded, methodologically rigorous research in LMIC settings.

Policy Implications

The findings of this thesis offer important, if sobering, implications for ECE policy in Pakistan and similar LMIC contexts. They reveal both the limits of relying solely on structural investments and the opportunities that lie in more holistic, context-sensitive approaches to supporting young children's development.

The finding that early emotion knowledge predicts children's later academic outcomes has meaningful policy implications for early childhood education in Pakistan. It highlights the importance of incorporating SEL – and particularly emotional competencies – into the early years curriculum. Current policy efforts tend to focus on foundational literacy and numeracy, but these results suggest that building children's ability to recognise and understand emotions may also serve as a foundation for academic success. In practical terms, this means embedding SEL components into curricula, teacher training, and classroom practices – not as an optional "add-on" but as a foundational pillar of effective learning. And this needs to be done from the early years, a time when children's brains are highly malleable and responsive to environmental inputs. Integrating SEL into ECE policy and practice could therefore strengthen both children's emotional wellbeing and their readiness to learn, offering a more holistic approach to early development. The classroom-level findings carry even sharper policy relevance. First, they underscore the need to shift policy attention beyond expanding access to ECE, towards improving the *quality* of children's everyday experiences in classrooms, which would involve

shifting away from didactic and rote-learning approaches, to a whole-child approach that provides children with stimulating learning environments and responsive pedagogy. While enrolment remains a pressing concern, this study highlights that how children are taught – their interactions, routines, and learning environment – matters significantly for their developmental outcomes.

The consistent outperformance of TCF schools in both process quality and child outcomes underscores the potential of well-managed non-profit school models in delivering high-quality early childhood education in low-resource settings. TCF's success suggests that quality is achievable without the extensive resources typically available to elite private schools. TCF's model combines strong community engagement, clear pedagogical frameworks, and investment in teacher support (Noorani & Hussain, 2021) – features that are often lacking in the overstretched public sector. Policymakers should examine the operational strategies, teacher training approaches, and accountability mechanisms used by TCF to distil actionable insights for public sector reform. This includes promoting a culture of ongoing teacher development, improving instructional leadership, and ensuring consistency in classroom practices. Importantly, partnerships between the public sector and non-profit providers like TCF could offer a pathway for scaling quality provision while also using the non-profit sector as a laboratory for innovation, informing public school reforms through the diffusion of successful practices.

The study's finding that higher maternal education is associated with improved child outcomes reinforces the critical role that parents play in children's development. However, given the low rates of female education in many parts of Pakistan, this finding points to the need for broader, family-focused policy strategies. In the short term, this means investing in parent engagement programmes, especially those that equip less-educated mothers with knowledge and strategies to support their children's learning at home. For example, community-based parenting sessions or home-based learning kits may help bridge the gap. In the longer term,

policies should continue to prioritise girls' access to education, as maternal education has long-term, intergenerational benefits for child development.

The observed gender gap in pre-numeracy skills – but not in pre-literacy or social-emotional domains – suggests that gender disparities in early development are domain-specific rather than universal. This challenges assumptions of uniform female disadvantage and underscores the need for nuanced and evidence-based responses. Policymakers and practitioners should avoid blanket approaches to gender equity and instead design early learning policies and interventions that reflect the distinct patterns of boys' and girls' development. In this case, interventions might focus on fostering girls' numeracy development through play-based maths exposure, encouragement of spatial reasoning activities. Furthermore, policies should work to counteract gender biases in classroom interactions, resource allocation, and pedagogical expectations. Teacher training should include content on gender equity and culturally embedded stereotypes, while learning materials should be reviewed for inclusive messaging. Promoting more equitable early learning environments will help ensure that both boys and girls have access to the full range of developmental supports..

In sum, the policy implications of this thesis resist easy solutions. They point instead toward a multi-layered agenda: one that strengthens the quality of children's daily learning environments both at home and in school, tailors interventions to the specific social-emotional and academic skills that matter, and recognises and adapts to the local cultural and systemic realities in which children's development unfolds. Only through such nuanced, context-sensitive policy design can early childhood systems hope to realise the full potential of Pakistan's young learners.

Future Research

The findings and limitations of this study point towards several avenues for future research that could significantly enhance understanding of early childhood development in Pakistan and similar contexts.

First, future studies should delve deeper into the specific dimensions of classroom quality that matter most for children's social-emotional and academic outcomes. While the ECERS-R provides a broad overview, it does not sufficiently disentangle the relative importance of different domains, such as the availability of learning materials, the integration of play-based learning, and the use of different pedagogical techniques. Given the low overall classroom quality scores observed but the significant predictive value of classroom environment quality for child outcomes, a more fine-grained investigation using culturally appropriate measures is warranted and could provide additional insight. Experimental designs could be particularly illuminating: for instance, training different groups of teachers to emphasise specific aspects of quality (such as increasing child-initiated play, using more varied instructional materials, or adopting explicit teaching strategies) could help identify which levers are most powerful in enhancing children’s development within the Pakistani educational context.

Second, given the strong predictive power of early emotion knowledge for later literacy and numeracy skills observed in this study, future research should prioritise the development and evaluation of contextually appropriate SEL programmes for young children. One promising direction would be to adapt or learn from programmes like RULER (Brackett et al., 2019) that focus on enhancing emotional literacy. Such programmes could help foster foundational socio-cognitive skills that are essential not only for wellbeing but also for academic success. A culturally grounded SEL curriculum, piloted and evaluated through rigorous experimental or quasi-experimental studies, could provide critical evidence for scaling early interventions nationally.

Third, while the current study did not find strong associations between interactional quality and children's development, this may be due to limitations in how interactional quality was captured. Future research should examine this association more closely using tools specifically designed to assess the depth and nuance of teacher–child interactions, such as the Classroom Assessment Scoring System (CLASS), which focus on dimensions like emotional support, classroom organisation, and instructional support. In addition, closer attention should be paid to the pedagogical strategies teachers use to scaffold learning through interactions, including language modelling, questioning techniques, and responsive feedback. Experimental or quasi-experimental studies that aim to strengthen interactional quality, such as those employing structured interactional frameworks like ShREC (Sharing attention, Responding contingently, Expanding meaning, and Creating opportunities for learning) (Ang et al., 2025) could provide more definitive evidence of causal links between teacher–child interactions and child outcomes. This line of inquiry is particularly important in the Pakistani context, as the present study found higher levels of warm and emotionally supportive teacher–child relationships, which may provide a strong foundation to improve interactional quality.

Fourth, future studies can look to developing more robust direct assessment measures of children's social skills. Although the current social skills measure captured important aspects of children's interpersonal behaviours, its limited internal reliability and predictive validity in this study suggests that more nuanced assessments are needed. Future research should explore, through qualitative methods, how social skills are understood and valued within the Pakistani context, and use these insights to develop direct assessments that more accurately reflect children's abilities and lived experiences. The thesis's conceptual framework and results carry important implications for early education programmes and assessments, particularly in LMIC contexts. Many programmes and tools conflate social and emotional skills or prioritise externally observable behaviours due to ease of measurement. Therefore, future research should use

balanced, developmentally sensitive frameworks that acknowledge the foundational role of internal emotion skills and the more emergent nature of social competencies.

Fifth, future research can focus on expanding the sample's geographic focus to encompass both urban and rural settings, and to systematically compare provinces, which would allow for a more comprehensive understanding of how context moderates developmental processes. Such research could also help policymakers better tailor interventions to the unique needs of different regions, rather than assuming a one-size-fits-all approach. Moreover, longitudinal designs that follow children over several years would offer richer insights into developmental trajectories and the persistence or attenuation of early effects of SEL on children's academic and wellbeing outcomes.

Another important area for future research is the investigation of more nuanced aspects of children's family environments. For example, a deeper exploration of sibling dynamics – including birth order, gender constellation, and sibling relationship quality – could illuminate important socialisation processes that mere sibling counts obscure. Similarly, studies of bilingualism should move beyond counting the number of languages spoken at home to consider critical factors such as the age of acquisition, the level of proficiency, the domains of language use, and the match (or mismatch) between home language and the language of instruction at school. Incorporating more detailed measures of the HLE, such as observations would enable a deeper understanding of how families conceptualise and support young children's learning in daily life. Capturing the emotional, motivational, and interactional dimensions of home learning would move beyond simplistic checklists of materials and activities, providing a richer portrait of children's early experiences (Melhuish et al., 2008). While the current study provides an initial first step into examining the associations between children's demographic factors and their development, future studies exploring these variables in more depth are needed.

Final Reflections

This thesis set out to understand not only *what* skills young children in Pakistan are developing in their early years, but also *how* and *why* these skills emerge in particular ways within the sociocultural and institutional context of urban Pakistan. It has asked what shapes children's development – from household resources and gender norms to classroom quality and the emotional competencies of children themselves – and what this implies for research, measurement, and policy for ECE in LMICs.

One of the central reflections emerging from this work is that child development is neither culturally neutral nor developmentally universal in its expression. Yet, there are aspects of early learning – particularly emotional competencies – that seem to hold predictive value across contexts. The finding that emotion knowledge, assessed using a Western-designed tool, predicted later academic outcomes in a culturally distinct setting lends weight to the idea that certain capacities are more 'intrinsic' to child development, developing somewhat independently of the cultural context. At the same time, the difficulties encountered in reliably measuring social skills – and the counterintuitive associations found in the data – highlight how culturally embedded and contextually contingent many behavioural expressions are. These dual realities call for both humility and creativity in cross-cultural research: humility in recognising the limitations of our tools and assumptions, and creativity in adapting or developing instruments that honour local understandings of what it means to be a competent child.

Another key reflection is that strengthening ECE and SEL in Pakistan requires not just technical improvements, but a cultural shift in how early education is valued and understood. Academic outcomes are prioritised – by parents, schools, and policymakers alike – while foundational social and emotional competencies are overlooked. Much of what is needed to improve ECE quality – such as child-centred practices, responsive teaching, and classroom dialogue that treats children as capable and equal participants – runs counter to prevailing

cultural norms that emphasise obedience, hierarchy, and rote learning. Yet the goal is not to emulate Western ideals. It is to ask: *How can we better support young children's growth within the realities of our own contexts?* This thesis demonstrates that even in low-resource settings, small but deliberate shifts – like nurturing emotionally attuned teacher–child interactions or integrating social-emotional learning into daily routines – can begin to reframe what quality looks like. Change is both necessary and possible, but it must be rooted in local understanding and driven by a shared commitment to helping all children thrive.

Finally, reflecting on the research process itself, this thesis has reaffirmed the value of longitudinal approaches employing sophisticated statistical techniques to early childhood research. Following children over time, combining observational, direct assessment, and parent-report data, and embedding the research in local contexts allowed for a nuanced understanding of development that would have been missed in a cross-sectional or purely descriptive study. Yet it has also made visible the practical and ethical challenges of conducting high-quality research in under-resourced settings – from attrition to tool adaptation to fieldworker training – all of which must be accounted for in future efforts to build robust evidence bases in LMICs.

In conclusion, this thesis contributes to a growing recognition that early childhood development research must be both scientifically rigorous and deeply contextualised. It calls for a shift in how we conceptualise and support early skills – away from universal checklists and towards a more grounded understanding of children as active, emotional, and socially situated learners. For Pakistan, and for other LMICs seeking to invest in their youngest citizens, this means moving beyond access and infrastructure to a richer, more child-centred vision of quality. It means designing policies and programmes that support not only academic development but also emotional growth and social wellbeing. And it means placing children's everyday experiences – at home, in school, and in community – at the centre of both research and reform.

References

Aboud, F. E. (2006). Evaluation of an early childhood preschool program in rural Bangladesh. *Early Childhood Research Quarterly*, *21*(1), 46–60. https://doi.org/10.1016/j.ecresq.2006.01.008

Acar, I. H., Veziroglu-Celik, M., Garcia, A., Colgrove, A., Raikes, H., Gönen, M., & Encinger, A. (2019). The Qualities of Teacher–Child Relationships and Self-Regulation of Children at Risk in the United States and Turkey: The Moderating Role of Gender. *Early Childhood Education Journal*, *47*(1), 75–84. https://doi.org/10.1007/s10643-018-0893-y

Ahmad, M. (2011a). Early Childhood Education in Pakistan: An International Slogan Waiting for National Attention. *Contemporary Issues in Early Childhood*, *12*(1), 86–93. https://doi.org/10.2304/ciec.2011.12.1.86

Ahmad, M. (2011b). Early Childhood Education in Pakistan: An International Slogan Waiting for National Attention. *Contemporary Issues in Early Childhood*, *12*(1), 86–93. https://doi.org/10.2304/ciec.2011.12.1.86

Ahmad, R., Imran, H., Khanam, S. J., & Riaz, Z. (2013). *Gender Differences in Domain Specific Self-Esteem of Adolescents*. *2*(2).

Ahmed, S. I. (2011). *ISSUE OF MEDIUM OF INSTRUCYION IN PAKISTAN*. *1*(1).

Akbar, M., Shah, A. A., Khan, E. A., Akhter, M., & Riaz, M. N. (2011). Relationship between Emotional Intelligence and Academic Achievement among Higher Secondary School Students. *Pakistan Journal of Psychology*, *42*(2), Article 2. http://www.pjpku.com/index.php/pjp/article/view/136

Akhtar, P., Malik, J. A., & Begeer, S. (2017). The Grandparents' Influence: Parenting Styles and Social Competence among Children of Joint Families. *Journal of Child and Family Studies*, *26*(2), 603–611. https://doi.org/10.1007/s10826-016-0576-5

Ali, T. S., Krantz, G., Gul, R., Asad, N., Johansson, E., & Mogren, I. (2011). Gender roles and their influence on life prospects for women in urban Karachi, Pak0istan: A qualitative study. *Global Health Action*, *4*(1), 7448. https://doi.org/10.3402/gha.v4i0.7448

Ang, L., Grenier ,Julian, Harmey ,Sinead, James ,Fliss, & and Prendergast, M. (2025). Supporting early years professional development to enhance high-quality conversational interactions in early childhood care and education settings: The ShREC approach. *Early Years*, *0*(0), 1–19. https://doi.org/10.1080/09575146.2025.2498717

Araujo, M. C., Carneiro, P., Cruz-Aguayo, Y., & Schady, N. (2016). Teacher Quality and Learning Outcomes in Kindergarten. *The Quarterly Journal of Economics*, *131*(3), 1415–1453. https://doi.org/10.1093/qje/qjw016

Arnett, J. (1989). Caregiver Interaction Scale. *Princeton, NJ: Educational Testing Service.*

Arnold, D. H., Kupersmidt, J. B., Voegler-Lee, M. E., & Marshall, N. A. (2012). The association between preschool children's social functioning and their emergent academic skills. *Early Childhood Research Quarterly*, *27*(3), 376–386. https://doi.org/10.1016/j.ecresq.2011.12.009

Arslan, E., Durmuşoğlu-Saltali, N., & Yilmaz, H. (2011). Social Skills and Emotional and Behavioral Traits of Preschool Children. *Social Behavior and Personality: An International Journal*, *39*(9), 1281–1287. https://doi.org/10.2224/sbp.2011.39.9.1281

Artipah, A., Sain, Z. H., Asfahani, A., & Sa'diyah, S. (2024). Early Childhood Education Reform in Pakistan: Challenges, Innovations, and Future Prospects. *Absorbent Mind*, *4*(1), Article 1. https://doi.org/10.37680/absorbent_mind.v4i1.4903

ASER, & ITA. (2022). *Annual Status of Education Report*. https://aserpakistan.org/document/aser/2021/reports/national/ASER_report_National_2021.pdf

ASER Pakistan. (2024). *Annual Status of Education Report, Pakistan 2023*. https://aserpakistan.org/document/2024/aser_national_2023.pdf

Asif, M. (2021). Gender stereotypes in the Single National Curriculum, Pakistan. *International Journal on Women Empowerment*, *7*, 47–59. https://doi.org/10.29052/2413-4252.v7.i1.2021.47-59

Astivia, O. L. O., & Zumbo, B. D. (2019). *Heteroskedasticity in Multiple Regression Analysis: What it is, How to Detect it and How to Solve it with Applications in R and SPSS*. *24*(1).

Awang, Z. (2012). *Research Methodology and Data Analysis Second Edition*. UiTM Press.

Bailey, C. S., Martinez, O., & DiDomizio, E. (2023). Social and Emotional Learning and Early Literacy Skills: A Quasi-Experimental Study of RULER. *Education Sciences*, *13*(4), Article 4. https://doi.org/10.3390/educsci13040397

Baker, C. E. (2013). Fathers' and Mothers' Home Literacy Involvement and Children's Cognitive and Social Emotional Development: Implications for Family Literacy Programs. *Applied Developmental Science*, *17*(4), 184–197. https://doi.org/10.1080/10888691.2013.836034

Bandura, A. (1997). *Social Learning Theory* (Vol. 1). Prentice Hall. http://www.asecib.ase.ro/mps/Bandura_SocialLearningTheory.pdf

Barlas, N. S., Sidhu, J., & Li, C. (2021). Can social-emotional learning programs be adapted to schools in Pakistan? A literature review. *International Journal of School & Educational Psychology*, 1–15. https://doi.org/10.1080/21683603.2020.1850374

Barnett, M. A., Gustafsson, H., Deng, M., Mills-Koonce, W. R., & Cox, M. (2012). Bidirectional Associations Among Sensitive Parenting, Language Development, and Social Competence. *Infant and Child Development*, *21*(4), 374–393. https://doi.org/10.1002/icd.1750

Barón, J. D., Bend, M., Mirza, F., Afzal, N., Wolde, H., & Hussain, N. (2024). *Spend Better, Spend More: How to Make Education Expenditures Count for Children in Pakistan*. World Bank. http://hdl.handle.net/10986/42190

Barros, S., & Aguiar, C. (2010). Assessing the quality of Portuguese child care programs for toddlers. *Early Childhood Research Quarterly*, *25*(4), 527–535. https://doi.org/10.1016/j.ecresq.2009.12.003

Bassett, H. H., Denham, S. A., Mincic, M., & Graling, K. (2012). The Structure of Preschoolers' Emotion Knowledge: Model Equivalence and Validity Using a Structural Equation Modeling Approach. *Early Education and Development*, *23*(3), 259–279. https://doi.org/10.1080/10409289.2012.630825

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software*, *67*, 1–48. https://doi.org/10.18637/jss.v067.i01

Baumrind, D. (1967). Child care practices anteceding three patterns of preschool behavior. *Genetic Psychology Monographs*, *75*(1), 43–88.

Belsky, J., Vandell, D. L., Burchinal, M., Clarke-Stewart, K. A., McCartney, K., Owen, M. T., & Network, T. N. E. C. C. R. (2007). Are There Long-Term Effects of Early Child Care? *Child Development*, *78*(2), 681–701. https://doi.org/10.1111/j.1467-8624.2007.01021.x

Berlinski, S., Galiani, S., & Manacorda, M. (2008). Giving children a better start: Preschool attendance and school-age profiles. *Journal of Public Economics*, *92*(5), 1416–1440. https://doi.org/10.1016/j.jpubeco.2007.10.007

Berti, S., Cigala, A., & Sharmahd, N. (2019). Early Childhood Education and Care Physical Environment and Child Development: State of the art and Reflections on Future Orientations and Methodologies. *Educational Psychology Review*, *31*(4), 991–1021. https://doi.org/10.1007/s10648-019-09486-0

Betancur, L., Maldonado-Carreño, C., Votruba-Drzal, E., & Bernal, R. (2021). Measuring preschool quality in low- and middle-income countries: Validity of the ECERS-R in Colombia. *Early Childhood Research Quarterly*, *54*, 86–98. https://doi.org/10.1016/j.ecresq.2020.08.001

Bhamani, S., Mughis, W., Raza, A., Ahmed, S., Umrani, F., Jakhro, S., Qureshi, K., Rehman, N., & Ali, A. (2023). *Children Raising Children: A cross-sectional survey of parental perceptions and practices regarding sibling caretaking in rural Pakistan*. Research Square. https://doi.org/10.21203/rs.3.rs-3498453/v1

Bhutta, E., Kousar, S., & Rehman, C. A. (2019). *Mediation Analysis of Factors Affecting the Performance of Public Schools at Early Childhood Level in Punjab, Pakistan*. 24.

