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# Early Childhood Development and Education in Singapore

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# Empowering Teaching and Learning through Policies and Practice: Singapore and International Perspectives

Volume 2

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# Chapter 1
# Introduction to Early Childhood Development and Research in Singapore

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## 1.1  Why Is Early Childhood Development and Research Important?

Education and well-being care are important throughout life, but especially so during early childhood, a time characterized by profound neural change. Importantly, early life experiences and neurodevelopment, in turn, lay the foundation for the subsequent ways in which neurodevelopment unfolds. As neurodevelopment is influenced by both genetic and environmental factors, it is not surprising that the quality of early childhood experiences has been found to have short- and long-term impacts upon individuals and society. For example, early environments characterized by relative responsiveness from caregivers (Fraley et al., 2013; Raby et al., 2015) may lead to academic and/or social competence even into adulthood. On the other hand, early childhood experiences with poverty and/or low socioeconomic status, exposure to parental mental health difficulties, forms of insecure attachment, and abuse or trauma have been linked to outcomes such as lower levels of school readiness, attentional problems, and/or difficulties in socioemotional development (e.g., Psychogiou et al., 2020; Fearon & Belsky, 2004; Dearing et al., 2001; Enlow et al., 2012).

Because early childhood education and care lay the foundation for the future, many countries worldwide are prioritizing early childhood development. Global institutions – including UNICEF, the World Bank Group, UNESCO, and WHO – have also focused on early childhood development in their work. For example,

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UNICEF promotes the importance of healthy brain development in early years through its "Early Moments Matter" campaign. Some of the efforts in this campaign include raising awareness about the topic, promoting investments in early childhood development programs, and supporting parents and caregivers to give their children the best start in life (Lake, 2017). WHO in collaboration with other partners[1] presents a global framework called the "Nurturing Care Framework" as a way for governments to think about supporting children by guaranteeing five inter-related components, namely, "good health, adequate nutrition, safety and security, responsive caregiving, and opportunities for learning" (WHO, 2018). This framework was created as a roadmap for the ways in which multiple groups (e.g., parents, caregivers, service providers, educational institutions, the private sector, governments and societies, academics, the United Nations, and academia) can strive to support children.

## 1.2   Singapore: Early Childhood Development and Research

The United Nations (UN) committee has praised the combined fourth and fifth periodic report of Singapore on the steps taken to execute the provisions of the Convention on the Rights of the Child (United Nations, CRC, 2017). These rights include those relevant to multiple aspects of well-being including their right to education, physical protection, food, education, health care, and opportunity. It recognizes the significant developments and investments that Singapore has made to improve the rights of the children, especially in early childhood education (Cheow, 2019).

There is a strong commitment to enhance the quality of early childhood development and education in Singapore. In 2012, Prime Minister Lee Hsien Loong first announced that the government would invest more substantially into the early childhood (EC) sector in Singapore and take on a more active role (Lee, 2012). This announcement was followed by several concrete actions. In 2013, the Early Childhood Development Agency (ECDA) was set up to manage and regulate childcare centers and kindergartens. In March 2018, the National Institute of Early Childhood Development (NIEC) was incorporated with Ms. Chan Lai Fung (then Permanent Secretary of Education, now Permanent Secretary of National Research Foundation), Ms. Lai Wei Lin (then Deputy Secretary of Education, now Permanent Secretary of Ministry of Law and Second Permanent Secretary of Education), and Professor Tan Oon Seng (then Director of the National Institute of Education, now Director of the Centre for Research in Child Development) as the first directors. Mrs. Loke-Yeo Teck Yong who previously led the establishment of Ministry of Education (MOE) kindergartens was appointed as Director of NIEC. The establishment of NIEC signals a major milestone in the early childhood sector for Singapore.

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[1] WHO, UNICEF, and the World Bank Group, in collaboration with the Partnership for Maternal, Newborn & Child Health the Early Childhood Development Action Network and many other partners.

Teacher quality has always been a hallmark of Singapore's education system. As such, NIEC, which is tasked to develop pre-service and in-service early childhood educators, will help raise the quality of teachers for the sector. Concomitant with the various national developments to enhance early childhood regulation, teacher professionalism and preparation is the recognition of the importance of research to inform and support policy and practice. The Centre for Research in Child Development (CRCD) at NIE was established to give more focus to research in early years with a view of longitudinal and large-scale research to better understand early childhood challenges and development for Singapore.

In 2012, the Singapore Ministry of Education published national guidelines for preschool teachers, called the "Nurturing Early Learners" (NEL) curriculum framework. The NEL curriculum framework guides preschool teachers who teach children aged four to six and is intended to improve the quality of teaching at this important developmental age. Furthermore, the NEL provides a common framework for preschool teachers to follow when it comes to pedagogical practices. Six early childhood education principles form the core of the NEL curriculum framework that is based on the idea of holistic learning. These help children become confident in the early years of their life. While preschools in Singapore do not necessarily have to follow the framework to the letter, they are encouraged to use it as a guiding framework.

A clear policy focus is to support economically disadvantaged children's access to high-quality preschool education. The government has invested in several programs such as KidSTART, Uplift, and KiFAS to achieve this. KidSTART provides health, learning, and developmental support to low-income families. KidSTART, and other similar programs, may help address some of the barriers that constrain children from such families from accessing good-quality early childhood care and education (ECCE). A new inter-agency task force – Uplift (Uplifting Pupils in Life and Inspiring Families Taskforce) – has also been created to promote inter-agency coordination. Different agencies are working under the Uplift umbrella to support and monitor the progress of low-income and vulnerable young children. Since the KidSTART pilot program started in 2016, the Uplift taskforce has reviewed its results (with more than 900 families receiving support through KidSTART) (Goy, 2017). The Kindergarten Financial Assistance Scheme (KiFAS) targets needy families who cannot afford to finance the education of their children. By subsidizing 90% of the monthly fees (or up to $82 SGD) per month, the KiFAS makes it more affordable for such families to send their children to eligible non-profit kindergartens. Additional help is available through several community organizations that are providing financial support to low-income families through different schemes to cover pre-school education (Tan, 2007). An important step in this direction has been a conscious effort to create platforms and opportunities for parents to develop a better understanding of the importance of holistic development among children and guidance on nurturing children as lifelong learners. The MOE, ECDA, and several other agencies are collectively involved in such efforts (MOE, 2012; ECDA, 2014).

In 2015, the NIE embarked on a Tier 3 project titled the "Singapore Kindergarten Impact Project" (SKIP). SKIP was the first large-scale local study examining how

the early educational environment affects children as they progress from Kindergarten 1 (K1) to Primary 1 (P1) (Goy, 2015). It marked NIE's deeper foray into early childhood education (ECE) research in Singapore.

With the enhanced emphasis on early childhood, there could not be a better time than now to introduce a book on early childhood in Singapore. The present edited book serves to chart the development of Singapore's early childhood sector. It also serves to consolidate the more recent research work that has been done in early childhood, specifically by researchers from the NIE.

## 1.3   Layout of the Book

The book opens with Prof. Oon Seng Tan and Jallene Chua's Chap. 2, "The Honeycomb of Early Childhood Development: A Big Picture Approach for Supporting Development and Education for Early Years." In this chapter, the authors stress that building character and competence from a young age is at the core of effective ECCE. This requires adopting a big picture approach involving multiple stakeholders and agencies. Therefore, they propose the "Honeycomb of Early Childhood Development" as a conceptual framework that tackles the essential and macro factors that make up early childhood development. The Honeycomb of Early Childhood Development comprises six important factors (the six "E"s): (1) economics, where they talk about ECD as an investment that is practical for the economy and beneficial for children when done early and strategically; (2) equity, where the importance of enabling access to ECCE for every child is highlighted; (3) essence, where they consider ECCE as a crucial phase of life that every child is entitled to; (4) education, where they discuss the types of curriculum and pedagogies that need to be incorporated together; (5) educators, where the role of preschool teachers, teacher education, and teacher policies are discussed; and (6) ecology, where the relevance of various stakeholders and parties in ECD is brought to attention. The chapter concludes with a message that Singapore would benefit greatly from this framework which can be used to drive research, policies, and practice in the future when it comes to the ECCE sector. Parents, educators, policymakers, and other important stakeholders involved in the early childhood journey may also use it as a guide.

In Chap. 3, "Pre-school Teacher Education in Singapore: Developments and Challenges," Dr. Nirmala Karuppiah reviews key policies and practices to improve preschool education quality and equity initiated in Singapore in recent decades. Efforts in four areas of improvement that have been identified by the MOE for the pre-school sector in Singapore are discussed – regulations, curriculum, training, and research. The author identifies the challenges Singapore faces in preschool education – lack of a stable and well-qualified workforce in the pre-school sector, stress and fatigue among preschool personnel, and challenges in working with young children and their families. Dr. Karuppiah believes that the setting up of the Centre for Research in Child Development (CRCD) in 2017 and the National Institute of Early

Childhood Development (NIEC) in 2018 has been a positive step forward in the Singapore government's commitment to invest and improve the provision of the quality care and education for young children and their families. The author concludes that much work involving changing mindsets and reviewing the goals of pre-school education in Singapore would be top priority in the next wave of change.

Chapter 4, "Early Learners Curriculum: Case of Singapore Early Childhood Education Working Toward Quality," investigates curriculum reform in Singapore that has been implemented to improve the preparation for and the quality of early childhood education (ECE). Dr. Heidi Layne describes the origin of the NEL curriculum framework for ECE as a child-centered ideology. First, the chapter contributes to an improved understanding of the meaning of learner/child-oriented curriculum in the field of ECE in Singapore. While the NEL curriculum framework recognizes the child's curiosity and ownership on learning, teachers must manage the process. The author believes that the creative component, which free play emphasizes, and which is also an important part of twenty-first century skills, is missing from the curriculum framework and from the teacher's talk. This calls for further analysis of the role of play in the NEL curriculum and further observations on the quality of play in Singapore. Second, using preschool teachers' reflections on the curriculum and professional practice, the author provides a better understanding of how the teachers interpret and use the curriculum. The chapter makes a case for teacher education programs that prepare teachers to follow such child-centered and inquiry-oriented curriculum.

In Chap. 5, "Researching Well-Being for Children with Low-Income Family Background in Singapore – for Whom and from Whose Perspective?," Dr. Layne, with Mardiana Abu Bakar, Mercy K. Jesuvadian, and Dhannea Rohaizad, discusses the need for a more holistic approach of well-being in early childhood pedagogy in the Singapore context, where interventions are set to meet the needs of individual children and their families and point to the diversity of families within the low-income categorizations. According to the authors, new diversities of Singapore society crisscross the socioeconomic demographics brought about by mixed marriages and immigration. Attention is also drawn to the current body of work on early intervention studies that tend to focus on the outcomes of child development and learning, rather than what is going on in the classrooms, or understanding the circumstances impacting children's and families' well-being. The authors make a case for a shift toward the new type of early childhood education where the child is the focus and where there is a greater emphasis on the quality of learning instead of only concentrating on outcomes. They feel that this is important for early interventions to be effective. The chapter also describes a research initiative on the Child Support Model (CSM) developed by NTUC First Campus. This CSM is a local (Singaporean) model aiming for holistic support (financial, learning, and social) for children from low-income backgrounds and their families. The authors explain why the CSM may provide a more holistic perspective in supporting the child's development, learning, and well-being. They also argue that analyzing the CSM can inform policy makers on how a process orientation can be meaningfully included in their intervention approaches when working with the range of diversities that families and children bring.

Chapter 6, "Early Childhood Intervention for Young Children with Special Needs in Singapore: Where We Have Been and Future Directions," provides an overview of early childhood intervention programs and research studies in Singapore. It traces the historical roots of early childhood intervention in Singapore followed by a description of the current ECI landscape that has seen a rise of ECI services. Drs. Xie Hui Chao, Yang Xueyan, and Kenneth Poon Kin Loong note that in contrast to earlier approaches that focused heavily on specialized intervention for these children with developmental needs, the newer approaches focus more on support within the preschool environment for the child with developmental needs. Such newer programs that are part of a larger continuum of services are described such as KidSTART, Developmental Support-Learning Support (DS-LS), Integrated Child Care Programme (ICCP), Early Intervention Programme for Infants and Children (EIPIC), and Circle of Care (COC). Through such programs, more and more young children with special educational needs have received intervention and are expecting to actively participate in the community, such as by attending a mainstream preschool. Based on a small but increasing number of studies conducted in Singapore, the authors present a summary of key findings from local research in the domains of identification and assessment, child profile and needs, inclusive education models/programs, support practices and support needs, as well as family-centered service provision. Drawing from a review of local studies, the final section of the chapter suggests three future directions for ECI in Singapore, namely: (1) enhancing systematic universal developmental screening and monitoring through the use of culturally appropriate instruments, (2) advancing toward inclusive early childhood education, and (3) providing professional development and training for ECI professionals. The authors conclude that to provide meaningful preschool experiences for every single child to reach the maximum potential of their development, collaboration and communications between early childhood education and early childhood interventions is needed.

Chapter 7, "Cross-Cultural Considerations for Adapting Valid Psycho-Educational Assessments," by Dr. Nicolette Waschl and Dr. Mo Chen, highlights the need for locally validated and culturally appropriate measures in Singapore and the factors that may influence the development and adaptation of such measures. The authors point out that because Singapore is at a crossroad of Asian and Western cultures and with advanced technological infrastructure, it stands out as an exciting place to examine and highlight issues of cross-cultural measurement and assessment and to develop smarter assessment tools. Concrete examples are used to show how the use of two broad types of measurement instruments – self- and other-report inventories and norm-referenced standardized tests – may be adapted in the Singaporean context. The chapter also discusses a new use of technology in psychological measurement (i.e., computerized adaptive testing) to allow for more individualized and efficient testing experiences, making assessment faster, smarter, and less expensive. Drs. Waschl and Chen propose that these are important steps in ensuring that constructs are measured accurately while developing a more accurate understanding of child development; without this, it becomes challenging to develop

and improve theories of child development both internationally and, specifically, in Singapore.

In Chap. 8, "The Importance of Positive Environments on Infant and Early Childhood Neurodevelopment: A Review and Preview of Upcoming, 'BE POSITIVE', Research," Dr. Anne Rifkin-Graboi considers animal and human research describing how brain development unfolds, especially in early life. The author highlights why early experiences are important in development, especially from a biological standpoint. The author's review of research demonstrating effects of the caregiving environment upon neurodevelopment shows gaps in the knowledge base, including how such relations unfold outside of low-risk North American and European homes and school systems. The author describes a new collaborative study in Singapore between CRCD and SingHealth, "BE POSITIVE," that aims to address these gaps starting in children four months to four years. The "BE POSITIVE" (Beginning Early: Singapore's Ongoing Study Starting in Infancy of Twenty-First-Century Skills, Individual Differences, and Variance in the Environment) study will focus upon environmental quality and aspects of child development including memory, emotion, pre-academics, and regulatory abilities and will collect data from approximately 1000 families at multiple points in time when underlying brain regions are likely to be exhibiting rapid growth. The author emphasizes the need for such research studies as essential to understanding the ways in which our early and subsequent experiences interact to influence outcomes and may foster greater acceptance of learning differences. Finally, the chapter considers the ways in which such research can be helpful in shaping interventions and policy to increase educational success and positively impact well-being.

Chapter 9, "Mindfulness in Early Childhood – Developing Twenty-First Century Competencies," discusses mindfulness-based practices in early childhood and how it can foster self-regulation and socioemotional competencies underlying twenty-first-century skills important for children to survive and thrive in a fast-changing world. Dr. Kiat Hui Khng presents that the skills required to be learned to practice mindfulness is minimal – breathing, walking, eating, listening – there is little new that needs to be learned except for the attitude and attention to which we bring to these everyday activities. Dr. Khng stresses that the influence of mindfulness on child outcomes is not restricted to the direct effects of mindfulness-based practices on the children who practice them; mindfulness in parents and teachers can impact the children they interact with in similar ways. Attention is drawn to mindfulness in the local school settings – how Singapore is performing when it comes to providing opportunities for direct child mindfulness training in schools, the state of mindfulness in teachers and parents, and how Singapore can improve further. The author highlights the need for future studies that will examine systems-level approaches involving teachers and parents.

Chapter 10, "Using Guided Play to Facilitate Young Children's Exploratory Learning," starts with a review of research highlighting the importance of exploratory play – i.e., children acquire cognitive, social, and motor skills as well as gain content knowledge through exploratory play, and their engagement in exploratory play is related to later developmental outcomes. Dr. Yu Yue presents empirical

studies that show that the guided play framework can facilitate young children's exploratory learning as it has the right balance between child-directed play and adult-directed instruction for optimal learning. The case of guided play is strengthened through studies from different nations that compare the effects of direct instruction, guided play, and free play on children's learning in the domains of numeracy and spatial skills, language and literacy, and self-directed learning. To apply guided play to the Singapore context, more research is needed to verify its cultural validity and parents' perceptions about it. If such research leads to positive findings, guided play has the potential to help educators, caregivers, and policy makers create a child-friendly and purposefully designed environment that promotes exploratory learning, in line with the principles of purposeful play and iTeach recommended by the NEL.

Drs. Stella Tsotsi and Yang Yang examine in Chap. 11, "Master Your Feelings: Emotional Competence in Early Childhood – Parent-Related Antecedents and Child Outcomes," the development and importance of emotional competence in early childhood. Through a review of international studies, they show that children's emotion understanding, emotion regulation, and empathy play an important role in a wide array of their behavioral, social, and cognitive development. Moreover, recognizing emotional cues and understanding their possible causes in the social environment has been shown to promote academic achievement. The discussion moves to the factors that affect children's emotional competence – research shows that parents play an important role in socializing children to understand and regulate emotions, and empathize with others, especially in early childhood. The chapter shows that most existing studies on emotional competence have been conducted among Western, especially European American, children, ignoring the important role of culture in children's emotional development. Therefore, the extensive findings in research in Western cultures may not necessarily apply in Singapore context and much remains unknown regarding emotional competence and its correlates among children in Singapore. The authors anticipate and describe that several ongoing projects and future projects in the Centre for Research in Child Development (CRCD) at Singapore's National Institute of Education may fill this gap by investigating Singaporean children's emotional development. Dr. Tsotsi and Dr. Yang also provide tips on how parents and educators can promote emotional competence based on international and local evidence.

Chapter 12, "Early Arithmetic Skills in Singaporean Kindergartners: What, When, and How?," addresses the development of arithmetic in early childhood. Drs. Pierina Cheung, David Munez, Ee Lynn Ng, Kiat Hui Khng, and Rebecca Bull review key factors across domain-specific and domain-general areas that may support the learning and development of arithmetic skills. The authors also present analyses on data from the Singapore Kindergarten Impact Project (SKIP), a large-scale project on preschool education, and find that children in Singapore have relatively strong counting skills and strong digit literacy. However, children's informal arithmetic skills can be further developed. The chapter concludes with some guidelines for promoting the development of early mathematical knowledge in the classroom and at home. Authors believe that by sharing basic research on child

development with teachers, they can be better equipped with the necessary information so that they know what to look for and can then use the information to analyze children's behavior.

In Chap. 13, "Harmonious Bilingual Development: The Concept, the Significance, and the Implications," Dr. Sun He demonstrates how Singapore society might benefit from implementing the notion harmonious bilingual development in early childhood development. It presents findings that have shown general links between bilingual input and use with children's language proficiencies and with their socioemotional well-being. The author believes that in Singapore, as in other bilingual societies, the key to achieving such harmonious bilingual development probably lies in the environment of children's mother tongue language learning. Decent mother tongue language and literacy input and use may promote child bilinguals' socioemotional and behavioral skills. Dr. Sun presents two cost-effective teaching approaches, namely, codeswitching and shared book reading, for their potential contribution to Singaporean children's mother tongue learning and harmonious bilingual development in a long run.

In Chap. 14, "Does Early Language Contribute to Socioemotional Functioning in Preschool and Beyond?," Dr. Shaun Goh provides a bird's eye view of what is known regarding the contribution of language to socioemotional functioning, especially in Singapore's multilingual environments. The chapter starts by providing a framework for understanding the early development of language and explains that language proficiency is a result of a complex interplay between multiple internal and environmental factors. However, it remains unclear if these same factors exert an equal importance across monolinguals and bilinguals, or among different languages of English, Mandarin, Tamil, and Malay. It then presents accumulating evidence from studies about the link between language and socioemotional functioning in early childhood. Although low language ability associates with three major clusters of low socioemotional functioning in childhood – behavioral, emotional, and ADHD type – the author concludes that very little is known about how these relationships come to develop, while even less is known among children who grow up learning two or more languages.

Dr. Ng Ee Lynn and Emily Meow examine in Chap. 15, "Preschool Teachers' Experiences of Work-Related Stress: A Pilot Study of Singapore Teachers," various international and local findings showing that teacher stress has serious consequences for both teachers and children, as well as for the quality of teacher-child interactions in the classroom. The review reveals that teachers may be exposed to many different job demands, which in turn lead to an increase in job strain, burnout, and exhaustion. Moreover, the review also reveals that teachers with access to job resources are more likely to report an increase in motivation and engagement at work, as well as increased job satisfaction. The authors present real-world examples of the ways in which job demands and resources interact to affect job satisfaction and well-being of preschool teachers in Singapore. Considering recent concerns about the high turnover rates of preschool teachers in Singapore and the scarcity of local studies on teacher stress, the authors argue that more systematic research is needed to understand the factors that contribute to teacher well-being.

This book is the first of its kind to cover the development of Singapore's early childhood sector and the latest research conducted by the NIE on early childhood. Most importantly, it is highly relevant for both practitioners and researchers. The topics covered in this book are focused largely on child development and education but also touch on teacher training, well-being, and the development of culturally appropriate assessment. Adopting a comprehensive approach, it is centered on the child, with a consideration of influences in the environment that can impact his/her development. It seeks to help readers understand that a child does not grow in a vacuum. Be it a practitioner in direct interaction with a child, or a researcher doing early childhood research, it will be helpful for him/her to take a holistic view and be mindful of the child as well as his/her environment. Readers will not only walk away with a fuller appreciation of early childhood in Singapore but will also be informed about possible actionable steps to take, both in practice as well as research. With the setup of NIEC and the rapid expansion of the early childhood sector in Singapore, there will be more than 1000 new early childhood teachers every year, for several years to come. This book will be a useful reference.

# References

Cheow, S. A. (2019, May 23). *UN commends Singapore on children's rights*. https://www.tnp.sg/news/singapore/un-commends-singapore-childrens-rights

Dearing, E., McCartney, K., & Taylor, B. A. (2001). Change in family income-to-needs matters more for children with less. *Child Development, 72*(6), 1779–1793. Retrieved from https://doi-org.libproxy.nie.edu.sg/10.1111/1467-8624.00378

ECDA press releases. (2014, September 20). *More resources for parents and educations in nurturing pre-school children*. https://www.ecda.gov.sg/PressReleases/Pages/More-Resources-For-Parents-And-Educators-In-Nurturing-Pre-School-Children.aspx

Enlow, M. B., Egeland, B., Blood, E. A., Wright, R. O., & Wright, R. J. (2012). Interpersonal trauma exposure and cognitive development in children to age 8 years: A longitudinal study. *Journal of Epidemiology and Community Health, 66*(11), 1005–1010. Retrieved from https://doi-org.libproxy.nie.edu.sg/10.1136/jech-2011-200727

Fearon, R. M., & Belsky, J. (2004). Attachment and attention: Protection in relation to gender and cumulative social-contextual adversity. *Child Development, 75*(6), 1677–1693. https://doi.org/10.1111/j.1467-8624.2004.00809.x

Fraley, R. C., Roisman, G. I., & Haltigan, J. D. (2013). The legacy of early experiences in development: Formalizing alternative models of how early experiences are carried forward over time. *Developmental Psychology, 49*(1), 109–126. https://doi.org/10.1037/a002785210.1037/a0027852.supp

Goy, P. (2015, June 1). *What's pre-school's effect on kids?* NIE skips to the chance. https://www.nie.edu.sg/docs/default-source/news-document/35005442%2D%2D-01_06_2015%2D%2D-st-st%2D%2D-first%2D%2D-b4.pdf?Status=Master&sfvrsn=0

Goy, P. (2017, August 21). *Promising feedback for KidStart scheme*. https://www.straitstimes.com/politics/promising-feedback-for-kidstart-scheme

Lake, A. (2017, January 18). *The first 1,000 days: A singular window of opportunity*. [Blog]. Retrieved from https://blogs.unicef.org/blog/first-1000-days-singular-opportunity/

Lee, H. L. (2012). *National Day Rally 2012: A home with hope and heart*. [Transcript]. Retrieved from https://www.pmo.gov.sg/Newsroom/prime-minister-lee-hsien-loongs-national-day-rally-2012-speech-english

MOE. (2012). *Nurturing early learners, a curriculum framework for kindergartens in Singapore – A guide for parents*. [Electronic copy]. Retrieved from https://www.ecda.gov.sg/growatbeanstalk/Pages/ArticleDetail.aspx?GBS=Ia3mRSU5UIj9xtKtgShuJptZkI0oQz6DBnSH0IjglKvH6SihrMgVsLcwCwHcjAqYGPYOsFAvHdjLDvy2dWCySK80E2OMar4wsdjIhwHXVQXfg4WoScjWno5TjZQKbhvx#.XzOT9ugzbIU

Psychogiou, L., Russell, G., & Owens, M. (2020). Parents' postnatal depressive symptoms and their children's academic attainment at 16 years: Pathways of risk transmission. *British Journal of Psychology, 111*(1), 1–16. Retrieved from https://doi-org.libproxy.nie.edu.sg/10.1111/bjop.12378

Raby, K. L., Roisman, G. I., Fraley, R. C., & Simpson, J. A. (2015). The enduring predictive significance of early maternal sensitivity: Social and academic competence through age 32 years. *Child Development, 86*(3), 695–708. https://doi.org/10.1111/cdev.12325

Tan, C. T. (2007). Policy developments in preschool education in Singapore: A focus on the key reforms of kindergarten education. *International Journal of Child Care and Education Policy, 1*(1), 35–43.

United Nations, Convention on the Rights of the Child. (2017). *Consideration of reports submitted by States parties under Article 44 of the Convention: Fourth and fifth periodic reports of States parties due in 2017, Singapore*. [Committee Report]. Retrieved from https://www.msf.gov.sg/policies/Children-and-Youth/Documents/Singapore%20-%204th%20and%205th%20periodic%20UNCRC%20Report.pdf

World Health Organization, United Nations Children's Fund, World Bank Group. (2018). *Nurturing care for early childhood development: A framework for helping children survive and thrive to transform health and human potential*. World Health Organization.

# Chapter 2
# The Honeycomb of Early Childhood Development (ECD): A Big Picture Approach for Supporting Development and Education for Early Years

**Oon Seng Tan and Jallene Jia En Chua**

**Abstract**   The power of education is far-reaching and universal, impacting people's capacity for adaptation in our world today. Singapore's dearth of natural resources necessitates a strong reliance on its skilled labor force, making education an especially important investment for this nation. Singapore's education system has been lauded for its successful outcomes, but the same success cannot be said for its early childhood system. Greater awareness toward the extensive importance of early childhood care and education (ECCE) has called for heightened efforts to holistically develop the sector in order to adequately prepare our children for the future. At this juncture, it is beneficial to understand early childhood development (ECD) with systematic thinking and connectivity to truly bring about transformation. In this chapter, we propose the honeycomb of early childhood development (ECD) to drive research, practice, and policies in ECD. It comprises six important factors: 1) economics, where we talk about ECD as an investment that is practical for our economy and beneficial for children when done *early* and *strategically*; 2) equity, where the importance of enabling access to ECCE for every child is highlighted; 3) essence, where we consider ECCE as a crucial phase of life that every child is entitled to; 4) education, where we discuss the types of curriculum and pedagogies that need to be incorporated together; 5) educators, where the role of preschool teachers, teacher education, and teacher policies are discussed; and 6) ecology, where the relevance of various stakeholders and parties in ECD is brought to attention.

**Keywords**   Early childhood education · Early childhood development

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Education is one of the most important investments for any nation and impacts on people's capacity for adaptation in today's knowledge-based economy and globalized society. From the time of her independence in 1965, Singapore, a country with hardly any natural resources, has always depended on the development of human resources as the key to her political and economic survival (Tan et al., 2017a, b).

In recent years, Singapore's education system has drawn global interest owing to her remarkable performance on international assessments of student performance such as the Trends in International Mathematics and Science Study (TIMMS), the Progress in International Reading Literacy Study (PIRLS), and the Programme for International Student Assessment (PISA). This can be attributed to multiple success factors, such as its responsive and differentiated learning system; its clear education goals, parental engagement, alignment of policies, practices, and preparation (Lee & Low, 2017); as well as its unique cultural and institutional arrangements and pedagogy (Deng & Gopinathan, 2016). While Singapore's primary, secondary, post-secondary, and higher education sectors are clearly well-invested in and among the best in the world by various yardsticks, the same cannot be said for the early childhood sector. To be truly cream of the crop, the excellence of Singapore's education system needs to extend to its ECCE sector, the "last frontier" we need to conquer.

How do we design good early childhood care and education? Firstly, an understanding of the aim of twenty-first century education is necessary. In the broadest sense, the aim is to produce a "good person" and "contributing citizen" (Tan, 2017a, b). Targeting these two goals, respectively, starts from fostering the two "C"s, character and competence (Colby et al., 1998), as early as during the early years. Character refers to a child's value, cultural, and dispositional set. Positive dispositions like self-directedness, resilience, diligence, and other intrapersonal qualities should be instilled during the early years, through parent-child connection and methods like play. Competence refers to a child's learning and thinking mindset. Prerequisites for future learning and thinking similarly need to be laid during the early years. For example, early year experiences with numbers build the foundations of mathematics in later years (e.g., Jordan et al., 2009; LeFevre et al., 2009), and experiences with narratives and stories build the foundations of learning and reading (e.g., Suggate et al., 2018; Zucker et al., 2013). In addition, relationships through caregiver mediation build roots, culture, values, and wisdom.

Second, implementation must take on a big picture approach through multi-disciplinary contributions and multi-stakeholder involvement. Here, a conceptual framework integrating the important systemic thinking and connectivity pertaining to ECD could be highly beneficial. We offer a big picture approach which is in some ways in trend with recent works on ECD such as that of Jay Belsky, Avshalom Caspi, Terrie E. Moffitt, and Richie Poulton, who collaboratively wrote a book entitled "The Origins of You: How Childhood Shapes Later Life," published by Harvard University Press. The authors are researchers who were involved in some of the most extensive and important research projects on human development around the world. The book speaks of human development as a "multidisciplinary science" (Belsky et al., 2020, p.6) that involves psychological science, neuroscience,

sociological science, as well as biological and public-health science. As noted by these researchers, it is psychological in terms of the need to understand emotion, cognition, and behavior; neurological as it unravels the mind and brain; sociological as it is linked to family, neighborhood, and community; and biological as its focus on genetics and health science concerns physical health and well-being.

Drawing inspiration from such contemporary works, we conceptualized and hereby propose the honeycomb of early childhood development (Fig. 2.1), a conceptual framework which brings together the essential and macro factors (called the six "E"s) that constitute the complete, holistic structure that should surround early childhood. The honeycomb lays the groundwork and provides impetus for constructing and improving the early childhood sector and can be used to drive research, policies, and practice in ECD. The six "E"s are the following:

1. Understanding the **E**conomics of ECD
2. Appreciating the **E**quity issues of ECD
3. Embracing the **E**ssence of ECD
4. Building the science and art of early childhood **E**ducation
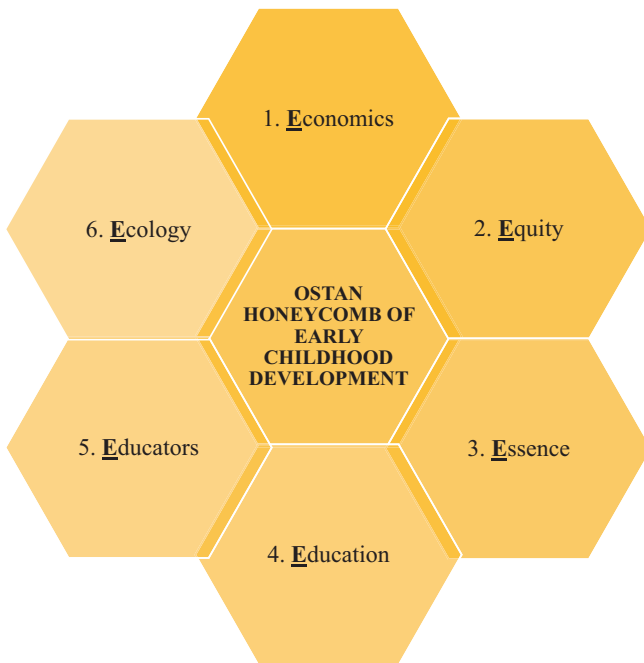


**Fig. 2.1**  OSTAN honeycomb of early childhood development
*Note.* The first author of this chapter, Oon Seng Tan, conceptualized the honeycomb model as an integrative and succinct way of framing and discussing key ideas surrounding early childhood development and is meant to be for illustrative and convenient purposes rather than prescriptive. Henceforth, we will be using the acronym OSTAN (for Oon Seng Tan) to represent his conceptualizations in upcoming sections

5. Empowering the **E**ducators (which include the caregivers) of the young
6. Knowing the **E**cology of ECD

While Singapore deserves merit for aggressively addressing the ECCE frontier in recent years[1], as we move forward, understanding early childhood development through the lens of this honeycomb framework could significantly help Singapore in her journey to transform the ECCE sector.

## 2.1   Understanding the <u>E</u>conomics of Early Childhood Development (ECD)

Early childhood development is an economic investment for the long haul, as ECD influences economic, health, and social outcomes for individuals and society for decades to come. The quality of ECD impacts people's capacity for adaption, value creation, capabilities for innovation, and adaptability for work life, health, and well-being. These are all critical factors for nation building, such as in terms of long-term economic benefits like workforce development and fiscal stability.

The Dunedin Multidisciplinary Health and Development Study, a longitudinal study of more than 40 years, followed the lives of 1037 babies in New Zealand since their birth (year 1972–1973), assessing health, development, and behavior at age 3, every two years from then till age 15, and subsequently at ages 18, 21, 26, 32, 38, and 45. The Dunedin study's enormous dataset led to the publication of over 1500 papers tracing life trajectories and development from early childhood to adulthood. Many factors in the early years such as health, environment, and temperament were found to impact lives at primary years, teenage years, and even adult years. For example, childhood self-control predicts physical health, financial success, and criminal behavior as adults (Moffitt et al., 2011). Poor neurocognitive functioning (Caspi et al., 2020) and even lead exposure (Reuben et al., 2019) during childhood predicts psychopathology and mental health issues in adolescence and adulthood. Belsky et al.'s (2020) book that was mentioned earlier also highlights how multiple forces during a child's early years often interact in various ways to predict who they will become later in life.

Evidently, the early years are extremely crucial. This is because during this time from birth to age five, "the brain develops rapidly to build the foundation of character and cognitive skills necessary for success in school, health, career, and life" (Heckman, 2012). Thus, investment should be done *early*, as early as possible. Professor Janet Currie, Chair of the Department of Economics at Princeton University, emphasized that increasing access to care for children during their early

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[1] Examples include: setting up the National Institute of Early Childhood Development (NIE) (Lee, 2017), increasing government-funded preschool places, installing comprehensive preschool facilities, improving mean-tested subsidies, and doubling annual spending on early childhood sector to more than S$2 billion per year from 2020 onwards (Yang, 2020).

years leads to better life outcomes for children and young adults, citing improved mental health and reduced death rates (Currie, 2018). She advocates the need for well-developed early intervention programs, health insurance, public housing, and food and nutrition programs.