Bialystok, E. (2015). Bilingualism and the Development of Executive Function: The Role of Attention. *Child Development Perspectives*, *9*(2), 117–121. https://doi.org/10.1111/cdep.12116

Black, M. M., Walker, S. P., Fernald, L. C. H., Andersen, C. T., DiGirolamo, A. M., Lu, C., McCoy, D. C., Fink, G., Shawar, Y. R., Shiffman, J., Devercelli, A. E., Wodon, Q. T., Vargas-Barón, E., & Grantham-McGregor, S. (2017). Early childhood development coming of age: Science through the life course. *The Lancet*, *389*(10064), 77–90. https://doi.org/10.1016/S0140-6736(16)31389-7

Black, S. E., Devereux, P. J., & Salvanes, K. G. (2005). The More the Merrier? The Effect of Family Size and Birth Order on Children's Education*. *The Quarterly Journal of Economics*, *120*(2), 669–700. https://doi.org/10.1093/qje/120.2.669

Blair, C., & Razza, R. P. (2007). Relating Effortful Control, Executive Function, and False Belief Understanding to Emerging Math and Literacy Ability in Kindergarten. *Child Development*, *78*(2), 647–663. https://doi.org/10.1111/j.1467-8624.2007.01019.x

Blau, D. M. (2000). The Production of Quality in Child-Care Centers: Another Look. *Applied Developmental Science*, *4*(3), 136–148. https://doi.org/10.1207/S1532480XADS0403_3

Bleses, D., Makransky, G., Dale, P. S., Højen, A., & Ari, B. A. (2016). Early productive vocabulary predicts academic achievement 10 years later. *Applied Psycholinguistics*, *37*(6), 1461–1476. https://doi.org/10.1017/S0142716416000060

Blewitt, C., Fuller-Tyszkiewicz, M., Nolan, A., Bergmeier, H., Vicary, D., Huang, T., McCabe, P., McKay, T., & Skouteris, H. (2018). Social and Emotional Learning Associated With Universal Curriculum-Based Interventions in Early Childhood Education and Care Centers: A Systematic Review and Meta-analysis. *JAMA Network Open*, *1*(8), e185727. https://doi.org/10.1001/jamanetworkopen.2018.5727

Blom, E., Boerma, T., Bosma, E., Cornips, L., & Everaert, E. (2017). Cognitive Advantages of Bilingual Children in Different Sociolinguistic Contexts. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.00552

Bobak, C. A., Barr, P. J., & O'Malley, A. J. (2018). Estimation of an inter-rater intra-class correlation coefficient that overcomes common assumption violations in the assessment of health measurement scales. *BMC Medical Research Methodology*, *18*(1), 93. https://doi.org/10.1186/s12874-018-0550-6

Borgonovi, F., Choi, A., & Paccagnella, M. (2021). The evolution of gender gaps in numeracy and literacy between childhood and young adulthood. *Economics of Education Review*, *82*, 102119. https://doi.org/10.1016/j.econedurev.2021.102119

Borowski, T. (2019). *CASEL's framework for systemic social and emotional learning*. https://measuringsel.casel.org/wp-content/uploads/2019/08/AWG-Framework-Series-B.2.pdf

Bracken, S. S., & Fischel, J. E. (2006). Assessment of preschool classroom practices: Application of Q-sort methodology. *Early Childhood Research Quarterly*, *21*(4), 417–430. https://doi.org/10.1016/j.ecresq.2006.09.006

Brackett, M. A., Bailey, C. S., Hoffmann, J. D., & Simmons, D. N. (2019). RULER: A Theory-Driven, Systemic Approach to Social, Emotional, and Academic Learning. *Educational Psychologist*, *54*(3), 144–161. https://doi.org/10.1080/00461520.2019.1614447

Brandlistuen, R. E., Flatø, M., Stoltenberg, C., Helland, S. S., & Wang, M. V. (2021). Gender gaps in preschool age: A study of behavior, neurodevelopment and pre-academic skills.

Scandinavian Journal of Public Health, *49*(5), 503–510. https://doi.org/10.1177/1403494820944740

Brinkman, S. A., Hasan, A., Jung, H., Kinnell, A., Nakajima, N., & Pradhan, M. (2017). The Role of Preschool Quality in Promoting Child Development: Evidence from Rural Indonesia. *European Early Childhood Education Research Journal*.

Britto, P. R., Lye, S. J., Proulx, K., Yousafzai, A. K., Matthews, S. G., Vaivada, T., Perez-Escamilla, R., Rao, N., Ip, P., Fernald, L. C. H., MacMillan, H., Hanson, M., Wachs, T. D., Yao, H., Yoshikawa, H., Cerezo, A., Leckman, J. F., & Bhutta, Z. A. (2017). Nurturing care: Promoting early childhood development. *The Lancet*, *389*(10064), 91–102. https://doi.org/10.1016/S0140-6736(16)31390-3

Britto, P. R., Yoshikawa, H., & Boller, K. (2011). *Quality of Early Childhood Development Programs in Global Contexts: Rationale for Investment, Conceptual Framework and Implications for Equity. Social Policy Report. Volume 25, Number 2*. Society for Research in Child Development. https://eric.ed.gov/?id=ED519240

Brody, L. R., & Hall, J. A. (2009). In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of Emotions* (Third, pp. 395–408). The Guilford Press.

Brown, G. L., Craig, A. B., & Halberstadt, A. G. (2015). Parent Gender Differences in Emotion Socialization Behaviors Vary by Ethnicity and Child Gender. *Parenting*, *15*(3), 135–157. https://doi.org/10.1080/15295192.2015.1053312

Brown, L. E., Kim, H. Y., Tubbs Dolan, C., Brown, A., Sklar, J., & Aber, J. L. (2023). Remedial Programming and Skill-Targeted SEL in Low-Income and Crisis-Affected Contexts: Experimental Evidence From Niger. *Journal of Research on Educational Effectiveness*, *16*(4), 583–614. https://doi.org/10.1080/19345747.2022.2139785

Brown, T. A. (2015). *Confirmatory Factor Analysis for Applied Research, Second Edition*. Guilford Publications.

Brunsek, A., Perlman, M., Falenchuk, O., McMullen, E., Fletcher, B., & Shah, P. S. (2017). The relationship between the Early Childhood Environment Rating Scale and its revised form and child outcomes: A systematic review and meta-analysis. *PLOS ONE*, *12*(6), e0178512. https://doi.org/10.1371/journal.pone.0178512

Brunsek, A., Perlman, M., McMullen, E., Falenchuk, O., Fletcher, B., Nocita, G., Kamkar, N., & Shah, P. S. (2020). A meta-analysis and systematic review of the associations between professional development of early childhood educators and children's outcomes. *Early Childhood Research Quarterly*, *53*, 217–248. https://doi.org/10.1016/j.ecresq.2020.03.003

Brush, K. E., Jones, S. M., Bailey, R., Nelson, B., Raisch, N., & Meland, E. (2022). Social and Emotional Learning: From Conceptualization to Practical Application in a Global Context. In J. DeJaeghere & E. Murphy-Graham (Eds.), *Life Skills Education for Youth* (Vol. 5, pp. 43–71). Springer International Publishing. https://doi.org/10.1007/978-3-030-85214-6_3

Bull, R., Espy, K. A., & Wiebe, S. A. (2008). Short-Term Memory, Working Memory, and Executive Functioning in Preschoolers: Longitudinal Predictors of Mathematical Achievement at Age 7 Years. *Developmental Neuropsychology*, *33*(3), 205–228. https://doi.org/10.1080/87565640801982312

Bull, R., Yao, S.-Y., & Ng, E. L. (2017). Assessing Quality of Kindergarten Classrooms in Singapore: Psychometric Properties of the Early Childhood Environment Rating Scale—Revised. *International Journal of Early Childhood*, *49*(1), 1–20. https://doi.org/10.1007/s13158-017-0180-x

Burchinal, M. (2018). Measuring Early Care and Education Quality. *Child Development Perspectives*, *12*(1), 3–9. https://doi.org/10.1111/cdep.12260

Burchinal, M., Cryer, D., Clifford, R. M., & Howes, C. (2002). Caregiver Training and Classroom Quality in Child Care Centers. *Applied Developmental Science*. https://doi.org/10.1207/S1532480XADS0601_01

Burchinal, M., Howes, C., Pianta, R., Bryant, D., Early, D., Clifford, R., & Barbarin, O. (2008). Predicting Child Outcomes at the End of Kindergarten from the Quality of Pre-Kindergarten Teacher–Child Interactions and Instruction. *Applied Developmental Science*, *12*(3), 140–153. https://doi.org/10.1080/10888690802199418

Burchinal, M., Kainz, K., & Cai, Y. (2011). How well do our measures of quality predict child outcomes? A meta-analysis and coordinated analysis of data from large-scale studies of early childhood settings. In *Quality measurement in early childhood settings* (pp. 11–31). Paul H. Brookes Publishing Co.

Burchinal, M. R., & Cryer, D. (2003). Diversity, child care quality, and developmental outcomes. *Early Childhood Research Quarterly*, *18*(4), 401–426. https://doi.org/10.1016/j.ecresq.2003.09.003

Burchinal, M., Vandergrift, N., Pianta, R., & Mashburn, A. (2010). Threshold analysis of association between child care quality and child outcomes for low-income children in pre-kindergarten programs. *Early Childhood Research Quarterly*, *25*(2), 166–176. https://doi.org/10.1016/j.ecresq.2009.10.004

Burke, R. S. (2013). Exploring ratios and group size as indicators of quality in the New Zealand and Japanese early childhood context. *Early Childhood Folio*, *17*(1), 30–35. https://doi.org/10.18296/ecf.0128

Camilli, G., Vargas, S., Ryan, S., & Barnett, W. S. (2010). Meta-Analysis of the Effects of Early Education Interventions on Cognitive and Social Development. *Teachers College Record*, *112*(3), 579–620. https://doi.org/10.1177/016146811011200303

Campbell, F. A., Pungello, E. P., Miller-Johnson, S., Burchinal, M., & Ramey, C. T. (2001). The development of cognitive and academic abilities: Growth curves from an early childhood educational experiment. *Developmental Psychology*, *37*, 231–242. https://doi.org/10.1037/0012-1649.37.2.231

Campos, M. M., Esposito, Y. lúcia, Bhering, E., Gimenes, N., & Abuchaim, B. (2011). Early childhood education quality: A Brazilian study in six capitals. *Cadernos de Pesquisa*, *41*, 20–54. https://doi.org/10.1590/S0100-15742011000100003

Carr, A., & Pike, A. (2011). Maternal Scaffolding Behavior: Links With Parenting Style and Maternal Education. *Developmental Psychology*, *48*, 543–551. https://doi.org/10.1037/a0025888

Cassidy, D. J., Hestenes, L. L., Hegde, A., Hestenes, S., & Mims, S. (2005). Measurement of quality in preschool child care classrooms: An exploratory and confirmatory factor analysis of the early childhood environment rating scale-revised. *Early Childhood Research Quarterly*, *20*(3), 345–360. https://doi.org/10.1016/j.ecresq.2005.07.005

Cavadini, T., Richard, S., Dalla-Libera, N., & Gentaz, E. (2021). Emotion knowledge, social behaviour and locomotor activity predict the mathematic performance in 706 preschool children. *Scientific Reports*, *11*(1), 14399. https://doi.org/10.1038/s41598-021-93706-7

Celikel, B., & Çoban, A. E. (2022). Self-Concept With Cross-Cultural Perspective: 36–72-Month-Old Preschool Children in Turkey and Germany. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.821074

Çetin, Z. (2021). The effect of a modular art education programme on the personal-social development of preschool children. *South African Journal of Childhood Education*, *11*(1), 1–7. https://doi.org/10.4102/sajce.v11i1.941

Chachar, Z. A., & Almani, D. A. S. (2022). An Evaluation Of The Status Of Early Childhood Education In Sindh. *Journal of Positive School Psychology*, *6*(9), Article 9.

Chaplin, T. M., Cole, P. M., & Zahn-Waxler, C. (2005). Parental Socialization of Emotion Expression: Gender Differences and Relations to Child Adjustment. *Emotion*, *5*(1), 80–88. https://doi.org/10.1037/1528-3542.5.1.80

Chen, D. W., Fein, G. G., Killen, M., & Tam, H.-Ping. (2010). Peer Conflicts of Preschool Children: Issues, Resolution, Incidence, and Age-Related Patterns. *Early Education and Development*, *12*(4), 523–544. https://doi.org/10.1207/s15566935eed1204_3

Chen, S., & Wolf, S. (2021). Measuring the Quality of Early Childhood Education in Low- and Middle-Income Countries. *Frontiers in Psychology*, *12*, 774740. https://doi.org/10.3389/fpsyg.2021.774740

Chen, X., & French, D. C. (2008). Children's Social Competence in Cultural Context. *Annual Review of Psychology*, *59*(1), 591–616. https://doi.org/10.1146/annurev.psych.59.103006.093606

Chen, X., Liu, M., & Li, D. (2000). Parental warmth, control, and indulgence and their relations to adjustment in Chinese children: A longitudinal study. *Journal of Family Psychology*, *14*(3), 401–419. https://doi.org/10.1037/0893-3200.14.3.401

Cherry, K. E., & Gerstein, E. D. (2021). Fathering and masculine norms: Implications for the socialization of children's emotion regulation. *Journal of Family Theory & Review*, *13*(2), 149–163. https://doi.org/10.1111/jftr.12411

Clements, D. H., & Sarama, J. (2014). Developing young children's mathematical thinking and understanding. In *The Routledge International Handbook of Young Children's Thinking and Understanding*. Routledge.

Clifford, R. M., Barbarin, O., Chang, F., Early, D., Bryant, D., Howes, C., Burchinal, M., & Pianta, R. (2005). What is Pre-Kindergarten? Characteristics of Public Pre-Kindergarten Programs. *Applied Developmental Science*, *9*(3), 126–143. https://doi.org/10.1207/s1532480xads0903_1

Cobb-Clark, D. A., & Moschion, J. (2017). Gender gaps in early educational achievement. *Journal of Population Economics*, *30*(4), 1093–1134. https://doi.org/10.1007/s00148-017-0638-z

Coleman, H. (2010). *Teaching and Learning in Pakistan: The Role of Language in Education*. The British Council. https://www.researchgate.net/profile/Hywel-Coleman/publication/265186454_Teaching_and_Learning_in_Pakistan_The_Role_of_Language_in_Education/links/5512738b0cf268a4aaea51b0/Teaching-and-Learning-in-Pakistan-The-Role-of-Language-in-Education.pdf

Colwell, N., Gordon, R. A., Fujimoto, K., Kaestner, R., & Korenman, S. (2013). New evidence on the validity of the Arnett Caregiver Interaction Scale: Results from the Early Childhood Longitudinal Study-Birth Cohort. *Early Childhood Research Quarterly*, *28*(2), 218–233. https://doi.org/10.1016/j.ecresq.2012.12.004

Corcoran, R. P., Cheung, A. C. K., Kim, E., & Xie, C. (2018). Effective universal school-based social and emotional learning programs for improving academic achievement: A systematic review and meta-analysis of 50 years of research. *Educational Research Review*, *25*, 56–72. https://doi.org/10.1016/j.edurev.2017.12.001

Côté, S. M., Boivin, M., Nagin, D. S., Japel, C., Xu, Q., Zoccolillo, M., Junger, M., & Tremblay, R. E. (2007). The Role of Maternal Education and Nonmaternal Care Services in the Prevention of Children's Physical Aggression Problems. *Archives of General Psychiatry*, *64*(11), 1305–1312. https://doi.org/10.1001/archpsyc.64.11.1305

Cryer, D., Tietze, W., Burchinal, M., Leal, T., & Palacios, J. (1999). Predicting process quality from structural quality in preschool programs: A cross-country comparison. *Early Childhood Research Quarterly*, *14*(3), 339–361. https://doi.org/10.1016/S0885-2006(99)00017-4

Cuartas, J., McCoy, D., Sánchez, J., Behrman, J., Cappa, C., Donati, G., Heymann, J., Lu, C., Raikes, A., Rao, N., Richter, L., Stein, A., & Yoshikawa, H. (2023). Family play, reading, and other stimulation and early childhood development in five low-and-middle-income countries. *Developmental Science*, *26*(6), e13404. https://doi.org/10.1111/desc.13404

Cumming, G. (2014). The New Statistics: Why and How. *Psychological Science*, *25*(1), 7–29. https://doi.org/10.1177/0956797613504966

Curby, T. W., Brown, C. A., Bassett, H. H., & Denham, S. A. (2015). Associations Between Preschoolers' Social–Emotional Competence and Preliteracy Skills. *Infant and Child Development*, *24*(5), 549–570. https://doi.org/10.1002/icd.1899

Curby, T. W., LoCasale-Crouch, J., Konold, T. R., Pianta, R. C., Howes, C., Burchinal, M., Bryant, D., Clifford, R., Early, D., & Barbarin, O. (2009). The Relations of Observed Pre-K Classroom Quality Profiles to Children's Achievement and Social Competence. *Early Education and Development*, *20*(2), 346–372. https://doi.org/10.1080/10409280802581284

Dagal, A. B. (2017). Investigation of the relationship between communication skills, social competence and emotion regulation skills of preschool children in Turkey. *Educational Research and Reviews*, *12*(4), 164–171. https://doi.org/10.5897/ERR2017.3139

Davis-Kean, P. E. (2005). The Influence of Parent Education and Family Income on Child Achievement: The Indirect Role of Parental Expectations and the Home Environment. *Journal of Family Psychology*, *19*(2), 294–304. https://doi.org/10.1037/0893-3200.19.2.294

De Houwer, A. (2018). The role of language input environments for language outcomes and language acquisition in young bilingual children. In D. Miller, F. Bayram, J. Rothman, & L. Serratrice (Eds.), *Bilingual Cognition and Language* (Vol. 54, pp. 127–153). John Benjamins Publishing Company.

Denham, S. A. (1998). *Emotional Development in Young Children.* Guilford Press, 72 Spring Street, New York, NY 10012; toll-free phone: 800-365-7006; fax: 212-966-6708; World Wide Web: http://www.

Denham, S. A. (2006). Social-Emotional Competence as Support for School Readiness: What Is It and How Do We Assess It? *Early Education & Development*, *17*(1), 57–89. https://doi.org/10.1207/s15566935eed1701_4

Denham, S. A. (2018). *Keeping SEL Developmental: The Importance of a Developmental Lens for Fostering and Assessing SEL Competencies*. Framework Briefs. https://casel.s3.us-east-2.amazonaws.com/CASEL-Resources-Keeping-SEL-Developmental.pdf

Denham, S. A., Bassett, H. H., Thayer, S. K., Mincic, M. S., Sirotkin, Y. S., & Zinsser, K. (2012). Observing Preschoolers' Social-Emotional Behavior: Structure, Foundations, and Prediction of Early School Success. *The Journal of Genetic Psychology*, *173*(3), 246–278. https://doi.org/10.1080/00221325.2011.597457

Denham, S. A., Bassett, H. H., Way, E., Mincic, M., Zinsser, K., & Graling, K. (2012). Preschoolers' emotion knowledge: Self-regulatory foundations, and predictions of early school success. *Cognition and Emotion*, *26*(4), 667–679. https://doi.org/10.1080/02699931.2011.602049

Denham, S. A., Bassett, H. H., & Wyatt, T. (2015). The Socialization of Emotional Competence. *Handbook of Socialization: Theory and Research*, 590–613.