The professional work of Nobel Laureate economist, Professor James Heckman, additionally suggests that investing in ECD will reduce deficits and strengthen the nation's economy. On the other hand, adverse early years environments will hinder the development of skills and abilities, lead to an increase of social costs, add to financial deficits borne by the public, and reduce a nation's productivity. Likewise, early childhood intervention for at-risk children at this stage is additionally effective for reducing social costs needed for availing special education, remediation, and rehabilitation (Heckman, 2012). Indeed, it is estimated that every \$1 invested in ECD yields a return of \$2 to \$17 (Heckman et al., 2010; Karoly, 2017; UNICEF, 2013), making investing in ECD more cost-effective in the long-term than investment at any older age (OECD, 2017).

Apart from investing early, ECD investment should also be done *strategically*. Cannon et al. (2018) conducted a research evaluation of 115 early childhood programs and found that aside from preschool, other types of early childhood interventions like home visiting, parent education, government transfers providing cash benefits, and programs with a combination of more than one of these approaches also produced positive child outcomes and generated positive economic returns. Thus, ECD investment should cover multiple bases and encompass all important components/outlets that have direct impacts on a child's development: 1) parents and caregivers, who are children's first teachers; 2) environment, which impacts children's experiences and growth; and 3) early childhood centers, where children receive quality early years programs to thrive holistically.

The types of interventions in these areas should be enlightened by research-based theories and evidence on early childhood development, such as those from neuroscience, brain studies, education, and psychological studies. For one, theories on cognitive development tell us that children learn through assimilation and accommodation (Piaget, 1971) as well as social interaction (Vygotsky, 1980), suggesting that investments should be made in, for example, developing sound early childhood education programs that capitalize on these cognitive processes and also in teaching parents to communicate with their children with pedagogical intent. Studies on brain development and neuroscience tell us that the brain develops rapidly and is incredibly plastic in the first 1000 days after birth, and thus investment should be made in, for example, ensuring high-quality infant care. For example, UNICEF's Early Moments Matter Campaign (UNICEF, 2017) was introduced based on evidence supporting the importance of the first 1000 days of life as a critical window of opportunity when the foundations of optimum growth and development across the lifespan are established. They propose nutrition, protection, and responsive stimulation as the three healthy ingredients of early childhood development and aim to make these accessible to children from underprivileged countries.

### 2.1.1   Parents and Caregivers

Parents, being the first adult figures that children encounter and their main caregivers, need to be equipped with the knowledge and skills on how to optimize the holistic development of their children, providing conditions that nurture and empower them to grow and become well-rounded individuals in the future. Investments should be made in providing them with knowledge about pregnancy and after birth care, including how to develop quality interactions, bonding, care and nutrition, security and safety, responsive caregiving, opportunities for early learning, etc. From a systemic point of view, investments should be made to establish support for families at three levels: 1) universal support, such as general health promotion and primary prevention; 2) targeted support, such as for at-risk communities; and 3) indicated support, such as for individual families with additional needs (e.g., disabilities). Currently in Singapore, public and private hospitals and parenting workshops are the main suppliers of knowledge pertaining to pregnancy care and after birth care. Having one of the best healthcare systems in the world, universal support is sound, but targeted and indicated support are often provided by non-profit organizations and may sometimes lack funding.

### 2.1.2   Environment

In terms of the environment, investments should be made into mitigating factors that disrupt the safe and efficient learning and growing environment for children, such as poor caregiver mental health, malnutrition, illnesses, injuries, neglect, maltreatment, and domestic violence. In a more physical sense, clean water, sanitation, and non-pollution are basic requirements. Singapore has one of the best environments for children in the world (Lee, 2018), where we ranked as the top country for children to grow up in, based on indicators like mortality rate, malnutrition, children out of school, child marriage, child homicide, child labor, and child population displaced by conflict. Nonetheless, support should always be in place to support children who may suffer from detrimental environments.

### 2.1.3   Early Childhood Centers

Lastly, there is a need to implement and sustain quality curricular and pedagogical integrity in early childhood centers. Investment is needed in teacher's training and professional development, teaching resources, children's learning aids, as well as indoor and outdoor learning spaces. Recent quantum leaps in the government's education budget for the sector suggest increased attention toward this area (Ministry of Social and Family Development, 2018). Forty thousand full-day preschool places

will be created by 2023, and provisions of mother tongue languages (MTL), such as MTL teacher training and increasing the number of Big Books, will be enhanced. The Early Childhood Industry Transformation Map (ITM) is a plan to increase innovation and productivity in EC centers, such as by streamlining day-to-day work processes with IT solutions and piloting with centralized catering and bus services. This will free up time and human resources to be focused toward children themselves.

## 2.2 Appreciating the Equity Issues of Early Childhood Development (ECD)

The inequity of early childhood development provision and care is a serious challenge (OECD, 2001). Deprivation from access to resources, opportunities, and experiences at the early years stage contributes greatly to deprivation from human flourishing in the future. For example, poverty experiences at 0–6 years have lasting effects on brain development, health, cognitive, and non-cognitive skills. More perilously, a lack of access to ECD in the early years affects the future of the child disproportionately, where children who start behind continue to stay behind and often cannot make up for lost ground (Burt & Roisman, 2010). Any gaps between children who have had and have not had access to quality ECD provisions fail to narrow in the years after early childhood (García & Weiss, 2017). Beyond that, a widening gap in life outcomes may only be a natural corollary. This suggests an urgent need to address equity issues as early as possible. The United Nations' goal for the early childhood sector, which is to have "by 2030, ensured access to quality early childhood development, care, and preprimary education for all girls and boys, so that they are ready for primary education" (United Nations, 2020), similarly reflects this importance. From a logistical point of view, investments of time and interventions required to close these gaps will also be less costly if done earlier during the early years.

To ensure that every child is afforded equitable opportunities and experiences at early childhood, policies on access and affordability need to be in place, ensuring the availability of universal access and funding models to support the lower socioeconomic groups, respectively. The Singapore Ministry of Education's vision is to provide "a strong start for every child," which reflects the core belief that the early years are truly a crucial time to nurture children and that every child deserves access to appropriate resources during this time regardless of their background. To advance this vision, the government is committed to increasing government-supported places to 80% by 2025, from just over 50% now (Yang, 2020). This implies an increased supply of places, thereby reducing competition and increasing the likelihood of greater participation across the population. These government-supported centers, mainly MOE Kindergartens (MK) (which also offer care services called Kindergarten Care, KCare), also stipulate school fees at affordable prices, enabling more families to access such services. The monthly fees for MK in 2020 are S$160 and S$320 for

Singapore Citizens and PRs, respectively, and the maximum monthly KCare fee is S$386 (Ministry of Education, 2020a). For comparison, the kindergarten and child-care fees of other private counterparts can cost from S$500 up to more than S$3000. In addition, the recent MK-EYC model, a collaboration between MK and Early Years Centres (EYC), provides continued access to quality and affordable preschool services for children aged two months to six years old (Kamil, 2018). Under the model, all eligible Singaporean Nursery 2 children who are enrolled at partnering EYCs will be guaranteed a Kindergarten 1 place in a nearby partner MOE Kindergarten in the year they turn five.

To further assist with affordability, Singapore has a funding model in place that provides support for other ECCE providers and families themselves. The Anchor Operator (AOP) and Partner Operator (POP) schemes encourage eligible operators to offer quality and affordable preschool programs and infant/childcare, respectively, by offering funding with the requirement that they maintain certain fee caps. Singapore has continued commitments to this, with plans to lower the fee caps further from January 2021. In addition, there are also means-tested preschool subsidies available such as the Additional Subsidy and Kindergarten Fee Assistance Scheme (KiFAS), which means needier families receive larger amounts. In January 2020, the gross monthly household income ceiling for KiFAS was raised to S$12,000 or S$3,000 on per capita income basis, and subsidy amounts across all income tiers were also increased (Early Childhood Development Agency, 2019).

The journey toward equitable early childhood care and education does not stop here. Apart from accessibility and affordability, there is also a need for inclusive-ness, where special attention needs to be paid to disadvantaged, vulnerable, and other diverse groups. The special needs sector in Singapore is decently developed, where there are private preschools that specifically cater to children with special needs and disabilities and other voluntary welfare organizations such as Early Intervention Programmes for Infants and Children Centres (EIPICs) and disability specific Voluntary Welfare Organisations (VWOs) that are often funded or sup-ported by the government. However, more can be done to improve inclusiveness in mainstream EC centers, similar to how there are support structures available for vulnerable children in mainstream primary schools and above, such as access arrangements and on-site allied educators and professionals to aid in learning and behavioral support, therapy, and counseling (see also Chap. 4).

To truly ensure that the entire sector is on board and to enable a greater system-wide support for the cause, there should also be quality assurance and standards for EC provisions in place, such as accreditation frameworks, protocols, and guidelines to ensure standardized enrollment and fair treatment, as well as staff professional-ism, where staff must be trained to be sensitive and embracing of children and fami-lies from all walks of life. All the above aspects mentioned should then come together to form system coherence and harmony.

Nevertheless, the issues and effects surrounding inequity are profound and go beyond the matter of money. The lack of money and socioeconomic resources gen-erates impacts that spill over to other areas of life, leading to more complex family disadvantages. Understanding inequity through the larger lens of family advantage

and disadvantage will improve how we approach policy making in this area. For example, equity formulas must look beyond extrinsic demographic indicators like family income, parental education, and housing but also consider measures that more closely impact child development such as appropriate parental guidance, nourishment, and positive encouragement. Although these factors are influenced by the amount of money the family has (e.g., insufficient income to purchase pricier foods that can be more nutritious and nourishing for the child or insufficient time to spend guiding children due to heavy work commitments), in order to truly lift families from their disadvantaged positions, policies require a more complex and multi-faceted approach that goes beyond providing economic resources and money. Instead, the truer measures gear toward looking at quality parenting, which encompasses stimulation, attachment, sensitive care, encouragement, and support provided for the child (see Chap. 7). By embracing these characteristics, Singapore can make significant progress in terms of equity.

## 2.3 Embracing the Essence of ECD

The developmental course from birth to young adulthood (approximately 18 years) is one where later stages are built upon earlier ones (see Fig. 2.2). Education hopes to develop contributing and resilient community builders by the time of around 18 years old. To do this, it is crucial to understand that many of these characteristics are built from the early years. This makes ECD more than just a desire for our children but a prerogative that would set children on the right path in the future. ECD is thus a life phase in its own right, a phase that every child is entitled to and a phase where every child deserves equal opportunity to fulfill their potential with dignity. This importance is also reflected by the World Health Organization (WHO)'s vision, which is for "every child to develop their full potential, leaving no child behind," as well as their Nurturing Care Framework for Early Childhood Development (WHO,
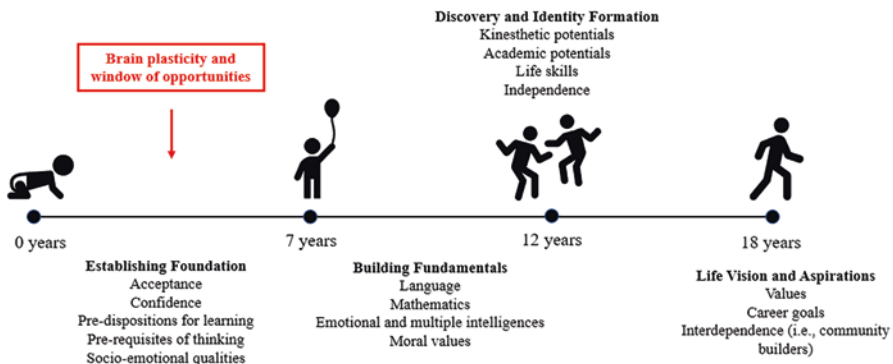


**Fig. 2.2** The developmental course from birth to young adulthood

2018), which consists of five inter-related and indivisible components of nurturing care that will help children reach their full potential. Additionally, according to the United Nations Conventions of Rights of Children, early childhood education should aim to maximize every child's fullest cognitive, emotional, and creative potentials. Every child is also entitled the right to be able to survive and thrive; be provided with a safe, secure, and loving environment; and be given the right nutrition to grow.

During the phase of 0–6 years, brain plasticity is present where the child is most susceptible to environmental influences, and it is the window of opportunity to lay foundations of health, well-being, learning, and productivity for childhood, adolescence, and adulthood. This is because the brain is developing and transforming rapidly during this time, especially from 0 to 3 years. During this stage, a child's brain develops an abundance of synapses, producing impressive brain plasticity that enables the brain to learn new skills at a much faster pace than the pruned adult brain (Charlesworth, 2017). Although different brain regions have varying developmental trajectories[2] (Dean et al., 2015), by 6.5 years old, 95% of the brain has already reached its peak volume (Gerber et al., 2009).

Early childhood development can be said to be a function of genes, environment, culture, and contexts. The genes component is intrapersonal, largely determined naturally and hereditarily. The environment component is interpersonal, determined by the child's surroundings and how the child interacts with them. Culture is intergeneration, referring to teaching and social behaviors as well as ways of life that are being passed down from generation to generation. Contexts refer to curated situations where nurture and care are provided for the child. While genes, culture, and to a certain extent the environment (e.g., the type of country and natural environment you are born in) are largely fixed, the contexts provided for the child can be controlled by the adults around the child. Childhood contexts and experiences interact with neurodevelopmental processes (Center for High Impact Philanthropy, 2015). An adverse atmosphere, such as deprivation or harmful exposure and stress, fails to build and maintain important brain connections, damaging brain development in a lasting manner (Perry, 2002). Thus, during the time where the child's brain is highly plastic and susceptible to such contexts (i.e., critical period), we need to give sustained attention and dosage to the child's growth, encouraging the development of caring behavior and strong cognitive capacities that will benefit them long into the future. Here, parents, caregivers, and teachers should know how to hone appropriate contexts for the child at and from the point of birth. Firstly, they need to provide physical protection, warmth, and sensitive care. This generates countless positive compounding effects for the child's future. For example, protection, warmth, and care create a sense of security in children, which can build self-esteem, acceptance,

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[2] For example, the cerebellum, which is mainly responsible for motor control such as movement and balance, grows rapidly in the first few months after birth; the hippocampus and amygdala, responsible for memory and emotion, grows substantially in early years; the prefrontal cortex, responsible for higher order processes like planning and regulation, continues to grow even in adolescence.

and confidence in later years. This can then impact factors like pro-social behavior and diligence, which further build perseverance and resilience in teenage and adult years, respectively. Secondly, adults should encourage and create learning opportunities for children inside and outside the classroom. These experiences similarly lay the prerequisites for the child's future in terms of academic learning and reasoning. Altogether, these can be done through providing rules, routines, rituals, storytelling, responsive and intentional interactions, and active play.

The benefits of quality experiences and contexts during the early years are far reaching, and this is also similar for the converse where a lack of such quality contexts generates lasting negative impacts. More importantly, these impacts are longer lasting than we think. Research has shown that early deprivation creates marks on genetic endowment that are expressed in future generations. That is, early life experiences can have not only lifelong but also transgenerational effects on neurology and behavior (Roth, 2012). This is due to molecular changes such as sustained change in DNA methylation, which involves chemical modification and silencing of gene transcription (Meaney, 2010).

Understanding the gravity of poor ECD would lead us to strongly believe that the early childhood sector is truly a necessity. It is one that allows us to give children better, wider, and deeper opportunities for active play, a sense of belonging, and communication, something that they deserve in order to grow healthily and something that will benefit generations to come. Thankfully, Singapore provides many of such ECCE services that span the entire early years age range from 0 to 6 years. Singapore has kindergartens, which provide preschool developmental programs for children aged 2 to 6, including playgroup, pre-nursery (or Nursery 1), nursery (Nursery 2), Kindergarten 1, and Kindergarten 2. Most kindergarten sessions range between 2 and 3 hours for playgroup and pre-nursery and between 3 and 4 hours for nursery and Kindergartens 1 and 2. Singapore also has childcare centers, which additionally provide childcare services from age 18 months, with some even providing infant care programs for 2 to 18 months old. Definitely, aside from ECCE services, parent education is crucial to support the development of children from pregnancy to 3 years, as they would be spending more time with parents during this time as compared to when they are a little bit older at 3 to 6 years.

## 2.4 Building the Science and Art of Early Childhood Education

*Children are born ready to learn. We don't have to make them ready to learn. We don't have to teach them how to learn. They are wired from the beginning to learn, and they're wired to experience and to master the world around them.* (Shonkoff, 2005)

Every child is born a learning child. Our job as parents, teachers, policy makers, and adults in this world is to welcome every child with open arms, into a world where we provide them with the optimal environment to learn, pursue development,

and thrive. As ECD involves interaction between the child and the environment, adults should support the quality of this interaction by selecting stimuli that is most appropriate for the child's enhanced and effective functioning. This concept is rooted in the mediated learning experience (MLE; Feuerstein, Klein, & Tannenbaum, 1991; Feuerstein, Rand, & Rynders, 1988), in which adults are often the mediating agents, guiding children and offering opportunities for their learning. Appropriate conditions foster the mediation of intentionality and reciprocity, meaning, and transcendence, the three parameters necessary for mediated interaction to take place (Chua et al., 2017). Tan and associates explain that intentionality and reciprocity refer to adults not only having clear intentions and aims to design stimuli for the child but also communicating these to the child and gauging their response. Meaning refers to communicating the significance of said mediated experience to children and in the midst helping them develop positive life aspirations. Transcendence refers to going beyond the immediate primary goal of interaction and leading children toward wider, more important goals, which will build future adaptability to changing environments (Tan et al., 2017a, b).

There is an ancient saying that aptly encapsulates the idea of mediated learning; it goes, "Train up a child in the way he should go, and when he is old, he will not depart from it." To "train up a child," we need to nurture, educate, and cultivate children interactively, intentionally, and sensitively. We should also do this "in the way he should go," meaning responding to each child's personal interests, tastes, as well as mental, physical, and psychological inclinations, taking a child-centered and customized approach. Doing these will ensure that "when he is old, he will not depart from it," where the architecture laid for the child will form foundations that will equip him or her for life. Understanding this ancient wisdom can inspire curriculum and pedagogy design in early childhood education.

### 2.4.1   Early Childhood Curriculum

Johann Heinrich Pestalozzi, a Swiss pedagogue and educational reformer in the seventeenth century, believed that education should develop the powers of the "head," which refers to knowledge and understanding; the "heart," which refers to passion and belief; and the "hands," which refers to activity and skill. This translates into cognitive and language development, socioemotional development, and physical development in the modern domains of child development. The curriculum of early childhood education programs needs to be designed intentionally to target these holistic needs, fulfilling age-appropriate developmental milestones in these domains. To accomplish this, we propose that EC curriculum should have the following seven elements (see Fig. 2.3) each targeting different "powers" or developmental domains. Altogether, they form the STEWARD curriculum. Do note that the STEWARD curriculum is an illustration of the key elements we feel are most crucial to early childhood curriculum and is not meant to be all-embracing or prescriptive in the Singapore context. Having said that, Singapore's Nurturing Early

**Fig. 2.3** OSTAN
STEWARD curriculum



**OSTAN
STEWARD CURRICULUM**

Learners (NEL) Kindergarten Curriculum Framework does capture many of the proposed aspects in the STEWARD curriculum. As the NEL is still being revised and refined, we believe that the STEWARD curriculum can offer additional elements for consideration that will be beneficial if also captured under the NEL.

### 2.4.1.1  Social Emotional Care

Firstly, social emotional care is of primary importance, as social emotional development determines other areas of life like how the child would interact with their experiences, environment, and ecology. Figure 2.4 is an example of what social emotional care consists of and how they can be illustrated. These aspects include: self-awareness and esteem, confidence and self-acceptance, managing emotions, motivation, listening and receiving, and building a relationship. Developmentally appropriate and culturally responsive practices, along with caregiving routines that provide safe, secure, and healthy environments for children, need to be incorporated.

### 2.4.1.2  Tools for Motor Skills

Secondly, children need to be provided with the tools for motor skills, supporting fine and gross motor development or physical development. This can include tools specifically designed with pedagogical intent to optimize children's development at each developmental level (e.g., factory-designed toys sold in commercial and department stores with specific purposes in motor development). If such specifically
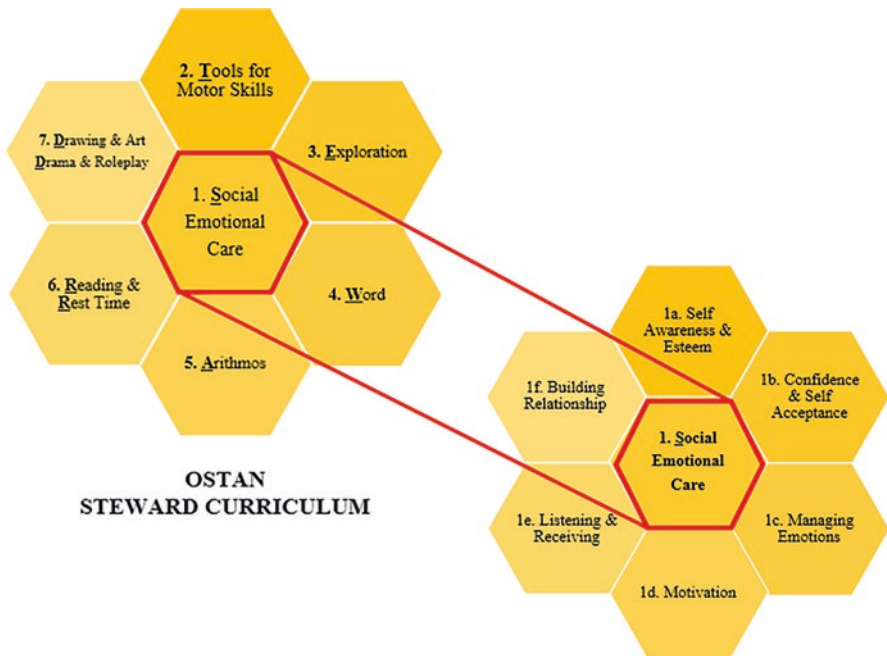
**Fig. 2.4** Example illustration of OSTAN honeycomb of social and emotional development, part of OSTAN STEWARD curriculum

designed equipment are not available, adults can also repurpose items that are used and found in everyday life as functional teaching tools for children (e.g., encouraging the use of typical objects like chairs, stools, chopsticks, etc. among children to train specific motor development skills).

### 2.4.1.3 Exploration

Next, children should also be given the tools, objects, and opportunities to explore and learn on their own. As mentioned by Dr. Jack Shonkoff, children are born ready to learn. These learning desires often surface in curiosity and inquisition. Thus, this should be supported not impeded. Children should be given the space to be active, to explore, and to develop their feelings of competence in multiple intelligences. When given rich opportunities to explore on their own, children are capable of generating strategies to overcome obstacles. On the other hand, without the understanding of how important exploration is, adults may create unwarranted hindrances to children's desires to explore and their intuition to constructing knowledge, stunting development (see also Chap. 11).

### 2.4.1.4   Word

Children need to have exposure to words to foster their language development. This includes storybooks, narratives, and so on. Adults should also place emphasis on communication, as children often pick up words and language through communication and interaction with others. Since the adults' role of talking and responding to children is key to encouraging language development here, the environment can be designed to maximize such communicative opportunities. For example, labels, questions, letters, words etc. can be put up on the walls in classrooms as conversation prompts for adults to spark interaction with young children. An abundance of other types of designs such as pictures, posters, decorations, videos etc. can also be used as topics for conversation. These environmental cues can be switched up occasionally or can differ across classrooms of different ages to suit their developmental level.

### 2.4.1.5   Arithmos

Children also need to gain exposure to numbers at an early age, which supports numeracy development and problem solving. This can be done through many methods, such as using physical manipulatives to teach quantity and using real-life scenarios to teach problem solving. Arithmos can also be intentionally incorporated into adult-child conversations, where adults can capitalize on interactions to bring up numeracy-related topics (e.g., "Oh look, we added your drawing to the wall, how many are there now?"). Numeracy can also be taught through fun activities that children can enjoy such as baking and cooking.

### 2.4.1.6   Reading and Rest Time

Incorporating reading into early childhood curriculum will not only foster language development but also lay the foundations for future literacy and comprehension skills. Rest time is also highly important for recovery and development, as sleep aids in learning and retention by helping children's brains process, organize, and consolidate information. They also keep children healthy and happy by helping them recover and regain their attention and energy. It is also important for children to stick to a structured routine for their naps at school. Besides sleep, there are also other restful options to allow children to have some down time such as engaging in quiet activities like puzzles and coloring.

#### 2.4.1.7  Drawing and Drama

Drawing and art promotes fine motor skills, whereas drama and roleplay promotes gross motor skills and encourages imagination and theory of mind. Importantly, they are both aesthetic experiences which allow for the healthy expression of creativity, as well as feelings, thoughts, and desires. Drama also allows children to take on roles within social contexts, learning important interactive and communication skills like turn-taking and negotiation. They also help with self-awareness and self-identity.

### 2.4.2  Early Childhood Pedagogy

How should we implement the early childhood curriculum? Early childhood pedagogy should be child-centered, focusing on what children like and enjoy. The ACTIONS framework (Fig. 2.5) shows the types of mediums and characteristics that can be incorporated into early childhood pedagogy which are enjoyable and relatable to children. The ACTIONS framework can be used as reference for

*OSTAN ACTIONS Pedagogy Framework*



**OSTAN**
**ACTIONS PEDAGOGY FRAMEWORK**

**Fig. 2.5**  OSTAN ACTIONS pedagogy framework

pedagogy planning in Singapore, which also has the NEL iTeach principles that guide planning, designing, and facilitation of learning experiences for children. Similar to how the NEL curriculum framework and STEWARD curriculum can be useful together, we believe that the ACTIONS pedagogy framework can also be useful together with the iTeach principles and that they can be used in conjunction with each other. For example, while iTeach principles focus on general guidelines for educators to follow (e.g., "encouraging children through purposeful play"), the ACTIONS framework contain specific elements and mediums that educators can adopt to follow through with these guidelines (e.g., using comedies, tales, and songs during purposeful play).

Animation helps children to imagine and develop representations of things, comedy is vital to children's happiness and their love for humor can foster memory, and tales are very powerful and influential with children, helping them understand larger concepts. Pedagogy should also incorporate inquisitiveness, allowing for curiosity, investigation, and questioning. At the same time, adults should be clear on the learning objectives of these activities and have a timeline of progressive learning. A nurturing element should also be incorporated, where care for others should be emphasized. Here, the nature and environment can also be used to nurture. Lastly, song and music, like other tools mentioned, are also highly powerful and influential in engaging children and imparting knowledge and experiences.

### 2.4.3   The Value of Play

The science and psychology of learning can be informed by both behaviorist and cognitivist perspectives. Behaviorism tells us that we learn by associations between stimuli and responses, resulting in learned behavior (e.g., Bandura et al., 1963; Hull, 1943; Skinner, 1963; Watson, 1913), whereas cognitivism tells us that we learn by processing and relating new information to known ones in memory (e.g., Bruner, 1961; Piaget, 1971). Integrating behavioral and cognitive science, we postulate that our brain is highly stimulated by and learns via two important systems (see Fig. 2.6): the patterning system, which refers to habits and repeated experiences, and the inquiry and problem-based system, which refers to novel things and experiences.
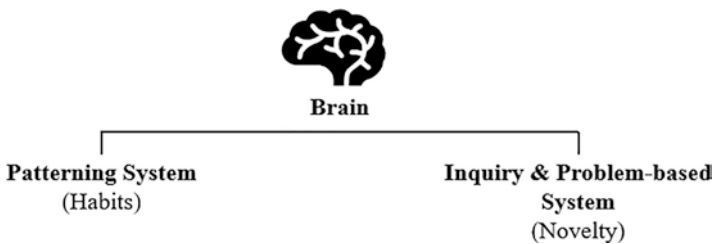


**Fig. 2.6** The two systems of learning

Children learn well by habits and patterns, which commit well to their memory and teach them to imitate, generalize, and model to future situations. Thus, it is often recommended to provide children with rules, routines, and rituals to capitalize on their patterning system and to cultivate proper behavior. However, in order to continuously learn new things, children also learn by the inquiry and problem-based system, where the act of seeking and understanding novel objects and experiences contributes to their knowledge base, and where ambiguity serves as the opportunity to learn things that were previously unknown.

Thus, on top of providing children with rules and structure, adults also need to constantly provide new environments to stimulate learning. Here, the value of play is tremendous. Research shows that play contributes to intellectual attainment, cognitive and metacognitive development, linguistic development, socioemotional learning and well-being, as well as self-regulatory abilities, development of independence and resourcefulness, and self-agency (Ahern et al., 2011) (see also Chap. 11). These attributes are important for future adaptability to economic, social, and environmental challenges. In general, there are seven fundamental types of human play: kinesthetic, fine motor, coordination, object, multiple imagination, roleplay, and games (Fig. 2.7). Each type of play supports a range of cognitive and emotional developmental goals, teaching various cognitive and non-cognitive skills. For example, roleplay teaches children how to take turns to take on different characters and can impart trust, self-control, tolerance, empathy, etc. Games can also teach self-control and perseverance. Just like how it is healthy to eat a balanced meal incorporating different macronutrients, children should also have exposure to a

**Fig. 2.7** OSTAN honeycomb of play



*OSTAN Honeycomb of Play*

range of play experiences, obtaining a good balance between the different play types and adopting a healthy play "diet".

Despite the benefits of play, the opportunities and support for children's play is under threat in many places around the world due to increased urbanization. Firstly, there is often a lack of access to the nature and the outdoors in urban cities, a powerful setting for play to take place. Secondly, the crowded city-life environment tends to result in a risk-averse society with tremendous amounts of stress and competition. Parents may allow stress from work to spill over into household territory, affecting children's emotions. Over-supervision and "helicopter parenting" may lead to parents restraining opportunities for play for their children with the misguided interest of protecting them. There may also be overscheduling of stereotypical learning activities (e.g., academic-focused tuition and homework), which, while having their merits, are sometimes misinterpreted by parents as the golden method to put their child "ahead of the rat race as early as possible."

The above is especially true in competitive societies with tensions in their educational systems, such as Singapore. Parents and educators need to appreciate the role of play in children's lives, and thus policies need to be in place to promote such awareness and change the attitudes of adults regarding children's play. On top of that, parents and educators need to know *how* to let children play. Even if toys and games are in abundance, play will still be poorly activated if parents and educators are inadequately prepared and knowledgeable in the methods of using play optimally. This also extends to the wider system involving preschools, who need to have appropriate support arrangements for risk-taking play such that children develop resilience through risk instead of severely hurting themselves, and even educational design companies and organizations, who should be informed on pedagogical design in order to develop "productive" toys, gadgets, and activities.

Nonetheless, the curriculum and pedagogy creations in Singapore have come a long way and is worthy of praise. Innovation is encouraged through funding of grants and research projects. The sharing of ideas and resources across the sector is also critical and supported by top-down and ground-up initiatives. Through this, the Nurturing Early Learners (NEL) Kindergarten Curriculum Framework, mentioned briefly earlier, was designed for educators to provide preschool education (4–6 years) that: 1) nurtures curiosity so that they can explore and discover the world, 2) encourages active learning so that they can learn by experimenting and experiencing, and 3) fosters their competence so that they can develop their thinking and reasoning skills (Ministry of Education, 2020b). The six key learning areas in the curriculum are 1) aesthetics and creative expression, 2) discovery of the world, 3) language and literacy, 4) motor skills development, 5) numeracy, and 6) social and emotional development. Holistic development in these areas is nurtured by planning appropriate learning experiences for children, planning for routines and transitions, as well as field trips. The Early Years Development Framework (EYDF) for the age of 2 months to 3 years was introduced in 2011 to complement the NEL framework, showing consistency in the intentionality to support children's holistic development and learning (Tan, 2017a, b). Together, the NEL and EYDF provide a seamless and coordinated approach to the care, development, and learning of children from

infancy through to age 6. As part of the frameworks, purposeful play, authentic learning contexts, and cooperative learning strategies are used by educators to facilitate the learning process (Ministry of Education, 2013). Similar to how piling works lay the foundations for a building amidst construction, having carefully curated and designed curriculum and pedagogical frameworks are paramount in laying foundations for our children to succeed in the future.

## 2.5   Empowering the Educators of the Young

Apart from parents, the next main educators of the young are the early childhood teachers and caregivers, who spend sizable amounts of time with children when their parents are occupied with other commitments like work. Thus, educators need to know how children learn best, and they must be proficient *designers* of the learning environment in order to make the environment an inviting, optimizing, and stimulating one. Thus, from a policy perspective, our teachers and caregivers need to be empowered and trained to be at the forefront of the ECCE sector.

In a broad sense, all twenty-first century teaching professionals need to embody the following attributes: learner-centered values, appropriate teacher identity, service to the profession and community, and the desired skills and knowledge (National Institute of Education, 2010). In order to build this, there should be teacher policy strategies in place at multiple stages of the profession. For example, there should be policies for recruitment of quality candidates and quality initial teacher preparation at the start, good compensation and incentives for teacher retention, and subsequently career and professional development structures for continued and sustained performance (see also Chap. 5). While this has been done for teachers at the primary level and above in Singapore, a similar system is lacking for the educators in the early childhood sector. Figure 2.8 shows the type of teacher policies that need to be in place for the sector.

While many of these teacher policies are similar to that of teacher policies for primary level and above, teacher preparation for early childhood is incredibly unique and will have to be different from that of teachers teaching the primary school level and above. This is because the curriculum and pedagogy required for the early years are quite special as discussed in the previous section, involving knowledge and skills in multiple domains. Thus, our teachers need to be well equipped with the capabilities to impart all of these holistic aspects. Based on literature research and study visits to various countries, pre-service ECCE teacher programs should incorporate the following design and curriculum in order to do so. Firstly, all ECCE teacher programs should have both theory and practicum components (see Fig. 2.9). The theory component builds a firm knowledge base for trainees, as well as allows them to learn about the strategies and skills for putting theory into action. A practicum offers the opportunity for these techniques to be executed and helps trainees understand the complexities of teaching as well as how knowledge from learning and developmental theories can be integrated into practice.
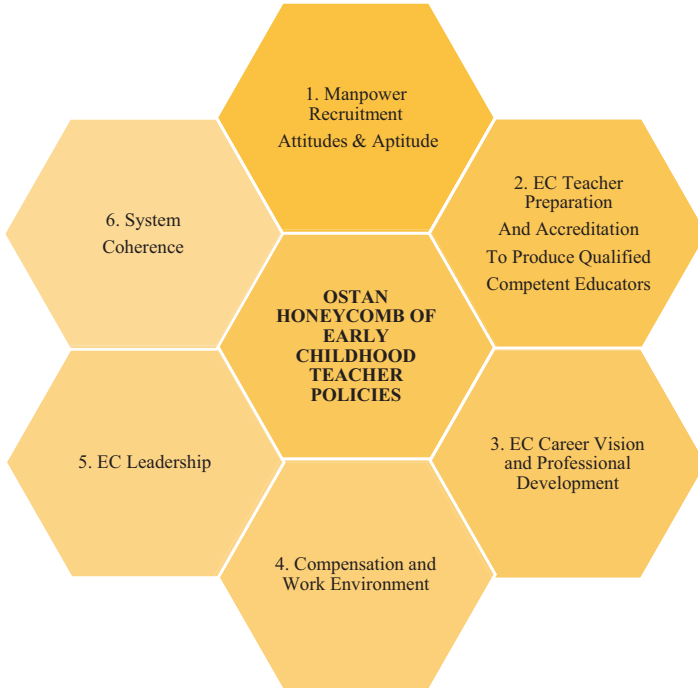
**Fig. 2.8** OSTAN honeycomb of early childhood teacher policies
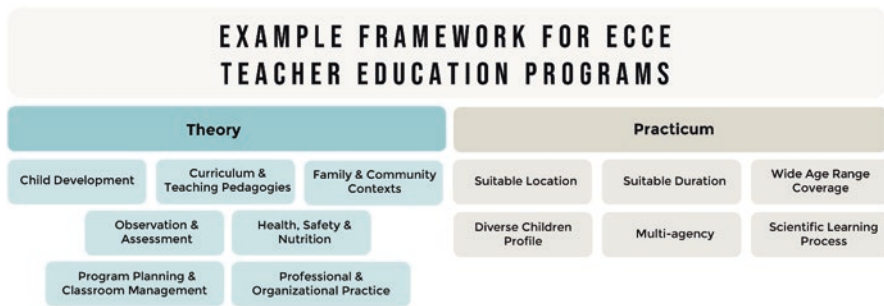


**Fig. 2.9** Example of possible framework for ECCE teacher education programs in Singapore in the future

Altogether, it builds a construction of professional knowledge as well as an increased awareness of their own strengths and weaknesses in terms of both theoretical and practical knowledge.

In terms of theory, there are eight core content categories that need to be covered (see Table 2.1). Trainees should be well equipped with both the knowledge and skills in these areas in which they can apply to practice during the practicum.

**Table 2.1** Core content categories and their sub-areas in ECCE teacher programs' theoretical curriculum

| Category | Areas |
| --- | --- |
| Child development | (1) Knowledge on children's development<br>(2) Skills on developing children |
| Curriculum and teaching pedagogies | (1) Curriculum and content knowledge<br>(2) Teaching pedagogies<br>(3) Integrating both and incorporating technology: pedagogical content knowledge (PCK) and technological pedagogical content knowledge (TPACK) |
| Program planning and classroom management | (1) Behavioral management<br>(2) Learning environment and activities |
| Observation and assessment | (1) Benefits, use, and tools for observation and assessment<br>(2) Monitoring children's progress and engaging families and other professionals<br>(3) Early intervention |
| Health, safety, and nutrition | (1) Legal requirements and guidance on health and safety<br>(2) Supporting children's physical and mental health |
| Family and community context | (1) Establishing and maintaining positive family and community partnerships<br>(2) Understanding diverse family and community backgrounds |
| Professional practice | (1) Professional mastery<br>(2) Professional values and ethics<br>(3) Management and administration<br>(4) Leadership<br>(5) Advocacy and research |
| Organizational practice | (1) Vision and planning<br>(2) Teamwork and collaboration |

In terms of practicum, a good practicum should meet certain standards in order to maximize the learning experience for the teacher trainee and help the trainee develop/practice the host of skills required to be an ECCE teacher (see Table 2.2).

In Singapore, the NIEC was recently set up under the ambit of the NIE. The NIEC is meant to be a national training institute delivering quality training to Singapore's early childhood educators and to deepen their professional development. Before this, the EC training landscape was fragmented with no single national institute overseeing EC training and professional development. With effect from 2019, there will be professional accreditation through early childhood teacher education programs with NIEC. NIEC needs to have excellent recruitment and entry systems involving appropriate selection and assessment procedures.

Next, Singapore needs to offer attractive compensation and incentives that is commensurate with the difficulty of the job. The effort required to build the skills, knowledge, and other softer qualities like patience, communication, etc. as a good EC professional is not an easy feat. Being underpaid will lead to profession fatigue, unhappiness, and demotivation, reducing overall productivity and performance in the sector. Currently, the ministry is collaborating with partners to strengthen the career prospects of teachers and leaders and projecting more competitive salaries.

**Table 2.2** Aspects of a good ECCE teacher practicum and their requirements

| Aspect | Requirements |
|---|---|
| Location | (1) Adequate exposure to more than one location |
| | (2) Quality criteria for selected schools/settings |
| Duration | (1) Duration should be synonymous with conferred degree |
| | (2) Designated amount of time to different age ranges |
| Children profile | Children profile should be diverse, including: |
| | (1) Children with special needs and disabilities |
| | (2) Bilingual children |
| | (3) Children of different age ranges, especially infants and toddlers below 3 |
| | (4) Children of diverse ethnic backgrounds |
| Agencies involved | Adopt a multi-agency approach, incorporating input from and collaboration with various stakeholders and individuals such as: |
| | (1) Teachers |
| | (2) Families |
| | (3) Community |
| Learning process | (1) Scientific and evidence-based learning process |
| | (2) Utilization of tools to optimize learning process |

However, lifting the entire sector and the next generation of professionals to a higher standard and payscale would probably come from having a professional accreditation degree system, which will, upon graduating from, demand higher salary standards. Singapore is currently working toward this.

For teachers in-service, there also needs to be a quality in-service training system to strengthen capacity building through professional development, career growth, and mentoring. Currently, Singapore has professional development programs for teachers, educarers, and leaders which are usually 3-year programs to support the professional development of these professionals with the potential to take on larger job roles in their organizations. There are usually incentives which come with completing these programs, such as annual cash awards and ECDA-funded overseas trips for the leader program. In addition, the ECDA Fellows scheme is an initiative to recognize pinnacle leaders in the early childhood profession and expand opportunities for these leaders to further develop their careers and to fulfil their aspirations. In the future, there are also plans for ECDA to work with Anchor Operators to provide greater opportunities to suitable teachers with the right aptitude and competencies to take on larger job roles, such as mentoring of junior teachers and for leaders to manage a larger center or a cluster of centers (Ministry of Social and Family Development, 2018). Lastly, all the above elements should come together to complement and be compatible with each other, forming a coherent early childhood teacher system.

Nonetheless, recent quantum leaps in early childhood investment suggest increased attention paid to the aspect of early childhood teacher education. For example, S$10 million was set aside for around 600 scholarships and teaching awards in 2012. However, overall, more research is still needed to strengthen the science of the EC practice, such as piloting new programs and systems, and to develop examples of excellence that are scalable.

## 2.6   Knowing the <u>E</u>cology of Early Childhood Development (ECD)

The Ecological Systems Theory (Bronfenbrenner, 1992) proposes that a child is surrounded by various types of environments that contribute to its development, including his or her immediate environment (microsystem), such as close relationships with family and peers, and his or her wider environments (mesosystem, home, neighborhood, and school; exosystem, mass media and government; and macrosystem, culture, history, ideologies, and law).

Thus, when designing policies and systems for ECD, we should also focus on factors beyond the child himself and adopt a whole-of-society approach. First, in order to help the child at school, there will be a need for strong home-center partnerships bringing together families and schools, encouraging parental engagement and sustained communication between teachers and parents. For example, in Singapore's MOE curriculum, families are encouraged to engage in activities with their children in school. Next, in order to help families of the child, we need to go wider and have an engaged community. This not only includes people but also the infrastructures of physical and interactive environments in the neighborhood. Lastly, there needs to be multi-sectorial involvement including health, education, nutrition, labor, finance, social, and family services. Having these in mind, we propose that in the ecology of ECD, there are the following elements: family, healthcare institutions, centers and kindergartens, neighborhood, community, governance and policy makers, as well as NGOs and philanthropies (see Fig. 2.10).

Here, developments in the ecological aspect of "neighborhood" requires special mention, as the "neighborhood" infrastructure and environment is a wide casting net that is available to the entire public and children. Aside from home and school, children spend much of their time in their neighborhoods, at public spaces like playgrounds, parks, museums, and libraries. Thus, it has the potential to be additionally impactful and meaningful for them. Singapore has also been making steps in the positive direction in this area. Figure 2.11 is an example of the kind of aspects that "neighborhood" can consist of, for considerations during future neighborhood design. Strategically designing and curating these environments for not just adults, middle-aged children, and teenagers but also specifically for children in their early years is incredibly worthwhile and may be cost-saving in the long run.

As mentioned, there have been efforts to improve the quality and safety of these areas in Singapore, as well as to design them more pedagogically or curate them to be catered to children. Prominent examples are libraries and playgrounds. Many of Singapore's national libraries are child-friendly with children zones and services as well as architecture. For example, Bukit Panjang National Library has a playtime session twice a week, in a play area with toys, costumes, and other playthings (Yu, 2017). Pasir Ris National Library's children's section has lower bookshelves which are designed to allow each book to be displayed with their cover in front instead of their book spine. This makes it more inviting and accessible for children to pick books independently. Other examples include the interactive "Knowledge Tree" in

**Fig. 2.10** OSTAN honeycomb of ecology

the Central Library where children can learn about environmental issues through shadow play and also interactive digital story telling kiosks and tablets installed with educational applications at Sembawang Public Library (Tan, n.d.).

There are also many playgrounds in HDB neighborhoods and parks available for young children. In the latest move to improve playground design, HDB's latest "thematic playgrounds" are meant to strengthen a town's identity, give children better play experiences, and encourage closer bonds between families and neighbors (Au-Yong, 2018). These playgrounds are designed with equipment to spur a wide array of activities such as climbing, swinging, balancing, and jumping, skills to build confidence in children. In addition, there are also a couple of inclusive playgrounds around Singapore (National Council of Social Service, n.d.) which provide appropriate physical structures such as wheelchair swings for children with special needs. Lastly, there are also many art and culture-related programs and exhibits organized by museums and galleries. This includes family storytelling programs and the Children's Museum by National Gallery and crafts workshops by the National Museum. Aside from the "neighborhood" aspect, Singapore will benefit from also strongly focusing on and developing other aspects of young children's ecological environment.

**Fig. 2.11** Example illustration of OSTAN honeycomb of neighborhood, part of OSTAN honeycomb of ecology

## 2.7   Conclusion

As the saying goes, "it takes a village to raise a child." To address all the elements in the honeycomb of ecology, strong political commitment and determination from the government, and a multi-ministry effort to lead and coordinate activities are required. Britto, Singh, Dua, Kaur, and Yousafzai (2018) suggest taking such a whole-of-government approach like that requires the following strategies: adopting multi-sectorial intervention packages, strengthening quality care through a trained workforce, broadening data and evidence systems, planning and costing for sustainable scaled program delivery, and having advocacy and communication strategies. There is also a need to monitor progress in these areas. Thus, in the case of Singapore, there will be a need to link areas such as curriculum, health, teacher certification and accreditation, professional development of EC professionals, standards and quality of centers' transitions, protection of young children, as well as support for families altogether in order to build a coherent and solid ecosystem for the child. There must also be laws, mandates, and frameworks that are aligned with the holistic development of children. For example, the Nordic countries (i.e., Finland, Sweden, and

Norway) topped the Starting Well Index[3] and were given credit for factors such as having a comprehensive early childhood development strategy, legal rights to early childhood education, well-defined preschool curriculum with clear health and safety standards, and a high bar for preschool educators with specific qualification requirements and commensurate wages. Singapore ranked 29th on the same index. Although Singapore has made improvements since the index was ranked, we can make further improvements by building and establishing a sound governmental and legal infrastructure to support early childhood care and education. Beyond that, we will also need to use innovative data tools and technologies to monitor our progress. Ultimately, the purpose of building up all these aspects is to have enabling environments that help to provide nurturing care for our young children. The aim is to strengthen caregiver capabilities, empower communities, and have supportive services and policies readily in place. By doing so, we can truly support parents to give sustained commitment and time to truly understanding and loving their children as they grow rapidly through the early years.

The lives of children are in the hands of the adults. Parenthood is a joy and privilege, while teaching is a wonderful calling. We hope this integrated honeycomb approach can truly empower adults in every role (not just parents and teachers, but also policy makers, researchers, etc.), every sector (education, healthcare, community service, etc.), and every stage (birth, toddler, preschooler) of the early childhood journey to design a learning and caring environment for young children to flourish in the twenty-first century. By developing better research, policies, and practices, we cannot only make a profound impact on their lives but also on ours and the lives of many generations to come.

# References

Ahern, R., Beach, R., Leibke, S. M., Proud, I., Spencer, A.-M., & Strickland, E. (2011). The benefits of play go well beyond physical fitness. *Exchange: The Early Childhood Leaders' Magazine Since, 1978*(*201*), 68–71.

Au-Yong, R. (2018). HDB playgrounds designed to give neighbourhood a stronger identity. In *The Straits Times*. Retrieved from https://www.straitstimes.com/singapore/hdb-designs-playgrounds-with-different-themes-to-give-neighbourhoods-a-stronger-identity

Bandura, A., Ross, D., & Ross, S. A. (1963). Vicarious reinforcement and imitative learning. *The Journal of Abnormal and Social Psychology, 67*(6), 601–607. https://doi.org/10.1037/h0045550

Belsky, J., Caspi, A., Moffitt, T. E., & Poulton, R. (2020). *The origins of you: How childhood shapes later life*. Harvard University Press.

Britto, P. R., Singh, M., Dua, T., Kaur, R., & Yousafzai, A. K. (2018). What implementation evidence matters: scaling-up nurturing interventions that promote early childhood development. *Annals of the New York Academy of Sciences, 1419*(1), 5–16. https://doi.org/10.1111/nyas.13720

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[3] A research program by the Economist Intelligence Unit (EIU) which ranked preschool environments in 45 countries (Economic Intelligence Unit, 2012)

Bronfenbrenner, U. (1992). Ecological systems theory. In *Six theories of child development: Revised formulations and current issues* (pp. 187–249). Jessica Kingsley Publishers.

Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review, 31*, 21–32.

Burt, K. B., & Roisman, G. I. (2010). Competence and psychopathology: Cascade effects in the NICHD study of early child care and youth development. *Development and Psychopathology, 22*(3), 557–567. https://doi.org/10.1017/S0954579410000271

Cannon, J. S., Kilburn, M. R., Karoly, L. A., Mattox, T., Muchow, A. N., & Buenaventura, M. (2018). Investing early: Taking stock of outcomes and economic returns from early childhood programs. *Rand health quarterly, 7*(4), 6–6.

Caspi, A., Houts, R. M., Ambler, A., Danese, A., Elliott, M. L., Hariri, A., … Moffitt, T. E. (2020). Longitudinal assessment of mental health disorders and comorbidities across 4 decades among participants in the Dunedin Birth Cohort Study. *JAMA Network Open, 3*(4), e203221–e203221. https://doi.org/10.1001/jamanetworkopen.2020.3221

Center for High Impact Philanthropy. (2015). New brain research. *Invest In a Strong Start for Children.*

Charlesworth, R. (2017). *Understanding child development* (10th ed.). Cengage Learning.

Chua, B. L., Tan, O.-S., & Sock, P. W. C. (2017). Mediated learning experience: Questions to enhance cognitive development of young children. *Journal of Cognitive Education and Psychology, 2*, 178–192. https://doi.org/10.1891/1945-8959.16.2.178

Colby, A., James, J. B., & Hart, D. (1998). *Competence and character through life*. University of Chicago Press.

Currie, J. (Writer). (2018). Life, death, and mental health: How access to care helps children succeed [Video file]. In: Institute of Fiscal Studies.

Dean, D. C., O'Muircheartaigh, J., Dirks, H., Waskiewicz, N., Walker, L., Doernberg, E., … Deoni, S. C. L. (2015). Characterizing longitudinal white matter development during early childhood. *Brain Structure and Function, 220*(4), 1921–1933. https://doi.org/10.1007/s00429-014-0763-3

Deng, Z., & Gopinathan, S. (2016). PISA and high-performing education systems: Explaining Singapore's education success. *Comparative Education, 52*(4), 449–472. https://doi.org/10.1080/03050068.2016.1219535

Early Childhood Development Agency. (2019). Subsidies and financial assistance. Retrieved from https://www.ecda.gov.sg/Pages/Subsidies-and-Financial-Assistance.aspx

Economic Intelligence Unit. (2012). *Starting well: Benchmarking early education across the world*. Retrieved from http://www.lienfoundation.org/sites/default/files/sw_report_2.pdf

Feuerstein, R., Rand, Y., & Rynders, J. E. (1988). Mediated learning experience. In *Don't accept me as I am: Helping "retarded" people to excel* (pp. 59–93). Springer US.

Feuerstein, R., Klein, P. S., & Tannenbaum, A. J. (1991). *Mediated learning experience (MLE): Theoretical, psychosocial and learning implications*. Freund Publishing House Ltd.

García, E., & Weiss, E. (2017). *Education inequalities at the school starting gate: Gaps, trends, and strategies to address them*. Retrieved from Washington DC.

Gerber, A. J., Peterson, B. S., Giedd, J. N., Lalonde, F. M., Celano, M. J., White, S. L., … Lenroot, R. K. (2009). Anatomical brain magnetic resonance imaging of typically developing children and adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry, 48*(5), 465–470. https://doi.org/10.1097/CHI.0b013e31819f2715

Heckman, J. J. (2012). *Invest in early childhood development: Reduce deficits, strengthen the economy*. Retrieved from https://heckmanequation.org/www/assets/2013/07/F_HeckmanDeficitPieceCUSTOM-Generic_052714-3-1.pdf

Heckman, J. J., Moon, S. H., Pinto, R., Savelyev, P. A., & Yavitz, A. (2010). The rate of return to the HighScope Perry Preschool Program. *Journal of Public Economics, 94*(1), 114–128. https://doi.org/10.1016/j.jpubeco.2009.11.001

Hull, C. L. (1943). *Principles of behavior: An introduction to behavior theory*. Appleton-Century.

Jordan, N. C., Kaplan, D., Ramineni, C., & Locuniak, M. N. (2009). Early math matters: Kindergarten number competence and later mathematics outcomes. *Developmental Psychology, 45*(3), 850–867. https://doi.org/10.1037/a0014939

Karoly, L. (2017). *The economic returns from investing in early childhood programs in the Granite State*.

Lee, A. (2017). New NIE-style institute to train early childhood educators. In *Today*. Retrieved from https://www.todayonline.com/singapore/new-national-institute-train-early-childhood-educators

Lee, W. Y. (2018). Singapore ranked best country for children to grow up in. *The Straits Times*. Retrieved from https://www.straitstimes.com/singapore/singapore-ranked-best-country-for-children-to-grow-up-in#:~:text=%22Singapore%20is%20a%20great%20place,safest%20countries%20in%20the%20world.

Lee, S. K., & Low, E. L. (2017). Singapore's education system: Some key success factors. Retrieved from https://www.nzcpr.com/singapores-education-system-some-key-success-factors/

LeFevre, J.-A., Skwarchuk, S.-L., Smith-Chant, B. L., Fast, L., Kamawar, D., & Bisanz, J. (2009). Home numeracy experiences and children's math performance in the early school years. *Canadian Journal of Behavioural Science, 41*(2), 55–66. https://doi.org/10.1037/a0014532

Meaney, M. J. (2010). Epigenetics and the biological definition of gene × environment interactions. *Child Development, 81*(1), 41–79. https://doi.org/10.1111/j.1467-8624.2009.01381.x

Ministry of Education. (2013). *Nurturing early learners: A curriculum for kindergartens in Singapore*. Retrieved from https://www.moe.gov.sg/docs/default-source/document/education/preschool/files/nel-edu-guide-overview.pdf

Ministry of Education. (2020a). Fees and financial assistance. Retrieved from https://beta.moe.gov.sg/preschool/moe-kindergarten/fees/#:~:text=MOE%20Kindergarten%20fees,Singapore%20Permanent%20Residents%20(PRs)

Ministry of Education. (2020b). Nurturing early learners (NEL) framework. Retrieved from https://beta.moe.gov.sg/preschool/curriculum/

Ministry of Social and Family Development. (2018). Transforming the early childhood sector to give every child a good start in life [Press release]. Retrieved from https://www.msf.gov.sg/media-room/Pages/Transforming-the-early-childhood-sector-to-give-every-child-a-good-start-in-life.aspx

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., … 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. https://doi.org/10.1073/pnas.1010076108

National Council of Social Service. (n.d.). Inclusive Playground. Retrieved from https://www.ncss.gov.sg/Our-Initiatives/Inclusive-Playground-(2)

National Institute of Education. (2010). *The new V3SK model: A compass for 21st century teacher education*. Retrieved from https://www.nie.edu.sg/docs/default-source/td_practicum/te21---v3sk.pdf

OECD. (2001). *Starting strong: Early childhood education and care*. Retrieved from Paris, France:

OECD. (2017). *Starting strong 2017: Key OECD indicators on early childhood education and care*. Paris, France.

Perry, B. D. (2002). Childhood experience and the expression of genetic potential: What childhood neglect tells us about nature and nurture. *Brain and Mind, 3*(1), 79–100. https://doi.org/10.1023/A:1016557824657

Piaget, J. (1971). The theory of stages in cognitive development. In *Measurement and Piaget* (pp. ix, 283–ix, 283). McGraw-Hill.

Reuben, A., Schaefer, J. D., Moffitt, T. E., Broadbent, J., Harrington, H., Houts, R. M., … Caspi, A. (2019). Association of childhood lead exposure with adult personality traits and lifelong mental health. *JAMA Psychiatry, 76*(4), 418–425. https://doi.org/10.1001/jamapsychiatry.2018.4192

Roth, T. L. (2012). Epigenetics of neurobiology and behavior during development and adulthood. *Developmental Psychobiology, 54*(6), 590–597. https://doi.org/10.1002/dev.20550

Shonkoff, J. P. (2005) *Dr. Jack P. Shonkoff – The Neuroscience of Nurturing Neurons/Interviewer: D. Boulton*. Children of the Code.

Skinner, B. F. (1963). Operant behavior. *American Psychologist, 18*(8), 503–515. https://doi.org/10.1037/h0045185

Suggate, S., Schaughency, E., McAnally, H., & Reese, E. (2018). From infancy to adolescence: The longitudinal links between vocabulary, early literacy skills, oral narrative, and reading comprehension. *Cognitive Development, 47*, 82–95. https://doi.org/10.1016/j.cogdev.2018.04.005

Tan, C. T. (2017a). Enhancing the quality of kindergarten education in Singapore: policies and strategies in the 21st century. *International Journal of Child Care and Education Policy, 11*(1), 7. https://doi.org/10.1186/s40723-017-0033-y

Tan, O. S. (2017b). Education and the child. In O. S. Tan, E. L. Low, & D. Hung (Eds.), *Lee Kuan Yew's educational legacy: The challenges of success*. Springer.

Tan, Y. J. (n.d.). Child-friendly libraries in Singapore. Retrieved from https://thenewageparents.com/child-friendly-libraries-singapore/

Tan, O. S., Chye, Y. L. S., Lim, K. J., Chua, B. L., Tuckman, B. W., & Monetti, D. M. (2017a). *Educational psychology: An Asia edition*. Cengage Learning.

Tan, O. S., Low, E. L., & Hung, D. (2017b). *Lee Kuan Yew's educational legacy: The challenges of success*.

UNICEF. (2013). Evidence for ECD investment. *Early Childhood.* Retrieved from https://www.unicef.org/earlychildhood/index_69851.html

UNICEF. (2017). *Early Moments Matter for every child*. Retrieved from https://www.unicef.org/media/files/UNICEF_Early_Moments_Matter_for_Every_Child_report.pdf

United Nations. (2020). Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. *Sustainable Development*. Retrieved from https://sdgs.un.org/goals/goal4

Vygotsky, L. S. (1980). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review, 20*(2), 158–177. https://doi.org/10.1037/h0074428

WHO. (2018). *Nurturing care for early childhood development: A framework for helping children survive and thrive to transform health and human potential*. Retrieved from https://nurturing-care.org/resources/Nurturing_Care_Framework_en.pdf

Yang, C. (2020). Singapore Budget 2020: More help to give every Singaporean child a good start in life. In *The Straits Times*. Retrieved from https://www.straitstimes.com/singapore/more-help-to-give-every-singaporean-child-a-good-start-in-life

Yu, J. (2017). Places to go this weekend: Bukit Panjang Public Library - Children Zone. Retrieved from https://www.bykido.com/blogs/events-and-activities/places-to-go-this-weekend-bukit-panjang-public-library-children-zone

Zucker, T. A., Cabell, S. Q., Justice, L. M., Pentimonti, J. M., & Kaderavek, J. N. (2013). The role of frequent, interactive prekindergarten shared reading in the longitudinal development of language and literacy skills. *Developmental Psychology, 49*(8), 1425–1439. https://doi.org/10.1037/a0030347

# Chapter 3
# Pre-school Teacher Education in Singapore: Developments and Challenges


Check for updates

**Nirmala Karuppiah**

**Abstract**  In Singapore, about 99 per cent of children attend at least one  year of pre-school (The term 'pre-school' will refer to the period prior to going to school which is for children aged seven years and above. 'Pre-school' will also be used interchangeably with the term, 'early childhood', unless there is a need to make a distinction.) (kindergarten or childcare centre) before entering Primary One (P1) (Tan, Int J Child Care Educ Policy, 11(7):1–22, 2017). Recognizing that pre-school education is necessary and influence later learning and development, the Singapore government has gradually increased its interest and investment in the pre-school sector in recent years. The introduction of new policies measures and initiatives over the years have created waves of change and pushed the pre-school sector forward (Yang, 2020). Since teachers play a pivotal role in the care and education of our young children, there have been many changes in teacher education (teacher preparation & professional development) programmes in terms of their entry requirements, duration and content over the years (ECDA, 2018).

Although some progress has been made in recent decades, the government would need to undertake a consolidated and systematic approach in resolving the issues and challenges which continue to exist in the Singapore pre-school sector. It is vital for the government to continue to review and enhance the pre-school policies, regulations, curriculum and teacher education. There is also a need to continue to attract and retain a stable and well-qualified workforce in the pre-school sector (OECD, 2018). Besides teacher education, supporting pre-school personnel through investing in research and development is also important and necessary for the transformation of early childhood care and education (ECCE) in Singapore.

**Keywords**  Teacher education · Career pathway · Early childhood · Preschool · Singapore

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## 3.1 Introduction

Similar to many developed countries around the world, the resident total fertility rate in Singapore has gradually fallen in recent years to 1.10 per female (Singapore Department of Statistics, 2020). This has prompted the government to introduce pro-family policies and measures such as baby bonus, infant-care and childcare subsidies, kindergarten and childcare financial schemes for needy families, higher tax reliefs for children and longer maternity and paternity leave. Besides attempting to promote procreation, these pro-family policies also support the government's economic and manpower policies to attract and retain women in the workforce. With both parents at work, many families have resorted to preschools (kindergartens or child care centres) to care for and educate their children, while they are at work (MSF, 2008).

In Singapore, the nursery level (N) is for three- and four- year-olds, and the kindergarten level (K) is for five- and six- year-olds; infant and toddler care is for children aged two months to three years. While some parents may enrol their children in a child care centre (for a full-day or half-day), other parents may enrol their children in a kindergarten (for 3 or 4 hours) if they have grandparents, relatives, domestic helpers or other caregivers to care for their children either before their children go to or after they return from the kindergarten. Preschools in Singapore can be grouped according to the following categories which are government, government-funded, not-for-profit and commercial. The government-funded, not-for-profit and commercial preschools are located across Singapore in Housing and Development Board (HDB) void decks, private landed property (terrace, semi-detached or bungalow houses), places of worship (churches, mosques or temples) or workplace premises. The government kindergartens which are operated by the Ministry of Education (MOE), on the other hand, are located mostly within the primary schools. These preschools have either adopted or are inspired by early childhood care and education (ECCE) curriculum models such as High-Scope, Montessori, Project- or Inquiry- based Learning, Reggio Emilia or Waldorf. The fees charged by the preschools depend on various factors such as the pre-school programme (kindergarten or childcare), duration, category, location, curriculum model, age group of child, group size and teacher-to-child ratio. The current stipulated teacher-to-child ratio for the different age groups is 1:6 for infants, 1:8 for toddlers, 1:12 for N1, 1:15 for N2, 1:20 for K1, and 1:25 for K2.

Currently, there are more than 430 kindergartens and 1530 child care centres located all over Singapore (ECDA, 2020). There are also infant care centres located within the child care centres, which have also increased rapidly from only 25 in 2004 to about 650 in 2020 (ECDA, 2020). Although pre-school education is not compulsory in Singapore, about 99 per cent of children attend at least 1 year of pre-school (kindergarten or childcare centre) before entering Primary One (Tan, 2017). Recognizing that pre-school education is necessary and influences later development, learning and behaviour, the government has gradually increased its interest and investment in the pre-school sector in recent years (ECDA, 2018). As a result, there has been an introduction of many new polices, measures and initiatives which

have created waves of changes and pushed the pre-school sector forward in providing quality care and education for young children in Singapore (Yang, 2020).

## 3.2  Waves of Change

In 1999, a Steering Committee was set up by the Ministry of Education (MOE) to improve the pre-school sector in Singapore. Four areas of improvement were identified which were *policies and regulations, curriculum, teacher education and research and development* (Leong, 1999). Additionally, the Starting Well Report by the Lien Foundation which ranked Singapore 29 out of 40 countries (Economic Intelligence, 2012) as well as the increasing demands from parents for higher-quality care and education for their children made it necessary for the government to review and expedite changes to the quality, accessibility and affordability of pre-school education in Singapore.

### 3.2.1  Policies, Regulations and Curriculum

In the past, kindergartens were regulated under the Education Act 1958, and child-care centres were regulated under the Childcare Act 1988. Until 2013, kindergartens and childcare centres used to come under the purview of two separate ministries. While the Ministry of Education (MOE) used to oversee the operations of the kindergartens, the Ministry of Social and Family Development (MSF) used to oversee the operations of the child care centres (Khoo, 2010). The MSF was previously known as Ministry of Community Development (MCD) and then, Ministry of Community Development, Youth and Sports (MCYS). While the MSF had implemented licensing guidelines to regulate the child care centres, the MOE had only introduced licensing guidelines for kindergartens in 2000. Pre-school operators have to meet these guidelines which stipulate the criteria for setting up the pre-school (kindergarten or childcare centre). These criteria include the physical environment, teacher-to-child ratio and teacher educational and professional qualifications. Licenses were issued to pre-school operators for a period of two or three years, depending on whether they meet the criteria. The licensing guidelines were aimed at ensuring that pre-schools were providing a minimum quality of care and education to young children in Singapore.

In 2013, the MSF and MOE together set up the Early Childhood Development Agency (ECDA) to consolidate the government's efforts to plan and implement the changes in the pre-school sector collectively, efficiently and effectively. With the formation of ECDA, all the functions of the two ministries (MOE & MSF) related to the provision of early childhood care and education (ECCE) were taken over, combined and streamlined to provide for better management of all the preschools (excluding the MOE Kindergartens which were managed by the MOE). The

introduction of the Early Childhood and Development Centres Act 2017 further empowered and strengthened ECDA's position in the pre-school sector in Singapore.

To recognise and support preschools in their efforts to improve their quality and enhance the holistic development and well-being of young children, the MOE introduced the Singapore Pre-school Accreditation Framework (SPARK) in 2011 (ECDA, 2013). SPARK involved using an instrument called the Quality Rating Scale (QRS) for self-evaluation and assessment of preschools and their programmes. The QRS comprised seven criteria which are *Curriculum, Health, Hygiene* and *Safety, Leadership, Pedagogy, Planning* and *Administration* and *Resources* and *Staff Management*. With the formation of ECDA in 2013, SPARK was administered to both kindergartens and childcare centres which were ready and interested to participate in the accreditation process. In 2018, ECDA developed the zero-to-three (0–3) section of the QRS for self-evaluation and assessment of preschools with infant and toddler programmes. This instrument focused on caring for children and facilitating their learning through play. It was felt that infants and toddlers had different and unique developmental needs compared to older children (ECDA, 2019). Currently, about 50 per cent of the preschools have been awarded the SPARK accreditation, which has a validity of six years (ECDA, 2021). Some preschools have shared that accreditation is beneficial in improving processes in the preschool and indicating to parents that they have achieved the quality benchmark. Other preschools have added that the whole process is time-consuming and involves much effort and manpower, which poses a challenge to preschools facing a shortage of teachers.

In 2003, the MOE launched the *Nurturing Early Learners: A Framework for a Kindergarten Curriculum in Singapore* (KCF 2003) which was aimed at providing children with the 'same quality of learning' across different age groups and settings (Tan, 2007, p. 39). To support the smooth transition from pre-school to primary school, the MOE formulated the following set of desired outcomes of pre-school education which are *Know what is right and what is wrong*, *Be willing to share and take turns with others*, *Be able to relate to others*, *Be curious and able to explore*, *Be able to listen and speak with understanding*, *Be comfortable and happy with themselves*, *Have developed physical coordination and healthy habits* and *Love their families, friends, teachers and school* (MOE, 2012). This set of outcomes, which was aligned with the set of desired outcomes of primary education, underlay the KCF 2003 and focused on the holistic development of the child.

Previously, many pre-schools focused on preparing children for primary school rather than for life-long learning and developing academic skills competencies rather than also including the social and emotional competencies of the child. Even with the introduction of the KCF 2003, some pre-schools continued to focus only on developing children's reading, writing and arithmetic skills (through rote-learning & drill-and-practice) since it was not mandatory for them to adopt the KCF 2003. In 2008, the KCF 2003 was revised to meet the changing needs of the pre-school sector.

In 2011, the MSF launched the Early Years Development Framework (EYDF 2011) (MCYS, 2011). While the KCF 2008 provided guidance for the nursery and

kindergarten programmes (4 years to 6 years), the EYDF 2011 provided guidance for the infant and toddler programmes (birth to 3 years). Parents, teachers and leaders welcomed the EYDF 2011 as it recognised the infant and toddler care and education as an integral part of the pre-school sector. Additionally, the EYDF emphasised that infants and toddlers require both care and education and not just custodial care alone.

To ensure the provision of quality pre-school education in Singapore, the MOE has continuously reviewed and enhanced the KCF. In 2013, the MOE introduced the *Nurturing Early Learners: A Curriculum Framework for Kindergartens in Singapore* (NEL Framework 2013) which was a refreshed version of the KCF 2008 (MOE PEB, 2012). As with previous versions, the NEL Framework 2013 was not mandatory for the preschools to adopt and use. However, this time round, the ECDA provided a training workshop for pre-school leaders and teachers on the use of the NEL Framework 2013 in their preschools. The NEL Framework 2013 which was built on the premise that *children are active, competent and curious learners*, aimed to balance the provision of knowledge, skills and dispositions with the need to nurture children's thinking, creativity, curiosity and sense of wonder. It also integrated the six learning areas which are *aesthetics and creative expression, discovery of the world, language and literacy, motor skills development, numeracy* and *social and emotional development* (MOE PEB, 2012). It focuses on purposeful play (or guided play) which ensures that there are clear intentional objectives and outcomes in the activities planned for the children. It also focuses on the six iTeach principles which are *integrated approach to learning, teachers as facilitators of learning, engaging children in learning through purposeful play, authentic learning through quality interactions, children as constructors of knowledge* and *holistic development* (MOE PEB, 2012). These six principles are supposed to guide the teacher in planning and facilitating learning to develop the child holistically (Fig. 3.1).