Denham, S. A., Bassett, H. H., & Wyatt, T. M. (2010). Gender differences in the socialization of preschoolers' emotional competence. *New Directions for Child and Adolescent Development*, *2010*(128), 29–49. https://doi.org/10.1002/cd.267

Denham, S. A., Bassett, H., Mincic, M., Kalb, S., Way, E., Wyatt, T., & Segal, Y. (2012). Social–emotional learning profiles of preschoolers' early school success: A person-centered approach. *Learning and Individual Differences*, *22*(2), 178–189. https://doi.org/10.1016/j.lindif.2011.05.001

Denham, S. A., Blair, K. A., DeMulder, E., Levitas, J., Sawyer, K., Auerbach–Major, S., & Queenan, P. (2003). Preschool Emotional Competence: Pathway to Social

Competence? *Child Development*, *74*(1), 238–256. https://doi.org/10.1111/1467-8624.00533

Denham, S. A., & Brown, C. (2010). “Plays Nice With Others”: Social–Emotional Learning and Academic Success. *Early Education and Development*, *21*(5), 652–680. https://doi.org/10.1080/10409289.2010.497450

Denham, S. A., & Liverette, K. H. (2019). The Emotional Basis of Learning and Development in Early Childhood Education. In O. N. Saracho (Ed.), *Handbook of Research on the Education of Young Children* (4th ed.). Routledge.

Denham, S. A., Renwick, S. M., & Holt, R. W. (1991). Working and Playing Together: Prediction of Preschool Social-Emotional Competence from Mother-Child Interaction. *Child Development*, *62*(2), 242–249. https://doi.org/10.1111/j.1467-8624.1991.tb01528.x

Denham, S. A., Salisch, M. von, Olthof, T., Kochanoff, A., & Caverly, S. (2002). Emotional and Social Development in Childhood. In *Blackwell Handbook of Childhood Social Development* (pp. 307–328). BLACKWELL PUBLISHERS.

Denham, S. A., Wyatt, T. M., Bassett, H. H., Echeverria, D., & Knox, S. S. (2009). Assessing social-emotional development in children from a longitudinal perspective. *Journal of Epidemiology & Community Health*, *63*(Suppl 1), i37–i52. https://doi.org/10.1136/jech.2007.070797

Dobbs, J., Doctoroff, G. L., Fisher, P. H., & Arnold, D. H. (2006). The association between preschool children’s socio-emotional functioning and their mathematical skills. *Journal of Applied Developmental Psychology*, *27*(2), 97–108. https://doi.org/10.1016/j.appdev.2005.12.008

Doctoroff, G. L., Fisher, P. H., Burrows, B. M., & Edman, M. T. (2016). Preschool Children’s Interest, Social–Emotional Skills, and Emergent Mathematics Skills. *Psychology in the Schools*, *53*(4), 390–403. https://doi.org/10.1002/pits.21912

Downey, D. B. (2001). Number of siblings and intellectual development: The resource dilution explanation. *American Psychologist*, *56*(6–7), 497–504. https://doi.org/10.1037/0003-066X.56.6-7.497

Downey, D. B., & Condron, D. J. (2004). Playing Well with Others in Kindergarten: The Benefit of Siblings at Home. *Journal of Marriage and Family*, *66*(2), 333–350. https://doi.org/10.1111/j.1741-3737.2004.00024.x

Draper, C., Cook, C., Howard, S., Makaula, H., Merkley, R., Mshudulu, M., Tshetu, N., & Scerif, G. (2023). *Social ecological factors influencing children's school readiness in low-income South African communities*. https://doi.org/10.31234/osf.io/u8yn6

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007a). School readiness and later achievement. *Developmental Psychology*, *43*(6), 1428–1446. https://doi.org/10.1037/0012-1649.43.6.1428

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007b). School readiness and later achievement. *Developmental Psychology*, *43*(6), 1428–1446. https://doi.org/10.1037/0012-1649.43.6.1428

Duncan, G. J., Magnuson, K., & Votruba-Drzal, E. (2014). Boosting Family Income to Promote Child Development. *The Future of Children*, *24*(1), 99–120.

Dunn, J. (2002). Sibling Relationships. In P. K. Smith & C. H. Hart (Eds.), *Blackwell Handbook of Childhood Social Development* (1st ed., pp. 223–237). Blackwell Publishers. http://5.202.73.55:8026/opac/temp/7157.pdf#page=240

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. *Child Development*, *82*(1), 405–432. https://doi.org/10.1111/j.1467-8624.2010.01564.x

Early, D. M., Maxwell, K. L., Burchinal, M., Alva, S., Bender, R. H., Bryant, D., Cai, K., Clifford, R. M., Ebanks, C., Griffin, J. A., Henry, G. T., Howes, C., Iriondo-Perez, J., Jeon, H.-J., Mashburn, A. J., Peisner-Feinberg, E., Pianta, R. C., Vandergrift, N., & Zill, N. (2007). Teachers' Education, Classroom Quality, and Young Children's Academic Skills: Results From Seven Studies of Preschool Programs. *Child Development*, *78*(2), 558–580. https://doi.org/10.1111/j.1467-8624.2007.01014.x

Ecalle, J., Magnan, A., & Gibert, F. (2006). Class size effects on literacy skills and literacy interest in first grade: A large-scale investigation. *Journal of School Psychology*, *44*(3), 191–209. https://doi.org/10.1016/j.jsp.2006.03.002

Egert, F., Fukkink, R. G., & Eckhardt, A. G. (2018). Impact of In-Service Professional Development Programs for Early Childhood Teachers on Quality Ratings and Child Outcomes: A Meta-Analysis. *Review of Educational Research*, *88*(3), 401–433. https://doi.org/10.3102/0034654317751918

Eisenberg, N., Sadovsky, A., & Spinrad, T. L. (2005). Associations of Emotion-Related Regulation with Language Skills, Emotion Knowledge, and Academic Outcomes. *New Directions for Child and Adolescent Development*, *109*, 109–118.

Eisner, E. W. (2002). What Can Education Learn from the Arts About the Practice of Education? *Journal of Curriculum and Supervision*, *18*(1), 4–16.

Ekerim-Akbulut, M., Şen, H. H., Beşiroğlu, B., & Selçuk, B. (2020). The Role of Theory of Mind, Emotion Knowledge and Empathy in Preschoolers' Disruptive Behavior. *Journal of Child and Family Studies*, *29*(1), 128–143. https://doi.org/10.1007/s10826-019-01556-9

Else-Quest, N. M., Hyde, J. S., Goldsmith, H. H., & Van Hulle, C. A. (2006). Gender differences in temperament: A meta-analysis. *Psychological Bulletin*, *132*(1), 33–72. https://doi.org/10.1037/0033-2909.132.1.33

Enders, C. K. (2011). Analyzing longitudinal data with missing values. *Rehabilitation Psychology*, *56*(4), 267–288. https://doi.org/10.1037/a0025579

Epstein, M. H., Synhorst, L. L., Cress, C. J., & Allen, E. A. (2009). Development and Standardization of a Test to Measure the Emotional and Behavioral Strengths of Preschool Children. *Journal of Emotional and Behavioral Disorders*, *17*(1), 29–37. https://doi.org/10.1177/1063426608319223

Ersan, C., & Tok, Ş. (2020). The Study of the Aggression Levels of Preschool Children in Terms of Emotion Expression and Emotion Regulation. *Education & Science / Egitim ve Bilim*, *45*(201), 359–391.

Ertem, I. O., Atay, G., Dogan, D. G., Bayhan, A., Bingoler, B. E., Gok, C. G., Ozbas, S., Haznedaroglu, D., & Isikli, S. (2007). Mothers' knowledge of young child development in a developing country. *Child: Care, Health and Development*, *33*(6), 728–737. https://doi.org/10.1111/j.1365-2214.2007.00751.x

Espinosa, M. P., & Kovářík, J. (2015). Prosocial behavior and gender. *Frontiers in Behavioral Neuroscience*, *9*. https://doi.org/10.3389/fnbeh.2015.00088

Evans, M. D. R., Kelley, J., Sikora, J., & Treiman, D. J. (2010). Family scholarly culture and educational success: Books and schooling in 27 nations. *Research in Social Stratification and Mobility*, *28*(2), 171–197. https://doi.org/10.1016/j.rssm.2010.01.002

Fantuzzo, J., Bulotsky-Shearer, R., McDermott, P. A., McWayne, C., Frye, D., & Perlman, S. (2007). Investigation of Dimensions of Social-Emotional Classroom Behavior and School Readiness for Low-Income Urban Preschool Children. *School Psychology Review*, *36*(1), 44–62. https://doi.org/10.1080/02796015.2007.12087951

Farver, J. A. M., Xu, Y., Eppe, S., & Lonigan, C. J. (2006). Home environments and young Latino children's school readiness. *Early Childhood Research Quarterly*, *21*(2), 196–212. https://doi.org/10.1016/j.ecresq.2006.04.008

Fassler, R. (2014). 'Let's Talk about the Books': The Complexity of Book Discussions in a Multilingual Preschool Classroom. *Contemporary Issues in Early Childhood*, *15*(2), 136–151. https://doi.org/10.2304/ciec.2014.15.2.136

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149–1160. https://doi.org/10.3758/BRM.41.4.1149

Ferrier, D. E., Bassett, H. H., & Denham, S. A. (2014). Relations between executive function and emotionality in preschoolers: Exploring a transitive cognition–emotion linkage. *Frontiers in Psychology*, *5*. https://www.frontiersin.org/articles/10.3389/fpsyg.2014.00487

Finch, J. E., Yousafzai, A. K., Rasheed, M., & Obradović, J. (2018). Measuring and understanding social-emotional behaviors in preschoolers from rural Pakistan. *PLOS ONE*, *13*(11), e0207807. https://doi.org/10.1371/journal.pone.0207807

Findlay, L. C., Girardi, A., & Coplan, R. J. (2006). Links between empathy, social behavior, and social understanding in early childhood. *Early Childhood Research Quarterly*, *21*(3), 347–359. https://doi.org/10.1016/j.ecresq.2006.07.009

Fine, S. E., Trentacosta, C. J., Izard, C. E., Mostow, A. J., & Campbell, J. L. (2004). Anger Perception, Caregivers' Use of Physical Discipline, and Aggression in Children at Risk. *Social Development*, *13*(2), 213–228. https://doi.org/10.1111/j.1467-9507.2004.000264.x

Firdoos, A., Naz, F. L., & Masud, Z. (2023). Impact of Cultural Norms and Social Expectations for Shaping Gender Disparities in Educational Attainment in Pakistan. *Qlantic Journal of Social Sciences and Humanities*, *4*(3), Article 3. https://doi.org/10.55737/qjssh.311246563

Firdous, A., Babur, N., Aziz, S., Ambreen, F., Iftikhar, S., & Farid, G. (2024). Influence of Bilingualism on Language Development: A Systematic Review. *Pakistan Journal of Medical & Health Sciences*, *18*(5), Article 5. https://doi.org/10.53350/pjmhs020241851

Fitzmaurice, G. M., Laird, N. M., & Ware, J. H. (2012). *Applied Longitudinal Analysis*. John Wiley & Sons.

Foster, M. A., Lambert, R., Abbott-Shim, M., McCarty, F., & Franze, S. (2005). A model of home learning environment and social risk factors in relation to children's emergent literacy

and social outcomes. *Early Childhood Research Quarterly*, *20*(1), 13–36. https://doi.org/10.1016/j.ecresq.2005.01.006

Foster, T. D., Froyen, L. C., Skibbe, L. E., Bowles, R. P., & Decker, K. B. (2016). Fathers' and mothers' home learning environments and children's early academic outcomes. *Reading and Writing*, *29*(9), 1845–1863. https://doi.org/10.1007/s11145-016-9655-7

Franco, M. da G., Beja, M. J., Candeias, A., & Santos, N. (2017). Emotion Understanding, Social Competence and School Achievement in Children from Primary School in Portugal. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.01376

Gambell, T. J., & Hunter, D. M. (1999). Rethinking Gender Differences in Literacy. *Canadian Journal of Education / Revue Canadienne de l'éducation*, *24*(1), 1–16. https://doi.org/10.2307/1585767

Garner, P. W., & Waajid, B. (2012). Emotion Knowledge and Self-Regulation as Predictors of Preschoolers' Cognitive Ability, Classroom Behavior, and Social Competence. *Journal of Psychoeducational Assessment*, *30*(4), 330–343. https://doi.org/10.1177/0734282912449441

Gelman, A., & Hill, J. (2007). *Data Analysis Using Regression and Multilevel/Hierarchical Models*. Cambridge University Press.

Gershon, P., & Pellitteri, J. (2018). *Promoting Emotional Intelligence in preschool education: A review of programs*. *10*(2), 16.

Goldberg, J. M., Sklad, M., Elfrink, T. R., Schreurs, K. M. G., Bohlmeijer, E. T., & Clarke, A. M. (2019). Effectiveness of interventions adopting a whole school approach to enhancing social and emotional development: A meta-analysis. *European Journal of Psychology of Education*, *34*(4), 755–782. https://doi.org/10.1007/s10212-018-0406-9

Gol-Guven, M. (2009). Evaluation of the quality of early childhood classrooms in Turkey. *Early Child Development and Care*, *179*(4), 437–451. https://doi.org/10.1080/03004430701217639

Gomez, J. A., Brown, J. L., & Spier, E. (2022). Factor structure, measurement invariance, and construct validity of MELQO measure of child development and early learning in Laos. *International Journal of School & Educational Psychology*, *10*(2), 181–207. https://doi.org/10.1080/21683603.2020.1791770

Gordon, R. A., Fujimoto, K., Kaestner, R., Korenman, S., & Abner, K. (2013). An Assessment of the Validity of the ECERS-R with Implications for Assessments of Child Care Quality and its Relation to Child Development. *Developmental Psychology*, *49*(1), 146–160. https://doi.org/10.1037/a0027899

Gormley Jr., W. T., Gayer, T., Phillips, D., & Dawson, B. (2005). The Effects of Universal Pre-K on Cognitive Development. *Developmental Psychology*, *41*, 872–884. https://doi.org/10.1037/0012-1649.41.6.872

Grantham-McGregor, S., Cheung, Y. B., Cueto, S., Glewwe, P., Richter, L., & Strupp, B. (2007). Developmental potential in the first 5 years for children in developing countries. *The Lancet*, *369*(9555), 60–70. https://doi.org/10.1016/S0140-6736(07)60032-4

Greenberg, A., Bellana, B., & Bialystok, E. (2013). Perspective-taking ability in bilingual children: Extending advantages in executive control to spatial reasoning. *Cognitive Development*, *28*(1), 41–50. https://doi.org/10.1016/j.cogdev.2012.10.002

Grusec, J. E. (2011). Socialization Processes in the Family: Social and Emotional Development. *Annual Review of Psychology*, *62*(Volume 62, 2011), 243–269. https://doi.org/10.1146/annurev.psych.121208.131650

Gul, S., Khan, M. B., Mughal, S., Rehman, S. U., & Saif, N. (2012). Gender Stereotypes and Teachers Perceptions (The Case of Pakistan). *Information and Knowledge Management*, *2*(7).

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2012). The Role of Parents and Teachers in the Development of Gender-Related Math Attitudes. *Sex Roles*, *66*(3–4), 153–166. https://doi.org/10.1007/s11199-011-9996-2

Gunnerud, H. L., Ten Braak, D., Reikerås, E. K. L., Donolato, E., & Melby-Lervåg, M. (2020). Is bilingualism related to a cognitive advantage in children? A systematic review and meta-analysis. *Psychological Bulletin*, *146*(12), 1059–1083. https://doi.org/10.1037/bul0000301

Hadeed, J. (2014). Reliability and validity of the Early Childhood Environment Rating Scale, Revised Edition, ECERS-R in Arabic. *Early Child Development and Care*, *184*(6), 819–842. https://doi.org/10.1080/03004430.2013.818991

Hadjicharalambous, D., & Dimitriou, L. (2020). The Relationship Between Parents' Demographic Factors and Parenting Styles: Effects on Children's Psychological Adjustment. *Journal of Psychology Research*, *10*(4). https://doi.org/10.17265/2159-5542/2020.04.001

Hair, J. F. (2011). Multivariate Data Analysis: An Overview. In *International Encyclopedia of Statistical Science* (pp. 904–907). Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-04898-2_395

Hakuta, K. (1996). *Mirror of language: The debate on bilingualism* (Nachdr.). Basic Books.

Hallgren, K. A. (2012). Computing Inter-Rater Reliability for Observational Data: An Overview and Tutorial. *Tutorials in Quantitative Methods for Psychology*, *8*(1), 23–34. https://doi.org/10.20982/tqmp.08.1.p023

Halpin, P. F., Wolf, S., Yoshikawa, H., Rojas, N., Kabay, S., Pisani, L., & Dowd, A. J. (2019a). Measuring early learning and development across cultures: Invariance of the IDELA across five countries. *Developmental Psychology*, *55*(1), 23–37. https://doi.org/10.1037/dev0000626

Halpin, P. F., Wolf, S., Yoshikawa, H., Rojas, N., Kabay, S., Pisani, L., & Dowd, A. J. (2019b). Measuring early learning and development across cultures: Invariance of the IDELA across five countries. *Developmental Psychology*, *55*(1), 23–37. https://doi.org/10.1037/dev0000626

Hammer, C. S., Hoff, E., Uchikoshi, Y., Gillanders, C., Castro, D. C., & Sandilos, L. E. (2014). The language and literacy development of young dual language learners: A critical review. *Early Childhood Research Quarterly*, *29*(4), 715–733. https://doi.org/10.1016/j.ecresq.2014.05.008

Hamre, B., Hatfield, B., Pianta, R., & Jamil, F. (2014). Evidence for General and Domain-Specific Elements of Teacher–Child Interactions: Associations With Preschool Children's Development. *Child Development*, *85*(3), 1257–1274. https://doi.org/10.1111/cdev.12184

Hamre, B. K., & Pianta, R. C. (2001). Early Teacher–Child Relationships and the Trajectory of Children's School Outcomes through Eighth Grade. *Child Development*, *72*(2), 625–638. https://doi.org/10.1111/1467-8624.00301

Hamre, B. K., & Pianta, R. C. (2005). Can Instructional and Emotional Support in the First-Grade Classroom Make a Difference for Children at Risk of School Failure? *Child Development*, *76*(5), 949–967. https://doi.org/10.1111/j.1467-8624.2005.00889.x

Hamre, B. K., & Pianta, R. C. (2007). Learning opportunities in preschool and early elementary classrooms. In *School readiness and the transition to kindergarten in the era of accountability* (pp. 49–83). Paul H. Brookes Publishing Co.