However, some preschools are still not ready to embrace the NEL Framework 2012, and they continue to focus on developing children's academic skills through rote-learning and drill-and-practice tasks, in order to meet parents' requests in preparing their children for the perceived academic rigors of primary school. Currently, the NEL Framework 2012 is being revamped using data gathered from focus group discussions involving various stakeholders as well as relevant findings from the Singapore Kindergarten Impact Project (SKIP). The SKIP is a local large-scaled longitudinal study which was conducted by the National Institute of Education (NIE) from 2013 to 2018. The SKIP aimed at understanding the impact of school, home and child factors on child outcomes in Singapore preschools.

### 3.2.2   Teacher Education

Besides regulations and curriculum, teacher education (teacher preparation & professional development) also plays an important role in the provision of quality care and education for young children and their families (OECD, 2018). There have been
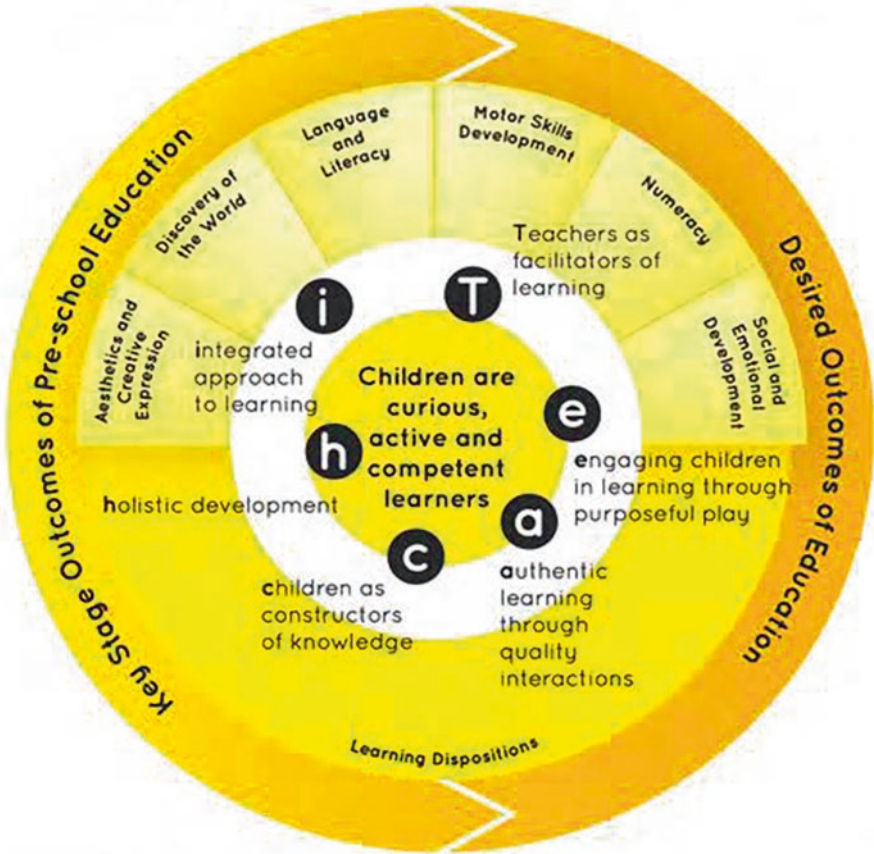
**Fig. 3.1** NEL framework 2013 (MOE PEB, 2012). (Source: Ministry of Education Preschool Education Branch (MOE PEB, 2012). *Nurturing early learners: A curriculum framework for kindergartens in Singapore.* Singapore: Author)

many changes in teacher education programmes in terms of their entry requirements, duration and content over the years (Annex 1). While pre-school personnel are required to pursue teacher preparation programmes to acquire the necessary knowledge and skills to work in the pre-school sector, professional development programmes provide pre-school personnel who are already working in the pre-school sector opportunities to upgrade or enhance their practices through further acquisition of in-depth or specific knowledge and skills.

Teacher education for pre-school personnel was ad hoc and brief when it was first introduced in the early 1970s. However, in 2001, a Pre-school Qualifications Accreditation Committee (PQAC) was jointly set up by the MOE and MCYS to assess and approve the teacher education programmes including their design, content, duration, modes of delivery, assessment and faculty staff qualifications. The PQAC also introduced the teacher education framework and mapped out a common

teacher education pathway for childcare and kindergarten teachers (Tan, 2007). In the past, the minimum professional qualification for pre-school teachers was a Certificate in Pre-school Teaching (CPT) (470 hours). However, by 2006, all teachers had to attain at least a diploma in pre-school education – teaching (DPET) (700 hours). Teachers who aspired to become principals had to acquire two years of teaching experience and go on to attain a Diploma in Pre-school Education – Leadership (DPEL) (500 hours). MOE also announced that by January 2008, one in four teachers in a preschool had to possess a DPET and all other teachers had to be at least certificate-trained.

The entry requirements for individuals entering the pre-school sector were continuously reviewed and gradually raised. The teacher education pathway was also reviewed and changed accordingly. In 2011, the PQAC reviewed and changed the minimum educational and professional qualifications for pre-school teachers and principals (ECDA, 2011). Subsequently, in 2012, MSF set up the Early Years Qualifications Accreditation Committee (EYQAC) to review the teacher education requirements for candidates working with children aged three years and below. It was announced that the Advanced Certificate in Early Childhood Care and Education and Certificate in Early Years will be introduced alongside the Certificate in Infant Care. It was also announced that all teachers had to complete a DPET to be able to teach all levels and that teachers with a CPT could only teach children aged three years and below (Tan, 2017). A Continuous Professional Development (CPD) Framework was also formulated for in-service teachers to continue upgrading their knowledge and skills through professional development. Generous funding and time-off for professional development programmes were also made available for leaders and teachers who wished to grow and develop in their profession.

In 2013, ECDA took over the accreditation of both the kindergarten and childcare personnel. ECDA also introduced a revised training and career pathway for all pre-school personnel including leaders, teachers and educarers (ECDA, 2013). Pre-school personnel working with children were grouped according to two career tracks which were the pre-school teacher track and educarer track. The pre-school teacher track was divided into three subgroups based on the children's age which were pre-school teacher (18 months to 6 years), pre-school teacher (18 months to 4 years) and para-educator (5 years to 6 years). The educarer track was also divided into three subgroups based on the children's age which were early years educarer (2 months to 3 years), infant educarer (2 months to 18 months) and para-educarer (2 months to 3 years). Each group/subgroup of pre-school personnel had their own set of entry requirements and educational and professional qualifications. Pre-school personnel working as leaders (principals and directors ) also had their own set of entry requirements and educational and professional qualifications.

However, further changes were instituted, and there were three career tracks for pre-school personnel which were the leadership track, teaching track and educarer track. Pre-school personnel could move up, down or across these tracks depending on their educational and professional qualifications, working experience and aspirations (Annex 2). The SkillsFuture Framework for ECCE which was formulated in 2016 clearly outlined the entry requirements and educational and professional

qualifications for each of these tracks (Annex 3). While educarers who worked with children aged 2 months to 4 years were required to have an accredited certificate, teachers who worked with children aged 18 months to four or six years (depending on their educational and professional qualifications & work experience) were required to complete an accredited diploma. Becoming a leader required additional professional qualifications and working experience. The SkillsFuture Framework is currently being revamped to meet the changing needs of the pre-school sector which has become more inclusive and complex. While the entry requirements and educational and professional qualifications of all pre-school personnel have been raised, it appears that the younger children are still being cared for by those who have lower educational and professional qualifications. However, research seems to indicate that younger children need to be cared for by pre-school personnel who have more or at least the same educational and professional qualifications as those who work with older children (Karuppiah, 2015).

There are currently approximately 20,000 pre-school personnel in Singapore (Paulo et al., 2018). According to the OECD (2018), one of the key determinants of high-quality pre-school education is high-quality teacher education (teacher preparation & professional development) programmes for pre-school personnel. It is believed that governments need to invest in intensive teacher preparation and professional development in order to deliver positive child outcomes. However, many governments around the world fear that funding and raising the educational and professional qualifications of pre-school personnel may result in demands for higher staff wages and, subsequently, higher cost of ECCE services (Pramling & Pramling, 2011). Besides continuously reviewing and raising the entry requirements into the pre-school sector, the Singapore government has also invested in teacher preparation and professional development through generous subsidies, bursaries and scholarships. Although the minimum professional qualification is a certificate or diploma in ECCE to enter the pre-school sector, there are also scholarships available for pre-school personnel who wish to pursue a bachelor's degree or master's degree. However, these degrees are currently not a requirement in preschools. Pre-school personnel with a master's degree can continue to stay in the preschools or aspire to become faculty members in Institutes of Higher Learning (IHLs) which are involved in teacher education programmes in ECCE.

In his National Day 2019 message, Prime Minister Lee Hsien Loong highlighted that the government will create more preschool places and raise the quality of pre-schools as well as upgrade the profession of pre-school teachers (PMO, 2019). In January 2019, the MOE set up the National Institute of Early Childhood Development (NIEC). The NIEC Headquarters is currently located at the National Institution of Education (NIE). NIEC is the consolidation of the early childhood expertise and capabilities of four institutions which are the Institute of Technical Education (ITE), Ngee Ann Polytechnic (NP), Temasek Polytechnic (TP) and NTUC's Seed Institute (MOE, 2018). It offers the Certificate and Diploma Pre-employment Training (PET) programmes for post-secondary students, Continuous Education and Training (CET) programmes for in-service and mid-career switchers and Continuous Professional Development (CPD) courses for in-service teachers and leaders to

further develop their competencies (MOE, 2018). It is believed that the setting up of the NIEC would improve the quality of pre-school personnel which would, in turn, raise the quality of ECCE in Singapore. It is also believed that this move would also help to attract good students (secondary, post-secondary and tertiary) into the pre-school sector.

### 3.2.3   Research and Development

The research-practice-policy nexus is crucial in the pre-school sector. Research informs policy, teacher education and practice. However, there is a dearth of deep research conducted in the field of ECCE in Singapore. One of the key organisations that have been conducting ECCE research is the National Institute of Education (NIE). In 2017, the MOE set up the Centre for Research in Child Development (CRCD) within the NIE to lead, develop and build an ECCE research base for the pre-school sector.

Previously, the ECDA had set up the Early Childhood Research Fund (ECRF) to provide grants of up to S$8000 to support and encourage pre-school leaders, teachers and academics to embark on ECCE research. In the recent years, the ECDA has replaced the ECRF grant with the Innovation Projects Grant to improve the quality of pre-school programmes and teaching-learning practices and to foster a culture of innovation and reflective practices (ECDA, 2021). The maximum approved grant amount is S$4000, and training is provided to support the participating pre-schools.

Similarly, the MSF Family Research Fund (FRF) also provides grants for ECCE research, but these grants are larger and usually taken up by academics and students pursuing their postgraduate or doctoral studies. Despite efforts being made to encourage and support pre-school leaders and teachers to conduct research or action research, the take-up rate has been slow and low. The reasons cited by pre-school leaders and teachers include lack of manpower and time as well as other more urgent priorities in the preschool.

Teachers play a key role in the care and education of our young children; hence, there is a need to improve the quality of teacher preparation and professional development programmes (OECD, 2018). However, there is a greater need to investigate exactly what aspects of these programmes need to be improved as well as examine teachers' beliefs, pedagogy and practice. Findings from in-depth studies would contribute to a strong, relevant and meaningful research base on teacher education in ECCE as well as provide vital information for the development of resources or intervention programmes. Hence, funding is very much needed to increase both the quantity and quality of research and development in the early years to improve the lives of young children and their families in Singapore.

## 3.3    Challenges in the Pre-school Sector

Despite increased government support and investment, the key challenge in Singapore is the lack of a stable and well-qualified workforce in the pre-school sector. It is believed that the poor image of the teacher, low salaries and working conditions of the teacher have made it challenging to attract and retain good teachers in preschools (OECD, 2018). Although the entry requirements and educational and professional qualifications of the pre-school personnel (leaders, teachers & educarers) were raised, the salaries of these pre-school personnel did not commensurate with the changes. As a result, many good teachers have left the pre-school sector for better-paying jobs in the other sectors.

Over the years, foreign teachers have been recruited to fill the vacancies in the growing number of preschools. Workers from the other sectors who are making a career switch or being retrenched have also been recruited to solve the manpower shortage in the preschools. Additionally, the NIEC has been approached to increase its intake of student teachers for the pre-school sector (Teng, 2015). Besides these measures, the ECDA has also drawn up a more detailed training and career pathway to help attract and retain good teachers in the pre-school sector (ECDA, 2018). It is believed that this training and career pathway will attract individuals who are interested and keen to undertake a teacher preparation programme and pursue a career in the pre-school sector. It is also believed the training and career pathway will help the pre-school operators to attract, develop and retain teachers and other personnel in the pre-school sector.

The ECDA has also approached the NIEC and other private teacher-training agencies (PTAs) to review, reform and transform their programmes in view of the changing the needs of the pre-school sector. They have also provided bursaries and scholarships to attract new entrants, subsidised teacher preparation programmes for pre-service teachers and upgraded opportunities through professional development for existing in-service teachers. These measures have helped to attract pre-school personnel into the sector, but the challenge still remains to retain good pre-school personnel in the sector (CNA, 2020).

The ECDA will continue to monitor the manpower situation closely to ensure that there are sufficient pre-school personnel available for the sector (ECDA, 2018). It has also been conducting an annual conference to provide a platform for leaders, teachers, researchers and other professionals to come together to network and be updated on the latest issues and trends in ECCE both in and outside Singapore. It also showcases the good practices and innovations in the pre-school sector through the following awards which are the outstanding educarer, teacher, leader and employer awards. The SPARK Awards are also presented at this annual conference, and it is a time for preschools to celebrate their success and acknowledge the benefit of good individual and teamwork of their pre-school personnel. These initiatives have helped to improve the professional image of the pre-school personnel as well as to attract and retain them in the sector.

With increasing expectations from parents, pre-school personnel are experiencing tremendous stress and fatigue. Parents tend to expect preschools to prepare their children for the perceived rigors of P1 by focusing more on the acquisition of academic skills (numeracy & literacy) through worksheets instead of play, especially

in the nursery and kindergarten levels (Bach & Christensen, 2017). As children from lower SES homes tend to have less well-developed language skills (oral language, phonological awareness & print knowledge) as compared to their peers from higher SES homes (Lonigan et al., 2015), pre-school teachers are expected to provide more support and assistance in preparing them for school later. With the inclusion of children with special needs in the classroom, pre-school teachers are struggling to meet the interests, needs and abilities of individual children given the current large group size and teacher-to-child ratios.

As pre-school teachers are finding it challenging to work with young children and their families in Singapore, it has become vital for pre-school teachers to work closely with parents and the community in the care and education of young children (Jeynes, 2012; Nunez et al., 2015). As pre-school personnel (educarers, teachers and leaders) are seeing themselves as facilitators of children's learning and development, it has also become crucial for pre-school personnel to make important choices, decisions and judgments regarding children. Hence, teacher education programmes must equip pre-school personnel to undertake the important role and responsibilities of caring for and educating young children for life-long learning.

Research shows that pre-school teachers' educational and professional qualifications have a strong influence on their beliefs and practices which will, in turn, impact children's learning, development and behaviour (Brownlee et al., 2009). However, it is also important to consider the design, delivery and focus of professional development carefully (Pianta et al., 2014) as well as provide opportunities for self-reflection (Schachter et al., 2019), sustained professional learning experiences (Zan & Donegan-ritter, 2014) and research (OECD, 2018) in order to ensure the effectiveness of professional development for pre-school teachers.

Practice is often borne out of the values and beliefs that are held by pre-school teachers (Karuppiah & Berthelsen, 2011; Berthelsen et al., 2011). Hence, pre-school teachers would have to be reflective and aware of the processes of teaching and learning and evidence-based practices. Their beliefs need to be more evaluativistic, that is, underpinned by more sophisticated epistemologies that view knowledge about practice as complex, evolving, tentative and evidenced-based (Kuhn & Weinstock, 2002) and involving a critique of multiple perspectives (Karuppiah & Berthelsen, 2011; Berthelsen et al., 2011; Karuppiah, 2015). Hence, it has become critical for pre-school teachers to possess the appropriate knowledge, skills, values and dispositions in order to provide quality care and education of children in the early years. Besides teacher education, it has also become important to consider providing coaching and mentoring as well as developing useful resources (e.g. local videos of good practices) to help pre-school teachers understand, appreciate and acquire the necessary skills to improve their pedagogy and practice in the classroom (Langeloo et al., 2019; Schachter, et al., 2019; Zan & Donegan-ritter, 2014). Other factors such as higher salaries, a positive organisational climate and professional learning communities have also been found to improve pre-school teachers' self-image and well-being as well as teacher-child interactions in the pre-school classrooms (OECD, 2018).

## 3.4   Summary and Conclusion

We have come to a crossroads in ECCE in Singapore. Globalisation and a knowledge-based economy have made it vital to equip young children with necessary knowledge, skills, positive values and dispositions. It has also made it essential for children to be prepared for a smooth transition from the home to pre-school and, later, from the pre-school to primary school and beyond. Although much progress has been made over the last few decades, a consolidated and systemic approach would be required to resolve the issues and challenges which continue to exist in the pre-school sector. Changing mindsets of various stakeholders and reviewing the goals of pre-school education would be top priority in the next wave of change in Singapore.

More importantly, it is crucial for the government to continue to review and enhance the pre-school policies, regulations, curriculum and quality of pre-school personnel (leaders, teachers & educarers). There is also a need to continue to attract and retain a stable and well-qualified teaching workforce in the pre-school sector (OECD, 2018). Additionally, there is also the need to continue to support and invest in teacher education (teacher preparation & professional development) programmes to improve the quality of ECCE of young children in Singapore. Besides teacher education, supporting pre-school personnel through investing in research and development is also important and necessary for the transformation of ECCE in Singapore.

**Questions**

- What do pre-school children need to succeed in school and later life?
- How appropriate are twenty-first century knowledge, skills and dispositions for pre-school personnel (teachers, educarers & leaders) and children?
- What determines the quality of pre-school education in Singapore?
- Why is teacher education (teacher preparation & professional development) important in the pre-school sector?
- What are the issues and challenges faced by pre-school personnel today, and how can they be resolved?

**Note**

Some content in this chapter have been taken from a document by the same author which is 'Karuppiah, N. (2014). *Early childhood education in Asia: Singapore*. Unpublished manuscript'. This document was prepared by the author for a keynote address delivered at a conference which was organised by the Pannasastra University of Cambodia and sponsored by the World Bank in 2014. It was deposited in the National Institute of Education Digital Repository by the author for private study or research purposes only. The copyrights of this unpublished document reside with the author only (and not with the NIE Digital Repository).

# Annexes

# Annex 1

**1949-74**
- Teacher Education courses were brief, ad-hoc or conducted in-house

**1982**
- Ministry of Community Development (MCD) set up Staff Development Section and courses for Childcare Centre staff

**1985**
- MCD introduced 3-Tier Teacher Education programmes
  - Basic course
  - Intermediate course
  - Advanced course
- MCD introduced Supplementary courses to enhance knowledge and skills for Childcare Centre staff

**1991**
- National Institute of Education (NIE) introduced Early Childhood (EC) courses
  - Certificate in Pre-school Teaching Level One
  - Certificate in Pre-school Management and Administration Level Two
- Association for Child Care Educators (ACCE) introduced the
  - Early Childhood Credential Programme

**1994 – 1997**
- MCD introduced 2 full-time Early Childhood Care and Education (ECCE) courses
  - Fundamental course
  - Intermediate course

**1999 – 2000**
- Ministry of Community Development, Youth & Sports (MCYS) introduced guidelines for ECCE courses
  - Diploma in ECCE
  - Specialist Diploma in ECCE

**2001**
- MCYS and MOE set up the Preschool Accreditation Committee (PQAC) to introduce guidelines for and accreditation of ECCE courses for 0 to 6 years
  - Certificate in ECCE (470 hours)
  - Diploma in ECCE in Teaching (700 hours)
  - Diploma in ECCE in Leadership 500 hours)
  - Specialist Diploma in ECCE (1200 hours)
- MCYS introduced a 3-year full-time Diploma programme at Ngee Ann Polytechnic

**2004 – 2012**
- MCYS introduced the Infant and Toddler Care and Education course
  - Certificate in Infant and Toddler care – 2 months to 3 years
- MCYS set up the Early Years Accreditation Committee (EYQAC) to introduce guidelines for and accreditation for ECCE courses 0 – 4 years
  - Certificate in Infant and toddler Care – 2 months to 18 months
  - Certificate in Infant Care – 2 months to 3 years
  - Certificate in Early Years – 2 months to 3 years
  - Advanced Certificate in ECCE – 18 months to 4 years

**2012**
- MCYS introduced the Continuous Professional Development (CPD) Framework for EC personnel
  - Advanced Diploma in EC Leadership (ADECL)
  - Advanced Diploma in EC Teaching & Learning (ADECT)

**2013**
- ECDA introduced the teacher education guidelines for EC personnel (Educarer, Teacher & Leader) in Preschools (Kindergartens & Childcare Centres)
- ECDA introduced the Professional Conversion Programme for mid-career switchers

**2019**
- NIEC conducts a range of teacher education programmes in ECCE
  - Certificate
    - Advanced Certificate in ECCE
    - Advanced Certificate in Early Years

**Fig. 3.2**  Timeline on key milestones in teacher education

- ■ Advanced Certificate in Early Years (Alternate Pathway)
- ■ Advanced Certificate in early Years (with Exemptions)
- ■ Certificate in Mother Tongue Language (MTL) Teaching – Malay
- ■ Certificate in Mother Tongue Language (MTL) Teaching – Tamil
- ■ Higher National Institute of Technical Education (NITEC) in ECE
- ○ Diploma
  - ■ Diploma in ECCE – Teaching
  - ■ Diploma in ECCE – Teaching (Conversion)
  - ■ Diploma in EC & Development
  - ■ Diploma in Chinese Studies (EC Teaching)
  - ■ Diploma in Tamil Studies with Early Education
- ○ Post Diploma
  - ■ Advanced Diploma in EC Intervention (Special Needs)
  - ■ Advanced Diploma in EC Leadership
  - ■ Teaching
  - ■ Advanced Diploma in Teaching & Leadership
  - ■ Specialist Diploma in Learning Support
- ○ CPD courses
- ○ Skills Based Modular courses & Professional Development programmes

**Notes:**

EC – Early Childhood
ECE – Early Childhood Education
ECCE – Early Childhood Care and Education
ECDA – Early Childhood and Development Agency
MCYS – Ministry of Community Development [later known as Ministry of Community, Youth and the Sports (MCYS) and then, Ministry of Social & Family Development (MSF)]
MOE – Ministry of Education

**Fig. 3.2** (continued)

## Annex 2



### ② Career Pathways in the EC Sector

- 3 tracks (Educarer, Teacher & Leader) covering 13 occupations in the ECCE sector
- Educators are provided with opportunities for both vertical and lateral progression across the 3 tracks
- Aspiring leaders may also choose to progress along the Centre Leadership or Teacher Leadership pathway
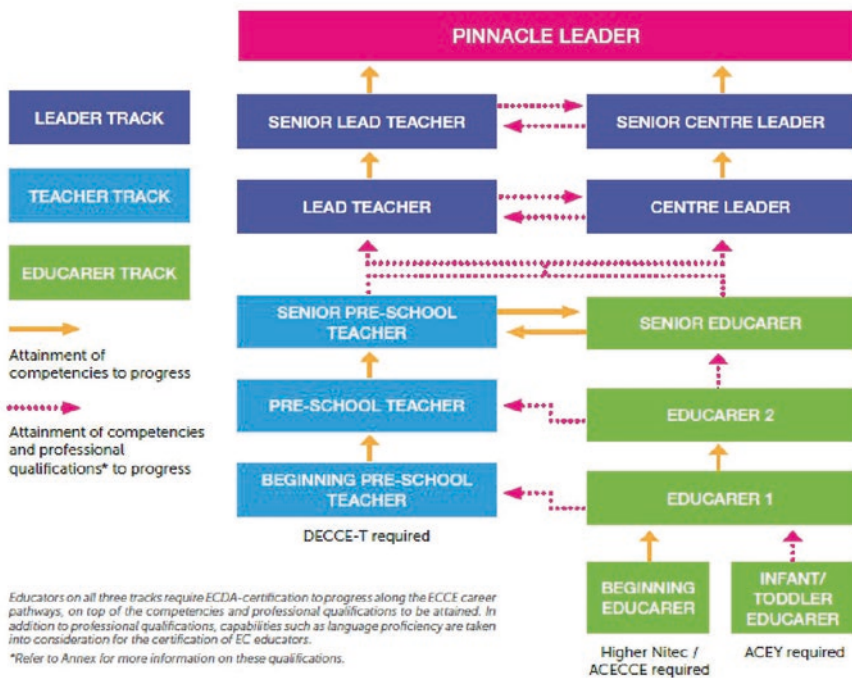


**Fig. 3.3** Career and training pathway in ECCE. (Source: SkillsFuture (2019). *About SkillsFuture*, Retrieved November 1, 2019, from https://www.skillsfuture.sg/AboutSkillsFuturehttps://www.skillsfuture.sg/skills-framework/ecce)

## Annex 3

**ECCE Career Entry Criteria & Information**

| Track | Age Group of Children | Occupation | Early Childhood Courses | Course Minimum Entry Requirements |
|---|---|---|---|---|
| Educarer | 2 months to 3 years | Infant/ Toddler Educarer | WSQ Advanced Certificate in Early Years (ACEY) | Minimum Secondary 4 education or completed 10 years of formal education |
| | | | | At least average SOA 5 in the Workplace Literacy (WPL) series, including SOA 5 for WPL (Written) |
| | 18 months to 4 years | Beginning Educarer | Higher Nitec in Early Childhood/ WSQ Advanced Certificate in Early Childhood Care and Education (ACECCE) | Minimum 3 GCE 'O' level credits including a credit (at least C6) in EL1 OR English Language Acceptable Alternatives |
| Teacher | 4 to 6 years[2] | Beginning Pre-school Teacher | Diploma in Early Childhood Care and Education in Teaching (DECCE-T) / WSQ Professional Diploma in Early Childhood Care & Education (PDECCE) | Minimum 5 GCE 'O' level credits, including a credit (at least C6) in EL1 OR English Language Acceptable Alternatives |
| | | | WSQ Professional Diploma in Early Childhood Care & Education - Childcare (PDECCE-CC) or WSQ Professional Diploma in Early Childhood Care & Education - Kindergarten Teaching (PDECCE-KT) / Diploma (Conversion) in Kindergarten Education - Teaching (NVKET) | 3-year polytechnic diploma with at least a credit in GCE 'O' level English as a first language (EL1)OR English Language Acceptable Alternatives |
| | | | | OR |
| | | | | State-recognised university degree where the medium of instruction is English |
| Leader | — | Lead Teacher | Advanced Diploma in Early Childhood Teaching & Learning (ADECT) | • Be ECDA-certified as a Level 2 pre-school teacher<br>• Have completed an ECDA-recognised diploma in early childhood care and education<br>• Have at least 3 years of trained teaching experience |
| | | Centre Leader | Advanced Diploma in Early Childhood Leadership (ADECL) | • Be ECDA-certified as a Level 2 pre-school teacher<br>• Have completed an ECDA-recognised diploma in early childhood care and education<br>• Have met the competency level for Senior Pre-school Teacher (with reference to the Skills Map)<br>• Have completed the pre-requisite core course(s) as identified and offered by ECDA |

**Fig. 3.4** Career entry criteria in ECCE. (Source: SkillsFuture (2019). *About SkillsFuture*, Retrieved November 1, 2019, from https://www.skillsfuture.sg/AboutSkillsFuturehttps://www.skillsfuture.sg/skills-framework/ecce)

# References

Bach, D., & Christensen, S. (2017). Battling the tiger mother: Pre-school reform and conflicting norms of parenthood in Singapore. *Children & Society, 31*(2), 134–143. https://doi.org/10.1111/chso.12162

Berthelsen, D., Brownlee, J., & Karuppiah, N. (2011). *Teachers' beliefs and practices in early childhood education in Singapore*. Pearson Education.

Brownlee, J., Berthelsen, D., & Segaran, N. (2009). Child care worker's and centre director's beliefs about child care quality and professional training. *Early Child Development and Care, 179*(4), 453–475.

Chanel News Asia (CNA). (2020). *Why it's still so hard to have more early childhood educators in Singapore*. Retrieved December 8, 2021 from https://www.channelnewsasia.com/cnainsider/why-still-hard-get-early-childhood-educators-singapore-preschool-793946

Early Childhood Development Agency (ECDA). (2011). *New training and certification pathway for early years educarers*. Retrieved December 8, 2021 from https://www.ecda.gov.sg/PressReleases/Pages/New-Training-and-Certification-Pathway-for-Early-Years-Educarers.aspx

Early Childhood Development Agency (ECDA). (2013). *A career guide for early childhood professionals*. Author.

Early Childhood Development Agency (ECDA). (2018). *Transforming the early childhood sector to give every child a good start in life*. Retrieved December 8, 2021 from https://www.msf.gov.sg/media-room/Pages/Transforming-the-early-childhood-sector-to-give-every-child-a-good-start-in-life.aspx

Early Childhood Development Agency (ECDA). (2019). *SPARK accreditation: QRS 0-3 section.*. Retrieved December 8, 2021 from https://www.ecda.gov.sg/sparkinfo/Pages/0-3Section.aspx

Early Childhood Development Agency (ECDA). (2020). *Biannual report statistics on ECDC services*. Retrieved December 8, 2021 from https://www.ecda.gov.sg/Operators/Pages/Statistics-n-Reports.aspx

Early Childhood Development Agency (ECDA). (2021). *ECDA innovation projects grant*. Retrieved December 8, 2021 from https://www.ecda.gov.sg/Educators/Pages/ECDA-Innovation-Projects-Grant.aspx

Jeynes, W. (2012). A meta-analysis of the efficacy of different types of parental involvement programs for urban students. *Urban Education, 4*(1), 706–742.

Karuppiah, N. (2014). *Early childhood education in Asia: Singapore*. Unpublished manuscript.

Karuppiah, N. (2015). Childcare staff's and parents' beliefs about quality care for infants/toddlers in centre-based programmes in Singapore. *Australian Journal of Early Childhood, 30*(4), 105–113.

Karuppiah, N., & Berthelsen, D. (2011). Multicultural education: The understandings of preschool teachers in Singapore. *Australian Journal of Early Childhood, 36*(4), 38–42.

Khoo, K. C. (2010). The shaping of childcare and preschool education in Singapore: From separatism to collaboration. *International Journal of Child Care and Education Policy, 4*(1), 23–34.

Kuhn, D., & Weinstock, M. (2002). What is epistemological thinking and why does it matter? In B. Hofer & P. Pintrich (Eds.), *Personal epistemology: The psychological beliefs about knowledge and knowing*. Lawrence Erlbaum.

Langeloo, A., Mascareno, M. L., Deunk, M. I., Klitzing, N. F., & Strijbos, J. W. (2019). A systematic review of teacher-child interactions with multilingual young children. *Review of Educational Research, 89*(4), 536–568.

Leong, W. K. (1999, November 14). *Panel to look into pre-school education* (p. 27). The Straits Times.

Lonigan, C. J., Phillips, B. M., Clancy, J. L., Landry, S. H., Swank, P. R., Assel, M., Taylor, H. B., Klein, A., Starkey, P., Domitrovich, C. E., Eisenberg, N., de Villiers, J., de Villiers, P., Barnes, M., & The School Readiness Consortium. (2015). Impacts of a comprehensive school readi-

ness curriculum for preschool children at risk for educational difficulties. *Child Development, 86*, 1773–1793.

Ministry of Community Development Youth and Sports (MCYS). (2008). *Child care in Singapore: Waves of professionalism*. Author.

Ministry of Community Development Youth and Sports (MCYS). (2011). *Early years development framework for child care centres*. Author.

Ministry of Education Preschool Education Branch (MOE PEB). (2012). *Nurturing early learners: A curriculum framework for kindergartens in Singapore*. Author.

Ministry of Education (MOE). (2018). *Core modules, new diploma & cross-campus experiences for NIEC students*. Retrieved on December 8, 2021 from https://www.niec.edu.sg/upload/media/Press-Release-on-new-ECDE-11-May.pdf

Nunez, J. C., Suarez, N., Rosario, P., Vallegjo, G., Valle, A., & Epstein, J. L. (2015). Relationship between perceived parental involvement in homework, student homework behaviours, and academic achievement: differences among elementary, junior high, and high school students. *Metacognition and Learning, 10*(3), 375–407.

Organisation for Economic Co-operation and Development (OECD). (2018). *Engaging young children: Lessons from research about quality in early childhood education and care.* Retrieved on December 8, 2021 from http://www.oecd.org/education/engaging-young-children-9789264085145-en.htm

Paulo, D. A., Yuxin, P., & Grosse, S. (2018). *Why it's still so hard to have more early childhood educators in Singapore*. Retrieved on December 1, 2021 from https://www.channelnewsasia.com/cnainsider/why-still-hard-get-early-childhood-educators-singapore-preschool-793946

Pianta, R., DeCoster, J., Cabell, S. Q., Burchinal, M., Hamre, B., Downer, J., LoCasale-Crouch, J., Williford, A. P., & Howes, C. (2014). Dose–response relations between preschool teachers' exposure to components of professional development and increases in quality of their interactions with children. *Early Childhood Research Quarterly, 29*(2014), 499–508.

Pramling, N., & Pramling, I. S. (2011). *Education encounters: Nordic studies in early childhood didactics*. Springer.

Prime Minister's Office Singapore (PMO). (2019). *National Day Rally 2019*. Retrieved December 8, 2021 from https://www.pmo.gov.sg/Newsroom/National-Day-Rally-2019

Schachter, R. E., Gerde, H. K., & Hatton-Bowers, H. (2019). Guidelines for selecting professional development for early childhood teachers. *Early Childhood Education Journal, 47*(4), 395–408.

Singapore Department of Statistics. (2020). *What is the racial proportions among Singapore citizens?* Retrieved December 8, 2021 from https://www.gov.sg/article/what-are-the-racial-proportions-among-singapore-citizens

SkillsFuture. (2019). *About SkillsFuture.* Retrieved December 8, 2021 from https://www.skillsfuture.gov.sg/AboutSkillsFuture

Tan, C. T. (2007). Policy developments in pre-school education in Singapore: A focus of the key reforms of kindergarten education. *International Journal of Child Care and Education Policy, 35*(1), 35–43.

Tan, C. T. (2017). Enhancing the quality of kindergarten education in Singapore: Policies and strategies in the 21st century. *International Journal of Child Care and Education Policy, 11*(7).

Teng, A. (2015, August 27). *300 gain entry to early childhood courses before exams*. Retrieved December 8, 2021 from https://www.asiaone.com/singapore/300-gain-entry-early-childhood-courses-exams

Yang, C. (2020, February 19). *Singapore budget 2020: More help to give every Singaporean child a good start in life*. Retrieved on December 8, 2021 from https://www.straitstimes.com/singapore/more-help-to-give-every-singaporean-child-a-good-start-in-life

Zan, B., & Donegan-ritter, M. (2014). Reflecting, coaching and mentoring to enhance teacher-child interactions in Head Start Classrooms. *Early Childhood Education Journal, 42*(2), 93–104.