Hamre, B. K., Pianta, R. C., Downer, J. T., DeCoster, J., Mashburn, A. J., Jones, S. M., Brown, J. L., Cappella, E., Atkins, M., Rivers, S. E., Brackett, M. A., & Hamagami, A. (2013). Teaching through Interactions: Testing a Developmental Framework of Teacher Effectiveness in over 4,000 Classrooms. *The Elementary School Journal*, *113*(4), 461–487. https://doi.org/10.1086/669616

Hamre, B. K., Pianta, R. C., Mashburn, A. J., & Downer, J. T. (2012). Promoting Young Children's Social Competence through the Preschool PATHS Curriculum and MyTeachingPartner Professional Development Resources. *Early Education & Development*. https://www.tandfonline.com/doi/full/10.1080/10409289.2011.607360

Han, W.-J. (2010). Bilingualism and socioemotional well-being. *Children and Youth Services Review*, *32*(5), 720–731. https://doi.org/10.1016/j.childyouth.2010.01.009

Hanno, E. C., Gonzalez, K. E., Lebowitz, R. B., McCoy, D. C., Lizárraga, A., & Korder Fort, C. (2020). Structural and process quality features in Peruvian early childhood education settings. *Journal of Applied Developmental Psychology*, *67*, 101105. https://doi.org/10.1016/j.appdev.2019.101105

Harding, J. F. (2015). Increases in maternal education and low-income children's cognitive and behavioral outcomes. *Developmental Psychology*, *51*(5), 583–599. https://doi.org/10.1037/a0038920

Harlow, E. (2021). Attachment theory: Developments, debates and recent applications in social work, social care and education. *Journal of Social Work Practice*, *35*(1), 79–91. https://doi.org/10.1080/02650533.2019.1700493

Harms, T., Clifford, R. M., & Cryer, D. (1998). *Early Childhood Environment Rating Scale. Revised Edition.* Teachers College Press, Columbia University, 1234 Amsterdam Avenue, New York, NY 10027; phone: 800-575-6566; fax: 802-864-7626 ($10.95). https://eric.ed.gov/?id=ed422128

Hatfield, B. E., Burchinal, M. R., Pianta, R. C., & Sideris, J. (2016). Thresholds in the association between quality of teacher–child interactions and preschool children's school readiness skills. *Early Childhood Research Quarterly*, *36*, 561–571. https://doi.org/10.1016/j.ecresq.2015.09.005

Helmerhorst, K. O. W., Riksen-Walraven, J. M., Vermeer, H. J., Fukkink, R. G., & Tavecchio, L. W. C. (2014). Measuring the Interactive Skills of Caregivers in Child Care Centers: Development and Validation of the Caregiver Interaction Profile Scales. *Early Education and Development*, *25*(5), 770–790. https://doi.org/10.1080/10409289.2014.840482

Henderson, S. R. (2023). *Effects of a Preschool Arts Curriculum on Social and Emotional Competence* [M.A., San Jose State University]. https://www.proquest.com/docview/2071341047/abstract/DE781F0A1FBA465CPQ/1

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, *33*(2–3). https://www.cambridge.org/core/journals/behavioral-and-brain-sciences/article/abs/weirdest-people-inthe-world/BF84F7517D56AFF7B7EB58411A554C17

Herba, C. M., Landau, S., Russell, T., Ecker, C., & Phillips, M. L. (2006). The development of emotion-processing in children: Effects of age, emotion, and intensity. *Journal of Child Psychology and Psychiatry*, *47*(11), 1098–1106. https://doi.org/10.1111/j.1469-7610.2006.01652.x

Herrera, M. O., Mathiesen, M. E., Merino, J. M., & Recart, I. (2005). Learning contexts for young children in Chile: Process quality assessment in preschool centres. *International Journal of Early Years Education*, *13*(1), 13–27. https://doi.org/10.1080/09669760500048253

Hestenes, L., Cassidy, D., Hegde, A., & Lower, J. (2007). Quality in Inclusive and Noninclusive Infant and Toddler Classrooms. *Journal of Research in Childhood Education*, *22*, 69–84. https://doi.org/10.1080/02568540709594613

Hindman, A. H., Pendergast, L. L., & Gooze, R. A. (2016). Using bifactor models to measure teacher–child interaction quality in early childhood: Evidence from the Caregiver Interaction Scale. *Early Childhood Research Quarterly*, *36*, 366–378. https://doi.org/10.1016/j.ecresq.2016.01.012

Hindman, A. H., Skibbe, L. E., Miller, A., & Zimmerman, M. (2010). Ecological contexts and early learning: Contributions of child, family, and classroom factors during Head Start, to literacy and mathematics growth through first grade. *Early Childhood Research Quarterly*, *25*(2), 235–250. https://doi.org/10.1016/j.ecresq.2009.11.003

Hoff, E. (2013). Interpreting the early language trajectories of children from low-SES and language minority homes: Implications for closing achievement gaps. *Developmental Psychology*, *49*(1), 4–14. https://doi.org/10.1037/a0027238

Howard, S. J., Siraj, I., Melhuish, E. C., Kingston, D., Neilsen-Hewett, C., de Rosnay, M., Duursma, E., & Luu, B. (2020). Measuring interactional quality in pre-school settings: Introduction and validation of the Sustained Shared Thinking and Emotional Wellbeing (SSTEW) scale. *Early Child Development and Care*, *190*(7), 1017–1030. https://doi.org/10.1080/03004430.2018.1511549

Howes, C., Burchinal, M., Pianta, R. C., Bryant, D., Early, D., Clifford, R., & Barbarin, O. (2008). Ready to learn? Children's pre-academic achievement in pre-Kindergarten programs. *Early Childhood Research Quarterly*, *23*(1), 27–50. https://doi.org/10.1016/j.ecresq.2007.05.002

Howes, C., Galinsky, E., & Kontos, S. (1998). Child Care Caregiver Sensitivity and Attachment. *Social Development*, *7*(1), 25–36. https://doi.org/10.1111/1467-9507.00048

Hox, J. J. (2013). *Multilevel Regression and Multilevel Structural Equation Modeling*. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199934898.013.0014

Hox, J., Moerbeek, M., & Schoot, R. van de. (2017). *Multilevel Analysis: Techniques and Applications, Third Edition* (3rd ed.). Routledge. https://doi.org/10.4324/9781315650982

Hu, B. Y., Fan, X., Wu, Z., LoCasale-Crouch, J., Yang, N., & Zhang, J. (2017). Teacher-child interactions and children's cognitive and social skills in Chinese preschool classrooms. *Children and Youth Services Review*, *79*, 78–86. https://doi.org/10.1016/j.childyouth.2017.05.028

Hunzai, Z. N. (2006). A Long-Term Investment in Pakistan: Early Childhood Education. *Contemporary Issues in Early Childhood*, *7*(2), 174–176. https://doi.org/10.2304/ciec.2006.7.2.174

Hussain, I., & Sultan, S. (2010). Parent's literacy and pre-school education: A study of practices and problems of early childhood education in Pakistan. *Procedia - Social and Behavioral Sciences*, *2*(2), 624–628. https://doi.org/10.1016/j.sbspro.2010.03.074

Hussein, S. A. (2008). Behavioral problems among children attending private and community schools in Karachi, Pakistan. *Pakistan Journal of Psychological Research*, *23*(1–2), 1–12.

Inam, A., Mushtaq, A., Zaman, S., & Wasif, S. (2022). *Preliminary Effectiveness Of Paths Curriculum For Preschool Children In Pakistan*. *19*(3).

Inam, A., Tariq, P. N., & Zaman, S. (2015). Cultural adaptation of preschool PATHS (Promoting Alternative Thinking Strategies) curriculum for Pakistani children. *International Journal of Psychology*, *50*(3), 232–239. https://doi.org/10.1002/ijop.12090

Inan, H. Z. (2009). *The Third Dimension in Preschools: Preschool Environments and Classroom Design*.

International Crisis Group. (2014). *Education Reform in Pakistan, Asia Report No. 257*. International Crisis Group. https://icg-prod.s3.amazonaws.com/education-reform-in-pakistan.pdf

International Labour Office. (2023). *World Employment and Social Outlook: Trends 2023*. https://doi.org/10.54394/SNCP1637

Iqbal, M. Z., Khalid, H. A., & Tufail, M. (2021). Early Childhood Education Programme in Punjab: Voices of Teachers & Head Teachers. *Journal of Educational Sciences & Research*, *8*(1), 169–187.

Isely, B. J. (2001). *Tamil Nadu Early Childhood Environment Rating Scale* (Quality Matters! Understanding the Relationship between Quality of Early Childhood Education and Learning Competencies of Children). M. S. Swaminathan Research Foundation.

Izard, C. E., Fine, S., Schultz, D., Mostow, A., Ackerman, B., & Youngstorm, E. (2001). Emotion Knowledge as a Predictor of Social Behavior and Academic Competence in Children at Risk. *Psychological Science*, *12*(1), 18–23.

Jakiela, P., Ozier, O., Fernald, L. C. H., & Knauer, H. (2020). *Big Sisters*. Wolrd Bank Group Education. https://pjakiela.github.io/research/big-sisters-2023-06-16.pdf

James, G., Witten, D., Hastie, T., Tibshirani, R., & Taylor, J. (2023). *An Introduction to Statistical Learning: With Applications in Python*. Springer International Publishing. https://doi.org/10.1007/978-3-031-38747-0

Jamil, B. R. (2009). *Curriculum reforms in Pakistan–A glass half full or half empty*.

Janus, M., & Offord, D. R. (2007). Development and psychometric properties of the Early Development Instrument (EDI): A measure of children's school readiness. *Canadian Journal of Behavioural Science / Revue Canadienne Des Sciences Du Comportement*, *39*(1), 1–22. https://doi.org/10.1037/cjbs2007001

Jennings, P. A., & Greenberg, M. T. (2009). The Prosocial Classroom: Teacher Social and Emotional Competence in Relation to Student and Classroom Outcomes. *Review of Educational Research*, *79*(1), 491–525. https://doi.org/10.3102/0034654308325693

Jones, D. E., Greenberg, M., & Crowley, M. (2015). Early Social-Emotional Functioning and Public Health: The Relationship Between Kindergarten Social Competence and Future Wellness. *American Journal of Public Health*, *105*(11), 2283–2290. https://doi.org/10.2105/AJPH.2015.302630

Jones, S., Brush, K., Bailey, R., Brion-Meisels, G., McIntyre, J., Kahn, J., Nelson, B., & Stickle, L. (2017). *NAVIGATING SEL FROM THE INSIDE OUT*. HARVARD GRADUATE SCHOOL OF EDUCATION.

Jukes, M. C. H., Gabrieli, P., Mgonda, N. L., Nsolezi, F., Jeremiah, G., Tibenda, J., & Bub, K. L. (2018). *“Respect is an Investment”: Community Perceptions of Social and Emotional Competencies in Early Childhood from Mtwara, Tanzania*.

Juma, A. (2004). Improving Practices in Early Childhood Classrooms in Pakistan: Issues and Challenges from the Field. *Contemporary Issues in Early Childhood*, *5*(3), 402–407. https://doi.org/10.2304/ciec.2004.5.3.11

Justice, L. M., Mashburn, A. J., Hamre, B. K., & Pianta, R. C. (2008). Quality of language and literacy instruction in preschool classrooms serving at-risk pupils. *Early Childhood Research Quarterly*, *23*(1), 51–68. https://doi.org/10.1016/j.ecresq.2007.09.004

Kagitcibasi, C. (2017). *Family, Self, and Human Development Across Cultures: Theory and Applications*. Routledge. https://doi.org/10.4324/9781315205281

Kalb, G., & van Ours, J. C. (2014). Reading to young children: A head-start in life? *Economics of Education Review*, *40*, 1–24. https://doi.org/10.1016/j.econedurev.2014.01.002

Kathawala, A., & Bhamani, S. (2015). Impact of Self-Regulation Skills on Academic Performance of Young Children in Private Schools of Karachi. *Journal of Education and Educational Development*, *2*(1), 30. https://doi.org/10.22555/joeed.v2i1.45

Khan, M. A. (2018). The status of early childhood education in Pakistan: Inside stories. *Contemporary Issues in Early Childhood*, *19*(3), 310–317. https://doi.org/10.1177/1463949118757049

Khan, N., Bhatti, M. A., Hussain, K. S., & Bano, S. S. (with Academy of Educational Planning and Management (Pakistan), & Pakistan). (2017). *Early childhood education in Pakistan: A research study*. Academy of Educational Planning and Management : Ministry of Federal Education and Professional Training.

Kline, R. B. (2023). *Principles and Practice of Structural Equation Modeling*. Guilford Publications.

Koo, T. K., & Li, M. Y. (2016). A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. *Journal of Chiropractic Medicine*, *15*(2), 155–163. https://doi.org/10.1016/j.jcm.2016.02.012

Kramer, L. (2014). Learning Emotional Understanding and Emotion Regulation Through Sibling Interaction. *Early Education and Development*, *25*(2), 160–184. https://doi.org/10.1080/10409289.2014.838824

LaBelle, B. (2023). Positive Outcomes of a Social-Emotional Learning Program to Promote Student Resiliency and Address Mental Health. *Contemporary School Psychology*, *27*(1), 1–7. https://doi.org/10.1007/s40688-019-00263-y

Lall, M. (2009). *Creating Agents of Positive Change – The Citizens Foundation in Pakistan*. https://d1wqtxts1xzle7.cloudfront.net/41233326/Creating_Agents_of_Positive_Change_-_The20160115-20448-1vg65kx-libre.pdf?1452889684=&response-content-disposition=inline%3B+filename%3DCreating_Agents_of_Positive_Change_The_C.pdf&Expires=1746815008&Signature=GmKrs8ZJ8-qe9Wlh12E6uUPEFkxjDstKy~5q-ZRnFCTKnz9J-SzSl1V4mQXWpnvSX7ITheYJ~lDvlwp5ItynlfXDHdJM4vpfXBnM2A7Hbx6GSG4Lr4KhIiYIlaCr7B4a4Nd8-zfEUIYwFrQprIGU-5Hr-mR~wN15Zhbqh3eVqW7hXEXtxoOJMSJxjMe1vbYi6u1WvjiSKKdITbVb0A0csAf4~6vG1aNlbAXBZl16PKrfgf6aZVh7gBkiRn5msxbCG~fis3aZIq6QuFpBEUQPAvu9HIL6T8JZqnREpza5WDaieT6Zyqlo63mbRt1QBHfiuzF59~tjdIPhj0oSIRwZMw__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

Lambert, M. C., Williams, S. G., Morrison, J. W., Samms-Vaughan, M. E., Mayfield, W. A., & Thornburg, K. R. (2008). Are the indicators for the Language and Reasoning Subscale of the Early Childhood Environment Rating Scale-Revised psychometrically appropriate for Caribbean classrooms? *International Journal of Early Years Education*, *16*(1), 41–60. https://doi.org/10.1080/09669760801892219

Landry, S. H., Smith, K. E., & Swank, P. R. (2006). Responsive parenting: Establishing early foundations for social, communication, and independent problem-solving skills. *Developmental Psychology*, *42*(4), 627–642. https://doi.org/10.1037/0012-1649.42.4.627

Layzer, J. I., Barbara D., G., & Moss, M. (1993). *Observational Study of Early Childhood Programs: Final Report* (1). Office of the Under Secretary U.S. Department of Education.

Layzer, J. I., & Goodson, B. D. (2006). The "Quality " of Early Care and Education Settings: Definitional and Measurement Issues. *Evaluation Review*, *30*(5), 556–576. https://doi.org/10.1177/0193841X06291524

Lecce, S., Caputi, M., Pagnin, A., & Banerjee, R. (2017). Theory of mind and school achievement: The mediating role of social competence. *Cognitive Development*, *44*, 85–97. https://doi.org/10.1016/j.cogdev.2017.08.010

Lee, B. K., & McGrath, J. J. (2015). Advancing parental age and autism: Multifactorial pathways. *Trends in Molecular Medicine*, *21*(2), 118–125. https://doi.org/10.1016/j.molmed.2014.11.005

Lee, V. E. (2000). Using Hierarchical Linear Modeling to Study Social Contexts: The Case of School Effects. *Educational Psychologist*, *35*(2), 125–141. https://doi.org/10.1207/S15326985EP3502_6

Leerkes, E. M., Paradise, M., O'Brien, M., Calkins, S. D., & Lange, G. (2008). Emotion and Cognition Processes in Preschool Children. *Merrill-Palmer Quarterly*, *54*(1), 102–124.

Lehrl, S., Kluczniok, K., & Rossbach, H.-G. (2016). Longer-term associations of preschool education: The predictive role of preschool quality for the development of mathematical skills through elementary school. *Early Childhood Research Quarterly*, *36*, 475–488. https://doi.org/10.1016/j.ecresq.2016.01.013

Lehtonen, M., Soveri, A., Laine, A., Järvenpää, J., De Bruin, A., & Antfolk, J. (2018). Is bilingualism associated with enhanced executive functioning in adults? A meta-analytic review. *Psychological Bulletin*, *144*(4), 394–425. https://doi.org/10.1037/bul0000142

Lemerise, E. A., & Arsenio, W. F. (2000). An Integrated Model of Emotion Processes and Cognition in Social Information Processing. *Child Development*, *71*(1), 107–118. https://doi.org/10.1111/1467-8624.00124

Leppänen, J. M., & Nelson, C. A. (2006). The development and neural bases of facial emotion recognition. In *Advances in Child Development and Behavior* (Vol. 34, pp. 207–246). Elsevier. https://doi.org/10.1016/S0065-2407(06)80008-X

Lewis, C. C. (1995). *Educating Hearts and Minds: Reflections on Japanese Preschool and Elementary Education*. Cambridge University Press.

Lewis, M. D., & Granic, I. (2010). Phases of Social–Emotional Development from Birth to School Age. In M. Ferrari & L. Vuletic (Eds.), *The Developmental Relations among Mind, Brain and Education: Essays in Honor of Robbie Case* (pp. 179–212). Springer Netherlands. https://doi.org/10.1007/978-90-481-3666-7_8

Leyva, D., Weiland, C., Barata, M., Yoshikawa, H., Snow, C., Treviño, E., & Rolla, A. (2015). Teacher–Child Interactions in Chile and Their Associations With Prekindergarten Outcomes. *Child Development*, *86*(3), 781–799. https://doi.org/10.1111/cdev.12342

Li, K., Hu, B. Y., Pan, Y., Qin, J., & Fan, X. (2014). Chinese Early Childhood Environment Rating Scale (trial) (CECERS): A validity study. *Early Childhood Research Quarterly*, *29*(3), 268–282. https://doi.org/10.1016/j.ecresq.2014.02.007

Li, K., Pan, Y., Hu, B., Burchinal, M., De Marco, A., Fan, X., & Qin, J. (2016). Early childhood education quality and child outcomes in China: Evidence from Zhejiang Province. *Early Childhood Research Quarterly*, *36*, 427–438. https://doi.org/10.1016/j.ecresq.2016.01.009

Lim, I. E., Mahmud, I., Chowdhury, Md. U., Kaiser, A., Bonny, F. A., Akanbonga, S., & Hasan, Md. T. (2024). Early Childhood Development (ECD) in Ghana: Assessing the Status and Determinants of the Literacy–Numeracy, Physical, Social–Emotional, and Learning

Domains. *International Journal of Early Childhood*, *56*(2), 255–276. https://doi.org/10.1007/s13158-023-00349-y

Liman, B. (2024). Self-Regulation Skills and Peer Preferences in Preschool Children. *International Journal of Contemporary Educational Research*, *11*(1), 131–142.

Lisonbee, J. A., Mize, J., Payne, A. L., & Granger, D. A. (2008). Children's Cortisol and the Quality of Teacher–Child Relationships in Child Care. *Child Development*, *79*(6), 1818–1832. https://doi.org/10.1111/j.1467-8624.2008.01228.x

LoCasale-Crouch, J., Konold, T., Pianta, R., Howes, C., Burchinal, M., Bryant, D., Clifford, R., Early, D., & Barbarin, O. (2007). Observed classroom quality profiles in state-funded pre-kindergarten programs and associations with teacher, program, and classroom characteristics. *Early Childhood Research Quarterly*, *22*(1), 3–17. https://doi.org/10.1016/j.ecresq.2006.05.001

Loeb, S., Bridges, M., Bassok, D., Fuller, B., & Rumberger, R. W. (2007). How much is too much? The influence of preschool centers on children's social and cognitive development. *Economics of Education Review*, *26*(1), 52–66. https://doi.org/10.1016/j.econedurev.2005.11.005

Love, J. M., Constantine, J., Paulsell, D., Boller, K., Ross, C., Raikes, H., Brady-Smith, C., & Brooks-Gunn, J. (2004). The Role of Early Head Start Programs in Addressing the Child Care Needs of Low-Income Families with Infants and Toddlers: Influences on Child Care Use and Quality. In *US Department of Health and Human Services Head Start Bureau*. US Department of Health and Human Services Head Start Bureau. https://eric.ed.gov/?id=ED484318

Lynd, D. (2007). *The education system in Pakistan: Assessment of the National Education Census*. UNESCO Islamabad, Pakistan.

MacCann, C., Jiang, Y., Brown, L. E. R., Double, K. S., Bucich, M., & Minbashian, A. (2020). Emotional intelligence predicts academic performance: A meta-analysis. *Psychological Bulletin*, *146*(2), 150–186. https://doi.org/10.1037/bul0000219

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation Analysis. *Annual Review of Psychology*, *58*(1), 593–614. https://doi.org/10.1146/annurev.psych.58.110405.085542

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, *7*(1), 83–104. https://doi.org/10.1037/1082-989X.7.1.83

Mackintosh, B. B., & McCoy, D. C. (2019). Exploring Social Competence as a Mediator of Head Start's Impact on Children's Early Math Skills: Evidence from the Head Start Impact Study. *Early Education and Development*. https://www.tandfonline.com/doi/abs/10.1080/10409289.2019.1576156

Magnuson, K. A., Sexton, H. R., Davis-Kean, P. E., & Huston, A. C. (2009). Increases in Maternal Education and Young Children's Language Skills. *Merrill-Palmer Quarterly*, *55*(3), 319–350.

Malik, F., & Shujja, S. (2013). Social Competence and School Systems as Predictor of Academic Achievement in High and Low Achieving Pakistani School Children. *Journal of Behavioural Sciences*, *23*(1), 77–92.

Malmberg, L.-E., Mwaura, P., & Sylva, K. (2011). Effects of a preschool intervention on cognitive development among East-African preschool children: A flexibly time-coded growth model. *Early Childhood Research Quarterly*, *26*(1), 124–133. https://doi.org/10.1016/j.ecresq.2010.04.003

Mariano, M., Caetano, S. C., Ribeiro da Silva, A., Surkan, P. J., Martins, S. S., & Cogo-Moreira, H. (2019). Psychometric Properties of the ECERS-R Among an Epidemiological Sample of Preschools. *Early Education and Development*, *30*(4), 511–521. https://doi.org/10.1080/10409289.2018.1554388

Mashburn, A. J. (2008). Quality of Social and Physical Environments in Preschools and Children's Development of Academic, Language, and Literacy Skills. *Applied Developmental Science*, *12*(3), 113–127. https://doi.org/10.1080/10888690802199392

Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O. A., Bryant, D., Burchinal, M., Early, D. M., & Howes, C. (2008). Measures of Classroom Quality in Prekindergarten and Children's Development of Academic, Language, and Social Skills. *Child Development*, *79*(3), 732–749. https://doi.org/10.1111/j.1467-8624.2008.01154.x

Maxwell, K. L., McWilliam, R. A., Louise Hemmeter, M., Ault, M. J., & Schuster, J. W. (2001). Predictors of developmentally appropriate classroom practices in kindergarten through third grade. *Early Childhood Research Quarterly*, *16*(4), 431–452. https://doi.org/10.1016/S0885-2006(01)00118-1

Mazhar, A., & Bailey, C. S. (2024). Emotion-specific recognition biases and how they relate to emotion-specific recognition accuracy, family and child demographic factors, and social behaviour. *Cognition and Emotion*, 1–19. https://doi.org/10.1080/02699931.2024.2408652

McCartney, K., Burchinal, M., Clarke-Stewart, A., Bub, K. L., Owen, M. T., & Belsky, J. (2010). Testing a series of causal propositions relating time in child care to children's externalizing behavior. *Developmental Psychology*, *46*(1), 1–17. https://doi.org/10.1037/a0017886

McClelland, M. M., Acock, A. C., & Morrison, F. J. (2006). The impact of kindergarten learning-related skills on academic trajectories at the end of elementary school. *Early Childhood Research Quarterly*, *21*(4), 471–490. https://doi.org/10.1016/j.ecresq.2006.09.003

McClelland, M. M., Cameron, C. E., Duncan, R., Bowles, R. P., Acock, A. C., Miao, A., & Pratt, M. E. (2014). Predictors of early growth in academic achievement: The head-toes-knees-shoulders task. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.00599

McClelland, M. M., Cameron, C. E., Wanless, S. B., Murray, A., Saracho, O., & Spodek, B. (2007). Executive function, behavioral self-regulation, and social-emotional competenc. In *Contemporary Perspectives on Social Learning in Early Childhood Education* (1–113–137). IAP.

McClure, E. B. (2000). A meta-analytic review of sex differences in facial expression processing and their development in infants, children, and adolescents. *Psychological Bulletin*, *126*(3), 424–453. https://doi.org/10.1037/0033-2909.126.3.424

McCoy, D. C. (2022). Defining and Measuring Young Children's Social–Emotional Development in Global Contexts. In *Measuring Noncognitive Skills in School Settings: Assessments of Executive Function and Social-Emotional Competencies* (pp. 62–80). New York, NY : The Guilford Press.

McCoy, D. C., Hanno ,Emily C., Tan ,Fei, Fonseca ,Gabriela, Ponczek ,Vladimir Pinheiro, & and Pinto, C. C. de X. (2024). Exploring the Effects of a Social-Emotional Learning Intervention in Brazilian Primary Schools: Findings from Year Two of Implementation. *Journal of Research on Educational Effectiveness*, *0*(0), 1–27. https://doi.org/10.1080/19345747.2024.2322609

McCoy, D. C., Peet, E. D., Ezzati, M., Danaei, G., Black, M. M., Sudfeld, C. R., Fawzi, W., & Fink, G. (2016). Early Childhood Developmental Status in Low- and Middle-Income Countries: National, Regional, and Global Prevalence Estimates Using Predictive Modeling. *PLOS Medicine*, *13*(6), e1002034. https://doi.org/10.1371/journal.pmed.1002034

McHale, S. M., Updegraff, K. A., & Whiteman, S. D. (2012). Sibling Relationships and Influences in Childhood and Adolescence. *Journal of Marriage and Family*, *74*(5), 913–930. https://doi.org/10.1111/j.1741-3737.2012.01011.x

McLeod, S., Harrison, L. J., Whiteford, C., & Walker, S. (2016). Multilingualism and speech-language competence in early childhood: Impact on academic and social-emotional

outcomes at school. *Early Childhood Research Quarterly*, *34*, 53–66. https://doi.org/10.1016/j.ecresq.2015.08.005

Melhuish, E. C., Ereky-Stevens, K., Petrogiannis, K., Ariescu, A., Penderi, E., Rentzou, K., Tawell, A., Slot, P. L., Broekhuizen, M., & Leseman, P. P. M. (2015). *A review of research on the effects of early childhood Education and Care (ECEC) upon child development.* https://www.researchgate.net/deref/http%3A%2F%2Fecec-care.org%2Fresources%2Fpublications%2F?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIiwicG9zaXRpb24iOiJwYWdlQ29udGVudCJ9fQ

Melhuish, E. C., Phan, M. B., Sylva, K., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2008). Effects of the Home Learning Environment and Preschool Center Experience upon Literacy and Numeracy Development in Early Primary School. *Journal of Social Issues*, *64*(1), 95–114. https://doi.org/10.1111/j.1540-4560.2008.00550.x

Miller-Graff, L., Maloney, C., Beauvil, L. J., & Feuille, M. O. (2024). The effectiveness of a contextually grounded social emotional learning program in Haiti: A pilot cluster randomized control trial. *Journal of School Psychology*, *106*, 101349. https://doi.org/10.1016/j.jsp.2024.101349

Ministry of Education, Government of Pakistan. (2009). *National Education Policy 2009*.

Ministry of Education, Government of Pakistan. (2017). *National Education Policy 2017*.

Mistry, R. S., Biesanz, J. C., Chien, N., Howes, C., & Benner, A. D. (2008). Socioeconomic status, parental investments, and the cognitive and behavioral outcomes of low-income children from immigrant and native households. *Early Childhood Research Quarterly*, *23*(2), 193–212. https://doi.org/10.1016/j.ecresq.2008.01.002

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., Houts, R., Poulton, R., Roberts, B. W., Ross, S., Sears, M. R., Thomson, W. M., & Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety.

Proceedings of the National Academy of Sciences, *108*(7), 2693–2698. https://doi.org/10.1073/pnas.1010076108

Mondi, C. F., Giovanelli, A., & Reynolds, A. J. (2021). Fostering socio-emotional learning through early childhood intervention. *International Journal of Child Care and Education Policy*, *15*(1), 6. https://doi.org/10.1186/s40723-021-00084-8

Montoya, M. F., Susperreguy, M. I., Dinarte, L., Morrison, F. J., San Martín, E., Rojas-Barahona, C. A., & Förster, C. E. (2019). Executive function in Chilean preschool children: Do short-term memory, working memory, and response inhibition contribute differentially to early academic skills? *Early Childhood Research Quarterly*, *46*, 187–200. https://doi.org/10.1016/j.ecresq.2018.02.009

Montroy, J. J., Bowles, R. P., Skibbe, L. E., McClelland, M. M., & Morrison, F. J. (2016). The development of self-regulation across early childhood. *Developmental Psychology*, *52*(11), 1744–1762. https://doi.org/10.1037/dev0000159

Moore, A. C., Akhter, S., & Aboud, F. E. (2008). Evaluating an improved quality preschool program in rural Bangladesh. *International Journal of Educational Development*, *28*(2), 118–131. https://doi.org/10.1016/j.ijedudev.2007.05.003

Morales, J., Calvo, A., & Bialystok, E. (2013). Working memory development in monolingual and bilingual children. *Journal of Experimental Child Psychology*, *114*(2), 187–202. https://doi.org/10.1016/j.jecp.2012.09.002

Morgan, J. K., Izard, C. E., & King, K. A. (2010). Construct Validity of the Emotion Matching Task: Preliminary Evidence for Convergent and Criterion Validity of a New Emotion Knowledge Measure for Young Children. *Social Development*, *19*(1), 52–70. https://doi.org/10.1111/j.1467-9507.2008.00529.x

Morris, P., Millenky ,Megan, Raver ,C. Cybele, & and Jones, S. M. (2013). Does a Preschool Social and Emotional Learning Intervention Pay Off for Classroom Instruction and Children's Behavior and Academic Skills? Evidence From the Foundations of Learning

Project. *Early Education and Development*, *24*(7), 1020–1042. https://doi.org/10.1080/10409289.2013.825187

Mundfrom, D. J., Shaw, D. G., & Ke, T. L. (2005). Minimum Sample Size Recommendations for Conducting Factor Analyses. *International Journal of Testing*, *5*(2), 159–168. https://doi.org/10.1207/s15327574ijt0502_4

Muñez, D., Bull, R., & Lee, K. (2022). Maternal education and siblings: Agents of cognitive development in kindergarten. *Developmental Science*, *25*(4), e13218. https://doi.org/10.1111/desc.13218

Naviwala, N. (2016). *Pakistan's Education Crisis: The Real Story*. Woodrow Wilson International Center for Scholars. https://eric.ed.gov/?id=ED570671

Nawaz, A., Ashraf, I., & Siddique, A. (2021). Impact of Effectiveness of Early Childhood Education on Students Learning Outcomes in Pakistan. *Interdisciplinary Journal of Education Research*, *3*(2), 32–39. https://doi.org/10.51986/ijer-2021.vol3.02.04

Neuman, M. J., Josephson, K., & Chua, P. G. (2015). *ECCE Personnel in Low- and Middle-Income Countries: A Literature Review*. UNESCO. https://policycommons.net/artifacts/8240704/a-review-of-the-literature/9157251/

Neuman, S. B., & Cunningham, L. (2009). The Impact of Professional Development and Coaching on Early Language and Literacy Instructional Practices. *American Educational Research Journal*, *46*(2), 532–566. https://doi.org/10.3102/0002831208328088

NICHD. (2006). *Child care and child development: Results from the NICHD study of early child care and youth development.* Guilford Press. https://www.nichd.nih.gov/sites/default/files/publications/pubs/documents/seccyd_06.pdf

NICHD Early Child Care Research Network. (2002). Child-Care Structure → Process → Outcome: Direct and Indirect Effects of Child-Care Quality on Young Children's Development. *Psychological Science*, *13*(3), 199–206. https://doi.org/10.1111/1467-9280.00438

Niklas, F., & Schneider, W. (2017). Home learning environment and development of child competencies from kindergarten until the end of elementary school. *Contemporary Educational Psychology*, *49*, 263–274. https://doi.org/10.1016/j.cedpsych.2017.03.006

Nix, R. L., Bierman, K. L., Domitrovich, C. E., & Gill, S. (2013). Promoting Children's Social-Emotional Skills in Preschool Can Enhance Academic and Behavioral Functioning in Kindergarten: Findings From Head Start REDI. *Early Education and Development*, *24*(7), 1000–1019. https://doi.org/10.1080/10409289.2013.825565

Noman, N. (2023). The School System Rebuilding Civil Society. *Stanford Social Innovation Review*, *21*, 1825. https://doi.org/10.48558/J8WG-B448

Noorani, A., & Hussain, N. (2021). Agents of Change: The Problematic Landscape of Pakistan's K-12 Education and the People Leading the Change. In *Oxford University Press*. Oxford University Press.

Oades-Sese, G. V., Esquivel, G. B., Kaliski, P. K., & Maniatis, L. (2011). A longitudinal study of the social and academic competence of economically disadvantaged bilingual preschool children. *Developmental Psychology*, *47*(3), 747–764. https://doi.org/10.1037/a0021380

Obradović, J., Bush, N. R., Stamperdahl, J., Adler, N. E., & Boyce, W. T. (2010). Biological Sensitivity to Context: The Interactive Effects of Stress Reactivity and Family Adversity on Socioemotional Behavior and School Readiness. *Child Development*, *81*(1), 270–289. https://doi.org/10.1111/j.1467-8624.2009.01394.x

Obradović, J., Finch, J. E., Connolly, C., Siyal, S., & Yousafzai, A. K. (2022). The unique relevance of executive functions and self-regulation behaviors for understanding early childhood experiences and preschoolers' outcomes in rural Pakistan. *Developmental Science*, *25*(6), e13271. https://doi.org/10.1111/desc.13271

Obradović, J., Yousafzai, A. K., Finch, J. E., & Rasheed, M. A. (2016). Maternal scaffolding and home stimulation: Key mediators of early intervention effects on children's cognitive

development. *Developmental Psychology*, *52*(9), 1409–1421. https://doi.org/10.1037/dev0000182

Ogelman, H. G., Seçer, Z., & Önder, A. (2013). Analyzing Perspective Taking Skills of 5- to 6-Year-Old Preschool Children in Relation to Their Self-Perception and Gender. *Journal of Research in Childhood Education*, *27*(4), 427–439. https://doi.org/10.1080/02568543.2013.822951

Orta, I. M., Corapci, F., Yagmurlu, B., & Aksan, N. (2013). The Mediational Role of Effortful Control and Emotional Dysregulation in the Link Between Maternal Responsiveness and Turkish Preschoolers' Social Competency and Externalizing Symptoms. *Infant and Child Development*, *22*(5), 459–479. https://doi.org/10.1002/icd.1806

Owens, J. (2016). Early Childhood Behavior Problems and the Gender Gap in Educational Attainment in the United States. *Sociology of Education*, *89*(3), 236–258. https://doi.org/10.1177/0038040716650926

Pakarinen, E., Lerkkanen, M.-K., Poikkeus, A.-M., Salminen, J., Silinskas, G., Siekkinen, M., & Nurmi, J.-E. (2017). Longitudinal associations between teacher-child interactions and academic skills in elementary school. *Journal of Applied Developmental Psychology*, *52*, 191–202. https://doi.org/10.1016/j.appdev.2017.08.002

Pakistan Bureau of Statistics. (2017). *Final Results of Census-2017*. https://www.pbs.gov.pk/content/final-results-census-2017-0

Pakistan Institute of Education. (2024). *Pakistan Education Statistics 2021-22—Highlights Report*. https://pie.gov.pk/SiteImage/Downloads/PES%20Highlights%202021-22%20New.pdf

Pardhan, A. (2012). Pakistani Teachers' Perceptions of Kindergarten Children's Learning: An Exploration of Understanding and Practice. *Frontiers of Education in China*, *7*(1), 33–64. https://doi.org/10.1007/BF03396934

Paxson, C., & Schady, N. (2007). Cognitive Development among Young Children in Ecuador: The Roles of Wealth, Health, and Parenting. *Journal of Human Resources*, *XLII*(1), 49–84. https://doi.org/10.3368/jhr.XLII.1.49

Perlman, M., Falenchuk, O., Fletcher, B., McMullen, E., Beyene, J., & Shah, P. S. (2016). A Systematic Review and Meta-Analysis of a Measure of Staff/Child Interaction Quality (the Classroom Assessment Scoring System) in Early Childhood Education and Care Settings and Child Outcomes. *PLOS ONE*, *11*(12), e0167660. https://doi.org/10.1371/journal.pone.0167660

Perlman, M., Zellman, G. L., & Le, V.-N. (2004). Examining the psychometric properties of the Early Childhood Environment Rating Scale-Revised (ECERS-R). *Early Childhood Research Quarterly*, *19*(3), 398–412. https://doi.org/10.1016/j.ecresq.2004.07.006

Phillips, D. A., Hutchison, J., Martin, A., Castle, S., & Johnson, A. D. (2022). First do no harm: How teachers support or undermine children's self-regulation. *Early Childhood Research Quarterly*, *59*, 172–185. https://doi.org/10.1016/j.ecresq.2021.12.001

Phillipsen, L. C., Burchinal, M. R., Howes, C., & Cryer, D. (1997). The prediction of process quality from structural features of child care. *Early Childhood Research Quarterly*, *12*(3), 281–303. https://doi.org/10.1016/S0885-2006(97)90004-1

Pianta, R. C. (1991). *Student-teacher relationship scale: Professional manual.* Psychological Assessment Resources.

Pianta, R. C. (1994). Patterns of relationships between children and kindergarten teachers. *Journal of School Psychology*, *32*(1), 15–31. https://doi.org/10.1016/0022-4405(94)90026-4

Pianta, R. C., Downer, J., & Hamre, B. (2016). Quality in Early Education Classrooms: Definitions, Gaps, and Systems. *The Future of Children*, *26*(2), 119–137. https://doi.org/10.1353/foc.2016.0015

Pianta, R. C., Howes, C., Burchinal, M., Bryant, D., Clifford, R., Early, D., & Barbarin, O. (2005). Features of Pre-Kindergarten Programs, Classrooms, and Teachers: Do They Predict Observed Classroom Quality and Child-Teacher Interactions? *Applied Developmental Science*, *9*(3), 144–159. https://doi.org/10.1207/s1532480xads0903_2

Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2008). *Classroom Assessment Scoring System™: Manual K-3.* (pp. xi, 112). Paul H. Brookes Publishing Co.

Piasta, S. B., & Wagner, R. K. (2010). Developing Early Literacy Skills: A Meta-Analysis of Alphabet Learning and Instruction. *Reading Research Quarterly*, *45*(1), 8–38.

Pisani, L., Borisova, I., & Dowd, A. J. (2018). Developing and validating the International Development and Early Learning Assessment (IDELA). *International Journal of Educational Research*, *91*, 1–15. https://doi.org/10.1016/j.ijer.2018.06.007

Pisani, L., Seiden, J., & Wolf, S. (2022). Longitudinal evidence on the predictive validity of the International Development and Early Learning Assessment (IDELA). *Educational Assessment, Evaluation and Accountability*, *34*(2), 173–194. https://doi.org/10.1007/s11092-021-09374-8

Pons, F., Harris, P. L., & de Rosnay, M. (2004). Emotion comprehension between 3 and 11 years: Developmental periods and hierarchical organization. *European Journal of Developmental Psychology*, *1*(2), 127–152. https://doi.org/10.1080/17405620344000022

Posthumus, J. A., Raaijmakers, M. A. J., Maassen, G. H., van Engeland, H., & Matthys, W. (2012). Sustained Effects of Incredible Years as a Preventive Intervention in Preschool Children with Conduct Problems. *Journal of Abnormal Child Psychology*, *40*(4), 487–500. https://doi.org/10.1007/s10802-011-9580-9

Powell, B., Steelman, L. C., & Carini, R. M. (2006). Advancing Age, Advantaged Youth: Parental Age and the Transmission of Resources to Children. *Social Forces*, *84*(3), 1359–1390. https://doi.org/10.1353/sof.2006.0064

Preacher, K. J., & Hayes, A. F. (2008). Contemporary approaches to assessing mediation in communication research. In *The Sage sourcebook of advanced data analysis methods for communication research* (pp. 13–54). Sage Publications, Inc. https://doi.org/10.4135/9781452272054.n2

Rahman, T. (2004). *Language policy and localization in Pakistan: Proposal for a paradigmatic shift*. CALLA Conference on computational linguistics.