# Chapter 4
# Early Learners Curriculum: Case of Singapore Early Childhood Education Working Towards Quality

**Heidi Layne**

**Abstract** Singapore's government has implemented numerous measures to improve the preparation for and the quality of early childhood education (ECE). One such reform is the Nurturing Early Learners (NEL) curriculum framework for ECE with the change from academic-oriented education toward a more child-centered ideology (Ministry of Education, 2003, 2013). With this reform and contextual change in ECE, it is paramount to understand child centeredness in the context of early childhood education in Singapore. Quality can be defined using structural factors, such as the teacher-child ratio, physical environment, and teachers' qualifications; it can also be defined using process factors such as the way in which the curriculum is implemented and the quality of teacher-child interactions. This chapter discusses the quality of ECE and the curriculum and its implementation and evaluates the Nurturing Early Learners Curriculum (NEL, 2003, 2012) utilizing Schiro's idea of curriculum ideology with a focus on learner-centeredness. Furthermore, it presents 12 preschool teachers' interpretations of good-quality ECE and curriculum changes in Singapore. Discourse analyses and discursive pragmatics (Zienkowski, Discursive pragmatics. A platform for the pragmatic study of discourse. In: Zienkowski J, Östman J-O, Verschueren J (eds), Discursive pragmatics. Benjamins, Amsterdam, pp 1–13, 2011; Wright, Post-structural methodologies: the body, schooling and health. In: Evans J, Davies, B, Wright J (eds) Body knowledge and control: Studies in the sociology of physical education and health. Taylor & Francis e-Library, pp 19–31, 2004), guided this small-scale pilot study. The results identify the ways in which the child-centeredness is discussed and understood in Singapore and possible ways to develop East-Asian early childhood pedagogy.

**Keywords** Early Childhood Education (ECE) · Curriculum theory · Curriculum analysis · Curriculum implementation · Child-centered approach · Singapore

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## 4.1   Introduction

Internationally, within the past decade, countries with well-developed or developing Early Childhood Education (ECE) systems have witnessed a range of reviews, public policies, inquiries, and research into what constitutes quality in ECE (Organisation for Economic Co-operation and Development OECD, 2006). Earlier research has provided numerous important reasons to be concerned with measuring the quality in ECE settings, one of which is to ensure that the ECE system maintains national standards for children and their families (Dahlberg et al., 2013). Furthermore, the said quality can be defined as the process by which the curriculum is delivered (Dahlberg et al., 2013); it can also be defined by how satisfied children are and how much the children are interested, fascinated, and being challenged at the limits of their capabilities (Laevers, 2017).

   Learner-centered education promotes an idea of agency and children having initiative over their own learning based on their personal development and needs (Schiro, 2008, 2013). Furthermore, it considers the role of teachers as facilitators in the learning process (Schiro, 2008). Confucian education, which is often regarded as grounding philosophy for the Asian/Singaporean education system, on the other hand, considers individuals in relation to others and to their society (Ho, 2018). However, because Singapore is a multicultural society, not all Singaporeans necessarily relate to the idea of Confucianism. The NEL curriculum framework has been identified as an action toward learner-centeredness in the Singaporean education system (Lim-Ratnam, 2013), embedded in "constructivist" paradigms where the child-teacher interaction is seen as a crucial part of learning. Teachers are guided with instructions to raise questions and encourage children's awakening curiosity toward learning. With references to Vygotsky, Dewey, and constructivism paradigms, NEL also suggests that individuals construct their knowledge within and through interactions with social contexts (NEL, 2012). NEL is specifically designed to accommodate learning for children aged three to six. In this chapter, the ECE refers to this specific framework. NEL is published by Ministry of Education (MOE), and recommended, but not mandated to be used in all kindergartens and child care centers in Singapore. Curriculum for earlier years (0–3) is currently under review by Early Childhood Development Agency (ECDA). However, teachers' educational backgrounds vary; therefore, teachers in this chapter are referred as preschool teacher or kindergarten teachers. The focus of this chapter is to explore the roles of children and teachers in the NEL curriculum. In addition, parallel to the discussion on the curriculum, small number of 12 preschool teachers were interviewed to understand how the curriculum is enacted in the ECE within Singapore. The preschool teachers interviewed were selected specifically from the Ministry of Education (MOE) kindergartens (9 teachers) and from the ECDA anchor operators (3 teachers). The MOE preschool sector supported in selecting the teachers. The aim of the interviews is to understand how the preschool teachers reflect on the quality of early childhood education and curriculum with their diverse educational backgrounds.

Organization for Economic Cooperation and Development (OECD) has investigated the policy developments behind early childhood education in different countries. Bennett (2003) defined two different types of policy alignments on focusing cognitive goals and school readiness (UK, US, Asian countries) and another one with more social pedagogic tradition (Nordic countries, many central European countries). Adopting a curriculum framework from other education systems without positioning the central terms, such as learner centeredness in to the local context, requires some unpacking of the central ideas. First, Stuart (2016) points out the power imbalance in theorizing child development and the pedagogies related to the early childhood education. These theories are mainly developed in the US (Western) context, and knowledge developed under these circumstances does not necessarily relate to the childhood experiences of children with diverse backgrounds. Second, the child-centered ideology needs to be unpacked in the Singaporean education system.

Currently, Singapore is a good example in ECE; there is a political desire for change and promoting an inclusive ECE system. One initiative to improve ECE has been the curriculum reforms which took place in 2003 and 2012. A second example of this is when Prime Minister Lee Hsien Loong announced, during the National Day Rally in 2017, that there would be a significant focus on teacher education in ECE within Singapore. Lately, the Ministry of Education in Singapore (MOE) has stated that they shall give priority for low-income family children for MOE kindergartens. This chapter aims to look into curriculum reform and the origin of the national curriculum framework, the NEL curriculum framework. The content of the curriculum is discussed in the framework of Schiro's work on curriculum development with a focus on understanding the foundation for learner-centered ideology (Schiro, 2008, 2013). Furthermore, the child-centeredness will be reconstructed in the Singapore context. The curriculum development in Singapore's ECE has been criticized as being too "child/learner-centered" to accommodate the academic requirements (Teo, 2018). Therefore, it is important to understand the curriculum in the Singaporean context and to have teachers speak out to understand the changes needed for teacher preparation. Thus, this chapter addresses the following research questions:

1. How can we better understand the meaning of learner/child-oriented curriculum in the field of ECE in Singapore?
2. How do teachers understand and experience the curriculum and teaches professionalism in their everyday work?

The discussion of these two questions will be concluded with some reflection toward the formation of East-Asian ECE and Care.

## 4.2  Background

### 4.2.1  Current Discourses About Early Childhood Education in Singapore

Singapore is often described as a small nation without natural resources, where education is especially important as the society is dependent on its skilled people for economic survival and development (Gopinathan, 2001). To achieve the government's aim of having a top-rate education system (Lim-Ratnam 2013), it is crucial to define and understand what constitutes a good-quality education. ECE is by no means separated from the economic powers and from assessment-oriented education in Singapore. The government of Singapore has a strong desire to open up more opportunities for good-quality ECE for the diverse population in the country. ECE reform has been explained with a more child/learner-centered approach toward education. This has not been received without doubt, as the Singaporean education system values academic knowledge. In addition, the new curriculum framework introduces a concept of play, which is also regarded as being troublesome as parents do not understand play as a part of academic learning (Nyland & Ng, 2016). There are different dispositions for play, and NEL guides for purposeful play being more teacher directed than free play (Nyland & Ng, 2016).

Preschool education in Singapore has previously been (and still mainly is) provided by the private sector (Bull & Bautista, 2018). Until recently, preschool pedagogy was claimed to be underlining academic competitiveness concerning the transition to primary school and, therefore, did not differ much from school pedagogy (Bull & Bautista, 2018). However, during the past decade, there have been good intentions to shift preschool education toward nurturing creative and lifelong learners, laying the foundation for a "passion for learning," which is a quality that is highly sought after in twenty-first-century skills (Bull & Bautista, 2018).

As a result, there was the formation of the NEL curriculum framework reform in 2003 (revised in 2012). During recent years, the MOE and the Ministry of Social and Family Development (MSF) have formed and implemented a committee to enhance and formulate affordable good-quality ECE for Singaporean families. This has been informed by a psychological understanding of early childhood as a significant phase of life with specific developmental and learning needs. The 2003 implemented and 2012 revised curriculum framework, NEL, aimed to promote sustainable, lifelong learning instead of anticipating an academic-focused pedagogy in kindergartens. In addition, teachers and educators were provided with supportive teaching and learning resources developed by the MOE. However, MOE kindergartens represent a small minority of the ECE providers within the field in Singapore. In addition, they provide half-day programs that challenge many working parents.

MOE presently recommends that all providers somehow follow the NEL framework, but the implementation and curriculums are not centralized within ECE (Nyland & Ng, 2016). Established in 2013, the Early Childhood Development Agency (ECDA) integrated the capabilities from an overview of different providers

in the field. The aim of the ECDA was to serve as a single point of contact for new and existing ECE professionals, parents, and families, as well as child care centers and kindergarten operators. In fact, the ECDA has identified some anchor operators and partner operators who provide funding support to selected preschool operators to increase access to good-quality and affordable ECE in Singapore (Bull & Bautista, 2018).

The Singaporean education system has been claimed to value academic competencies, testing, and exams (Bach & Christensen, 2016). Parents have to balance the demands and care for their children. In literature and public discourses, parents are sometimes labelled as "Kiasu parents," an expression derived from a Chinese dialectal term "Kiasu," or the fear of losing out. These parents want their children to get ahead of their peers at any price in order to gain access to prestigious schools and well-paid jobs (Bach & Christensen, 2016). However, these parents are part of the social system of meritocracy, where "one is believed to receive what they deserve through hard work" (Gopinathan, 2001).

Teo (2018), in her ethnographic research on low-income families in Singapore, reflected on how an academically oriented education system does not recognize skills that many children and young people adopt in low income families, such as the capacity for care and "indigenous" knowledge (Teo, 2018; see also the "Funds of Knowledge Approach" by González et al., 2005). Moreover, this chapter aims to understand what type of early childhood pedagogy and curriculum implementation (teacher preparation) can predict a change in the practices that are more in line with the curriculum framework as well as changes that are under debate in Singapore. However, we also need to bear in mind the reality of the varieties of different providers and curricula in the field. Various good intentions have been made to improve the teaching of the early years. Different types of training have been an important part of the government's strategy for implementing reform, for example, equipping principals with knowledge of leadership, management, and early childhood teaching (Tan, 2017). Early childhood education reforms have been designed to ensure a smooth transition for children from the early childhood setting to the formal primary school (Tan, 2017, p. 37). In the case of Singapore, after 10 years, there is evidence to suggest that if any change in teaching practice has eventuated, it has been minimal.

## 4.3   The Curriculum and Implementation in Theory

Curriculum evaluation and analysis have different meanings. While evaluation is more pragmatic, analysis is interested in the educational value of a curriculum and reveals the hidden paradigms of an intended curriculum (Keeves, 1992; Schiro, 2008). In this article, I concentrate more on the analysis of how teachers and children are positioned to the curriculum, to better frame the learner-centered framework in Singapore. A curriculum is an informative, administrative, and pedagogical document. Doyle and Rosemartin (2012; see also Doyle, 1992) presented two

different, distinctive levels of curriculums: (a) a policy and programmatic level, which is also an institutional level, and (b) a classroom level. The institutional level deals with sublevels: first, on a policy level in the intersections of schooling, society, and culture, and, second, on a programmatic level to produce relevant classroom practices. At the classroom level, the programmatic curriculum is enacted and reflected among the students (Doyle & Rosemartin, 2012). With the curriculum analysis, one can make better sense of these roles and philosophical perspectives (Schiro, 2008). The meaning and definitions for curriculum have changed over time, and they are deeply rooted in the education ideologies of different education systems. Therefore, the NEL curriculum framework has also been critiqued by some parents for changing education toward a too child-centered approach for the Singaporean understanding of education. This is what inspired this study in the curriculum analysis, specifically, the interpretation of child−/learner-centeredness. Once the multiple layers of curriculum are understood, as well as how to make sense of them, it enables a better understanding of the dispositions of child and childhood, interpreting them both globally and locally.

Simply said, curriculum is also a policy document. In educational Confucianism, it refers to the totality of learning experiences provided to students (Tan, 2017). For example, in Finland, the mission of the new national framework for pre-primary education is to promote the equal implementation of high-quality and unified pre-primary education within the entire country (Finnish National Agency for Education, 2016). Curriculum itself is one way to look into the quality of education, what it states, and, furthermore, into the way it is delivered.

Curriculum ideologies, overall, determine a good framework for policy analyses to understand the focus behind education on all levels and the roles for both children/students and teachers. Furthermore, focus on what to teach or how to teach is one way to understand the ideology and meaning behind the curriculum and an educational goal in a certain context. Aside from understanding curriculum at different levels, we can analyze the role of knowledge and child-teacher goals set by the curriculum, helping also in the development of teacher education.

Common for many education systems across the globe, educators, parents, and policy makers have diverse opinions on what the curriculum should be and include. Schiro (2008) introduced four different ideologies that are useful in interpreting the curriculum: the Scholar Academic Ideology, the Social Efficiency Ideology, the Learner-Centered Ideology, and the Social Reconstruction Ideology. Each ideology adopts different dispositions for the learner (child), the nature of knowledge, and the teacher's role (Schiro, 2008, 2013). Child-centeredness is an area of interest explored in the present paper concerning the NEL curriculum framework to contextualize it better within the Singapore context. The Learner-Centered Ideology (Schiro 2008, 2013) believed that people possess the agency to actualize their own capabilities for growth. It also shifts the focus on quality toward the process factors, such as the relationships and interactions between teachers and children, and how the children are involved and challenged in learning. Teachers are seen as facilitators in nurturing the knowledge that has a personal meaning for each different learner.

### 4.3.1    Discourse Analysis

Discourse analyses and discursive pragmatics were used to analyze the data. For the interviews, parts of curriculum framework, where the curriculum described the teachers' qualities and children, were used in the interviews. Here, the empirical task was to start by identifying the "institutional and cultural texts, which are likely to serve as important sources for the discourses which constitute the field of inquiry" (Wright, 2004, p. 24). This means that texts from relevant sources "will provide indication of how discourses are constituted and how these become invested with personal and cultural desires, needs, and so on" (Wright, 2004, p. 24). Curriculum, both written and implemented (acted), forms a paradigm of activities as being either pragmatic or discursive (Zienkowski, 2011). Curriculum that serves as a policy document, determining the educational values of society, acts in different forms for different stakeholders, such as policy makers, parents, and teachers.

### 4.3.2    Insights to Nurturing Early Learners Curriculum

Over the years, there has been a shift in educational philosophy. In 2008, Zulkifli, a Senior Parliamentary Secretary at the MOE, noted that, in the past, teachers were seen as bearers of knowledge and were expected to teach skills and content to children who were seen as passive learners. Now, the NEL (2012) curriculum framework views children as active learners who construct knowledge for themselves, and the role of the teacher has been transformed to one of helping students to construct their own learning in a seamless, integrated, and holistic way (NEL, 2012; Ebbeck & Yoke, 2010). In the educational discourses, there are often certain professional expectations of qualities of expertise, specifically on the knowledge that teachers are expected to have. In the Singapore context, the academic knowledge is highly valued with the system of meritocracy (Gopinathan, 2001).

The NEL curriculum (2012) states that "As children interact with objects, people, ideas and events, they demonstrate to the teachers how they think and reason. This enables skillful teachers to recognize each child's interests and abilities and make informed decisions on how to guide and provide for their holistic development" (NEL, 2012, p. 28). Teachers are seen as skillful in recognizing children's interest. Moreover, according to Nyland and Ng (2016), the NEL curriculum relies on a play-based pedagogy and teachers as change agents. However, complimented with instructional support (Nylan & Ng, 2016, p. 466), the NEL also plans to nurture children's holistic development with an integrated approach by facilitating children's thinking and learning, by reflecting on and enhancing professional practice, and by collaborating with the families (NEL, 2012).

Changing curriculum requires changes in practices, and child/learner centeredness requires certain types of teacher-child interactions (Bautista et al., 2016). This challenges the Confucian philosophy, where the teacher is highly respected as a

dispenser of knowledge. However, Singapore is not alone in this, but, in general, education reforms tend to be challenging. International literature reviews indicate that the shift from the idea of transmitting knowledge to constructing knowledge requires an additional shift in the teachers' educations and in the minds of some parents. Constructivist teacher education, derived from sociocultural and situated theories of learning, prompts teachers to understand and reconsider their own prior understanding and to do the same with their students (Cochran-Smith & Lythle, 1999). This requires more understanding of preschool teacher preparation in Singapore.

The desired outcome for education in Singapore according to Ministry of Education (MOE), stated in NEL (2012), is as follows:

- A confident person who has a strong sense of right wrong, is adaptable and resilient, knows himself, is discerning in judgement, thinks independently and critically, and communicates effectively.
- A self-directed learner who takes responsibility for his own learning, who questions, reflects, and perseveres in the pursuit of learning.
- An active contributor who is able to work effectively in teams, exercises initiative, takes calculated risks, is innovative, and strives for excellence.
- A concerned citizen who is rooted to Singapore, has a strong civic consciousness, is informed, and takes active role in bettering the lives of others around him. (NEL, 2012, p. 17).

The goals set by NEL for kindergarten education are that the child is able to: know what is right and wrong; be willing to share and take turns; be able to relate to others; be curious and able to explore; be able to listen and speak with understanding; be comfortable and happy with themselves; have developed physical coordination and healthy habits; and love their family, friends, teachers, and school (NEL, 2012, p. 18).

The NEL curriculum framework has an educators' guide with instructional support, helping to translate the NEL framework into quality learning experiences for children (NEL, 2012, p. 7). The NEL curriculum describes children as "curious, active, and competent learners" (NEL, 2012). The idea of a competent child has globally become a very commonly valued entity; however, it has also been criticized for its neo-liberal ideology and social efficiency (Schiro, 2008). The idea of a competent child also dismisses diverse family backgrounds (Teo, 2018). Leaner-centered ideology (Schiro, 2008, 2013) employs an idea of a capable rather than competent child (Schiro, 2013). NEL lists certain qualities for children, such as being curious, active, and competent, as students who learn through social actions, by free choice, through problem solving, and within intentional and purposeful play (NEL, 2012). Where learner-centered ideology often relies on agency, NEL simultaneously promotes purposeful play (teacher directed) and free choice (NEL, 2012).

Results from the Singapore Kindergarten Impact Project (SKIP) propose some further investigations toward alignment between the pedagogies and principles of the child-centered approach, as well as alignments between curriculum and practices (Bautista et al., 2016). The curriculum also outlines good qualities that children need to gain from education. One example is that children are given opportunities for decision-making, so they learn to take responsibility (NEL, 2012).

There is a fine line between allowing children to take agency in their learning and actually expecting certain behaviors that are required from children (Schiro, 2008, 2013). Learner-centeredness can be analyzed in a framework of children who are allowed to be children or children as potential adults (Schiro, 2008). This is important in understanding the foundations for learner-centered ideology and to reassure Singaporean parents' concerns about the new approaches in education.

Furthermore, children are known to learn through managing emotions and behaviors, which also leads to managerial discourses in education that are prevailing in the system (NEL, 2012; Schiro, 2013). Thus, child-centeredness needs to be understood through these dispositions. The NEL curriculum framework does adopt an idea of children as unique persons who construct their own knowledge, skills, and dispositions that they have also acquired earlier. Moreover, the NEL applies learning specific areas, which are (a) aesthetics and creative learning, (b) discovery of the world, (c) language and literacy, (d) motor skills development, (e) numeracy, and (f) social and emotional skills. In addition, there are some learning dispositions, including those such as perseverance, reflectiveness, appreciation, inventiveness, a sense of wonder, curiosity, and engagement. The NEL also has a section for mother tongue instruction (NEL, 2012).

The NEL approaches teachers as facilitators and stimulators of learning. Teachers are encouraged to plan and implement active learning, however, based on the teachers' knowledge of child development and through intentionally planned activities (NEL, 2012). Again, teachers are, at times, given a managerial position as they mitigate children's learning in a social-emotional foundation (NEL, 2012). Certain types of managerial roles in teaching are still visible in the curriculum and also in the way the instructional materials are organized.

Schiro's (2008, 2013) curriculum ideologies can also be claimed as representative of Western ideology. The NEL clearly possesses good intentions to bring the child to the center of learning at the intersection with the academic areas of importance in the Singaporean context. Moving forward, we will next discuss the teachers' perceptions and experiences of curriculum and its implementation. Furthermore, ideas for future education reforms will be discussed and linked to the Asian context.

## 4.4  Preschool Teachers' Reflections on the Curriculum and Professional Practice

### 4.4.1  Interviews

Nine individual and one focus group interview were conducted with a total of 12 teachers to better understand how the teachers interpreted and used the curriculum. With this small-scale pilot study, the intention was also to understand if there is any difference in the depth of conversation when conducting one-on-one interviews or when conducting focus groups discussions. Questions in both interview designs

were the same. The sampling criteria for teachers were 3 years or less from graduating from their teacher preparation program (degree or diploma). All teachers were either working for MOE kindergartens or for one of the ECDA anchor operators. Teachers are coded from T1 to T12. The table below describes the variety of different educational backgrounds that the teachers have working in the field. Two teachers were specifically assigned as mother tongue teachers. Teachers' education backgrounds were based on the way teachers reported their education during the interview.

| | |
|---|---|
| Interview 1 FGD: T1, T2, T3 | Studying for BA in Singaporean University. All three have diplomas from the same polytechnic |
| Interview 2: T4 | Diploma from the polytechnic and BA from the Singapore-based foreign university |
| Interview 3: T5 | Diploma from the polytechnic and BA from the Singapore-based foreign university |
| Interview 4: T6 | Polytechnic (18-month course completed in 6 months) |
| Interview 5: T7 | Conversion from other university degree into diploma in kindergarten teaching |
| Interview 6: T9 | Diploma conversion from other field to early childhood education |
| Interview 7: T10 | Diploma conversion from other field to early childhood education |
| Interview 9: T11 | Diploma from the polytechnic |
| Interview 10: T12 | Polytechnic degree, currently studying for BA in Singaporean university |

**Quality of Education and Curriculum Implementation** When designing the interview protocol, the point of departure was learning about how the teachers discussed the quality and what kind positions they took in regard the quality of education and curriculum implementation. The purpose was not to directly point to the child-centered pedagogy in the interview but more on NEL and to understand what positions they took in the discourse on good-quality curriculum in the field of early childhood education. The teachers tended to place both learning outcomes and the child in the center of the discourse. Their understanding of the good-quality early childhood education consisted of *holistic curriculum*, *child's well-being, joy*, *and developmentally appropriate activities,* which goes beyond academics, but at the same time the *academic knowledge and standards* are present in every discussion. The reflection on outcomes was mainly on the requirements of primary education and parents. These statements were often followed by references toward parents' expectations and primary school curriculum orientations not being aligned with the child-centered ideology: "curriculum doesn't really match up to the standard in primary schools, so when the children step over to primary school the parents feedback that they actually feel stressed" (T1). Private tuition is already common among children aged 5–7 before starting primary school. However, there was also a teacher who specifically said that they get good feedback from primary school teachers that the children are well prepared for the school after attending at the MOE kindergarten. The academically focused education system and parents' demands are regularly

reported in the studies in Singapore context and seem hard to break as long as Primary School Leaving Examination (PSLE) exists in the system. Further initiatives by the government are in place to try to break this cycle.

There were slight differences in the discourses in between the teachers' education background and in how teachers, teaching, and children were positioned in the discourse (Zienkowski, 2011; Wright, 2004). Regardless the education level, they all had less than 3 years of working experience. In the following excerpts, the teachers with bachelor's degree or studying toward obtaining BA degrees discuss the curriculum, children, learning outcomes, and teachers' roles:

- "I feel that a quality curriculum is mostly based on the children's well-being and also how well the teachers can implement the curriculum to meet the target outcome" (T2).
- "[I]t's the teachers. I mean firstly, it's the passion toward children and also how they are able to understand the curriculum and also suit it to meet the children's, the different children's needs" (T4).
- "I believe that children learn very much through play. So, I always inject very much fun activities. It also depends on the children's profile. So, for example of the class very hyper, I will get them to have more hands-on activities because they cannot sit down" (T12).

These teachers reflected on child's needs and well-being, although the well-being was not further defined or prompted in the interviews. The teachers with diplomas tend to used slightly more technical skill-based discourse, and though they mentioned that the curriculum believes that teachers are facilitators, the teachers delivering teaching, "So in my opinion it has to have a balance of academic and socioemotional skills" (T7), and about implementing the curriculum, "Whatever topic we start they already know something. So, we cannot think that they don't know anything. They have to introduce what they already know, so we ask question to find what they know and from there we have to start teaching" (T6).

The quality of early childhood education was reflected on different societal levels, as what Wright (2004) reflect on how discourses are reflected of personal and cultural levels: one is on a macro-level how education needs to be "affordable for the citizens" (T5); "I think it is the curriculum" (T12); "I think it's one that will encourage children to maybe explore and something that will help to (um) enhance their learning" (T11). T5, who mentioned that education needs to be affordable to all, continued her reflection on the wide selection of day care providers in Singapore and how prices and curriculums vary, challenging the equal opportunities for all to choose the curriculums. Good-quality education and an egalitarian education system are crucial factors in increasing the wealth of any society (Layne & Lipponen, 2014). The privatized sectors also challenge teachers in the way they formulate their answers of the good-quality early childhood education, as she also states that, "it is better not to construct stable idea as the teachers need to be very flexible with their professionalism as the curriculums and orientations change so much by the service providers" (T5). This is quite an interesting statement as it limits teachers in the way they construct their own teaching philosophy, educational beliefs, and professional development.

**Teachers' Professionalism**  A polytechnic degree was described to provide basic professional skills with similar basic six learning areas than the NEL curriculum framework. Polytechnic was seen as being adequate by those who had diploma level education, but those who had gone for the university degree reflected on how they only then understood the difference between teacher- and child-directed activities. T1 reflected on how, before doing the module in the Perspectives on Child Study as a part of the university studies, she felt that her enacting curriculum and choosing teaching styles were decided "by flow," but after completing the module, she was more aware of what is teacher-directed and what is child-directed teaching. T3 confirmed this point of view and gave an example on how behaviorism and constructivism work differently and how by constructive approach "you guide them to construct the knowledge on how they should behave….so rather than giving them consequences of what happens if you don't behave….you tell them that if you don't sit down you won't be able to see, so completing the module it alters the way we work actually" (T3). T1 then expressed also that she did not have any belief until that university module, and how she now observed the different styles in her center. Interestingly, the teachers overall, regardless the education level, reflected that teachers' education level is not the one determinant for the quality of curriculum delivery. They were more referring to the different teaching styles that some mother tongue teachers have coming from countries with more academic-oriented education systems. Culture of education is something that is relevant to consider in Singapore education, as Singapore is multiracial and also the teachers come from different ethnic groups. There's no one single way of discussing the meaning of children and childhood but reflected through personal level and experience of education (Wright, 2004).

T4 described that polytechnic focuses on basics, and in the university she was forced out of her comfort zone, specifically as she studied in the foreign university although based in Singapore, they had to do period of study abroad. According to her, they (student teachers who were studying in this program) were really exposed to what constructivism really is and how children can guide their own learning during their study period abroad. Her comments on the NEL curriculum framework also reflects this perspective: "I think what they can work on more is how teachers can allow children to be constructors of their own knowledge cause I know there is a part where they (referring to NEL) say children are supposed to construct their own knowledge but cause Singapore I think we're very used to a teacher-directed and structured educational setting where the teacher tells you what to do and as a student you just follow" (T4).

T6 explained that teachers need to have "multiple personalities and the work is a lot about multitasking, because it is a lot about planning and preparing learning centers, events, and documentation of children's work, projects, gardening, and water play" (T6).

All the teachers mentioned following the instructional guidelines from the NEL curriculum framework, at least to some extent. However, the common comment for the challenges in implementing the curriculum was the time constraint. T12

mentioned how sometimes there were too many activities that required the children to sit down, and often different methods are needed to be applied for those who could not sit down. T11 reflected on how the teacher training helps to understand the curriculum so that the teachers do not teach out of context.

Singapore, like many other countries, suffers from a high turnover rate of teachers, especially in the early childhood education. From the teaching profession perspective, the teachers were asked to reflect on the meaningful moments during their studies and in construction of the teachers' professional identity. Teaching practice was mentioned by many to be very important in understanding the field and also determining their own motivation. Teaching practice was mentioned to be one that actually divided people in those who were motivated to complete their diplomas or to not complete their studies. Practical training in different sectors of preschool providers gave the teachers also better understanding of the different opportunities in the field and with which provider they were possibly interested to work after graduation.

## 4.5  Discussion and Conclusion

### 4.5.1  Contextualizing Child and Teachers' Professionalism in Singapore

This study focused on two different paradigms to provide insight as to how to better understand the curriculum ideology, what the challenges of curriculum implementation are, and where is Singapore at the moment. The limitation of the study is the small sample size, which prevents generalizing the results. It is important also to note that the data used is interview-based and does not reflect the real practices of the teachers. Based on research by Arby et al. (2015), there is an opportunity for misalignment between preschool teachers' practices and beliefs. Despite the small number of interviewees, their educational backgrounds vary.

Child centeredness need to be looked at from three interrelated perspectives: (a) how is the meanings constructed in the curriculum, (b) how is the curriculum enacted, and (c) how are the teachers prepared for the curriculum implementation. Currently NEL curriculum framework does recognize the child's curiosity and ownership on learning, but at the same time there are a lot of management required from the teachers. Play and learning through play is an approach in early childhood education that has been mentioned in the literature as a mean for children to take agency over their own learning and also something that NEL mentions (purposeful play). Play does not come out in the teachers' talk other than in fun activities that teachers organize for the children. The creative component, which free play emphasizes, is also an important part of twenty-first-century skills and is missing from the curriculum framework and from the teachers talk. Further analysis on the role of play in the

Nurturing Early Learners Curriculum is needed, and further observations on the quality of play are needed in Singapore.

Child-centered curriculum requires teacher preparation with similar ideology. One of the teachers interviewed reflected that she was only able to understand the true meaning of child centeredness during the degree studies and when she understood constructivism. In addition, teachers studying toward bachelor's degree in Early Childhood Education or having completed it, one addressed how they became aware of the child centeredness in a different level during their degree studies. Teacher education programs with a focus on child-centered ideology tend to prepare teachers to follow more child-centered and inquiry-oriented curricula (Polly et al., 2014).

Moreover, teachers need to be guided to facilitate knowledge building, learning by play and inquiry, where children have more lead in their learning. Unpacking and localizing the terms and ideology will help to prepare teachers and parents for the future education.

Based on earlier research, the classroom interaction measures have been low in Singapore preschools (Bautista et al., 2018). A well-organized ECE system is important specifically from the perspective of children with vulnerable backgrounds. Therefore, good-quality degree programs for preschool teachers are an important step, but it is not enough without a pedagogical and ideological understanding. Earlier research indicates that Singaporean preschool teachers, to some extent, understood what inquiry-based learning meant, but they lacked the practical competency for applying inquiry-based education (Ebbeck & Yoke, 2010). According to the same study, the teachers were willing and interested in developing research skills, but, unless their working conditions improved, they would continue to face challenges (Ebbeck & Yoke, 2010). Inquiry-based teacher education provides teachers with tools to evaluate their own beliefs and to understand the education ideologies and child-centeredness aside from the skills and academic competency approach. In addition, teacher education that prepare for curriculum implementation may reduce the stress and high turnover rate of teachers. Vietnam has undergone a similar shift as Singapore from a more academic-focused education toward a student-centered approach. The reform has been reported to cause preschool teachers to experience stress through the unfamiliar concepts and required reassessment of theories and practices without sufficient focus on teacher preparation (Thao & Boyd, 2014). Education reforms need to be understood in a larger socio-cultural perspective, where children, families, and teachers are part of larger social interlocutors with conflicting beliefs.

# References

Abry, T., Latham, S., Bassok, D., & LoCasale-Crouch, J. (2015). Preschool and kindergarten teachers' beliefs about early school competencies: Misalignment matters for kindergarten adjustment. *Early Childhood Research Quarterly, 31*(2), 78–88. https://doi.org/10.1016/j.ecresq.2015.01.001

Bach, D., & Christensen, S. (2016). Battling the Tiger mother: Pre-school reform and conflicting norms of parenthood in Singapore. *Children and Society, 31*(2), 134–143. https://doi.org/10.1111/chso.12162

Bautista, A., Ng, S. C., Múñez, D., & Bull, R. (2016). Learning areas for holistic education: Kindergarten teachers' curriculum priorities, professional development needs, and beliefs. *International Journal of Child Care and Education Policy, 10*(8), 1–18. https://doi.org/10.1186/s40723-016-0024-4

Bautista, A., Moreno-Nunez, A., Ng, S. C., & Bull, R. (2018). Preschool educators' interactions with children about sustainable development: Planned and incidental conversations. *International Journal of Early Childhood, 50*(1), 15–32.

Bennett, J. (2003). Starting strong: The persistent division between care and education. *Journal of Early Childhood Research, 1*(1), 21–48. https://doi.org/10.1177/1476718X030011006

Bertram, T., Pascal, C., Cummings, A., Delaney, S., Ludlow, C., Lyndon, H., & Stancel-Piatak, A. (2016). *Early childhood policies and systems in eight countries: Findings from IEA's early childhood education study*. International Association for the Evaluation of Educational Achievement.

Biesta, G. J. J. (2010). *Good education in an age of measurement: Ethics, politics, democracy*. Paradigm Publishers.

Blaicklock, K. (2014). *Te Whāriki*, the New Zealand early childhood curriculum: Is it effective? *International Journal of Early Years Education, 18*(3), 201–212. https://doi.org/10.1080/09669760.2010.521296

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher, 33*(8), 3–15.

Brodin, J., & Renblad, K. (2014). Early childhood educators' perspectives of the Swedish National Curriculum for preschool and quality work. *Early Childhood Education Journal, 43*(347), 347–355. Retrieved from: https://doi.org/10.1007/s10643-014-0657-2

Bull, R., & Bautista, A. (2018). A careful balancing act: Evolving and harmonizing a hybrid system of ECEC in Singapore. In S. L. Kagan (Ed.), *The early advantage: Early childhood systems that Lead by example* (pp. 155–181). Teachers College Press.

Burgess, J., Robertson, G., & Patterson, C. (2010). Curriculum implementation: Decisions of early childhood teachers. *Australian Journal of Early Childhood, 35*(3), 51–59.

Chambers, B., Cheung, A., & Slavin, R. (2016). Literacy and language outcomes of comprehensive and developmental-constructivist approaches to early childhood education: A systematic review. *Educational Research Review, 18*, 88–111. Retrieved from: https://doi.org/10.1016/j.edurev.2016.03.003

Cochran-Smith, M., & Lytle, S. L. (1999). Relationships of knowledge and practice: Teacher learning in communities. *Review of Research in Education, 24*, 249–305.

Dahlberg, G., Moss, P., & Pence, A. (2013). *Beyond quality in early childhood education and care*. Routledge.

Doyle, W. (1992). Curriculum and pedagogy. In P. W. Jackson (Ed.), *Handbook of research on curriculum* (pp. 486–516). Macmillan.