Raikes, A., Koziol, N., Davis, D., & Burton, A. (2020). Measuring quality of preprimary education in sub-Saharan Africa: Evaluation of the Measuring Early Learning Environments scale. *Early Childhood Research Quarterly*, *53*, 571–585. https://doi.org/10.1016/j.ecresq.2020.06.001

Raikes, A., Sayre, R., Davis, D., Anderson, K., Hyson, M., Seminario, E., & Burton, A. (2019). The Measuring Early Learning Quality & Outcomes initiative: Purpose, process and results. *Early Years*, *39*(4), 360–375. https://doi.org/10.1080/09575146.2019.1669142

Ramani, G. B., & Brownell, C. A. (2014). Preschoolers' cooperative problem solving: Integrating play and problem solving. *Journal of Early Childhood Research*, *12*(1), 92–108. https://doi.org/10.1177/1476718X13498337

Rana, D. M. (2022). *Developing Socio-Emotional Domain of Kindergarten Pupils using Aesthetic/Creative Activities*. https://doi.org/10.5281/zenodo.6908875

Rao, N. (2010). Preschool Quality and the Development of Children From Economically Disadvantaged Families in India. *Early Education & Development*, *21*(2), 167–185. https://doi.org/10.1080/10409281003635770

Rao, N., & Pearson, E. (2007). *An Evaluation of Early Childhood Care and Education Programmes in Cambodia*.

Rao, N., Ranganathan, N., Kaur, R., & Mukhopadhayay, R. (2021). Fostering equitable access to quality preschool education in India: Challenges and opportunities. *International*

Journal of Child Care and Education Policy, *15*(1), 9. https://doi.org/10.1186/s40723-021-00086-6

Rao, N., & Sun, J. (2010). *Early childhood care and education, regional report: Asia and the Pacific*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000189210

Rao, N., & Sun, J. (2015). Quality early childhood care and education in lowresource level countries in Asia. In *Investing against Evidence The Global State of Early Childhood Care and Education* (pp. 211–230). UNESCO Publishing. http://education2030-africa.org/images/talent/Atelier_melqo/Investing-against-evidence--The-Global-State-of-Early-Childhood-Care-and-Education.pdf#page=205

Rao, N., Sun, J., & Chen, E. E. (2017). Effectiveness of Early Childhood Interventions in Promoting Cognitive Development in Developing Countries: A Systematic Review and Meta-analysis. *Hong Kong Journal of Pediatrics*, *22*(1). https://www.hkjpaed.org/details.asp?id=1103&show=1234

Rao, N., Sun, J., Pearson, V., Pearson, E., Liu, H., Constas, M. A., & Engle, P. L. (2012). Is Something Better Than Nothing? An Evaluation of Early Childhood Programs in Cambodia: Evaluation of Early Childhood Programs. *Child Development*, *83*(3), 864–876. https://doi.org/10.1111/j.1467-8624.2012.01746.x

Rathore, M. A., Armstrong-Carter, E., Siyal, S., Yousafzai, A. K., & Obradović, J. (2023). Pakistani preschoolers' number of older siblings and cognitive skills: Moderations by home stimulation and gender. *Journal of Family Psychology*, *37*, 132–142. https://doi.org/10.1037/fam0001018

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods*. SAGE.

Raver, C. C. (2002). Emotions Matter: Making the Case for the Role of Young Children's Emotional Development for Early School Readiness. *Social Policy Report*, *16*(3), 1–20. https://doi.org/10.1002/j.2379-3988.2002.tb00041.x

Raver, C. C., Garner, P. W., & Smith-Donald, R. (2007). The roles of emotion regulation and emotion knowledge for children's academic readiness: Are the links causal? In *School readiness and the transition to kindergarten in the era of accountability* (pp. 121–147). Paul H Brookes Publishing.

Raver, C. C., Roy, A. L., Pressler, E., Ursache, A. M., & Charles McCoy, D. (2016). Poverty-Related Adversity and Emotion Regulation Predict Internalizing Behavior Problems among Low-Income Children Ages 8–11. *Behavioral Sciences*, *7*(1), Article 1. https://doi.org/10.3390/bs7010002

Razali, N. M., & Wah, Y. B. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling tests. *Journal of Statistical Modeling and Analytics*, *2*(1), 21–33.

Rey-Guerra, C., Yousafzai, A. K., & Dearing, E. (2024). Gender similarities and differences in early childhood development in low- and middle-income countries. *International Journal of Behavioral Development*, *48*(3), 279–289. https://doi.org/10.1177/01650254231217465

Reynolds, A. J., Richardson, B. A., Hayakawa, M., Lease, E. M., Warner-Richter, M., Englund, M. M., Ou, S.-R., & Sullivan, M. (2014). Association of a Full-Day vs Part-Day Preschool Intervention With School Readiness, Attendance, and Parent Involvement. *JAMA*, *312*(20), 2126. https://doi.org/10.1001/jama.2014.15376

Reynolds-Salmon, R., Samms-Vaughan, M., Coore-Desai, C., Reece, J., & Pellington, S. (2024). Does household size matter? Crowding and its effects on child development. *Psychology, Health & Medicine*, *29*(6), 1165–1178. https://doi.org/10.1080/13548506.2024.2326867

Rhoades, B. L., Warren, H. K., Domitrovich, C. E., & Greenberg, M. T. (2011). Examining the link between preschool social–emotional competence and first grade academic

achievement: The role of attention skills. *Early Childhood Research Quarterly*, *26*(2), 182–191. https://doi.org/10.1016/j.ecresq.2010.07.003

Rimm-Kaufman, S. E., Curby, T. W., Grimm, K. J., Nathanson, L., & Brock, L. L. (2009). The contribution of children's self-regulation and classroom quality to children's adaptive behaviors in the kindergarten classroom. *Developmental Psychology*, *45*(4), 958–972. https://doi.org/10.1037/a0015861

Rizwan, M., Taniguchi, K., & Hiraoka, R. (2022). *The Role of the Private Sector in Pakistan's School Education* (0 ed., ADB Briefs) [ADB Briefs]. Asian Development Bank. https://doi.org/10.22617/BRF220018-2

Roberts, T., & Neal, H. (2004). Relationships among preschool English language learner's oral proficiency in English, instructional experience and literacy development. *Contemporary Educational Psychology*, *29*(3), 283–311. https://doi.org/10.1016/j.cedpsych.2003.08.001

Robson, D. A., Allen, M. S., & Howard, S. J. (2020). Self-regulation in childhood as a predictor of future outcomes: A meta-analytic review. *Psychological Bulletin*, *146*(4), 324–354.

Rogoff, B., Dahl, A., & Callanan, M. (2018). The importance of understanding children's lived experience. *Developmental Review*, *50*, 5–15. https://doi.org/10.1016/j.dr.2018.05.006

Romano, E., Babchishin, L., Pagani, L. S., & Kohen, D. (2010). School Readiness and Later Achievement: Replication and Extension Using a Nationwide Canadian Survey. *Developmental Psychology*, *44*(1), 232–232. https://doi.org/10.1037/0012-1649.44.1.217

Root, A. K., & Denham, S. A. (2010). The role of gender in the socialization of emotion: Key concepts and critical issues. *New Directions for Child and Adolescent Development*, *2010*(128), 1–9. https://doi.org/10.1002/cd.265

Root, A. K., & Rubin, K. H. (2010). Gender and parents' reactions to children's emotion during the preschool years. *New Directions for Child and Adolescent Development*, *2010*(128), 51–64. https://doi.org/10.1002/cd.268

Rose-Krasnor, L. (1997). The Nature of Social Competence: A Theoretical Review. *Social Development*, *6*(1), 111–135. https://doi.org/10.1111/j.1467-9507.1997.tb00097.x

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, *48*(2). https://doi.org/10.18637/jss.v048.i02

Rubin, D. B. (2004). *Multiple Imputation for Nonresponse in Surveys*. John Wiley & Sons.

Rubin, K. H., Bukowski, W. M., & Laursen, B. P. (2009). *Handbook of Peer Interactions, Relationships, and Groups*. Guilford Press.

Rudasill, K. M., Reichenberg, R. E., Eum, J., Barrett, J. S., Joo, Y., Wilson, E., & Sealy, M. (2020). Promoting Higher Quality Teacher–Child Relationships: The INSIGHTS Intervention in Rural Schools. *International Journal of Environmental Research and Public Health*, *17*(24), 9371. https://doi.org/10.3390/ijerph17249371

Sakai, L. M., Whitebook, M., Wishard, A., & Howes, C. (2003). Evaluating the Early Childhood Environment Rating Scale (ECERS): Assessing differences between the first and revised edition. *Early Childhood Research Quarterly*, *18*(4), 427–445. https://doi.org/10.1016/j.ecresq.2003.09.004

Sathyanarayana, S. S., & Thangamuthu, M. (2024). Fit Indices in Structural Equation Modeling and Confirmatory Factor Analysis: Reporting Guidelines. *Asian Journal of Economics, Business and Accounting*, *24*, 561–577. https://doi.org/10.9734/ajeba/2024/v24i71430

Saud, M., & Ashfaq, A. (2022). NGOs schools are promoting education for sustainable development in rural areas. *Globalisation, Societies and Education*, *20*(5), 682–694. https://doi.org/10.1080/14767724.2021.1993796

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*(2), 147–177. https://doi.org/10.1037/1082-989X.7.2.147

Schminkey, D. L., von Oertzen, T., & Bullock, L. (2016). Handling Missing Data With Multilevel Structural Equation Modeling and Full Information Maximum Likelihood Techniques. *Research in Nursing & Health*, *39*(4), 286–297. https://doi.org/10.1002/nur.21724

School Education & Literacy Department. (2020). *Annual School Census (ASC) 2019*. Government of Sindh. https://rsu-sindh.gov.pk/contents/profiles/Profiling%202019%2013-01-2020.pdf

School Education & Literacy Department. (2024). *Early Childhood Care, Education and Foundational Learning Policy 2024*.

Schultz, D., Izard, C. E., & Ackerman, B. P. (2000). Children's Anger Attribution Bias: Relations to Family Environment and Social Adjustment. *Social Development*, *9*(3), 284–301. https://doi.org/10.1111/1467-9507.00126

Sebanc, A. M. (2003). The Friendship Features of Preschool Children: Links with Prosocial Behavior and Aggression. *Social Development*, *12*(2), 249–268.

Seiden, J., Hasan, A., & Luna-Bazaldua, D. (2024). *Early Learning in South Punjab, Pakistan: Investigating Child Development and Classroom Quality*. The World Bank. https://doi.org/10.1596/1813-9450-10764

Seidman, E., Kim, S., Raza, M., Ishihara, M., & Halpin, P. F. (2018). Assessment of pedagogical practices and processes in low and middle income countries: Findings from secondary school classrooms in Uganda. *Teaching and Teacher Education*, *71*, 283–296. https://doi.org/10.1016/j.tate.2017.12.017

Sette, S., Bassett, H. H., Baumgartner, E., & Denham, S. A. (2015). Structure and Validity of Affect Knowledge Test (AKT) in a Sample of Italian Preschoolers. *The Journal of Genetic Psychology*, *176*(5), 330–347. https://doi.org/10.1080/00221325.2015.1075466

Shavitt, I., Ayres de Araujo Scatollin, M., Suzart Ungaretti Rossi, A., Pacífico Mercadante, M., Gamez, L., Resegue, R. M., Pisani, L., & do Rosário, M. C. (2022). Transcultural adaptation and psychometric properties of the International Development and Early Learning Assessment (IDELA) in Brazilian pre-school children. *International Journal of Educational Research Open*, *3*, 100138. https://doi.org/10.1016/j.ijedro.2022.100138

Shokrkon, A., & Nicoladis, E. (2021). Absence of a bilingual cognitive flexibility advantage: A replication study in preschoolers. *PLOS ONE*, *16*(8), e0255157. https://doi.org/10.1371/journal.pone.0255157

Shonkoff, J. P., & Phillips, D. A. (Eds.). (2000). *From Neurons to Neighborhoods: The Science of Early Childhood Development*. National Academies Press.

Siddiqui, N., & Shaukat, S. (2021). Teacher Mobility in Punjab, Pakistan: Stayers and Movers within the Public and Private Schools. *Education Sciences*, *11*(7), Article 7. https://doi.org/10.3390/educsci11070358

Siddiqui, S. (2007). *Rethinking Education in Pakistan: Perceptions, Practices, and Possibilities*. Paramoutn Publishers.

Simon, P., & Nader-Grosbois, N. (2023). Empathy in Preschoolers: Exploring Profiles and Age- and Gender-Related Differences. *Children*, *10*(12), Article 12. https://doi.org/10.3390/children10121869

Singer, D. G., & Singer, J. L. (2013). Reflections on Pretend Play, Imagination, and Child Development. *American Journal of Play*, *6*(1), 1–14.

Siraj, A., Jami, H., Kanwal, H., & Khan, H. S. (2021). Affect knowledge test: Preliminary pscyhometric evaluation in a pakistani preschool sample. *Elementary Education Online*, *20*(5), 7314–7321.

Siraj, I., Kingston, D., & Melhuish, E. C. (2015). *Assessing quality in early childhood education and care: Sustained shared thinking and emotional well-being (SSTEW) scale for 2–5-year-olds provision* (I. Siraj, D. Kingston, & E. C. Melhuish, Eds.). Trentham Books. https://ioepress.co.uk/books/early-years-and-primary-education/assessing-quality-in-early-childhood-education-and-care/

Siraj, I., Melhuish, E., Howard, S. J., Neilsen-Hewett, C. M., & Kingston, D. (2018). *Fostering Effective Early Learning (FEEL) Study: Final Report*. NSW Department of Education.

https://education.nsw.gov.au/early-childhood-education/whats-happening-in-the-early-childhood-education-sector/data-and-research/feel-study-2018

Slot, P. L. (2018). *Structural characteristics and process quality in early childhood education and care: A literature review*. OECD. https://doi.org/10.1787/edaf3793-en

Slot, P. L., Bleses, D., Justice, L. M., Markussen-Brown, J., & Højen, A. (2018). Structural and Process Quality of Danish Preschools: Direct and Indirect Associations With Children's Growth in Language and Preliteracy Skills. *Early Education and Development*, *29*(4), 581–602. https://doi.org/10.1080/10409289.2018.1452494

Snijders, T. A. B., & Bosker, R. J. (2011). *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. SAGE.

Soliday Hong, S. L., Sabol, T. J., Burchinal, M. R., Tarullo, L., Zaslow, M., & Peisner-Feinberg, E. S. (2019). ECE quality indicators and child outcomes: Analyses of six large child care studies. *Early Childhood Research Quarterly*, *49*, 202–217. https://doi.org/10.1016/j.ecresq.2019.06.009

Spinrad, T. L., & Eisenberg, N. (2014). Empathy, Prosocial Behavior, and Positive Development in Schools. In *Handbook of Positive Psychology in School*. Routledge.

Su, Y., Rao, N., Sun, J., & Zhang, L. (2021). Preschool quality and child development in China. *Early Childhood Research Quarterly*, *56*, 15–26. https://doi.org/10.1016/j.ecresq.2021.02.003

Suchodoletz, A. von, Lee, D. S., Henry, J., Tamang, S., Premachandra, B., & Yoshikawa, H. (2023). Early childhood education and care quality and associations with child outcomes: A meta-analysis. *PLOS ONE*, *18*(5), e0285985. https://doi.org/10.1371/journal.pone.0285985

Sun, H., Yussof, N. T. B., Mohamed, M. B. B. H., Rahim, A. B., Bull, R., Cheung, M. W. L., & Cheong, S. A. (2021). Bilingual language experience and children's social-emotional and behavioral skills: A cross-sectional study of Singapore preschoolers. *International*

Journal of Bilingual Education and Bilingualism, *24*(3), 324–339. https://doi.org/10.1080/13670050.2018.1461802

Sun, J., & Tang, Y. (2019). Maternal scaffolding strategies and early development of self-regulation in Chinese preschoolers. *Early Child Development and Care*, *189*(9), 1525–1537. https://doi.org/10.1080/03004430.2017.1395874

Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2004). *The final report: Effective pre-school education*. Institute of Education, University of London.

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*(2), 109–124. https://doi.org/10.1177/1476718X10387900

Sylva, K., & Wiltshire, J. (1993). *The impact of early learning on children's later development a review prepared for the RSA inquiry 'start right': European Early Childhood Education Research Journal: Vol 1, No 1*. https://www.tandfonline.com/doi/abs/10.1080/13502939385207331

Tahira, M., Malik, A., & Hassan, A. (2020). *Teacher Education in Pakistan*.

Tahira, S., Shabbir, M., & Jalal, H. (2021). *Practices of Early Childhood Education and Development: Challenges and Issues in Pakistan*. *20*, 2210–2219. https://doi.org/10.17051/ilkonline.2021.03.257

Tassopoulou, E. (2017). *Impact of Storytelling on School Readiness and Socio-Emotional Development of Preschool Age Children* [University of Bolton]. https://core.ac.uk/download/pdf/301021214.pdf

TCF. (2021). *TCF Primary Schools Are Changing*. https://www.tcf.org.pk/education-programme/early-years-education/

Tearne, J. E. (2015). Older maternal age and child behavioral and cognitive outcomes: A review of the literature. *Fertility and Sterility*, *103*(6), 1381–1391. https://doi.org/10.1016/j.fertnstert.2015.04.027

Tearne, J. E., Robinson, M., Jacoby, P., Allen, K. L., Cunningham, N. K., Li, J., & McLean, N. J. (2016). Older maternal age is associated with depression, anxiety, and stress symptoms in young adult female offspring. *Journal of Abnormal Psychology*, *125*(1), 1–10. https://doi.org/10.1037/abn0000119

Thomason, A. C., & La Paro, K. M. (2009). Measuring the Quality of Teacher–Child Interactions in Toddler Child Care. *Early Education and Development*, *20*(2), 285–304. https://doi.org/10.1080/10409280902773351

Tietze, W., Cryer, D., Bairrão, J., Palacios, J., & Wetzel, G. (1996). Comparisons of observed process quality in early child care and education programs in five countries. *Early Childhood Research Quarterly*, *11*(4), 447–475. https://doi.org/10.1016/S0885-2006(96)90017-4

Tobin, J. (2017). Quality in Early Childhood Education: An Anthropologist's Perspective. In *International Handbook of Teacher Quality and Policy*. Routledge.

Tobin, J., Hsueh, Y., & Karasawa, M. (2009). *Preschool in Three Cultures Revisited: China, Japan, and the United States*. University of Chicago Press.

Tofighi, D., & MacKinnon, D. P. (2011). RMediation: An R package for mediation analysis confidence intervals. *Behavior Research Methods*, *43*(3), 692–700. https://doi.org/10.3758/s13428-011-0076-x

Torrente, C., Alimchandani, A., & Aber, J. L. (2015). International perspectives on SEL. In *Handbook of social and emotional learning: Research and practice* (pp. 566–587). The Guilford Press.

Torres, M. M., Domitrovich, C. E., & Bierman, K. L. (2015). Preschool Interpersonal Relationships Predict Kindergarten Achievement: Mediated by Gains in Emotion Knowledge. *Journal of Applied Developmental Psychology*, *39*, 44–52. https://doi.org/10.1016/j.appdev.2015.04.008

Trentacosta, C. J., & Izard, C. E. (2007). Kindergarten children's emotion competence as a predictor of their academic competence in first grade. *Emotion*, *7*(1), 77–88. https://doi.org/10.1037/1528-3542.7.1.77

UNESCO. (2020). *Global Education Monitoring Report 2020: Inclusion and education: All means all. Paris*. UNESCO. https://doi.org/10.54676/JJNK6989

UNESCO. (2021). *UNESCO science report: The race against time for smarter development*. United Nations Educational, Scientific and Cultural Organization.

UNESCO, UNICEF, Bank, W., & Education, B. I. (USA) C. for U. (2017). *Overview: MELQO: Measuring Early Learning Quality and Outcomes*. UNESCO Publishing.

UNICEF. (2021). *Pakistan Country Office Annual Report 2021*. https://www.unicef.org/media/116341/file/Pakistan-2021-COAR.pdf

UNICEF. (2025). *UNICEF Pakistan Annual Report 2024*.

Unsworth, S. (2016). Quantity and quality of language input in bilingual language development. In *Bilingualism across the lifespan: Factors moderating language proficiency* (pp. 103–121). American Psychological Association. https://doi.org/10.1037/14939-007

van Buuren, S., & Groothuis-Oudshoorn, K. (2011). mice: Multivariate Imputation by Chained Equations in R. *Journal of Statistical Software*, *45*, 1–67. https://doi.org/10.18637/jss.v045.i03

van IJzendoorn, M., Tavecchio, L., Stams, G., E, V., & J, R. (1998). Quality of Center Day Care and Attunement Between Parents and Caregivers: Center Day Care in Cross-National Perspective. *The Journal of Genetic Psychology*, *159*, 437–454.

Vandell, D. L., Belsky, J., Burchinal, M., Vandergrift, N., & Steinberg, L. (2010). Do Effects of Early Child Care Extend to Age 15 Years? Results From the NICHD Study of Early Child Care and Youth Development. *Child Development*, *81*(3), 737–756. https://doi.org/10.1111/j.1467-8624.2010.01431.x

Vandell, D. L., & Corasaniti, M. A. (1990). Variations in early child care: Do they predict subsequent social, emotional, and cognitive differences? *Early Childhood Research Quarterly*, *5*(4), 555–572. https://doi.org/10.1016/0885-2006(90)90019-W

Veraksa, A., Bukhalenkova, D., & Almazova, O. (2020). Executive Functions and Quality of Classroom Interactions in Kindergarten Among 5–6-Year-Old Children. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.603776

Voltmer, K., & von Salisch, M. (2017). Three meta-analyses of children's emotion knowledge and their school success. *Learning and Individual Differences*, *59*, 107–118. https://doi.org/10.1016/j.lindif.2017.08.006

Voltmer, K., & von Salisch, M. (2022). The feeling thinking talking intervention with teachers advances young children's emotion knowledge. *Social Development*, *31*(3), 846–861. https://doi.org/10.1111/sode.12586

von Suchodoletz, A., Trommsdorff, G., & Heikamp, T. (2011). Linking Maternal Warmth and Responsiveness to Children's Self-regulation. *Social Development*, *20*(3), 486–503. https://doi.org/10.1111/j.1467-9507.2010.00588.x

von Suchodoletz, A., Uka, F., & Larsen, R. A. A. (2015). Self-Regulation Across Different Contexts: Findings in Young Albanian Children: Early Education and Development: Vol 26, No 5-6. *Early Education and Development*, *26*. https://www.tandfonline.com/doi/abs/10.1080/10409289.2015.1012189

Walker, O. L., & Henderson, H. A. (2012). Temperament and Social Problem Solving Competence in Preschool: Influences on Academic Skills in Early Elementary School. *Social Development*, *21*(4), 761–779. https://doi.org/10.1111/j.1467-9507.2011.00653.x

Walker, S. P., Wachs, T. D., Gardner, J. M., Lozoff, B., Wasserman, G. A., Pollitt, E., & Carter, J. A. (2007). Child development: Risk factors for adverse outcomes in developing countries. *The Lancet*, *369*(9556), 145–157. https://doi.org/10.1016/S0140-6736(07)60076-2

Wang, Y., Yang, Z., Zhang, Y., Wang, F., Liu, T., & Xin, T. (2019). The Effect of Social-Emotional Competency on Child Development in Western China. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.01282

Wasi, N., Sharjeel, D. M. Y., Wahab, Z., & Kiazai, D. A. N. (2018). A Study of Existing Early Childhood Education System in Pakistan. *Bi-Annual Research Journal "BALOCHISTAN REVIEW"*, *XXXIX*(2), 10.

Watanabe, N., Denham, S. A., Jones, N. M., Kobayashi, T., Bassett, H. H., & Ferrier, D. E. (2019). Working Toward Cross-Cultural Adaptation: Preliminary Psychometric Evaluation of the Affect Knowledge Test in Japanese Preschoolers. *SAGE Open*, *9*(2), 2158244019846688. https://doi.org/10.1177/2158244019846688

Weiser, M., Reichenberg, A., Werbeloff, N., Kleinhaus, K., Lubin, G., Shmushkevitch, M., Caspi, A., Malaspina, D., & Davidson, M. (2008). Advanced Parental Age at Birth Is Associated With Poorer Social Functioning in Adolescent Males: Shedding Light on a Core Symptom of Schizophrenia and Autism. *Schizophrenia Bulletin*, *34*(6), 1042–1046. https://doi.org/10.1093/schbul/sbn109

White, I. R., Royston, P., & Wood, A. M. (2011). Multiple imputation using chained equations: Issues and guidance for practice. *Statistics in Medicine*, *30*(4), 377–399. https://doi.org/10.1002/sim.4067

Whitebook, M., Howes, C., & Phillips, D. (1989). Research Report. Who Cares? Child Care Teachers and the Quality of Care in America. *Young Children*, *45*(1), 41–45.

Williford, A. P., Vick Whittaker ,Jessica E., Vitiello ,Virginia E., & and Downer, J. T. (2013). Children's Engagement Within the Preschool Classroom and Their Development of Self-Regulation. *Early Education and Development*, *24*(2), 162–187. https://doi.org/10.1080/10409289.2011.628270

Wirth, A., Stadler, M., Birtwistle, E., & Niklas, F. (2023). New directions in the conceptualization and operationalization of the home learning environment. *Journal of Educational Psychology*, *115*(1), 160–172. https://doi.org/10.1037/edu0000749

Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2013). Sample Size Requirements for Structural Equation Models: An Evaluation of Power, Bias, and Solution Propriety. *Educational and Psychological Measurement*, *76*(6), 913–934. https://doi.org/10.1177/0013164413495237

Wolf, S., Aber, J. L., Behrman, J. R., & Tsinigo, E. (2019). Experimental Impacts of the "Quality Preschool for Ghana" Interventions on Teacher Professional Well-being, Classroom Quality, and Children's School Readiness. *Journal of Research on Educational Effectiveness*, *12*(1), 10–37. https://doi.org/10.1080/19345747.2018.1517199

Wolf, S., Halpin, P., Yoshikawa, H., Dowd, A. J., Pisani, L., & Borisova, I. (2017). Measuring school readiness globally: Assessing the construct validity and measurement invariance of the International Development and Early Learning Assessment (IDELA) in Ethiopia. *Early Childhood Research Quarterly*, *41*, 21–36. https://doi.org/10.1016/j.ecresq.2017.05.001

Wolf, S., & McCoy, D. C. (2019). The role of executive function and social-emotional skills in the development of literacy and numeracy during preschool: A cross-lagged longitudinal study. *Developmental Science*, *22*(4), e12800. https://doi.org/10.1111/desc.12800

Wolf, S., Raza, M., Kim, S., Aber, J. L., Behrman, J., & Seidman, E. (2018). Measuring and predicting process quality in Ghanaian pre-primary classrooms using the Teacher Instructional Practices and Processes System (TIPPS). *Early Childhood Research Quarterly*, *45*, 18–30. https://doi.org/10.1016/j.ecresq.2018.05.003

Wolf, S., Reyes, R. S., Weiss, E. M., & McDermott, P. A. (2021). Trajectories of social-emotional development across pre-primary and early primary school. *Journal of Applied Developmental Psychology*, *75*, 101297. https://doi.org/10.1016/j.appdev.2021.101297

Wolfgang, C. H., Stannard ,Laura L., & and Jones, I. (2001). Block Play Performance Among Preschoolers As a Predictor of Later School Achievement in Mathematics. *Journal of Research in Childhood Education*, *15*(2), 173–180. https://doi.org/10.1080/02568540109594958

Wong, T. K. Y., Konishi, C., & Kong, X. (2022). A longitudinal perspective on frequency of parent–child activities and social–emotional development. *Early Child Development and Care*, *192*(3), 458–469. https://doi.org/10.1080/03004430.2020.1765773

World Bank. (2018). *PAKISTAN: Helping Private Schools for Low-income Families Improve by Offering Loans*. https://www.worldbank.org/en/programs/sief-trust-fund/brief/investing-in-the-education-market-strengthening-private-schools-for-the-rural-poor

World Bank. (2022a). *Pakistan Learning Poverty Brief* (Country Learning Poverty Briefs, p. 2). https://documents1.worldbank.org/curated/en/099812207212211713/pdf/IDU0e0c38ddc0f77b04fda0a7ad0e2f4235d517a.pdf

World Bank. (2022b). *Teach ECE Implementation Brief*. Wolrd Bank Group Education. https://documents1.worldbank.org/curated/en/791161615930358857/pdf/Teach-ECE-Implementation-Brief.pdf

World Bank. (2023). *World Bank Open Data*. World Bank Open Data. https://data.worldbank.org

Xie, S., & Li, H. (2022). Self-regulation mediates the relations between family factors and preschool readiness. *Early Childhood Research Quarterly*, *59*, 32–43. https://doi.org/10.1016/j.ecresq.2021.10.005

Yang, S., Yang, H., & Lust, B. (2011). Early childhood bilingualism leads to advances in executive attention: Dissociating culture and language. *Bilingualism: Language and Cognition*, *14*(3), 412–422. https://doi.org/10.1017/S1366728910000611

Yoshikawa, H., Weiland, C., Brooks-Gunn, J., Burchinal, M. R., Espinosa, L. M., Gormley, W. T., Ludwig, J., Magnuson, K. A., Phillips, D., & Zaslow, M. J. (2013). *Investing in Our*

Future: The Evidence Base on Preschool Education. Society for Research in Child Development. https://eric.ed.gov/?id=ED579818

Yoshikawa, H., Wuermli, A. J., Raikes, A., Kim, S., & Kabay, S. (2018). *Toward High-Quality Early Childhood Development Programs and Policies at National Scale: Directions for Research in Global Contexts* (Social Policy Report 30; pp. 1–36). Society for Research in Child Development.

Yousafzai, A. K., Rasheed, M. A., Rizvi, A., Shaheen, F., Ponguta, L. A., & Reyes, C. R. (2018). Effectiveness of a youth-led early childhood care and education programme in rural Pakistan: A cluster-randomised controlled trial. *PLOS ONE*, *13*(12), e0208335. https://doi.org/10.1371/journal.pone.0208335

Zachrisson, H. D., Dearing, E., Lekhal, R., & Toppelberg, C. O. (2013). Little Evidence That Time in Child Care Causes Externalizing Problems During Early Childhood in Norway. *Child Development*, *84*(4), 1152–1170. https://doi.org/10.1111/cdev.12040

Zada, K. (2014). Early childhood teacher education in Pakistan: Time for action. *International Journal of Early Years Education*, *22*(3), 263–270. https://doi.org/10.1080/09669760.2014.944886

Zafar, H., Debowska, A., & Boduszek, D. (2021a). Emotion regulation difficulties and psychopathology among Pakistani adolescents. *Clinical Child Psychology and Psychiatry*, *26*(1), 121–139. https://doi.org/10.1177/1359104520969765

Zafar, H., Debowska, A., & Boduszek, D. (2021b). Emotion regulation difficulties and psychopathology among Pakistani adolescents. *Clinical Child Psychology and Psychiatry*, *26*(1), 121–139. https://doi.org/10.1177/1359104520969765

Zahra, S. T., & Saleem, S. (2022). Family Cohesion and Emotional–Behavioral Problems in Pakistani Young Children: A Moderating Role of Interpersonal Skills. *The Family Journal*, 10664807221139504. https://doi.org/10.1177/10664807221139504

Zaman, R. M. (2014). Parenting in Pakistan: An Overview. In H. Selin (Ed.), *Parenting Across Cultures: Childrearing, Motherhood and Fatherhood in Non-Western Cultures* (pp. 91–104). Springer Netherlands. https://doi.org/10.1007/978-94-007-7503-9_8

Zaman, R. M., Stewart, S. M., & Zaman, T. R. (2006). Pakistan: Culture, community, and familial obligations in a Muslim society. In *Families across cultures: A 30-nation psychological study* (pp. 427–434). Cambridge University Press. https://doi.org/10.1017/CBO9780511489822.032

Zhao, H., & Akiba, M. (2009). School expectations for parental involvement and student mathematics achievement: A comparative study of middle schools in the US and South Korea. *Compare*. https://doi.org/10.1080/03057920701603347

Zhu, J., Fu, R., Li, Y., Wu, M., & Yang, T. (2021). Shyness and Adjustment in Early Childhood in Southeast China: The Moderating Role of Conflict Resolution Skills. *Frontiers in Psychology*, *12*. https://www.frontiersin.org/articles/10.3389/fpsyg.2021.644652

Zhu, J., Xiao, B., Hipson, W., Yan, C., Coplan, R. J., & Li, Y. (2021). Social Avoidance and Social Adjustment: The Moderating Role of Emotion Regulation and Emotion Lability/Negativity Among Chinese Preschool Children. *Frontiers in Psychology*, *12*. https://www.frontiersin.org/articles/10.3389/fpsyg.2021.618670

Zill, N., Resnick, G., Kim, K., O'Donnell, K., Sorongon, A., Ziv, Y., & Alva, S. (2006). *Head Start Performance Measures Center Family and Child Experiences Survey (FACES 2000) Technical Report.* Administration for Children and Families, Office of Planning, Research and Evaluation. https://www.acf.hhs.gov/sites/default/files/documents/opre/tech2k_final2.pdf

Zondervan-Zwijnenburg, M. A. J., Veldkamp, S. A. M., Neumann, A., Barzeva, S. A., Nelemans, S. A., van Beijsterveldt, C. E. M., Branje, S. J. T., Hillegers, M. H. J., Meeus, W. H. J., Tiemeier, H., Hoijtink, H. J. A., Oldehinkel, A. J., & Boomsma, D. I. (2020). Parental Age

and Offspring Childhood Mental Health: A Multi-Cohort, Population-Based Investigation. *Child Development*, *91*(3), 964–982. https://doi.org/10.1111/cdev.13267

Appendix A

Ethical Approval(s)

Ph: 021-99246094

NO: DSE/PRY/B&A/(-12106-)/2023

GOVERNMENT OF SINDH
EDUCATION & LITERACY DEPARTMENT
DIRECTORATE OF SCHOOLS EDUCATION
KARACHI REGION KARACHI
NEAR APWA GOVT. GIRLS COLLEGE, KARIMABAD, KARACHI

Dated: - 13/09/2023

To,

Ms. Anushay Mazhar,
PhD Student, University of Oxford.

SUB:- **PERMISSION TO CONDUCT RESEARCH IN EARLY CHILD HOOD CLASSES IN KARACHI REGION.**

As per the instruction issued by Secretary School Education & Literacy Department Government of Sindh, this Directorate is please to allow you to visit classes with preschool-aged children in Primary Schools in different Districts of Karachi Region, for the purpose of your research study titled 'Exploring Early Childhood Education in Pakistan' to observe everyday practices and do assessments with children. We have reviewed ethical approval provided by University of Oxford (Ref: EDUC-C1A-23-247) and find it sufficient, not requiring further local ethical review.

We wish you best of luck.

13/09/23

(MUSARRAT NOUREEN)
DEPUTY DIRECTOR
DIRECTORATE OF SCHOOL EDUCATION
(PRIMARY) KARACHI REGION, KARACHI

SOCIAL SCIENCES & HUMANITIES
INTERDIVISIONAL RESEARCH ETHICS COMMITTEE
DEPARTMENTAL RESEARCH ETHICS COMMITTEE

Department of Education
15 Norham Gardens, Oxford OX2 6PY
student.curec@education.ox.ac.uk; staff.curec@education.ox.ac.uk



Anushay Mazhar Anushay.mazhar@education.ox.ac.uk
Department of Education, Social Sciences Division
University of Oxford

17 July 2023

Dear Anushay,

Research ethics approval

Research title: Investigating How Characteristics of Early Childhood Education Quality in Pakistan Predict Children's Academic and Social-Emotional Development
Research ethics reference: EDUC_C1A_23_247

The above application has been considered on behalf of the Education Departmental Research Ethics Committee (DREC) in accordance with the University's procedures for ethical approval of all research involving human participants.

I am pleased to confirm that, on the basis of the information provided to the DREC, ethics approval has now been granted for this study.

Please note the following:

Personal data: It is the responsibility of the PI to ensure that all personal data collected during the project is managed in accordance with the University's guidance and legal requirements.

In-person activities: Any data collection involving in-person interactions with participants must have an up-to-date fieldwork risk assessment in place; further guidance is available from the Safety Office's website.

Amendments: Please notify the committee if you intend to make any amendments to the information in your ethics application as submitted at date of this approval, as all changes must receive ethical approval prior to implementation. The amendment form is available on the SSH IDREC webpage.

We welcome feedback on your experience of the ethical review process and suggestions for improvement. Please email any comments to staff.curec@education.ox.ac.uk / student.curec@education.ox.ac.uk or ethics@socsci.ox.ac.uk.

Yours sincerely

James Carroll
DREC Member

cc: Katharina Ereky-Stevens, katharina.ereky@education.ox.ac.uk

Appendix B

School Characteristics

School ID	School Category	Total No of Students	No. Of Teachers	Hours	Students in T1	Students in T2
s01	Public	22	1	3.5	13	13
s02	Public	29	1	3.67	13	12
s03	Public	57	1	3	14	0
s04	Public	31	1	3	11	3
s05	Private	18	2	5.5	14	11
s06	Private	16	1	3.5	9	0
s07	TCF	32	1	2.91	10	9
s08	Private	25	1	4	14	11
s09	Public	52	1	5.5	14	0
s10	Public	35	1	4	11	8
s11	Public	14	1	3.5	10	7
s12	TCF	33	1	3.9	14	14
s13	Private	26	3	4.75	20	17
s14	Private	11	2	3.5	10	8
s15	Private	18	1	4.5	11	9
s16	Public	59	2	4	14	11
s17	Public	70	2	5.5	10	10
s18	Private	40	1	3.5	11	9
s19	Public	17	2	5	10	2
s20	TCF	33	1	3.75	14	13
s21	Private	21	2	4.5	14	11
s22	Private	20	1	4	12	7
s23	Private	32	2	4	14	13
s24	Public	63	2	4.5	12	8
s25	TCF	33	1	4	13	11
s26	TCF	33	1	4.75	15	14
s27	Public	40	2	4	13	9
s28	Public	48	2	5.5	12	10
s29	Public	92	2	5	10	3
s30	Private	24	1	4	12	0
s31	Public	25	1	5	12	10
s32	Public	51	1	5	12	8
s33	TCF	33	1	4.6	14	11
s34	TCF	35	1	4	12	10
s35	Private	22	0	4	13	12
s36	Private	14	1	3	10	7
s37	Public	70	2	4.5	15	14

s38	Public	36	1	4	15	9
s39	Private	25	2	4.5	12	12
s40	Public	42	2	3	13	10
s41	Public	36	1	4	13	9
s42	TCF	28	1	3.5	14	13
s43	Private	30	2	4	12	12
s44	Private	16	1	4.5	12	9
s45	Public	46	0	5	12	7
s46	Public	31	1	4	12	10
s47	Private	23	2	3.5	13	0
s48	Private	35	2	4.25	11	11
s49	Public	36	1	4.5	13	0
s50	TCF	33	1	3.9	12	14
s51	TCF	33	1	2.83	12	12
s52	Public	58	1	4.5	7	0

Appendix C

Invitation Letter



Lead Researcher: Anushay Mazhar
Email: anushay.mazhar@education.ox.ac.uk
www.education.ox.ac.uk/people/anushay-mazhar
+92 3233291343

PI: Professor Katharina Ereky-Stevens
Email: katharina.ereky@education.ox.ac.uk
+44 1865 274040

((Date))

((Name))
((Position))
((School Name))

Exploring Early Childhood Education in Pakistan

Dear _____,

I hope you are well. I am a PhD student at the University of Oxford, and I am leading a research study on early childhood education in Pakistan, to which I would like to invite XX to take part in. The research study is titled "Exploring Early Childhood Education in Pakistan (ExECEP)", in which we aim to understand how different aspects of everyday classroom experiences in Pakistan are related to children's development. The study has been approved by Oxford's Central University Research Ethics Committee (Reference: EDUC_C1A_23_247).