Doyle, W., & Rosemartin, D. (2012). The ecology of curriculum enactment. Frame and task narrative. In T. Wubbles et al. (Eds.), *Interpersonal relationships in education* (pp. 137–147). Sense Publishing.

Ebbeck, M., & Yoke, Y. (2010). Instituting change in early childhood education: Recent developments in Singapore. *Early Childhood Education Journal, 38*, 457–463. https://doi.org/10.1007/s10643-010-0435-8

Finnish National Agency for Education. (2016). *Opetushallitus*. https://www.oph.fi/sites/default/files/documents/esiopetuksen_opetussuunnitelman_perusteet_2014.pdf

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Polity Press.

González, N., Moll, L. C., & Amanti, C. (2005). *Funds of knowledge. Theorizing practices in households, communities and classrooms*. Routledge.

Gopinathan, S. (2001). Globalisation, the state and education policy in Singapore. In J. Tan, S. Gopinathan, & W. K. Ho (Eds.), *Challenges facing Singapore education system today* (pp. 3–17). Prentice Hall.

Gorski, P. (2008). Good intentions are not enough: A decolonizing intercultural education. *Intercultural Education, 19*(6), 515–525. https://doi.org/10.1080/14675980802568319

Hendrick, J. (Ed.). (2004). *Next steps toward teaching the Reggio way*. Merrill Prentice Hall.

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

Ho, L-C. (2018). "Consensus not conflict": Harmony and multicultural education in Singapore. In Y-K. Cha, K. Cha, S-H. Ham, & M. Lee (Eds.), *Routledge international handbook of multicultural education research in Asia Pacific* (pp. 83–90). Routledge.

Kaga, Y., Bennett, J., & Moss, P. (2010). *Caring and learning together: A cross-National Study of integration of early childhood care and education within education*. UNESCO.

Keeves, J. (1992). *Methodology and measurement in international and educational surveys*. Pergamon Press.

Laevers, F. (2017). How are children doing in ECEC? Monitoring Quality within a process-oriented approach. In N. Klinkhammer, B. Schafer, D. Harring, & A. Gwinner (Eds.), *Monitoring Quality in Early Childhood Education and Care: Approaches and experiences from selected countries* (pp. 178–201). Munich: German Youth Institute.

Layne, H., & Lipponen, L. (2014). Student teachers in the contact zone: Developing critical intercultural "Teacherhood" in kindergarten teacher education. *Globalisation, Societies and Education, 14*, 1–17.

Lim-Ratnam, C. (2013). Tensions in defining quality pre-school education: The Singapore context. *Educational Review, 65*(4), 416–431. https://doi.org/10.1080/00131911.2012.707641

Mahon, R., Anttonen, A., Bergqvist, C., Brennan, D., & Hobson, B. (2012). Convergent care regimes? Childcare arrangements in Australia, Canada, Finland and Sweden. *Journal of European Social Policy, 22*(4), 419–431. https://doi.org/10.1177/0958928712449776

Ministry of Education (MOE). (2003). *Launch of pre-school curriculum framework*. Retrieved from: http://www.moe.gov.sg/media/press/2003/pr20030120_print.htm

Ministry of Education (MOE). (2013). Nurturing early learners: A curriculum for kindergartens in Singapore. *Educators' guide: overview*. Retrieved from https://www.moe.gov.sg/docs/default-source/document/education/preschool/files/nel/edu/guide/overview.pdf

Nyland, B., & Ng, J. (2016). International perspectives on early childhood curriculum changes in Singapore and Australia. *European Early Childhood Education Research Journal, 24*(3), 465–476. https://doi.org/10.1080/1350293X.2015.1102416

Organisation for Economic Co-Operation and Development (OECD). (2006). *Starting strong II*. https://www.oecd.org/education/school/startingstrongiiearlychildhoodeducationandcare.htm

Polly, D., Margerison, A., & Piel, J. (2014). Kindergarten teachers' orientations to teacher- centered and student-centered pedagogies and their influence on their students' understanding of addition. *Journal of Research in Childhood Education, 28*(1), 1–17. https://doi.org/10.1080/02568543.2013.822949

Rigby, E. (2007). Same policy area, different politics: How characteristics of policy tools alter the determinants of early childhood education policy. *Policy Studies Journal, 35*(4), 653–669.

Schiro, M. S. (2008). *Curriculum theory. Conflicting visions and enduring concerns*. Sage.

Schiro, M. S. (2013). Curriculum theory. Conflicting visions and enduring concerns. US:Sage. Students' Understanding of Addition. *Journal of Research in Childhood Education, 28*(1), 1–17. https://doi.org/10.1080/02568543.2013.822949

Stuart, M. (2016). Out of place: Economic imperialisms in early childhood education. *Educational Philosophy and Theory, 48*(2), 138–149. https://doi.org/10.1080/00131857.2014.971094

Tan, C. (2017). Enhancing the quality of kindergarten education in Singapore: Policies and strategies in the 21st century. *International Journal of Child Care and Education Policy, 11*(1), 1–22. https://doi.org/10.1186/s40723-017-0033-y

Teo, Y. Y. (2018). *This is what inequality looks like*. Ethos Books.

Thao, D. P., & Boyd, B. A. (2014). Renovating early childhood education pedagogy: A case study in Vietnam. *International Journal of Early Years Education, 22*(2), 184–196. https://doi.org/10.1080/09669760.2014.909306

Wright, J. (2004). Post-structural methodologies: The body, schooling and health. In J. Evans, B. Davies, & J. Wright (Eds.), *Body knowledge and control: Studies in the sociology of physical education and health* (pp. 19–31). Taylor & Francis e-Library.

Zeng, Y., Nyland, B., & Zeng, X. (2011). Early childhood kindergarten programs in China: Issues of access and funding. *Asia-Pacific Journal of Research in Early Childhood Education, 5*(1), 139–161.

Zienkowski, J. (2011). Discursive pragmatics. A platform for the pragmatic study of discourse. In J. Zienkowski, J.-O. Östman, & J. Verschueren (Eds.), *Discursive pragmatics* (pp. 1–13). Benjamins.

# Chapter 5
# Researching Well-Being for Children with Low-Income Family Background in Singapore – For Whom and from Whose Perspective?

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**Abstract**  Firstly, this chapter presents a review on what the current body of work – both international and local – indicates about research on childhood, inclusion and well-being for children from low-income family background. Secondly, it introduces a research initiative on the Child Support Model (CSM) developed by NTUC First Campus for low-income families in early learning context in Singapore. This chapter asserts that inclusion and well-being need to be recognised from a holistic perspective as a part of early childhood practices. Contemporary early childhood pedagogy, according to Pramling and Pramling (Educational encounters: Nordic studies in early childhood didactics. Springer, Dordrecht, 2011), refers to the interaction and communication between a teacher, a child and the learning environment, based on the achievement of intersubjectivity or sustained shared thinking (Siraj-Blatchford, Asia-Pac J Res Early Child Educ 1: 3–23, 2007). Therefore, we propose understanding of inclusion as a part of early childhood practices to serve children with diverse backgrounds beyond developmental delays. Furthermore, the chapter aims to discuss the meaning of well-being and problematises the idea of 'low-progress', often associated with children from low-income homes, thus confirming deficit theories where failure is attributed to the individual. The chapter then introduces the possibility of inclusion to meet the needs of individual children in a diversity of families within the low-income categorisations and beyond.

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## 5.1 Introduction

This chapter starts by discussing the state of well-being of children living in low-income homes in Singapore. It then discusses inclusion and interventions by presenting a Child Support Model that aims to provide holistic support for these children and their families. The new diversities of Singapore society that criss-cross the socio-economic demographics brought about by mixed marriages and immigration will be discussed. Subsequently, an exploration of the meanings of children's well-being in early childhood education context will be made, arguing for a shift from an outcome perspective towards holistic approach. By holistic approach, we refer to understanding well-being as a composite which is co-constructed in the interaction within the learning environment. Based on earlier research, children's well-being seems to be congruent on the quality of their relationship with individuals in their immediate environment or microsystem, who have active and constant interaction with them. They feel a sense of happiness when the relationship is well nurtured, stable and reciprocated. Conversely, a form of conflict may threaten their well-being, both at home and in school (Hart, 2004; Thoilliez, 2011; Shum-Cheung et al., 2008). For the purpose of this chapter, well-being in a learning context is defined as a developing state where a child has self-confidence, self-esteem, assertiveness and resilience, is well in touch with his/her own feelings and is intensely engaged in social interactions and activities (Laevers, 2017). Early interventions should concentrate on supporting this process and understand how it ought to be varied based on the diverse backgrounds of children.

Existing literature indicates that children from low-income family backgrounds demonstrate lower school readiness than their peers. Since 2012, when the first version of Vital Voices for Vital Age (VV1) report by Lien Foundation was published, the Singapore government has implemented numerous measures to improve the quality of early childhood education. Soon after this report, in April 2013, the Early Childhood Development Agency (ECDA) was established. ECDA is jointly overseen by the Ministry of Education (MOE) and the Ministry of Social and Family Development (MSF) and was set up for more concerted provisions towards early childhood interventions, teaching and learning. Past efforts in early childhood provisions by the Singapore Ministry of Education have largely concentrated on aligning curriculum, teaching and learning practices and cultures within a largely privatised and corporatised early childhood provision model (Lim, 2017a, b). ECDA is now more assiduously looking into issues of teacher development through master-planning the infrastructure and manpower resources to support the early childhood sector and enhancing affordability of quality preschool programs as well as developing capabilities and quality standards of the sector. These issues include provisions for children with special needs and developmental delays.

The aims of ECDA point to a gap that has been left desolate for a rather long while. In addition, the difficult circumstances of lower-income families have received constant media attention in the years following the comprehensive VV1 report (Lien Foundation, 2012), casting a shadow over Singapore's success story

and indicating that children with special needs and those from low-income backgrounds have yet to receive enough of the early childhood interventions as a public good from the state.

The recent measures by the state have included direct involvement in setting up MOE-run kindergartens since 2014, the consolidation of teacher training via the set-up of a National Institute of Early Childhood (NIEC) in 2018 and a rolling-out of the KidSTART program (commenced in 2016 as a pilot) targeted towards low-income families with children 6 years old and under. Lien Foundation's Vital Voices 2 (VV2) published in 2019 continued to address the issues of inclusion of children from low-income backgrounds and those with special needs. The pulse check they did showed that some families may continue to be underserved. Services for families with needs are still too often hospital and centre based – where the responsibility for delivering interventions relies on isolated tasks performed by specific professionals, instead of a holistic intervention provision (Lien Foundation, 2019, p. 15) that includes day-to-day continuous delivery at the centres where the children are enrolled. A clear need to strengthen the ecosystem of support for the well-being of young children from low-income and disadvantaged backgrounds was highlighted by the report. Singapore's education system is built on the dual track system with mainstream schools and special schools. According to Lim et al. (2014), differentiation is used in the schools to rank the students based on their academic skills level.

The international trend for inclusion can be traced back to 1994, when 92 countries and 25 international organisations signed the Salamanca Statement on Principles, Policy and Practice in Special Needs Education, advocating for inclusive and non-discriminatory practices in mainstream schools (UNESCO, 1994). The integration of students with special education needs into mainstream classrooms has seen a rise in the prevalence of classroom support professionals globally (Gottfried, 2018). Inclusive education, as delineated by Ainscow and Miles (2008), encompasses altering cultures, policies and practices in order to transcend the mere physical presence of students with needs in mainstream classrooms and also to include and prioritise their participation and achievement. Early intervention has been instituted in many parts of the world – the United States (US), the United Kingdom (UK) and Europe (e.g. Italy, Finland, Norway and Sweden) – and Australia since the 1990s. Defined as a broad array of activities designed to enhance a child's development (Ramey & Ramey, 1998: see also Yeo et al., 2011), early intervention aims to provide appropriate support and services for children at risk or those identified to have developmental delays, to prepare them to meet the demands of school as well as be provided affordances to improve their cognitive, academic and social outcomes to do well later in life (Ramey & Ramey, 1998; Yeo & Clarke, 2006; Yeo et al., 2011; Hebbeler & Spiker, 2016). However, these inclusive practices should not be limited to specific interventions but seen as a holistic support for children and families. Earlier research has indicated substantial gains in emotional and cognitive development and improvements in educational outcomes for children participating in early education programs (Karoly et al., 1998). Such effects are especially pronounced for children in low-income environments, especially those with

developmental delays because they start off from a disadvantaged point and have the most to gain from participation in quality early education programs (Currie, 2001).

The current body of work on early intervention studies tend to focus on the outcomes of child development and learning, rather than what is going on in the classrooms, or understanding the circumstances impacting children's and families' well-being. In her ground-breaking, ethnographic research on low-income families in Singapore, Teo (2018) reflects on how low-income earning mothers experience high stress in their awareness that their children are at risk of lagging behind in Singapore's highly competitive education system. Poor conditions during the early ages in childhood cause stress which may lead to social-emotional problems later in life. Teo's study also shows that acute financial shortage places a tremendous stress on parenting. Jesuvadian (2016) studied the evolving parent-child relationship in low-income earning Indian single mother homes in Singapore and found that the quality of parent-child relationships grew increasingly strained as the children developed and matured. Low-income single mothers found themselves facing multiple stressors simultaneously which impaired their ability to fully care and nurture their children in ways that were demonstrable and welcomed by the children. For example, children asked that mothers spend quality time with them. They identified activities like prolonged conversations, parental interest in knowing child strength and talents, joint play time and shared mealtime as indicative of parental love and warmth. However, mothers faced time, energy and material resource limitations and could not reciprocate in the ways their children expected. This disjoint in expectations led to a growing strain on how children perceived and understood care and how mothers demonstrated care, in turn rendering the parent-child relationship unsettling and troublesome. A key stressor for the mothers in this study was low income. They all worked long hours to earn extra money as their educational qualifications did not provide access to higher paying jobs in the current employment market in Singapore (Jesuvadian, 2016).

Children who come from low-income families also tend to face more challenges in the academic and non-academic spheres of life (Chaudry & Wimer, 2016). Their general well-being is compromised as their limited income restricts access to both material (resources that money can buy, e.g. better health care and better nutrition) and non-material resources like parental time and energy, which impact upon the degree of care, nurturance and love that is available from parent to child. Interventions and other preventative measures in a child's early years may result in better outcomes in health, education and possible further success in life. More research and analysis are needed on effective means to support the well-being of these children and families, and this chapter will unpack some of the work that has been done and still needs to be done.

## 5.2    Quality of Life: Experiencing Low Income in Singapore

Over five decades of independence, Singapore has developed into a global success story. Its meteoric rise as an economic powerhouse is closely linked to its education system and has significant implications on the life opportunities of its citizens. Singapore's education system is a response to its historical development. The People's Action Party (PAP) has been governing Singapore since independence in 1965 and its earliest ideological position on education is the close coupling between economic development and the education system in place. The demands of the economy have influenced the scope and reach of education pathways which have been open for its citizenry (Reyes & Gopinathan, 2015; Gopinathan & Mardiana, 2013). Education policies have been put in place to enable a robust and capable labour force that can harness the growth that globalisation brings as Singapore lacks the natural resources that can be an alternative source of economic growth.

A strong narrative that emerged post-independence and persists today is that Singapore remains vulnerable due to its small size, geopolitical contexts and lack of a hinterland (Heng, 2013). Local demand alone will not enable Singapore to grow and thrive – it needs to plug itself into global trade and commerce in order to be a viable economic entity. In fact Koh (2014, p.184) argues that the Singapore state under the leadership of the PAP seeks to be an 'economic powerhouse' no matter the circumstance. It needs to tactically build its economy by projecting how the global economy would shapeshift in response to technological, political and social changes that are happening across the world. A keyway it has been doing this is through tactical educational reform.

Educational change in today's Singapore is dynamic, and the shift in governmental discourse to reduce the pressure of academic performance of young children and youth in Singapore has been welcomed. Yet, a deeper look at the changes shows that academic credentialism is still a key pathway to success and the highly competitive education system framed within a discourse of an extreme form of meritocracy obscures how the education system can reproduce and reinforce class stratification (Tan, 2008). Add to this, the current economic realities, the inherent inequality that exists in Singapore have been made more visible.

Inequality impacts on the degree of human capital and social capital (Coleman, 2000) available, which in turn influences the kind of learning experiences young children have access to. For example, higher-income earning families are able to better prepare their children both academically and socially. They are able to provide quality early education, afford enrichment classes and build their children's skills and knowledge which, in turn, equip their children to successfully navigate the education landscape in Singapore. They are better prepared for schooling and are able, for the most part, to earn diplomas and degrees, which open up greater job opportunities to earn a larger income. Lim (2017a, b) has pointed to the fact that the Singapore state came quite late into the Early Childhood and Care Education sector (ECCE) and a private, marketised and even corporatised system dominated the

landscape until very recently. This has implications for families which have been facing both human and social capital limitation generationally.

An OECD report (2006) points out how international studies have repeatedly indicated the that ECCE programs can have a positive effect on the children's development and access to good-quality free programs especially benefit children with low-income family backgrounds. It is important to note at this juncture that societies across the globe have seen the importance of provision and intervention to support the vulnerable in society early enough so the poverty cycle can be disrupted. Such programs have been beneficial in scaffolding and enabling families with low social and human capital to mitigate the largely detrimental effects that poverty and resource limitation have on child developmental outcomes. Early Head Start (EHS), a federally funded program for infants and toddlers in the United States, is a dual generational program serving low-income families with children. Intervention begins prenatally through age three years (Green et al., 2014). Detailed evaluation of the program's efficacy has shown that this intervention program had positively impacted families by reducing levels of physical and emotional abuse of youngsters by their stressed parents. Evidence of greater emotional connection and demonstration of affection between parent and child was noted. This particular study (Green et al., 2014) focused on child maltreatment episodes with children under the EHS and the control group. The study tracked individual children up to 10 years of age and found that children who were served by the EHS suffered less physical and sexual abuse and reported greater gains in social-emotional regulation. Parenting practices over time grew to be nurturing and warm. It can be argued that such provisions served to improve the quality of care and life in families which experienced multiple risk factors. There is value in examining how such programs contribute to improving family strengths and enabling a nurturing environment for child growth and development long term. At the moment there are no local longitudinal studies that can be referred to.

Unequal access to nature of education as a social good also impacts upon the economic success that citizenry can experience. Singapore has one of the world's most stable economies and is a good example of what Rodan (2016, p.211) terms as a 'capitalist transformation' – the economy grew spectacularly from a low-skilled labour-intensive model to one which is now based on a highly skilled workforce that is knowledge based. The Singapore economy continues to focus on drawing in external investment to build capacity in its people, strengthen and expand the economic output and to redistribute the earnings from a robust economy to even out the benefits for members of the society who may not be directly generating or benefitting from the enhanced economic activities. In other words, the Singapore model exemplifies the 'trickle-down' economy (Lee & Morris, 2016; Ng, 2015). Such an economic model has a prerequisite – in order to provide highly skilled labour in selected industries, people need to be educated and trained in niche areas. People with specialised education and possessing marketable skills benefit most in such an economy.

In recent decades, especially after the 1990s, Singapore has seen a large growing class divide between the educated elites and the less-educated low-skilled

population. In 2018, after adjusting for taxes and government transfers, the Gini coefficient based on per household member registered at 0.404. It was 0.458 before adjustments were made (Singapore Department of Statistics, 2019). This reading indicates that inequality in Singapore society is still large, notwithstanding the state's intervention through redistribution of resources. It also suggests that the actual number of people who now occupy the low-income rungs in Singapore has increased. A recent study also found that the median household income of more than 1,000 families who sought help from local charity Beyond Social Services fell from $1,600 before the Covid-19 pandemic to $500 (Menon, 2021).

In Singapore, there is an implicit understanding that the individual is, for a large part, responsible for the economic success and well-being of themselves and their families. According to K. P. Tan (2008), the government had been demonising state welfare for decades, and its 'anti-welfare stance shifted very modestly in 2007' (p. 22). Even now, state support in the form of subsidies and public goods is connected to two significant factors – employment and familial resources. The family is the central means to enable well-being in its members – it is assumed that able-bodied adults will be employed and support their families. If this is not possible, the families though may have access to public goods (Teo, 2015). This conception of welfare has implications for low-income earning families.

Families are asked to seek out ways to improve their earning power and draw on familial resources *first* before turning to the state for assistance. The intent behind these policies is to discourage an over-dependence on the state as a provider. Similar to the variety of learning intervention providers, the state also draws on the community partners to alleviate the stresses faced by low-income families – Social Service Agencies, registered under the National Council for Social Services, NGOs and self-help groups organised along racial lines – Chinese Development Assistance Council (CDAC), Malay self-help group Mendaki, the Singapore Indian Development Association (SINDA) and the Eurasian Association to name a few. People who require assistance are expected to largely draw on these community resources.

Building on state discourse of individual and family as the key contributors to economic growth and success, the Singapore government has increased resources and support through its various organs to build up the skills and knowledge of the individual citizen in order to keep the economy nimble and adaptive to global economic trends and development. The provision of SkillsFuture funding for Singaporeans encourages individuals to take self-ownership to train or retrain in order to gain employable skills. Each Singaporean is credited with $500 and can choose from a range of courses offered by educational institutions of higher learning (SkillsFuture Singapore Agency, 2019). The understanding is that the upskilling will improve productivity, which in turn provides opportunities for greater earning.

However, Lee and Morris (2016) present a compelling argument in their paper that the latest initiatives for life-long learning are more appropriate for Singaporeans who are highly skilled. A more recent study suggests that blue-collar workers suffered the steepest decline in participation of the SkillsFuture continuing education training (CET) after age 35, and the participation of older workers is far lower than

OECD countries (Gog, 2019). The political discourse promotes life-long learning as a means through which the low-skilled can build up their capacities through targeted educational opportunities, with the understanding that they then will be able to earn larger salaries. The Workforce Development Agency (WDA), which is in charge of all life-long learning provisions and is run under the auspices of the Ministry of Manpower, caters to two broad groups of learners – the low-skilled and the higher-skilled (professionals, managers and executives [PMEs]). Lee and Morris (2016) note that the PMEs have more developed pathways to enhance their productivity and growth through retraining than do the lower-skilled.

Singapore remains an unequal society that has in recent years seen a great rise in the numbers of working poor families, elderly poor and people with disabilities who continue to struggle to locate work that is paying a decent wage (Mathew & Ng, 2016; Ng, 2015). Wage stagnation plagues people who work in the expanding services sector, especially women who are less educated. This is coupled with the fact that Singapore has no minimum wage regulations, and the influx of cheap foreign labour in the service sector further depresses wages that low-income Singaporeans can earn. Working mothers who fall into this category earn far less than the men employed in the same sector with similar qualifications (Lim, Y. C, 2015). Single-mother families in poverty especially face very grave challenges in everyday life, and research suggests that children coming from poor single-parent homes suffer increased disadvantages (Maldonado & Nieuwenhuis, 2014, Jesuvadian, 2016, unpublished thesis). Essentially, the lowly educated and the low-skilled members of Singapore society continue to face immense struggle in meeting daily needs to provide for their families while at the same time taking on the responsibility to upgrade in order to enhance their earnings in a competitive labour market.

Policy interventions have been only slowly addressing issues of inequities in Singapore; meanwhile low-income earning families face multiple stressors that reduce the quality of life experienced. Low-income families are diverse and much has been said about the associated risks, but little is known about their resilience in facing up to the new economic landscape. In her book about inequalities in Singapore, Teo (2018) described the life experiences of low-income earning families, illuminating both the risks and resilience factors. This perspective is often missing from the success narrative presented by policy makers. When we turn our lens to the well-being of young children who come from low-income earning families, we can discern the disadvantages that they face in education and by extension the struggles and support towards their potential cognitive and socio-emotional growth.

It is necessary at this point to note that poverty is intergenerational, and disrupting the cycle of poverty necessitates greater policy initiative to intervene early in a child's life. Recent reports on social mobility (OCED, 2018) and its link to poverty suggests that it takes on average at least 100 years before children from low-income and low-education profiles can reach the mean earning levels in developed economies, for example, OECD member nations. It is important to note that such conditions exist even with state and social intervention to limit inequality. As discussed earlier such interventions and support structures do benefit the most vulnerable and

enable greater equity in the long run. Yet, it takes *time*. Social mobility then is not a single leap – it is akin to taking small incremental steps towards the goal by slowly eliminating the structural and systemic factors which constrain particular groups from moving up. Singapore, since its inception as a nation has placed a great emphasis on meritocracy as a means to level the playing field for locals, but social mobility is contingent on individual will and hard work. A recent article (Teo, 2019) presents a strong argument on how the narrative of meritocracy in Singapore can conceal structural inequalities which constrain the speed and degree of social mobility children from ethnic minority and poor backgrounds can attain. The Singapore Dream nested in its cloak of meritocracy is not as easily attained for children hailing from homes facing multiple risk factors.

Neuroscience research has revealed that toxic stress experienced by low-income families affects the developing brains and bodies of young children in such families. Toxic stress affects cognitive growth, self-regulation and physical and mental health, often lasting a lifetime unless appropriate intervention takes place early in a child's life (McEwen and McEwen, 2017, p.448). Interventions need to be understood also from the families' perspective. Both biological and sociocultural contexts impact the life trajectory of children who come from low-income families. Ng (2015) argues that impoverished conditions coexist with social contexts, which makes it more challenging for families to increase incomes. To illustrate, as argued earlier, low education entails low pay and longer working hours, depleting the time and energy resources of the adults in the family (Jesuvadian, 2016). Families in a financial bind also tend to experience spousal disunity, health problems, and in some cases mental health issues, which in turn affects working life. Children experience the toxic stresses of their parents' lives, and this in turn affects the children's ability to grow and develop normally. Multiple stressors that occur simultaneously impair psychological and cognitive functioning of individuals which impacts the earning power of the adult/s in the family. Breaking families out of poverty requires more than just a slew of subsidies. Therefore, it is paramount to turn the research lens to examine the well-being of children and the quality of life their families are able to offer them in order to have a holistic comprehension of learning and development of children who come from disadvantaged backgrounds.

## 5.3   Defining Well-being and Quality of Life

Aristotle (cited in Adler and Seligman, 2016, p.4) understood well-being as a state of flourishing. Adler and colleague (2016, p.4–5) present well-being as experiencing positive emotions, stable and meaningful relations, environmental mastery, engagement and self-actualisation. Well-being has two dimensions, namely, (1) hedonic well-being (feeling good) and (2) eudaemonic well-being (the ability to function well). Subjective well-being, i.e. how people think and feel about their state of well-being is contingent on three factors: (1) frequent and intense positive affective states, (2) the relative absence of negative emotions and (3) global life

satisfaction. The literature on well-being suggests that adults with a greater sense of well-being are healthier, have greater self-control and exhibit prosocial behaviours.

Well-being is fundamental for learning and overall development of children. However, at this juncture, it is critical to note that a child's well-being is contingent on the well-being of the significant adults around him/her. The environment in which a child grows contributes strongly to how he or she develops the capacity to learn and develop. The environment and the people around him/her also shape how the child responds to the conditions of his/her life. Raghavan and Alexandrova (2015) assert that a child who is experiencing well-being engages with the world with curiosity, spontaneity and emotional security.

Many countries adopt the concept of care at the centre of the early childhood education, the professional identity of teachers and professional development of teachers (Pang, Rivera and Mora, 1999; see also Hellman et al., 2018). We would like to claim that the care is important for the child's well-being. However, well-being needs to be understood beyond child's outcome-based measurements, and in addition, considering it as a part of teachers' professionalism and the interactions in the classroom as a part of relationship building. Increasingly, research indicates that social emotional skills are not individual traits and features, but something that is socially constructed, and therefore important to be modelled in early childhood education (Lipponen, 2017). Teachers and classroom support professionals play an important role in constructing an emotionally supportive learning environment where children feel safe and nurtured. A holistic approach to the academic, emotional and social needs of children is needed when trying to find ways of facilitating educational success for all children (Hellman et al., 2018).

## 5.4   Examining Child Well-being and Quality of Life Further

It is necessary for local researchers to begin examining how young children from disadvantaged family backgrounds experience quality of life in order to better understand how learning and development in this context takes place. By the quality of life, we mean the opportunities to take part in society, education and meaningful relationships amongst adults and peers. Moving away from the idea of placement towards inclusion and learning would enable researchers and policy makers to better understand how children actually take part in the learning activities, how the learning environment is set up to stimulate the interest and learning needs of the child and to note how child well-being is understood by the adults in the school setting. Examining classroom activities and learning conditions will facilitate greater understanding of how children initiate and navigate social contacts and interactions which contribute to a child's overall sense of well-being.

In the next section, we discuss the elements of the Child Support Model (CSM) as developed by NTUC First Campus (NFC), one of Singapore's leading (anchor) operators of early childhood provisions and the current site of study of the authors. The research we are conducting is designed to examine the effects of CSM in

serving young families with low-income family background in Singapore. This study investigates both child outcomes and learning processes in terms of well-being and involvement experienced by the children while undergoing interventions under CSM. The aim is to understand better how to bridge the gaps in learning and development for low-income children before they enter primary school. The premise of CSM is to support the families' well-being holistically and the aim of the current research is to evaluate the effect of this model.

## 5.5  The Child Support Model (CSM)

The Child Support Model (CSM) Program was developed by the NTUC First Campus (NFC) in 2016 to provide holistic support program for children from low-income families and children with learning needs at My First Skool (MFS) centres. Children receive financial, social and learning assistance under the CSM. Some programs are funded by the Bright Horizon Fund (BHF) of the NFC, while others are government-funded programs. The CSM program includes:

1. Financial Assistance – for childcare fees, school uniforms, field trip expenses, Kindergarten 2 (K2) graduation package.
2. Development Support Program (DSP) – where children with mild developmental needs are supported by Learning Support Educators (LSEds) or therapists who provide language, literacy, handwriting, social skills support, speech therapy, occupational therapy and psychological services. Children who are flagged by teachers will go through screening and undergo DSP. There are four cycles of DSP each year.
3. Read-to-Reach (RTR) – an early literacy intervention program for Kindergarten 1 (K1) children who are weak in English literacy. Teachers guide a small group of children in recognising alphabets, phonics and reading.
4. FLAiR – Focused Language Assistance in Reading is a language intervention program started by the Ministry of Education in 2007 to support K2 children who have difficulties in learning English. The FLAiR professional works with a small group of three to five children daily to scaffold their language experience.
5. Classroom Co-facilitators (CCF) – support teachers who facilitate small group learning/teaching with identified children with learning and developmental needs during class activities, focusing on handwriting, language, social well-being, and literacy. Typically, a CCF supports children during Core Curriculum in class but may also do pull-out sessions. Some CCFs are shared between MFS centres.
6. Child Enabling Executives (CEEs) – In 2016, NFC established the role of CEEs under the Early Childhood Development Agency (ECDA)'s KidSTART initiative. CEEs are stationed at all 10 KidSTART centres run by NFC, where they monitor the children's well-being and attendance. CEEs follow up with parents when children have low or irregular attendance and help lower-income families obtain relevant resources and aids such as grants and subsidies.

 7. Family and School Together (FAST) – these are educational tours and excursions for low-income families and their children to provide them with the opportunity to participate in outings that they would otherwise not be able to afford.
 8. You've Got Talent (YGT) – Under this program, children attend enrichment classes to develop their talents in activities such as Wushu, visual arts or dance classes.
 9. You Are Special (YAS) Birthday Cakes – Birthday cakes are provided for children from low-income backgrounds as part of their birthday celebration in school.
10. Parenting Years (PY) – a yearly parenting workshop conducted by the SEED Institute Parents College targeted mainly for KidSTART parents. SEED Institute is one of the pioneers of early childhood development training in Singapore and was set up in 1989.

The definition of holistic Child Support Model in this study also includes the family involvement and family experiences in the programs. Some of the children in CSM are also receiving KidSTART. KidSTART is a program for low-income and vulnerable young children in Singapore and is also part of the Child Support Model. It started in 2016 to enable these children to have a more equitable start in life. It aims to provide new forms of support to upstream child development, coordinate and strengthen holistic support for these vulnerable children as well as monitor their development (ECDA, 2019). The aim of KidSTART is to build an ecosystem of support for the well-being of these children and their families. Under this initiative, trained officers visit the families even before a baby is born to support the expectant mother and impart skills and knowledge on health, nutrition and child development. The officers continue to work with the parents after the child is born, all the way through preschool years. The intention of such interventions is to provide support for vulnerable families and for early interventions in the mainstream school setting. The next section details the research aims, processes and context of the study.

## 5.6 Indicators for Well-being and Involvement for Learning and Development

The joint study between NFC and the National Institute of Education (NIE) began in January 2019. It aims to understand the effects of the Child Support Model (CSM) in serving young children from low-income families at My First Skool (MFS) childcare centres in Singapore. The objectives of the study are to look into how CSM supports the well-being of the families and children, as well as the development and learning afforded by the different intervention programs. One example of looking into the learning process aspect of intervention in this study is to focus on children's well-being and involvement within the curriculum and the Child Support Model programs. Our study utilises the Laevers Scales developed by Dr Ferre Laevers and

his team for this purpose. The Laevers Scales look into the involvement and well-being of children vis-a-vis various activities in a preschool setting. Involvement refers to when a child focuses his or her attention to a specific task that is not too easy or too demanding and is rarely, if ever, distracted (Pascal et al., 1996). Laevers (2005) describes involvement as an integral part in a child's development, as it is strongly connected to openness to learning and being comfortable. Researchers agreed that involvement is an observable measure of quality, as it is highly connected to effective teaching and learning process, and reflects on the activities and curriculum offered (Laevers, 1997; Pascal et al., 1996; Raspa et al., 2001; Theodotou, 2015; Ulich & Mayr, 2002). Phelps, Nhung, Graham and Geeves (2012) and Sönmez and Ceylan (2016) found that a teacher-directed approach can result in lower children involvement in activities and saw higher involvement and persistence during child-initiated activities which involve creativity. Well-being is an equally essential aspect in children's growth and development, as a child who is emotionally undeveloped and insufficiently supported in preschool may not have positive future social involvement and emotional development (Cooper et al., 2009). Referencing the publication Reflect, Respect, Relate (South Australia Department of Education Training and Employment, 2008), involvement and well-being are observed using indicators. For involvement, nine indicators are scored on a low, medium or high scale range, which are then consolidated into overall involvement scores of between one (no involvement) and five (high involvement). There are 55 indicators across three domains for well-being, 20 indicators for 'happiness and satisfaction', 19 indicators for 'social functioning' and 16 indicators for 'dispositions'. Based on the indicators, observers would then score either low, medium or high for the three domains and arrive at an overall score of one (negative well-being) to five (positive well-being). Ebbeck et al. (2012) found the tool to be culturally appropriate and well suited for preschool children in Singapore. As this research is focused on children from low-income and disadvantaged backgrounds, the scales will help in understanding the learning process and general well-being for the children taking part in the study in Singapore. The same scale has been used in previous studies to look into the involvement of children from minority and at-risk backgrounds, where the mean involvement scores for these children were found to be low and 'worrying' (Declercq, 2011; Theodotou, 2015; Ulich & Mayr, 2002).

For the baseline data collection for Laevers scale involvement and well-being, researchers observed the children during six different activities offered at MFS centres: Morning Message (discussion as a class in the morning), Core Curriculum (literacy, numeracy and Inquiry Project), Motor Development (going outdoors, music and movement and physical activities), Child Support Model programs (RTR, CCF and DSP), routines (breakfast, lunch, snacks, reciting pledge, etc.) and transitions (arrival, between activities, toileting, etc.). Overall, preliminary data suggest that children have slightly higher involvement during CSM programs compared with other activities. Based on the baseline data gathered, involvement is linked to language development. Language is a key to learning. In general, children's well-being was found to be in the acceptable range. Not a great difference was found in the children's well-being during CSM programs and other activities.

However, it is important to note that the data collected so far constitute only the baseline, wave 1 results of the study. Second and third data collection waves will provide a more in-depth understanding on the effect of CSM and how both the integrated and pull-out interventions support the learning, development and well-being of these children and families in the study.

## 5.7 Researching with Children – Voices from the Children and Families

Besides numeric understanding on the quality of involvement and well-being in the child support model, a component to the research was added where the researchers could research together with the children in order to understand their lives better. Therefore, it was important to test the ways in which children can have a voice in the study. A qualitative well-being exercise for children developed by the Crivello, Morrow and Wilson (2013) as a part of the Young Lives longitudinal qualitative research is used in this study. During this exercise, researchers draw together with the children happy and sad faces. In this study, while drawing with the case study children, we talk about happy and sad experiences at home and at school and about the people who make the children happy and sad in their lives. Based on the preliminary analysis, the well-being of the case study children is closely linked to the quality of relationships in their ecosystem. Children expressed their love, likes, dislikes and feelings of being loved and feelings of not being liked by their teachers and parents in their drawings and stories linked to the drawings. These narratives will be used further in the case study analyses. As mentioned earlier, children are considered as active members of societies (Bruner, 1996), and therefore, it is important to provide them a way to participate and have a voice in the study.

## 5.8 (Re)shaping the Idea of Inclusion for Children and Families with Diverse Backgrounds

Inclusion as a concept is gradually shifting towards a greater emphasis on the *quality of learning* instead of only concentrating on outcomes. The shift is important as interventions traditionally applied more *placement concept* (is the child 'ready' for the mainstream or special needs classroom/school) than *a learning concept* (Anderson, Klassen & Georgiou, 2007). The learning concept is the extent to which a school or community welcomes students with disabilities as full members of the group and values their contributions (Anderson et al., 2007; Booth, 2010). It includes all children, wherever they learn best (Warnock, 2008).

Penney, Jeans, O'Connor and Alfrey (2018) offer a comprehensive understanding of inclusion in education and practice. The authors posit that inclusion is a basic

human right and one that is fundamental in enabling an equitable society. Inclusion, as a process, can power eradication of social exclusion that arises out of differences in race, ethnicity, social class, faiths, gender and ability. As such, inclusion is viewed as ways 'teachers and schools value the accomplishments, attitudes and well-being of every young person' (p. 1064). Inclusion and researching inclusive practices in post-modern framework mean an on-going process focusing on increased participation in education for everyone involved (Booth, 2010). Inclusive practice focuses on diversity and the way schools and educators respond to and value a diverse group of students as well as other members of the school community. Inclusion takes on many guises relative to the cultural and education context of the respective countries that implement it. Singapore can be seen as an early proponent of inclusion when, in 1965, it was declared that it would be a meritocracy, respecting the inherent worth of each member of its polity. Every individual is seen as important and his/her rights in terms of race, language and religion were enshrined in the constitution. Historically, Singapore's racial management and focus on harmony has been lauded by other nations. Yet, as the society developed and continues to grow, fissures have emerged. Recently, policy makers have seen the need to involve people in voicing his or her experiences of the policies which have governed their lives. More grounded perspectives are sought to shape policy as can be seen in the Our Singapore Conversations initiative which was started in August 2012 and has involved over 47,000 Singaporeans participating in over 660 dialogue sessions nationwide. First mooted by Mr. Lee in his 2012 National Day Message, the Singapore Conversation series sought out life experiences, views and opinions from Singaporeans from all walks of life in order to create a Singapore that is conducive to the overall development of all Singaporeans.

Additionally, children are seen as knowledgeable, competent, strong and powerful members of society – a phenomenal change brought about by the New Sociology of Childhood (Bruner, 1996, Prout, 2011) must also be brought to fore in looking into inclusion in ECCE. In order to truly understand a child's perspectives in matters which concern him or her, researchers need to provide opportunities for voice. The qualitative well-being exercise that this current study adopts is one such way to hear the ground-up situations of children and their family, as they perceive them.

As the demographics of Singapore society evolve towards a wider range of cultural, ethnic, language and religious characteristics, an understanding of a diversity perspective is also paramount. The current ecology of Singapore's governance and policy making and implementation is predisposed towards the fixed racial categories of Chinese, Malay, Indian and Others (CMIO), which has not taken into account the increasing percentage of mixed marriages and immigrant families with mixed ethnic backgrounds who bring with them a variety of additional home languages and other variables of ethnic and class demographics. These new diversities of Singapore society that criss-cross its socio-economic demographics have stymied social mobility (Teo, 2018). It is timely to study how such diversities contribute towards individuals' perception of well-being and quality of life in the Singapore context. Primarily, it is critical to examine how children respond to conditions of life in families that may experience an intersection of such diversities in Singapore in order to mediate and improve life chances for children and families in the long run.

## 5.9 Concluding Remarks: Education and Interventions for Children with At-Risk Background

This chapter focused on the current concerns in researching childhood intervention practices with children from low-income backgrounds. It aims to explain where Singapore is heading in putting forth the politics and policies of inclusion. The chapter drew from the literature of international and local research on how child development is closely linked to the economic and education systems in place, i.e. development is contextual. Taylor (2013) considered this question in relation to the cultural construction of understandings of childhood and nature of child development theories. Therefore, understanding of childhood experiences are often developed based on the certain theories and profiles of children and families constructing the norm (Taylor, 2013) undermining the changing demographics in society and also the diverse contexts of theories behind how we understand children and childhoods.

The baseline data of our research indicates that the model under scrutiny has some potential in bridging the gap for those children with only slightly lower outcomes in language and academic development. Furthermore, the analyses of the Child Support Model and the family's well-being may provide a more holistic perspective in supporting the child's development, learning and well-being. Through the design of the qualitative case studies, the research also gathers interview and observational and ethnographic data from and with the child and his or her educators, therapists and families.

The child's voice and the family's intersectional situations form an important part of the data as it is believed that the results should inform the processes enabling the development of young children. Well-being is generally understood as the quality of people's lives and is a dynamic state that is enhanced when people can fulfil their personal and social goals. It must be understood both in relation to objective measures, such as household income, educational resources and health status, and subjective indicators, such as equal access to opportunities and resources. This study embraces both the subjective and objective measures and the emic and etic perspectives. The Child Support Model has allowed for a more emic and holistic understanding towards intervention to be formed and an exploration of the potentialities of such intervention. It has the possibility to contribute to a deeper understanding of an interconnected approach to working with children and families. It is essential, in this country's development, to seek to provide new ways of thinking and analysing the responses of a service provider. With the study, some incentive has been taken towards more effective provision of developmental support for children from low socio-economic backgrounds. The analysis of such data can also inform policy makers on how a process orientation can be meaningfully included in their intervention approaches when working with the range of diversities that families and children bring.

# References

Adler, A., & Seligman, M. E. (2016). Using wellbeing for public policy: Theory, measurement, and recommendations. *International Journal of Wellbeing, 6*(1), 1–35. https://doi.org/10.5502/ijw.v6i1.429

Ainscow, M., & Miles, S. (2008). Making education for all inclusive: Where next? *Prospects, 38*(1), 15–34. https://doi.org/10.1007/s11125-008-9055-0

Anderson, C. J., Klassen, R. M., & Georgiou, G. K. (2007). Inclusion in Australia: What teachers say they need and what school psychologists can offer. *School Psychology International, 28*(2), 131–147. https://doi.org/10.1177/0143034307078086

Booth, T. (2010). *How should we live together? Inclusion as a framework of values for educational development*. Paper presented at the Kinderwelten Conference, Berlin, June 11, 2010.

Bruner, J. (1996). *The culture of education*. Harvard University Press.

Chaudry, A., & Wimer, C. (2016). Poverty is not just an indicator: The relationship between income, poverty, and child well-being. *Academic Pediatrics, 16*(3), S23–S29. https://doi.org/10.1016/j.acap.2015.12.010

Coleman, J. (2000). Social capital in the creation of human capital. *Knowledge and Social Capital*, 17–41. https://doi.org/10.1016/b978-0-7506-7222-1.50005-2

Cooper, J. L., Masi, R., & Vick, J. (2009). *Social-emotional development in early childhood: What every policymaker should know*. Columbia University. National Center for Children in Poverty.

Crivello, G., Morrow, V., & Wilson, E. (2013). *Young lives longitudinal qualitative research: A guide for researchers (Young Lives Technical Notes)*. Young Lives.

Currie, J. (2001). Early childhood education programs. *Journal of Economic Perspectives, 15*(2), 213–238. https://doi.org/10.1257/jep.15.2.213

Declercq, B. (2011). Levels of well-being and involvement of young children in centre-based provision in. *South African Journal of Childhood Education, 1*(2). https://doi.org/10.4102/sajce.v1i2.85

Ebbeck, M., Winter, P., Russo, S., Yim, H. Y., Teo-Zuzarte, G. L., & Goh, M. (2012). Measuring children's involvement as an indicator of curriculum effectiveness: A curriculum evaluation of a selected child study centre in Singapore. *Early Child Development and Care, 182*(5), 609–619. https://doi.org/10.1080/03004430.2011.566329

ECDA. (2019). *KidSTART*. Retrieved 20 September 2019, from https://www.ecda.gov.sg/Parents/Pages/KidSTART.aspx

Gog, S. (2019). Excluded within the inclusive institution: The case of low-skilled, low-wage security employees. In D. Guile & L. Unwin (Eds.), *The Wiley handbook of vocational education and training* (pp. 207–226). Wiley Blackwell.

Gopinathan, S., & Mardiana, A. (2013). Globalization, the state and curriculum reform. In Z. Deng, S. Gopinathan, & C. Lee (Eds.), *Globalization and the Singapore curriculum: From policy to classroom*. Springer. https://doi.org/10.1007/978-981-4451-57-4

Gottfried, M. A. (2018). Teacher's aides in kindergarten: Effects on achievement for students with disabilities. *The Journal of Educational Research, 111*(5), 620–630. https://doi.org/10.1080/00220671.2017.1354174

Green, B. L., Ayoub, C., Bartlett, J. D., Von Ende, A., Furrer, C., Chazan-Cohen, R., & Klevens, J. (2014). The effect of Early Head Start on child welfare system involvement: A first look at longitudinal child maltreatment outcomes. *Children and Youth Services Review, 42*, 127–135. https://doi.org/10.1016/j.childyouth.2014.03.044

Hart, J. (2004). *Children's participation in humanitarian action: Learning from zones of armed conflict, synthesis report prepared for the Canadian International Development Agency (CIDA)*. University of Oxford, Refugee Studies Centre.

Hebbeler, K., & Spiker, D. (2016). Supporting young children with disabilities. *The Future of Children, 26*(2), 185–205.

Hellman, A., Ragnarsdóttir, H., Jónsdóttir, F. B., Blöndahl, H., Lauritsen, K., & Paavola, H. (2018). Socially just learning spaces: Inclusion and participation in preschool settings in the Nordic

countries. In H. Ragnarsdóttir & L. A. Kulbrandstad (Eds.), *Learning spaces for inclusion and social justice: Success stories from four Nordic countries* (pp. 119–151). Cambridge Scholars Publishing.

Heng, Y. K. (2013). A global city in an age of global risks: Singapore's evolving discourse on vulnerability. *Contemporary Southeast Asia, 35*(3), 423–446. https://doi.org/10.1355/cs35-3e

Jesuvadian, M.K. (2016). S*hadow's Child: A qualitative study of three single mothers' parenting practices and their children's experience of being parented in low-income Indian families in Singapore* (Unpublished doctoral dissertation). National Institute of Education, Nanyang Technological University, Singapore.

Karoly, L. A., Greenwood, P. W., Everingham, S. S., Hoube, J., Kilburn, M. R., Rydell, C. P., Sanders, M., & Chiesa, J. (1998). *Investing in our children: What we know and don't know about the costs and benefits of early childhood interventions*. RAND.

Koh, A. (2014). Doing class analysis in Singapore's elite education: Unravelling the smokescreen of 'meritocratic talk'. *Globalization, Societies and Education, 12*(2), 196–210. https://doi.org/10.1080/14767724.2014.888308

Laevers, F. (1997). Assessing the quality of childcare provision: 'Involvement' as criterion. *Researching Early Childhood, 3*, 151–165.

Laevers, F. (2005). *Well-being and Involvement in care settings. A process-oriented Self-evaluation Instrument (SIC's)*. Research Centre for Experiential Education.

Laevers, F. (2017). How are children doing in ECEC? Monitoring Quality within a process-oriented approach. In N. Klinkhammer, B. Schafer, D. Harring, & A. Gwinner (Eds.), *Monitoring quality in early childhood education and care: Approaches and experiences from selected countries* (pp. 178–201). German Youth Institute.

Lee, M., & Morris, P. (2016). Lifelong learning, income inequality and social mobility in Singapore. *International Journal of Lifelong Education, 35*(3), 286–312. https://doi.org/10.1080/02601370.2016.1165747

Lien Foundation. (2012). *Vital voices for vital years: a study of leaders' perspectives on improving the early childhood sector in Singapore*. Retrieved from: http://www.lienfoundation.org/sites/default/files/vitalvoices_1.pdf

Lien Foundation. (2019). *Vital Voices for Vital Years 2: Perspectives on Early Childhood Development in Singapore*. Retrieved from: http://www.lienfoundation.org/sites/default/files/Vital-Voices-for-Vital-Years-2_FINAL.pdf

Lim, L. Y. C. (2015). Beyond gender: The impact of age, ethnicity, nationality and economic growth on women in the Singapore economy. *The Singapore Economic Review, 60*(2), 1–16. https://doi.org/10.1142/S0217590815500204

Lim, E. (2017a). Development Support Programme: Exploring implementation issues and challengers of Learning Support Educators in Singapore, (Unpublished thesis). National Institute of Education Singapore.

Lim, S. M. (2017b). Marketization and corporatization of ECCE in Singapore. In M. Li, J. Fox, & S. Grieshaber (Eds.), *Contemporary issues and challenge in early childhood education in the Asia-Pacific region* (pp. 17–32). Springer.

Lim, S. M. Y., Wong, M. E., & Tan, D. (2014). Allied educators (learning and behavioural support) in Singapore's mainstream schools: first steps towards inclusivity? *International Journal of Inclusive Education, 18*(2), 123–139. https://doi.org/10.1080/13603116.2012.758321

Lipponen, L. (2017). Constituting cultures of compassion in early childhood educational settings. In S. Garvis (Ed.), *Nordic children and families* (pp. 39–50). Routledge.

Maldonado, L. C., & Nieuwenhuis, R. (2014). Family policies and single parent poverty in 18 OECD countries, 1978-2008 *LIS Working Paper Series, No. 622 Luxembourg Income Study (LIS)*, pp. 1–32. Cross-National Data Center.

Mathew, M., & Ng, I. Y. H. (2016). Coping through reproducing State ideology: Working poor families in Singapore. *Global Social Welfare, 3*, 269–277. https://doi.org/10.1007/s40609-016-0055-3

McEwen, C. A., & McEwen, B. S. (2017). Social structure, adversity, toxic stress, and intergenerational poverty: an early childhood model. *Annual Review of Sociology, 43*, 445–472. https://doi.org/10.1146/annurev-soc-060116-053252

Menon, M. (2021, February 9). Household income from work for poor families in Singapore fell 69% last year due to Covid-19: Study. *The Straits Times*. Retrieved from: https://www.straitstimes.com/singapore/household-income-from-work-for-poor-families-fell-69-last-year-due-to-covid-19-study-by

Ng, I. Y. H. (2015). Being poor in a rich "nanny state": Developments in Singapore social welfare. *Singapore Economic Review, 60*(3), 1–17. https://doi.org/10.1142/S0217590815500381

OECD. (2006). *Starting strong II: Early childhood education and care, starting strong*. OECD Publishing. https://doi.org/10.1787/9789264035461-en

OECD. (2018). *A broken social elevator? How to Promote Social Mobility*. OECD Publishing. https://doi.org/10.1787/9789264301085-en

Pang, V. O., Rivera, J., & Mora, J. K. (1999). The ethic of caring: Clarifying the foundation of multicultural education. *The Education Forum, 64*(1), 25–32. https://doi.org/10.1080/00131729908984722

Pascal, C., Bertram, A. D., Ramsden, F., Georgeson, J., Saunders, M., & Mould, C. (1996). *Evaluating and developing quality in early childhood settings: A professional development programme*. Amber Publications.

Penney, D., Jeanes, R. O. C., & J, & Alfrey, L. (2018). Re-theorizing inclusion and reframing inclusive practice in physical education. *International Journal of Inclusive Education, 22*(10), 1062–1077. https://doi.org/10.1080/13603116.2017.1414888

Phelps, R., Nhung, H. T., Graham, A., & Geeves, R. (2012). But how do we learn? Talking to Vietnamese children about how they learn in and out of school. *International Journal of Educational Research, 53*, 289–302. https://doi.org/10.1016/j.ijer.2012.04.003

Pramling, N., & Pramling Samuelsson, I. (2011). *Educational encounters: Nordic studies in early childhood didactics*. Springer. https://doi.org/10.1007/978-94-007-1617-9

Prout, A. (2011). Taking a step away from modernity: Reconsidering the new sociology of childhood. *Global Studies of Childhood, 1*(1), 4–14. https://doi.org/10.2304/gsch.2011.1.1.4

Raghavan, R., & Alexandrova, A. (2015). Toward a theory of child well-being. *Social Indicators Research, 121*(3), 887–902. https://doi.org/10.1007/s11205-014-0665-z

Ramey, C. T., & Ramey, S. L. (1998). Early intervention and early experience. *American Psychologist, 53*(2), 109–120. https://doi.org/10.1037/0003-066X.53.2.109

Raspa, M. J., Mcwilliam, R. A., & Ridley, S. M. (2001). Child care quality and children's engagement. *Early Education & Development, 12*(2), 209–224. https://doi.org/10.1207/s15566935eed1202_3

Reyes, V. C., Jr., & Gopinathan, S. (2015). A critique of knowledge-based economies: A case study of Singapore education stakeholders. *International Journal of Educational Reform, 24*(2), 136–159. https://doi.org/10.1177/105678791502400205

Rodan, G. (2016). Capitalism, inequality and ideology in Singapore: New challenges for the ruling party. *Asian Studies Review, 40*(2), 211–230. https://doi.org/10.1080/10357823.2016.1155536

Shum-Cheung, H. S., Tan, A., Chua, Y. S., Hawkins, R., Lee, A. K. B., Shiu, M., & Fung, D. (2008). Children's social and emotional well-being in singapore. Retrieved from: https://www.childrensociety.org.sg/resources/front/template/scs/files/singapore.pdf

Singapore Department of Statistics. (2019). Key household income trends, 2018 [Press release]. Retrieved from: https://www.singstat.gov.sg/-/media/files/publications/households/pp-s25.pdf

SirajBlatchford, I. (2007). Creativity, communication and collaboration: The identification of pedagogic progression in sustained shared thinking. *Asia-Pacific Journal of Research in Early Childhood Education, 1*, 3–23.

SkillsFuture Singapore (2019). *SkillsFuture*. Retrieved from https://www.skillsfuture.sg/

Sönmez, S., & Ceylan, B. (2016). Teachers perceptions of well-being and involvement in preschool children. *Early Child Development and Care, 187*(1), 35–44. https://doi.org/10.1080/03004430.2016.1150272

South Australia Department of Education Training and Employment. (2008). *Reflect Respect Relate. Assessing for learning and development in the early years using observation scales*. DECS Publishing.

Tan, K. P. (2008). Meritocracy and elitism in a global city: Ideological shifts in Singapore. *International Political Science Review, 29*(1), 7–27. https://doi.org/10.1177/0192512107083445

Taylor, A. (2013). *Reconfiguring the natures of childhood*. Routledge.

Teo, Y. (2015). Differentiated Deservedness: Governance through familialist social policies in Singapore. *TRaNS: Trans-Regional and National Studies of Southeast Asia, 3*(1), 73–93. https://doi.org/10.1017/trn.2014.16

Teo, Y. (2018). *This is what inequality looks like*. Ethos Books.

Teo, T. A. (2019). Perceptions of meritocracy in Singapore: Inconsistencies, contestations and biases. *Asian Studies Review, 43*(2), 184–205. https://doi.org/10.1080/10357823.2019.1587592

Theodotou, E. (2015, July). *"Can we play again with Picasso Miss?" The effects of the arts in children's involvement during literacy activities in the early years settings: A case study in the Greek context*. Paper presented at the 3rd International Academic Conference on Social Sciences, Istanbul, Turkey.

Thoilliez, B. (2011). How to grow up happy: An exploratory study on the meaning of happiness from children's voices. *Child Indicators Research, 4*(2), 323–351.

Ulich, M., & Mayr, T. (2002). Children's involvement profiles in daycare centres. *European Early Childhood Education Research Journal, 10*(2), 127–143. https://doi.org/10.1080/13502930285209001

Warnock, M. (2008). Special educational needs: A new look. *Challenges for Inclusion*, 43–65. https://doi.org/10.5040/9781472541284.ch-01

Yeo, L. S., & Clarke, C. (2006). Adjustment to the first year in school – A Singapore perspective. *European Early Childhood Education Research Journal, 14*(2), 55–68. https://doi.org/10.1080/13502930285209911

Yeo, L. S., Neihart, M., Tang, H. N., Chong, W. H., & Huan, V. S. (2011). An inclusion initiative in Singapore for preschool children with special needs. *Asia Pacific Journal of Education, 31*(2), 143–158. https://doi.org/10.1080/02188791.2011.566990

# Chapter 6
# Early Childhood Intervention for Young Children with Special Needs in Singapore: Where We Have Been and Future Directions

**Kenneth Poon, Huichao Xie, and Xueyan Yang**

**Abstract** The early childhood years are foundational to every child's development and outcomes in life (Shonkoff et al., The developing brain. In: National Research Council, Shonkoff JP, Phillips DA (eds) From neurons to neighborhoods: The science of early childhood development. National Academies Press, Washington, DC, 2000). However, children with disabilities or at risk of developing disabilities may struggle to achieve the same levels of competencies in developmental domains as their typically developing counterparts. Research has established the importance and effectiveness of quality Early Childhood Intervention (ECI) for children with or at risk of developing disabilities. The early childhood window holds the most promise for effective intervention and development. This chapter examines the context of ECI within Singapore in three sections. The first section provides an overview of the formative years of ECI development in Singapore from 1950 to 2000 and describes the expansion of ECI services from 2001 to 2020, offering a brief description of the support programs offered in a range of inclusive to specialized settings. The second section presents key findings from the small but growing number of ECI studies conducted in Singapore. This section describes key findings in the areas of identification and assessment, child profile and needs, inclusive education models and programs, support practices and support needs, and family-centered service provision. The chapter concludes by offering recommendations for the road ahead for Singapore's ECI field. Recommendations include improvements in universal developmental screening and monitoring, providing supports within preschool settings to facilitate the move toward inclusive early childhood education and enhancing the quality of current early childhood professionals through a tiered approach of training and ongoing professional development.

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The early childhood years are foundational to every child's development and outcomes in life (Shonkoff et al., 2000). Quality early childhood environments are a key component to supporting young children's developing competencies in cognitive, socioemotional, and physical domains, namely (Thompson, 2016). Children with disabilities or who are at risk of developing disabilities may struggle to achieve the same levels of competence in these developmental domains as their typically developing counterparts. Disparities between them and their peers are likely to widen as they progress from preschool to primary school and beyond, leading to lower educational attainment and poorer life outcomes (Chowdry & Oppenheim, 2015; Tickell, 2011). Research has established the importance and effectiveness of quality Early Childhood Intervention (ECI) for children with or at risk of developmental disabilities. The window of early childhood holds the most promise for effective intervention and development. This chapter examines the context of ECI within Singapore in three parts. It begins with an overview of the historical roots of the ECI scene in Singapore and a description of Singapore's current ECI landscape. The second section presents key findings from research conducted in the local setting. Based on the key research findings, the concluding section offers implications for future directions for ECI in Singapore.

## 6.1  Overview of ECI in Singapore

### 6.1.1  The Formative Years of ECI Development: 1950 to 2000

The provision of services for children at risk and for those with disabilities is not new to Singapore, with many services existing in Singapore under British administration. For instance, the Singapore Children's Society was established in 1952 providing for, among others, vulnerable children and youth (Singapore Children's Society, 2020). Likewise, services for persons with physical disabilities were provided in 1950 with the conversion of a leper camp to Trafalgar Home in 1950 (Alkhatib, 2015).

However, it was not until the early years after Singapore's independence in the 1970s that services were established to provide beyond immediate and basic needs. These include ECI services for young children, established as informal groups with physical (and usually multiple) impairments, with a playgroup established by the Asian Women's Welfare Association (AWWA) and by the Christian Outreach to the Handicapped (Poon et al., 2007). Likewise, this focus on broader issues of child well-being started with the establishment of the Child Guidance Clinic by the

Ministry of Health and the School Social Work Association of Singapore (later renamed Student Care Service) in 1976.

The late 1980s was marked by the development of the formalized Early Intervention Program for Infants and Children (EIPIC) by Rainbow Center and AWWA. In response to demands, there was a proliferation of early intervention centers through the next three decades. Additionally, there was the introduction of TEACH ME by AWWA to integrate children with mild (and mostly physical) disabilities into mainstream pre and primary schools.

### 6.1.2  A Deepening and Broadening of ECI Services: 2001 to 2020

The first decade of the twenty-first century was marked by a further proliferation of ECI situated within specialized settings for children with developmental needs (i.e., EIPIC). In contrast to earlier approaches that focused primarily on specialized intervention for these children, the newer approaches focused more on supports within the preschool environment for the child with developmental needs. Earlier programs have included programs such as Healthy Start for at-risk families and the Positive Parenting Program (Triple-P) that are conducted in specific settings. In contrast, newer programs for children from at-risk backgrounds are introduced as part of a larger continuum of services. This continuum of ECI services in Singapore is ordered in terms of increasing specialization (and reduced inclusivity). In a corresponding fashion, the supported children are also profiled according to their level of support needs.

**KidSTART** is an ECI initiative started in 2016 by the Early Childhood Development Agency (ECDA) with the purpose to enrich the early years of children from disadvantaged families. Under this scheme, ECDA collaborates with partners such as preschools, hospitals, social service offices and family service centers to identify and provide coordinated support to families whose children aged 6 years and below may benefit from ECI (Channel News Asia, 2016). Such children will be given access to health, learning and developmental support, and their progress is monitored from birth to age six. Children identified to have special needs would be referred to providers offering the appropriate programs and services that would address their needs.

Besides children, KidSTART also offers support to parents by equipping them with the requisite knowledge and skills that would enable them to better nurture their children in their early years of development (ECDA, 2016). Such assistance takes the form of regular home visits, parent support groups, and the provision of parenting workshops and reading programs at preschools. Up to 1000 children living in pilot sites are expected to benefit from this initiative in the first 3 years.

The **Developmental Support-Learning Support (DS-LS)** is a newly emerged program serving children with risk and those with mild disabilities

attending preschool settings. It consists of learning support (LS) for children with learning needs and development support (DS) for children with mild developmental needs (SG Enable, 2015a). LS provides specialized instruction for 6–10 weeks focusing on literacy, language, social, or handwriting skills. DS provides therapy and learning support for 10–15 weeks, namely, occupational therapy, speech and language therapy, literacy and learning support, or psychological services. Those who need further intervention can have DSP extended by one additional block of 6–10 weeks of intervention. Additionally, teachers are encouraged to continue supporting the child via the generalization of strategies.

The **Integrated Child Care Program (ICCP)** is a government-funded initiative providing resources for the support of children with mild to moderate levels of need in preschools (SG Enable, 2015b). As reported by Poon and Yang (2016), 75% of ICCPs reported providing individualized teaching supports compared to 14% of preschools, and 25% of ICCPs offered therapy services compared to 14% of preschools. ICCPs also do not deliver an individualized curriculum but rather make adaptations to the curriculum to meet children's needs. ICCPs also provide ample opportunities for young children to learn and develop alongside with their typically developing same age peers in contrast to only 13% of EIPIC centers.

The **Early Intervention Program for Infants and Children (EIPIC)** is a government-subsidized program serving about 40% of young children with disabilities in Singapore (EM 2012–2016 Steering Committee, 2011). EIPIC is designed to serve children with moderate to severe disabilities (Poon & Lim, 2012). In comparison with the other service providers, Poon and Yang (2016) reported that most EIPIC centers provide individualized teaching supports and therapies (88% and 100% of centers, respectively), compared to ICCP (75% and 25% of centers, respectively) and preschools (14% and 14%, respectively). Additionally, some EIPIC centers have started to deliver home-based child intervention services though most centers are still delivering intervention services in a center-based format. It should be noted that EIPIC provides 5–12 h of services per week (SG Enable, 2015c). Hence, children attending EIPIC may also attend preschool or childcare centers, as a recent study found (Poon et al., 2007).

**Circle of Care (COC)** is an ECI initiative jointly developed by the Lien Foundation and Care Corner Singapore in 2013. Under this initiative, early childhood professionals, such as teachers, educational therapists and social workers, healthcare professionals, and community partners are brought together to provide integrated care for children and improve their long-term life outcomes, particularly those from disadvantaged households (Lien Foundation, 2016). COC provides intervention to children within the childcare center setting and engages parents as partners in their children's development. The initiative also provides talks, workshops, and support as part of efforts to enhance parenting skills and knowledge while social workers conduct regular home visits to engage parents.

## 6.2   Key Findings from Early Childhood Intervention Research in Singapore

A small but growing number of studies conducted in various aspects of ECI in Singapore have been particularly informative in the areas of identification and assessment, child profile and needs, inclusive education models/programs, support practices and support needs, as well as family-centered provision. Findings are summarized in the following sections for each of these areas.

### 6.2.1   Identification and Assessment

Early childhood intervention processes in Singapore begin with the developmental screening and assessment in the identification of children at risk or with disabilities. Children picked up during screening are referred to one of two child development units in Singapore for a more comprehensive assessment.

**Developmental Monitoring and Screening**   Children born in Singapore are given a Child Health Booklet for developmental monitoring and surveillance from birth to 4 years (Poon & Lim, 2012). The Child Health Booklet was developed based on the validated Denver Developmental Screening Test (DDST), Singapore, and contains developmental checklists and child monitoring schedules that indicate recommended times for visits with physicians, including the immunization schedule. The developmental checklists also include activities that a nurse or parents may carry out with their child at different points of the child development. Although parents find the developmental checklist useful for monitoring their child's development and feel it is important to fill in, developmental monitoring appeared to decrease after the immunization schedule was complete at 18 months of age (Koh et al., 2016). Koh and colleagues recommended making the developmental screening at age 3 mandatory, with text reminders sent to parents prior to the time to schedule an appointment. They also suggested making developmental checklists more easily accessible to parents by creating a web-based version and smartphone application (Koh et al., 2016; Ho, 2018). At present, the DDST, Singapore, is the only standardized tool adapted and normed on a Singapore population (Ho, 2018).

Although the Child Health Booklet provides guidance for parents to play a key role in monitoring their child's development from birth to 4 years old, along with their primary care physicians (Ho, 2018; Poon & Lim, 2012), there are no formal procedures for developmental monitoring and screening in the preschool years (Poon & Lim 2012). Children in the preschool ages may be identified through various channels such as the primary healthcare services including Maternal and Child Health clinics or private clinics, which may then provide a referral for a comprehensive multidisciplinary assessment at one of two Child Developmental Units (CDU) (Ho, 2018; Poon & Lim, 2012). As Poon and Lim (2012) noted, the developmental

monitoring and screening services tend to be decentralized and less coordinated, suggesting a need for a universal screening and monitoring system that allows a more coordinated effort at identifying children at risk for developmental concerns.

**Assessment and Evaluation** In Singapore, the Enabling Masterplan (Enabling Masterplan Steering Committee, 2016) describes a developmental screening network consisting of efforts from three sectors: the primary care sector (e.g., hospitals, polyclinics), families and caregivers, and other community partners such as preschools and family service centers. A comprehensive multidisciplinary assessment for children identified at screening is conducted at Child Development Units in two hospitals, which serve as an access point of entry to the ECI system (Ho, 2018; Poon & Lim, 2012). A pediatrician serves as the case manager, with other allied health including psychologists, speech-language pathologists, occupational therapists, and physical therapists. A study by Lian et al. (2012) indicates that clinical diagnoses at first consultation for children referred for developmental and behavioral concerns appeared to remain stable a year later, when definitive diagnoses were made based on clinical information and results from standardized tests conducted over the year. As Poon and Lim (2012) point out, the lack of locally normed standardized tests used in evaluation suggests a need to create locally normed instruments with future research.

## 6.2.2   Child Profile and Needs

Children with identified delays and special needs fall into four categories outlined by Ho (2007). These four categories were developed based on local funding and resources. Children with low-prevalence, high-severity developmental problems fall under Category A (e.g., intellectual disability/global developmental disability, severe cerebral palsy, autism spectrum disorder, and multiple disabilities). Children in this category are usually referred to EIPIC centers and subsequently to special schools. Children in Category B are those with high-prevalence, moderate-severity developmental conditions (e.g., severe ADHD, high-functioning autism spectrum disorder, severe learning disability, moderately severe motor, sensory, or behavior problems). Children with high-prevalence, low-severity developmental conditions (e.g., mild ADHD, speech and language delay, mild learning disability, mild physical or sensory impairment, and mild behavioral problems) fall under Category C. Children in Category D have developmental delay or behavior problems due to environmental factors, which would benefit from early intervention but may remain at-risk if environmental issues are not addressed. Children in Categories B, C, and D demonstrate intellectual abilities in the normal range and would be educated in the regular preschools (Ho, 2007; Poon & Lim, 2012).

### 6.2.3   Inclusive Education Models/Programs

Inclusive education programs in Singapore are often catered to children with milder disabilities, such as those who fall into categories C and D. In particular, two programs, Project ASSIST (Quah, 1997) and Therapy Outreach Program (TOP; Yeo et al., 2011), had been developed specifically to support the inclusion of children with special needs within preschool settings. Although the programs differed in their approach, common features supporting inclusive attitudes include providing in-class support to educators with children with disabilities, providing educators with knowledge about disabilities and training on supporting the child, and offering platforms supporting bidirectional communication and collaborative practices between families, educators, and therapists (Quah, 1997; Yeo et al., 2011). Yeo et al.'s (2011) study also identified four facilitators of inclusion: namely, communication, collaboration, training and resources, and staff readiness for inclusion. Four barriers to inclusion were also found in relation to person-related hindrances, structural obstacles, gaps in the program, and limited specialized training and resources.

Teacher needs and parent needs with regard to inclusive education were also identified. Teachers indicated needing more specific and on-going training and access to resources and materials to support the child. They also highlighted challenges with large class sizes and limited manpower. Parents also indicated a need for information on supporting their child and needs for themselves on self-help and counselling (Quah, 1997; Yeo et al., 2011).