The research will take place in pre-primary classrooms with the 4- to 5-year-olds. We are looking to observe everyday practices and routines of the students. We are not aiming to change what or how teachers choose to teach and will not be making any judgements about teaching. Additionally, to understand children's development, we will also conduct some fun game-based tasks with children at two time points. All the research will be confidential, and any research data will be anonymised before sharing it with others.

In **October** we will provide the school with information and consent sheets to for teachers and parents, to offer teachers and parents/guardians the opportunity to refuse to participate. Throughout the research, teachers, students, and parents/guardians will be able to refuse to participate at any time. The commitment from the school would be to assist us in informing the parents and teachers, as well as collecting consent from them. A quiet and safe space would be required to conduct the sessions with children.

The data collection is spread over three timepoints. The first timepoint will be in early **November 2023**

during which three trained fieldworkers will visit your school for one day and will conduct the tasks with approximately 12 children (from the same class). The sessions take approximately 30 minutes with each child and can be split into two sessions. The classroom teacher and parents of those 12 children will also be asked to complete a brief form. The second timepoint will be in **January 2024** during which one fieldworker will visit your school to conduct a full-day observation of the chosen class. S/he would observe and take notes from the day, as well as use some pre-established scales to code the observation in a systematic manner. We will not be doing any audio- or video-recordings at any point. We ask that teachers carry out their class like normal as we are interested in children's everyday routines. The researcher will not be making any judgements, they will just be learning about the children's environment. Anything they observe will be confidential. The third timepoint will be scheduled around **mid-April** to **early May 2024**, in which fieldworkers will reassess the 12 children and ask the teachers to complete a form about their everyday behaviours.

All participants, including students, teachers, and the school, would be made **anonymous** in all research reports. The personal data collected would be kept strictly confidential, available only to my supervisors and the researchers and not used other than specified. All researchers including myself have received thorough training on working with children.

By participating in the research, your school would be contributing to research that would help address the gap in research in Pakistani schools and will help understand what aspects of preschool education are important for Pakistani children's development so that we do not have to rely on research conducted in Western countries that may not be applicable to us. If you are interested, we are happy to provide overarching anonymous feedback from our visits and summaries of our findings. If you need more information about what is involved in the project or have any questions, please contact me.

Thank you for your time and attention. I look forward to hearing from you.

Yours Sincerely,

Anushay Mazhar
PhD Candidate, University of Oxford
Anushay.mazhar@education.ox.ac.uk
www.education.ox.ac.uk/people/anushay-mazhar

Appendix D

Exploring Early Childhood Education in Pakistan

ExECEP

Lead Researcher: Anushay Mazhar
E-mail: anushay.mazhar@education.ox.ac.uk
www.education.ox.ac.uk/people/anushay-mazhar

Parent Information Sheet

Central University Research Ethics Committee (CUREC) Approval Reference: EDUC_C1A_23_247

We are excited to invite your child to participate in a research study conducted by the University of Oxford, which your child's school has agreed to take part in. The purpose of this research is to investigate how early education affects children's development.

Why is this research being conducted?

Researchers have mostly studied how young kids learn in Western countries like the US and Europe. They used that information to decide how to teach children in other countries because there is very less research in these countries, especially Pakistan. That is why we're doing research in Pakistani preschools and nurseries to understand what makes learning better for Pakistani children. We're looking at things like how teachers teach and how kids develop skills like language, numbers, problem-solving, etc. By understanding this, we can find ways to make education in Pakistan even better for young people like your child.

You can get more information about the research by contacting the research team (details in the end).

Why has my child been invited to be involved in this research?

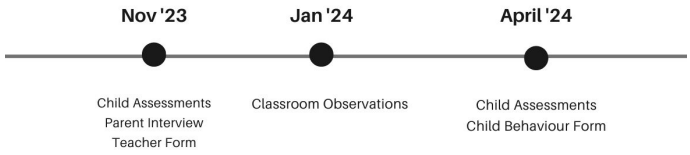
Your child has been invited to participate because they are a student at a partnering school. We are inviting over 500 children to take part from different schools in Pakistan.

Does my child have to be involved?

No, your child's participation is optional. If you choose to allow participation and later change your mind, you can withdraw your child from the study and their data at any time without giving a reason. Withdrawing will not affect your child's education.

What will happen if my child takes part?

The research is expected to last until May 2024. The research will be spread over three timepoints, as shown in the figure below. The first timepoint will be in November 2023 during which a trained researcher will do some games and tasks for your child to complete. If your child requires a break, the sessions can be split into two parts each. Around that time, we may also be conducting a brief call with you to gather basic information about your child such as their age, gender, etc. The second timepoint will be in January 2024 during which a researcher will conduct a whole day observation for your child's classroom. Your child will not be directly involved in this timepoint. The third timepoint will be conducted in April 2024 in which the trained researchers will repeat the tasks from timepoint one with your child.



What are the possible disadvantages and risks in taking part?

We take your child's safety and well-being seriously. Our research staff has years of experience working with children and we have provided additional training to minimize any discomfort children may experience. If at any point your child is not comfortable or upset, we will immediately stop the session, with no disadvantage to your child. It is important to note that we will ensure your child's privacy and confidentiality throughout the research. Strict data protection measures are in place to keep personal information secure.

Are there any benefits in taking part?

While there may not be direct benefits to your child from participating, the research aims to benefit young people as a whole. The findings from this research could help improve the quality of education and therefore children's development in Pakistan.

What information will be collected?

Completed consent forms may be retained by the school for the duration of the research. All research data will be anonymised (your child's name will not be included) and made available for other researchers. Regular summaries of our findings will be given to the school and will be available to interested families. We will not identify the school, teacher, or any students including your child in any reports of the research.

Will the research be published? Could my child be identified from any publications or other research outputs?

The research findings may be published in various forms such as reports, academic papers, or presentations. However, we will not identify the school, teachers, or individual students in any reports or publications. We will take steps to ensure that you cannot be identified from the research outputs. As this research is part of a PhD thesis, a copy of the thesis will be deposited both in print and online in the Oxford University Research Archive where it will be publicly available to facilitate its use in future research.

On a practical level, our research team will also have access to the research data, however you and your child's name will not be included in this data.

Who do I contact if I have a concern about the research, or I wish to complain?

If you have a concern about any aspect of this research, please contact Anushay Mazhar (lead researcher, anushay.mazhar@education.ox.ac.uk) or Katharina Ereky-Stevens (katharina.ereky@education.ox.ac.uk). If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter as soon as possible: ethics@socsci.ox.ac.uk

What should I do next?

Please fill in the consent form and return it to your child's teacher or email Anushay (anushay.mazhar@education.ox.ac.uk). Please remember that you may withdraw at any time and without giving a reason, by notifying the researcher or your child's teacher.

Further Information and Contact Details

If you would like to discuss the research with someone beforehand (or if you have questions afterwards), please contact:

Anushay Mazhar

Anushay.mazhar@education.ox.ac.uk
+92 3233291343

Appendix E

Exploring Early Childhood Education in Pakistan

ExECEP

Lead Researcher: Anushay Mazhar
E-mail: anushay.mazhar@education.ox.ac.uk
www.education.ox.ac.uk/people/anushay-mazhar

Parent Consent Form

Central University Research Ethics Committee (CUREC) Approval Reference: EDUC_C1A_23_247

- Your child's school has agreed to take part in a study run by the University of Oxford looking at how Pakistani children develop skills and learn.
- If your child takes part, a researcher will come and visit them at school, do some activities and play some fun games with them.
- To find out more about the study, please read the attached information sheet. You can e-mail us at Anushay.mazhar@education.ox.ac.uk, or call Anushay on +92 3233291342 if you have any questions.
- We ask for your mobile number so that we may contact you in case there is some missing information.
- Please fill in the form below and return it to your child's class teacher as soon as possible to let us know whether you would like your child to take part in our study or not.

- - - -

Appendix F

Exploring Early Childhood Education in Pakistan
ExECEP

School Name:
_____

Parent Questionnaire

1. What is your child's name?	
2. What is the sex of your child?	❒ Girl ❒ Boy
3. Date of Birth of child:	Day_____ Month_____ Year:_____
4. How old is your child?	Years_____ Months_____
5. What is your name?	
6. How are you related to the child?	❒ Mother ❒ Father ❒ Grandparent ❒ Older brother/sister ❒ Other caregiver: _____
7. What is the mother's age?	
8. What is the highest level of education that the mother has completed?	❒ None ❒ Not completed primary ❒ Completed Primary ❒ Completed Secondary ❒ Completed O Levels / Metric ❒ Completed A Levels / Inter ❒ Completed Undergraduate / Bachelors ❒ Completed Master's ❒ Completed Doctorate ❒ Don't know ❒ Other _____
9. What is the father's age?	
10. What is the highest level of education that the father has completed?	❒ None ❒ Not completed primary ❒ Completed Primary ❒ Completed Secondary ❒ Completed O Levels / Metric ❒ Completed A Levels / Inter ❒ Completed Undergraduate / Bachelors ❒ Completed Master's ❒ Completed Doctorate ❒ Don't know ❒ Other _____
11. How many adults live in the house?	
12. How many children live in the house?	

13. Who lives at home with the child? (check as many as apply)	❒ Mother ❒ Father ❒ Grandparent ❒ Older brother/sister ❒ Younger brother/sister ❒ Other children: _____ ❒ Other adults: _____
13. What languages are spoken at home? (check as many as apply)	❒ Urdu ❒ English ❒ Other: _____
14. What language does your child feel most comfortable speaking and understanding?	❒ Urdu ❒ English ❒ Other: _____

PART 2: Home Environment

1. **Do you have any story/picture books or other reading materials at home?** ❒ Yes ❒ No

   If yes, how many books: _____

2. **Does anyone at home ever read to/with your child?** ❒ Yes ❒ No

   If yes, how often: ❒ once a week ❒ several times a week ❒ Almost everyday

3. **Does anyone at home ever help your child to learn the ABC or the alphabet or letters?** ❒ Yes ❒ No

   If yes, how often: ❒ once a week ❒ several times a week ❒ Almost everyday

4. **Does anyone at home play with or help your child to learn numbers, shapes or counting?** ❒ Yes ❒ No

   If yes, how often: ❒ once a week ❒ several times a week ❒ Almost everyday

5. **Does anyone at home tell your child any stories?** ❒ Yes ❒ No

   If yes, how often: ❒ once a week ❒ several times a week ❒ Almost everyday

6. **Does your child ever paint or draw at home?** ❒ Yes ❒ No

   If yes, how often: ❒ once a week ❒ several times a week ❒ Almost everyday

Part 3: Disability

1. Do you suspect or know that the child has any disabilities?	❒ Yes ❒ No
2. If so, what type?	❒ Communication/language ❒ Cognitive ❒ Sensory integration/attention ❒ Physical ❒ Visual ❒ Auditory ❒ Other _____

Appendix G

Exploring Early Childhood Education in Pakistan
ExECEP

Teacher Questionnaire

1. What is your name?	
2. Name of your school	
3. What your gender?	❒ Female ❒ Male
4. What is your age?	
5. What is the highest level of education that you have completed?	❒ None/Not completed primary ❒ Completed Primary ❒ Completed Secondary ❒ Completed O Levels / Metric ❒ Completed A Levels / Inter ❒ Completed Undergraduate / Bachelors ❒ Completed Master's ❒ Completed Doctorate ❒ Don't know ❒ Other _____
6. Do you have any specific training in ECE?	❒ Yes ❒ No ❒ If yes, which _____
7. How long have you been teaching the early years (pre-primary)?	
8. What languages do you speak? (check as many as apply)	❒ Urdu ❒ English ❒ Other: _____

1. Area the school is located in	
2. Curriculum used	
3. School Type	❒ Public ❒ Private ❒ Public but run by an NGO ❒ Private by run by an NGO ❒ Other _____
4. Number of students in your classroom	
5. Number of <u>other</u> teachers in your classroom	
6. Class timings?	

Appendix H

Exploring Early Childhood Education in Pakistan
ExECEP

School: _____
Teacher: _____
Date: _____
Researcher: _____

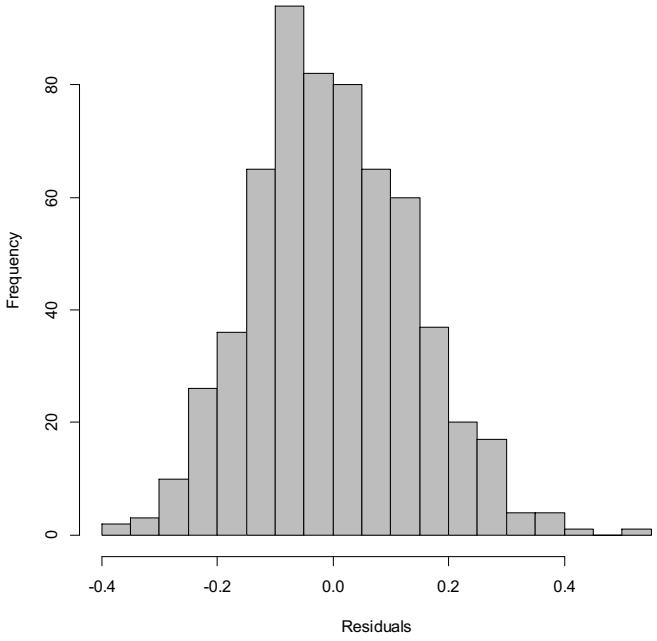
Caregiver Interaction Scale (CIS)

	Not at all true	Somewhat true	Quite a bit true	Very true
1. Speaks warmly to the children				
2. Is critical of the children				
3. Listens attentively when children speak to her				
4. Places high value on obedience				
5. Seems distant or detached from the children				
6. Seems to enjoy the children				
7. When the children misbehave, explains the reason for the rule they are breaking				
8. Encourages the children to try new experiences				
9. Doesn't try to control the children at all				
10. Speaks with irritation or hostility to the children				
11. Seems enthusiastic about the children's activities and efforts				
12. Threatens children while trying to control them				
13. Spends most time in activity that does not involve interaction with the children				
14. Pays positive attention to the children as individuals				
15. Doesn't reprimand children when they misbehave				

16. Talks to children on a level they can understand				
17. Punishes the children without explanation				
18. Exercises firmness when necessary				
19. Encourages children to exhibit prosocial behaviour, e.g., sharing, helping				
20. Finds fault easily with children				
21. Doesn't seem interested in the children's activities				
22. Seems to prohibit many of the things that children want to do				
23. Doesn't supervise the children very closely				
24. Expects the children to exercise self-control				
25. When talking to children, kneels, bends, or sits at their level				
26. Unnecessarily harsh when scolding or prohibiting children				

Appendix I

Pre-Numeracy Histogram of Residuals



Appendix J

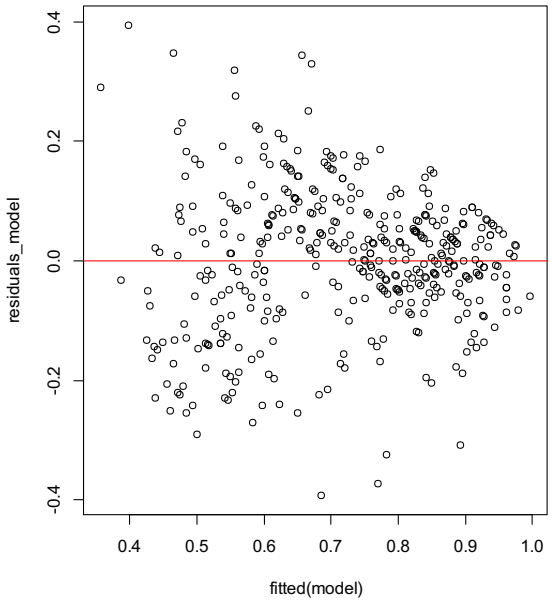
Descriptive Statistics of ECERS Items

Scale	Item	Mean	SD	Min	Max
Space and Furnishings	1 – Indoor Space	3.43	2.33	1	7
	2 – Furniture for Routine care, play, and learning	2.76	2.11	1	6
	3 – Furnishings for relaxation and comfort	1.14	0.53	1	4
	4 – Room arrangement for play	1.51	0.99	1	4
	5 – Space for privacy	1.08	0.44	1	4
	6 – Child-related display	2.39	0.70	1	5
	7 – Space for gross motor play	2.94	1.10	1	5
	8 – Gross Motor Equipment	1.75	1.23	1	6
Personal Care Routines	9 – Greeting/Departing	1.61	1.15	1	6
	10 – Meals/Snacks	1.67	1.58	1	7
	12 – Toileting/diapering	1.15	0.63	1	4
	13 – Health practices	1.47	0.61	1	4
	14 – Safety Practices	2.00	1.11	1	4
Language-Reasoning	15 – Books and Pictures	1.45	0.94	1	5
	16 – Encouraging children to communicated	2.48	1.71	1	7
	17 – Using language to develop reasoning skills	1.67	1.28	1	6
	18 – Informal use of language	2.61	1.89	1	7
Activities	19 – Fine more	2.20	1.30	1	6
	20 – Art	1.67	1.19	1	6
	21 – Music/Movement	1.43	0.64	1	4
	22 – Blocks	1.31	0.73	1	4
	23 – Sand/water	1.10	0.50	1	4

	24 – Dramatic play	1.18	0.48	1	3
	25 – Nature/Science	1.24	0.91	1	7
	26 – Math/number	1.86	1.18	1	4
	27 – Use of TV, video, and/or computers	1.31	0.76	1	4
	28 – Promoting acceptance of diversity	1.29	0.73	1	4
Interaction	29 – Supervision of gross motor activities	2.05	1.61	1	6
	30 – General supervision if children	2.20	1.75	1	7
	31 – Discipline	2.46	1.80	1	7
	32 – Staff-child interactions	2.98	2.48	1	7
	33 – Interactions among children	2.04	1.60	1	7
Programme Structure	34 – Schedule	1.43	0.78	1	4
	35 – Free play	1.47	0.81	1	4
	36 – Group time	1.82	1.57	1	7
Parents and Staff	38 – Provisions for parents	2.12	1.09	1	4
	39 – Provisions for personal needs of staff	1.96	1.36	1	7
	40 – provisions for professional needs of staff	3.18	1.99	1	7
	41 – staff interaction and cooperation	3.33	2.14	1	7
	42 – supervision and evaluation of staff	2.86	1.30	1	6
	43 – opportunities for professional growth	1.90	1.12	1	5

Appendix K

RQ3 Emotion Knowledge Model Residuals vs Fitted Plot



Appendix L

RQ1 Single Level Regressions

	Pre-Num	Pre-Lit	Emotion Know	Social Skills
Child Gender	.41*	.41*	.23*	.33*
Child Age	-.06*	.05*	-.03*	-.06*
Maternal Age	-.03*	.07*	.10*	.02
Paternal Age	.02*	-.04*	-.01	.04*
Maternal Edu.				
ME 5-8 years	.03*	.05*	.11*	.05*
ME 9-13 years	.15*	.10*	.17*	.15*
ME Higher Ed	.18*	.19*	.23*	.14*
Household Size	.10*	.10*	.20*	.07*
Number of Siblings	-.10*	-.08*	-.24*	-.12*
Languages	-.07*	-.11*	.01	-.05*
Books	.16*	.08*	.12*	.15*
HLE	.17*	.20*	.25*	.08*

Note. Standardised beta coefficients displayed. * = $p < .05$