Leadership also plays a role as found in Cheng's (2014) study of preschool center administrators' decision-making process in admitting children with special needs. These administrators generally offered a trial period for the children to experience and adjust to the setting while also emphasizing the role of parents as active decision-makers. As Cheng (2014) noted, the administrators' initiative and commitment to the children with and without special needs was a key driving force in securing resources and support to facilitate the inclusion of children with special needs.

### 6.2.4   Support Practices and Support Needs

**Support Practices Across EC Settings**  ECI programs range from self-contained settings to the provision of support within regular preschool settings. Accordingly, the availability of resources and types of support practices vary, with the more specialized settings (e.g., EIPIC and private ECI) providing more specialized teaching and learning supports and therapy services compared to ICCPs and regular preschools (Poon & Yang, 2016). Center supports (supports provided by the organization to the teacher and child) and teacher supports (supports provided in the classroom by the teacher) were found to be present to a greater extent in EIPIC, private ECI, and ICCPs than preschools (Poon & Yang, 2016). This may point to a

need to better equip regular preschool centers with resources and their teachers with the training needed to support children with SEN in their classrooms.

**Support Needs of Educators in EC Settings**   Preschool teachers and learning support educators have demonstrated positive attitudes toward supporting children with SEN in regular preschools (Lian et al., 2008; Nonis et al., 2016). However, Lian et al. (2008) found that the educators possessed limited knowledge about childhood developmental and behavioral disorders and felt ill-equipped to support children with special needs. Educators in Nonis et al.'s (2016) study echoed the need for teacher training in strategies for supporting the child and assessing their skills and for reasonable teacher-pupil ratio when there were children with developmental needs in the class. Leong et al. (2014) also highlighted the importance of training teachers on identifying and using evidence-based practices and learning to use systematic progress monitoring to evaluate the efficacy of an intervention in class. As Xie and Poon (2019) note, these findings point to a need for increased training and support for professionals and teachers, especially those in regular early childhood settings.

### 6.2.5   Family-Centered Service Provision

Service provision in early childhood programs in Singapore is in the process of moving from the traditional, expert-centered approach to a more family-centered approach (Acar et al., 2019; Poon & Lim, 2012). This is evident in the emphasis on empowering families in the three Enabling Masterplans in Singapore, which are official documents that guide policy around public disability services (Enabling Masterplan Steering Committee, 2006, 2011, 2016; Acar et al., 2019).

**Family Perspectives**   Families who are enrolled in EI programs have reported moderately positive perceptions of the EI programs with regard to family centeredness (Chong et al., 2012; Poon et al., 2014). Parents in EI programs appreciated the responsiveness of the programs to their child's needs and the parental need for information on supporting their child (Chong et al., 2012), and they reported moderately high family outcomes, finding the EI programs to be generally helpful (Poon et al., 2014). Nonetheless, parents also highlighted areas for improvement such as skills-based parent training, systems support allowing greater access to family and daily living, as well as personal and family support including platforms to provide social and emotional support and self-care resources (Chong et al., 2012). They also wanted their child to be able to take part in desired activities and information about available options when their child graduates from the EI programs and to be connected to a network of service providers (Poon et al., 2014).

**Service Provider Perspectives**   The delivery of family-centered services can be influenced by providers' self-efficacy and beliefs about family-centered practices.

Teachers who had more experience working with families and professionals with higher self-efficacy in implementing family-centered service principles had more positive perceptions regarding family-centered service (Tang et al., 2012). However, Tang et al.'s study also found that positive beliefs about family-centered service did not necessarily translate to practice. To address the discrepancy between the beliefs and practices of teachers and professionals, the authors offered two suggestions: (a) provide increased and sustained opportunities for service providers to work directly with children and families and (b) provide PD and training to increase service providers' confidence in implementing family-centered service.

In sum, although families and professionals are generally in agreement on the importance of family-centered practices, it is evident that there are areas for improvement. In particular, service providers may require more opportunities to work directly with families and to avail of training to implement family-centered practices (Tang et al., 2012). Programs should also consider supporting providing parent training that focuses on equipping parents with practical skills needed to support children in the home, post-program information, and offer access to resources that build on families' abilities for self-care and social and emotional supports (Chong et al., 2012; Poon et al., 2014).

## 6.3  Implications for Early Childhood Intervention in Singapore

Early childhood intervention in Singapore experienced a rapid growth in the past 10–15 years (Tan, 2016). The number of young children diagnosed with developmental problems has shown a consistent increase over the past 10 years (Tan, 2016). Meanwhile, more and more funding has been allocated to the provision of early childhood intervention services as well as to the development of new service programs (Chia, 2019). Based on the local research as reviewed above and the cutting-edge international research, three future directions are proposed for early childhood intervention in Singapore.

### 6.3.1  Implication #1: Enhancing Systematic Universal Developmental Screening and Monitoring Using Culturally Appropriate Instruments

Accurately identifying young children who would benefit from intervention services is the critical first step to successful intervention. Inaccurate identification may result in two unwanted consequences. First, when children with developmental delays are overlooked, a delay in service provision may compromise the effectiveness of intervention. Secondly, misidentified children without developmental delays

who are referred for intervention may cause a misdirection of scarce public resources. Based on the existing research, the developmental screening instruments in Singapore need an update in order to accurately identify young children who require intervention services. Culturally sensitive instruments should be developed and validated on the multi-cultural population in Singapore to facilitate accurate screening practices. Innovations and coordination at the systems level are also critical in improving the efficiency of early identification from multiple sources (e.g., healthcare sector, early childhood education sector, social and family services sector) as described in the early detection system in the Enabling Masterplan (Enabling Masterplan Steering Committee, 2016). The Child Health Booklet is currently available only in physical copies, which is not convenient for many families. As Ho (2018) pointed out, new technologies such as an electronic version of developmental screening should be adapted to facilitate implementation. The development of a universal screening and monitoring system also requires cross-discipline and cross-agency collaborations, such as developmental information sharing and referral between healthcare and early childhood education sectors. As a community, public awareness of the importance of developmental screening should be enhanced.

One specific area for improvement is the implementation of developmental screening in the early childhood sector. Traditionally, developmental screening has been considered the responsibility of healthcare professionals, not educators. However, developmental screenings during well-child check-ups have difficulties in reaching children older than 18 months when all the vaccination visits are completed. In contrast, 79% of children aged 2–4 years and 90% of those aged 4–5 years are enrolled in some childcare or preschool programs (Bull & Bautista, 2018). For toddlers and preschoolers, preschool is the primary setting for regular developmental screening. To date, no research has been published on developmental screening practices in preschools in Singapore.

### 6.3.2 Implication #2: Moving Toward Inclusive Early Childhood Education

A recent study (Lipponen et al., 2019) found that a large proportion of children enrolled in EIPIC are also attending childcare centers or preschools, including those with moderate to severe levels of needs. However, as Quah (1997) and Yeo et al. (2011) reported, even those preschools with a mission of including children with disabilities are targeting mild to moderate needs. As indicated in Lian et al. (2008), preschool teachers in Singapore are generally underprepared for serving children with special educational needs. As a result, as Poon and Yang (2016) reported, preschools rarely offer any specialized supports and therapy services, likely because they were not equipped to do so. Further research is needed to better understand to what extent and in what way young children with special educational needs, especially those with moderate to severe needs, are supported in mainstream preschool

settings. Future research is needed to assess the gap between the needs of children and the resources available in preschools.

### 6.3.3   Implication #3: Professional Development and Training for ECI Professionals

Future development of early childhood intervention services in Singapore requires further involvement of early childhood professionals in both early detection of children with needs and supporting them in mainstream preschool settings. It is within expectation that the population served in the early childhood sector is a more diverse group of children than school-age children, which requires professionals to be equipped with new knowledge and skills to provide the support they need in order to meet children's needs within their inclusive classrooms. This evolving landscape of early childhood education proposes new roles for professionals as:

- An expert in child development who is trained to use culturally appropriate and psychometrically rigorous instruments to regularly screen each child's development.
- A proactive team member in collaborating with professionals from other disciplines, such as early childhood intervention, therapy, healthcare, and family and social services.
- An efficient communicator with families in understanding and supporting the child's needs.
- An active advocate for children's diverse needs.

At an entry level, all early childhood professionals should be prepared to follow a systematic procedure developed either by the childcare center or the government to screen and refer children who may need early childhood intervention. Meanwhile, they should be able to make individualized adaptations and modifications to the general curriculum and classroom activities for diverse learners.

For early childhood educators with more experience or training, they are expected to develop and implement a data collection plan in order to monitor children's development and learning progress in order to facilitate curriculum planning. They should be carefully identifying and implementing evidence-based, naturalistic strategies in the classroom to embed individual learning goals in daily routines and activities.

Some early childhood educators with further experience or training may be expected to take on a leadership role. These professionals should have developed their area of specialization, such as child assessment, transdisciplinary teaming, or family involvement. They are expected to share their expertise and serve the community as a consultant, mentor, or head teacher, in addition to their role as a classroom teacher. At the leadership level, it is also important for policy makers and leaders in early childhood education to re-evaluate the new requirements of teachers

and to make needed adjustments in teachers' income and career development pathways to facilitate sustainable progress.

## 6.4 Conclusion

With the advancement of early childhood intervention in Singapore, more and more young children with special educational needs have received intervention and are expecting to actively participate in the community, such as by attending a mainstream preschool. This requires collaboration and communication between early childhood education and early childhood intervention in order to provide meaningful preschool experiences for every single child to reach the maximum potential of their development.

## References

Acar, S., Chen, C. I., & Xie, H. (2019). Family engagement practices in early intervention: A review of three countries. In L. Lo & Y. Xu (Eds.), *Family, school, and community partnerships for students with disabilities* (pp. 141–152). Springer.

Alkhatib, S. (2015, February 21). Former leprosy patients at Silra Home look forward to visitors during Chinese New Year. *The New Paper*.

Bull, R., & Bautista, A. (2018). A careful balancing act: Evolving and harmonizing a hybrid system of ECEC in Singapore. In S. L. Kagan (Ed.), *The early advantage: Early childhood systems that Lead by example* (pp. 155–181). Teachers College Press.

Channel NewsAsia. (2016). *KidSTART Initiative to help children from vulnerable families*. Retrieved from: http://www.channelnewsasia.com/news/singapore/kidstart-initiative-to/2688318.html

Cheng, C.-C. (2014). Early childhood administrators' admission decision making process in including children with special needs in Singapore. *Asia-Pacific Journal of Research in Early Childhood Education, 8*(1), 37–56.

Chia, L. (2019, January 28). *MSF to enhance early intervention framework; More support for children with developmental needs*. Channel NewsAsia. Retrieved from https://www.channelnewsasia.com/news/singapore/msf-to-enhance-early-intervention-framework-more-support-for-11175870

Chong, W. H., Goh, W., Tang, H. N., Chan, W. P., & Choo, S. (2012). Service practice evaluation of the early intervention programs for infants and young children in Singapore. *Children's Health Care, 41*(4), 281–301.

Chowdry, H., & Oppenheim, C. (2015). *Spending on late intervention: How we can do better for less*. Early Intervention Foundation. Retrieved from: www.eif.org.uk/wp-content/uploads/2015/02/SPENDING-ON-LATE-INTERVENTION.pdf

Enabling Masterplan Steering Committee. (2006). *Enabling masterplan (2007–2011)*. Retrieved from https://www.msf.gov.sg/policies/Disabilities-and-Special-Needs/Pages/EM%201.pdf?utm_source=website

Enabling Masterplan Steering Committee. (2011). *Enabling masterplan (2012–2016)*. Retrieved from https://www.msf.gov.sg/policies/Disabilities-and-Special-Needs/Enabling-Masterplan-2012-2016/Pages/default.aspx

Enabling Masterplan Steering Committee. (2016). *Enabling masterplan 2017–2021: Caring nation, inclusive society*. Retrieved from https://www.ncss.gov.sg/NCSS/media/NCSS-Documentsand-Forms/EM3-Final_Report_20161219.pdf

Ho, L. Y. (2007). Child development Programme in Singapore 1988 to 2007. *Annals of the Academy of Medicine, 36*, 898–910.

Ho, L. Y. (2018). *Building an inclusive early childhood intervention ecosystem in Singapore, 1988–2017*. KK Women's and Children's Hospital, Department of Child Development.

Koh, H. C., Ang, S. K. T., Kwok, J., Tang, H. N., Wong, C. M., Daniel, L. M., & Goh, W. (2016). The utility of developmental checklists in a parent-held child health record for identifying children with developmental issues in Singapore. *Journal of Developmental and Behavioral Pediatrics, 37*(8), 647–656.

Leong, H. M., Stephenson, J., & Carter, M. (2014). The use of sensory integration therapy in Malaysia and Singapore by special education teachers in early intervention settings. *Journal of Intellectual and Developmental Disability, 39*(1), 10–23.

Lian, W. B., Ho, S. K. Y., Choo, S. H. T., Chan, D. K. L., Yeo, C. L., & Ho, L. Y. (2008). Pre-school teachers' knowledge, attitudes and practices on childhood developmental and behavioural disorders in Singapore. *Journal of Paediatrics and Child Health, 44*(4), 187–194.

Lian, W. B., Ho, S. K. Y., Choo, S. H. T., Shah, V. A., Chan, D. K. L., Yeo, C. L., & Ho, L. Y. (2012). Children with developmental and behavioural concerns in Singapore. *Singapore Medical Journal, 53*(7), 439–445.

Lien Foundation. (2016). *Singapore's first model of integrated care expands to 9 preschools and 2 primary schools. More than 1,700 children to benefit in the next 3 years.* Retrieved from http://circleofcare.sg/wp-content/uploads/2016/03/COC-2016-Press-Release-Final.pdf

Lipponen, L., Ang, L., Lim, S., Hilppo, J., Lin, H., & Rajala, A. (2019). Vital *Voices for vital years 2: Perspectives on early childhood development in Singapore*. Retrieved from http://www.lien-foundation.org/sites/default/files/Vital-Voices-for-Vital-Years-2_FINAL.pdf

Nonis, K., Chong, W. H., Moore, D. W., Tang, H. N., & Koh, P. (2016). Pre-school teacher's attitudes towards inclusion of children with developmental needs in kindergartens in Singapore. *International Journal of Special Education, 31*(3), 1–30.

Poon, K. K., & Lim, A. K. (2012). Current provision, recent developments, and future directions for early childhood intervention in Singapore. *Infants and Young Children, 25*(4), 323–333.

Poon, K. K., & Yang, X. (2016). The student profile, service delivery model, and support practices of four early childhood intervention environments in Singapore. *Asia Pacific Journal of Education, 36*(3), 437–449.

Poon, K. K., Khaw, J., & Tan, L. S. (2007). Special needs support: The Singapore context. In K. K. Poon & J. Khaw (Eds.), *Supporting students with special needs in mainstream schools: An introduction* (pp. 1–10). Pearson.

Poon, K. K., Ooi, N., Bull, R., & Bailey, D. B. (2014). Psychometric validation of the family outcome survey-revised in Singapore. *Research in Developmental Disabilities, 35*, 1534–1543.

Quah, M. M. (1997). Family-centred early intervention in Singapore. *International Journal of Disability, Development and Education, 44*(1), 53–65.

SG Enable. (2015a). *Development Support (DS) & Learning Support (LS)*. Retrieved from https://www.sgenable.sg/pages/content.aspx?path=/for-children/development-support/

SG Enable. (2015b). *Integrated child care program (ICCP)*. Retrieved from https://www.sgenable.sg/pages/content.aspx?path=/for-children/integrated-child-care-programme-iccp/

SG Enable. (2015c). *Early Intervention Programme for Infants & Children (EIPIC) and Development Support Plus (DS-Plus)*. Retrieved from https://www.sgenable.sg/Pages/content.aspx?path=/for-children/early-intervention-programme-for-infants-children-eipic/

Shonkoff, J. P., Phillips, D. A., & National Research Council. (2000). The developing brain. In National Research Council, J. P. Shonkoff, & D. A. Phillips (Eds.), *From neurons to neighborhoods: The science of early childhood development*. National Academies Press.

Singapore Children's Society. (2020). *Society overview*. Retrieved from https://www.childrensociety.org.sg/society-overview

Tan, T. (2016, May 29). More children diagnosed with developmental problems. *The Straits Times*. Retrieved from https://www.straitstimes.com/singapore/more-children-diagnosed-with-developmental-problems

Tang, H. N., Chong, W. H., Goh, W., Chan, W. P., & Choo, S. (2012). Evaluation of family-centred practices in the early intervention programmes for infants and young children in Singapore with measure of processes of Care for Service Providers and Measure of beliefs about participation in family-centred service. *Child: Care, Health and Development, 38*(1), 54–60.

Thompson, R. A. (2016). What more has been learned? The science of early childhood development 15 years after "Neurons to Neighborhoods". *Zero to Three, 36*(3), 18–24.

Tickell, D. C. (2011). *The early years: Foundations for life, health and learning.* Retrieved from http://www.educationengland.org.uk/documents/pdfs/2011-tickell-report-eyfs.pdf

Xie, H., & Poon, K. K. (2019). Maximizing participation in preschool education of young children with developmental delays/disabilities in Singapore: Building a continuum of early childhood intervention service. *Young Exceptional Children Monograph Series, 18*, 24–32.

Yeo, L. S., Neihart, M., Tang, H. N., Chong, W. H., & Huan, V. S. (2011). An inclusion initiative in Singapore for preschool children with special needs. *Asia Pacific Journal of Education, 31*(2), 143–158.

# Chapter 7
# Cross-Cultural Considerations for Adapting Valid Psychoeducational Assessments


Check for updates

**Nicolette Waschl and Mo Chen**

**Abstract**  Accurate measurement of children's understanding and learning is essential for educational practice – in order to identify individual needs, evaluate pedagogical effects, and ultimately inform broader education policy. Much research and practice in child learning and development is predicated on accurate measurement. However, most common measurement instruments (tests, surveys) have been developed and validated in Western contexts. While these measures may be broadly appropriate for use in Singapore, they may not exhibit the same measurement properties and validity as reported in other contexts and may require modification. This chapter will thus focus on the need for locally validated and culturally appropriate measures in Singapore and the factors that may influence the development and adaptation of such measures.

Specifically, this chapter will consider how the unique context of Singapore differs from Western contexts and how these contextual factors relate to and can inform the adaptation and use of different types of measurement instruments: self- and other-report inventories, norm-referenced standardised tests, and computerised adaptive tests (CATs). For example, norm-referenced measures which seek to compare a child to his or her peers require a valid frame of reference which is not necessarily provided by internationally standardised and normed measures, while CATs allow for more individualised and efficient testing experiences.

In summary, this chapter will use concrete examples of test adaptation and development as well as evaluations of the measurement properties of internationally validated measures to highlight issues regarding cross-cultural measurement in the context of childhood development in Singapore. Implications for practitioners will be highlighted.

**Keywords**  Psychological measurement · Child development · Cultural adaptation

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Measurement in psychology and education is predicated on the notion that human attributes (e.g. abilities, traits, attitudes, achievement) can be quantified, similar to the quantification of length and weight in the physical sciences. To this purpose, measurement instruments containing items thought to be reflective of an intended psychological or learning trait/construct (e.g. adaptive skills, metacognition, motivation) are created, and then these instruments undergo a rigorous validation process in order to obtain evidence that they are sufficiently reliable and valid. With a small body of exceptions most psychological measures are originally developed and validated in English speaking Western cultures and countries (e.g. the United States, the United Kingdom). With the backdrop of globalization all over the world, however, there is an increasing need for measures that can be used in other countries and cultures that may differ from the United States or the United Kingdom (e.g. Singapore). Most psychological traits and constructs (e.g. temperament, adaptive behaviour skills, attitudes) may not be readily generalised from one culture to another (Azuma, 1984). In particular, cross-cultural contexts can complicate psychological and educational measurement as content reflective of certain constructs can differ in important ways across cultural contexts, as can individuals' response styles to certain types of items.

Researchers and practitioners outside of the 'mainstream' countries where the majority of psychological measures are developed, therefore, are frequently faced with three options as highlighted by He and van de Vijver (2012): (1) to use the measurement instrument as it is, including a simple translation of the instrument if needed (adoption), (2) to modify some culturally inappropriate stimuli in addition to any necessary translations (adaptation), or (3) to develop a new measure of the same psychological construct (assembly). In cases where simple adoption is not desirable, assembly also can be too time, resource, and funding intensive. Thus, cross-cultural *adaptation* of psychological measures is often the most appropriate option for researchers and practitioners who need locally validated measurement tools for certain psychological constructs. Cross-cultural adaptation encompasses a process that examines both language (translation) and cultural modification issues for transporting one measure from its original context to another new one (Guillemin et al., 1993). It is posited that cross-cultural modification stands out to be more obviously important in certain situations, especially when there are clear differences between the target (where the measure is going to be applied) and source (where it was originally developed) in terms of country, culture, and language (Beaton et al., 2002).

One issue in measurement which makes adaptation or assembly important is the issue of test bias. Bias can take many forms, including: construct, method, and item biases (He & van de Vijver, 2012; van de Vijver & Poortinga, 1997; van de Vijver & Tanzer, 2004). Construct bias occurs when there are differences in the construct measured between the original culture and the new one where cultural adaptation is required, so that some items from the original culture may not be culturally relevant or sensitive in the new culture, while some construct-relevant behaviours from the new culture are left out and not sampled or included in the measure. For example, research has demonstrated that maternal warmth practices may differ

cross-culturally, with Chinese American mothers more likely to foster positive affect and comfort, to take care of daily routine needs and to provide guidance and learning opportunities as a way to express warmth, while European American mothers may be more likely to express warmth through physical and verbal expressions such as hugging and kissing and affective involvement (Chea et al., 2015). Conceivably, a scale measuring maternal warmth by assessing physical and verbal expressions of warmth may be biased at the construct level for Chinese American mothers because it may not be representative of the construct of interest for their context. Items in such a scale may be less likely to be endorsed simply because it is not how these mothers would typically demonstrate maternal warmth rather than because they do not display maternal warmth.

Method bias happens when variations in responses result from the measurement instrument, administration process, or sampling method rather than the actual attributes of the respondents that the instrument attempts to uncover. In other words, the results obtained are contaminated by 'noise' stemming from the biased instrument, which may relate to different culturally impacted aspects. Some examples of potential causes of this 'noise' are where individuals from different cultures may be less familiar with the response mode (e.g. computer-assisted assessment) or may tend to demonstrate different response styles (e.g. a tendency to agree with items regardless of item content) compared to individuals from cultures where the instrument was developed.

Item bias occurs when specific items mean different things across cultures, resulting in a situation where scores on that item do not accurately represent the individual's level of the construct being measured in the new culture. In such cases, the item from the original culture may have been designed such that it is more easily endorsed by individuals high on the construct and less easily endorsed by individuals low on the construct. However, this item may be unlikely to be endorsed by all individuals of all levels of the construct in a novel cultural context, due to factors unrelated to the construct being measured. For example, and item such as 'my child uses a knife and fork independently' may be designed to measure the daily living or fine motor skills of a child in a Western context, where the parent of a child with a higher level of daily living or fine motor skills is more likely to endorse the item. However, in the case of Singapore, because it is more common to use a spoon and a fork, this item may not be endorsed by the majority of parents regardless of their child's level of the construct. All of these different types of biases should be considered in adapting a measurement instrument cross-culturally.

Overall, adapting culturally relevant, reliable, and valid psychological measures in Singapore can be intriguingly complex given its status as a country of multiple cultures, ethnicities, and languages (even if English is the main language in education and workplace). This chapter will consider cross-cultural issues of psychological and educational measurement in the context of Singapore, with a summary of the research and practice implications of each highlighted measurement issue. First, this involves consideration of some of the factors that make Singapore unique and that therefore require attention when using internationally developed measurement instruments. Following this, the chapter will discuss recent research related to the

use of self- and other-report inventories and norm-referenced standardised assessments in Singapore. Finally, this chapter will culminate in an example showcasing the need to develop a new tool for the well-established psychological construct of adaptive behaviour in the Singapore context. This example highlights use of a newer technique, computerised adaptive testing (CAT), to improve the accuracy and efficiency of measurement in Singapore. Advancing the cross-cultural adaptation of existing assessment inventories as well as assembling new culturally sensitive psychological measures will provide greater potential for cross-country data comparison and aggregation. This becomes increasingly important in many countries including Singapore in the era of rapid globalization and the advancement of big data.

## 7.1 Singapore Context

Singapore is a country of small size in South East Asia with people of different ethnicities (74.3% Chinese, 13.3% Malay, 9.1% Indian, and 3.3% Others; Singapore Department of Statistics, 2018) and highly diverse religions (e.g. Buddhism, Christianity, Islam, Taoism, Hinduism). It has a population of 5.64 million as of June 2018 (Singapore Department of Statistics, 2018) and occupies a land area of 714.3 km$^2$. The total population of Singapore is comprised of 71 percent citizens and permanent residents (approximately four million) and 29% non-residents (1.64 million) who are in Singapore for work, study, or family reasons. The use of language is complex and diverse in Singapore, with many changes in the patterns of language use over the past century (Gupta, 1994). There are four official languages (English, Mandarin, Malay, and Tamil; Singapore Department of Statistics, 2019). While English is the common language for education, government, and business, the other three official languages are referred to as mother tongue languages (MTL). Therefore, most Singaporeans are bilingual, with English being the dominant language used for education and business and the additional language being Mandarin, Malay, or Tamil.

Singapore is considered as a relatively safe and secure country in terms of its political stability (Loh, 2019) and low crime rate (Low, 2018) and is also considered a favourable place to conduct business (Loh, 2019). Most people in Singapore live in HDBs (public housing under the regulation of the Housing and Development Board) which range in size for the varying income levels of people and families, and HDBs are also the most affordable type of housing available in Singapore. Most HDBs are close to a form of public transport such as buses or the Mass Rapid Transit System (MRTs) for ease of travel across the country island. Small cafeterias or 'Kopitiams' are commonly found near HDBs to provide people with ease of access to affordable food. However, purchasing HDBs comes with some restrictions set by the government, such as a marriage requirement to buy government build-to-order houses before the age of 35, and the requirement of citizenship for all ages. Some alternative housing types exist such as executive condominiums, private

apartments and condominiums, and private landed or terraced housing (where the plot of land is owned together with the private housing), although they can be much more expensive to purchase.

As a result of many immigrants coming into Singapore in the past 50 years, cultural diversity in Singapore has flourished and is reflected in its wide range of ethnic cuisine, major festivals, and unique traditions and practices. For example, Muslims fast, abstaining from food, drinks, or both, during the month of Ramadan; the Chinese perform lion dances during major Chinese festivals; the Indians celebrate Deepavali, also known as the Festival of Light, where many Hindus spring-clean their homes as the festival approaches; and the Westerners welcome Santa Claus during the season of Christmas. Therefore, in Singapore these 'personal' holidays are nationally recognized as public 'days off'. Along with the diversity of ethnicities and religions, Singapore has also developed its own unique customs only seen locally, such as the use of Singapore Colloquial English (SEC) or 'Singlish' where multiple dialects and languages are mixed in conversations along with unique new words such as 'chope', which means to reserve something. Singaporeans are also known to stay in long queues for various reasons, such as for purchasing food or attending events (Kaur, 2018), and are known for being 'kiasu', (pronounced kee-ah-sue), where people are always fearful of missing out, and they are competitive to win (Hwang et al., 2002).

Singapore's educational system has been rather successful and even deemed as a model for Western countries for years (Hogan, 2014). There is a high proportion of preschool enrolment in Singapore, and all children are required to attend primary school starting at the age of 7 so as to provide everyone with a basic level of education. The educational system in Singapore also focuses more on the transmission of conventional curriculum knowledge and performance in exams, which has been proven to be effective in students' outstanding results in International Assessments such as the Trends in International Mathematics and Science Study (TIMSS) and the OECD's Programme for International Student Assessment (PISA) (OECD, 2015).

The educational system is also moving towards a more inclusive and stress-free environment with more careful attention to the use of assessments. For instance, all Primary 6 students need to take the Primary School Leaving Examinations (PSLE) before moving on to secondary school. Currently, the scoring system for PSLE is that every student will receive their aggregate numerical T-score, which is dependent on the performance of other students in the cohort (e.g. if most students are able to obtain a score higher than 90 for a particular subject, a student scoring 85 will receive a lower T-score compared to if most students are only able to obtain a score higher than 85 for that subject). However, this scoring system has been changed recently into one where students will receive a banded letter score (ranging from 1 to 8) instead. Specifically, each subject will be scored using these 8 bands, also known as achievement levels (AL). The AL scores are given to the students solely based on their performance, without being modulated by the performance of others (e.g. if a student scores 85 for a particular subject, he or she will receive an AL of 2 regardless of the performance of others). This change in scoring system

(from a norm-referenced system to a criterion-referenced one) has been made with the aim to reduce the distinction between a student's individual performance and performance by others (MOE, 2019). Meanwhile, this change in scoring system also reflects the need to further explore and improve the fairness and equity of using standardised tests (either normed-referenced or criterion-referenced standardised tests) in quantifying educational outcomes in the Singapore context.

Another major change to the educational system is the replacement of streaming with subject-based banding. In the current system, after a student enters secondary school, he or she will be streamed into one of the three levels – Express, Normal (Academic; NA), or Normal (Technical; NT), with the Express stream allowing students to complete secondary school in 4 years, while the NA and NT streams require about 5 years to complete. These three streams also differ in the difficulty of the content taught, with Express having the highest difficulty level, followed by NA and NT. The change from streaming to subject-based banding means that students are no longer classified into one of the three streams, but instead, students could choose the difficulty of subjects they are going to take in secondary school, ranging from General 1 (G1, roughly equivalent to the NT standard), General 2 (G2, roughly equivalent to the NA standard), and General 3 (G3, roughly equivalent to the Express standard). In the new system, students can choose to take a combination of subjects across different bands according to their own strengths and interests (Davie, 2019). Apart from the compulsory education in schools, Singaporeans usually also take a step further to prepare their children through external tuition by sending their children to either a tuition centre or hiring a private tutor. The purpose of external tuition is to help strengthen their children's understanding of the knowledge that has been taught in school or teach their children a particular subject at a more advanced level compared to what is taught in school, which could provide their children with a competitive advantage compared with their peers. It is reported that in 2015 70% of parents sent their children to tuition centres, and families spent a median monthly amount on tuition ranging from S$155 to S$260 (Davie, 2015). The educational system in Singapore, to a certain extent, again reflects the national culture of 'kiasu-ism' where parents are afraid that their children would fall behind their peers and thus they try their best to prepare their children as best as they can.

As previously described, Singapore has its unique culture as a multi-ethnic, multilingual, and multi-religious country and places a heavy emphasis on social inclusivity. Against this social backdrop, Singapore stands out to have a mixture of Western and Asian cultural influences. In particular, the Asian cultures often view the self as part of a larger group (Markus & Kitayama, 1991), which can be demonstrated by showing more concern for family's 'face' and achieving for family and focusing more on social status (Nisbett et al., 2001). In contrast, Western cultures tend to focus more on individual needs and wants (Markus & Kitayama, 1991). To a certain extent, Singapore exemplifies the adoption of both holistic and analytic cognitive styles emphasised in these two types of cultures, respectively. In Asian cultures, people tend to perceive the world holistically as inherently interconnected, related, and ever changing and describe

reality in a subjective sense (Peng & Nisbett, 1999). In contrast, Western cultures are more likely to perceive the world analytically as independent and consider that reality is stable and can be characterised by rules and laws (Peng & Nisbett, 1999). With the embrace of multiculturalism as a way to a harmonious and inclusive society (Chan, 2013), both holistic and analytic cognitive styles can co-exist in different aspects of life in Singapore as a cohesive nation. Compounded by the fact that more than one fifth of the country's population consists of expatriates, Singapore makes itself quite a special case in terms of cultural traits.

In addition to the cultural complexities, in Singapore, language use is another important factor to be taken into consideration in conducting cultural adaptation of psychological measures. Although English is the primary language in Singapore, the way certain English vocabulary is used in Singapore may differ from that in Western countries due to the influence from other co-existing official languages such as Mandarin, Malay, and Tamil. For instance, the word 'send' can be used to express the meaning of accompanying someone to a place, which is an example of a word ([pronounced as 'song' in Chinese]) borrowed from Mandarin, and the word 'makan' (to eat) is an often used term borrowed from the Malay language (Deterding, 2007). Singaporeans also tend to use the word 'will' to refer to regular events and the word 'would' to express tentativeness (Deterding, 2005). Therefore, it is possible that even when translation into Mandarin, Malay, or Tamil is not required for cultural adaptation of certain psychological measures, nuances in English usage may still remain to be considered for establishing cultural equivalence (Lim et al., 2016).

All of these facets of the Singapore cultural and linguistic context outlined above underscore the important role that valid assessments play. This includes the central role of high-stakes assessments in the context of streaming and banding, such as issues related to norm-referenced versus criterion-referenced assessment, the different purposes and considerations for use of these different types of assessment (discussed later in this chapter), as well as validity evidence of different educational and/or psychological measures in a unique culture. Generally speaking, the development of locally validated measures or cross-cultural adaptation of standard psychological measures is critical given the juxtaposition of different cultural traits within Singapore and policymakers' increasing attention to the field of child development and education.

In the sections to follow, these cultural considerations are taken into account for specific cases of self-report inventories, standardised tests, and a CAT, based on examples of research recently conducted in Singapore. These sections will also illustrate how cultural, linguistic, and societal factors may influence the process of cultural adaptation of psychological measures.

Describe yourself as you generally are now, not as you wish to be in the future.

Am the life of the party.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Very inaccurate | Moderately inaccurate | Neither accurate not inaccurate | Moderately accurate | Very accurate |

**Fig. 7.1** Likert scale item from the International Personality Item Pool

## 7.2 Cultural Adaptation of Self- and Other-Report Inventories

One of the main types of measurement instruments used in psychological measurement is the questionnaire or self- and other-report inventory. This type of measurement instrument typically asks an individual to rate their agreement with how well certain statements represent themselves or someone close to them. The most widely used type of scale to measure responses to these statements is a Likert scale (Likert, 1932), which assumes a monotonic increase from strong agreement to strong disagreement (or vice versa). Typically, individuals completing the test must choose from several response options along this continuum, which are then coded numerically. For example, the following item is featured as part of the International Personality Item Pool (Goldberg, 1999; Goldberg et al., 2006), a pool of items used to measure personality through self-report (Fig. 7.1).

This item can be changed to other-report by changing the item wording to 'Is the life of the party' and asking the individual to rate how accurate they believe that statement to be for a close friend or relative. Using the self- and other-report format, one can measure a person's behaviours, beliefs, attitudes, intentions, and more. For example, with regard to child development, self- and other-report can be used to measure child temperament (e.g. *Child Behaviour Questionnaire*; Rothbart et al., 2001), child executive function (*Behavior Rating Inventory of Executive Function*; Gioia et al., 2000), family quality of life for families of children with special needs (*Beach Center Family Quality of Life Scale*; Hoffman et al., 2006), and child social, emotional, and behavioural competencies (*Strengths and Difficulties Questionnaire*; Goodman, 1997), among others.

### 7.2.1 Macro-level Measurement: Are the Constructs Measured the Same?

The first thing to consider when using a self- or other-report measure in a context different from that in which it was developed is whether it measures the same thing in the new context as it did in the original context. This can be assessed at many

different levels using factor analytic methods (e.g. configural, metric, scalar invariance; see Putnick & Bornstein, 2016; Vandenberg & Lance, 2000; Widaman & Reise, 1997). The term 'measurement invariance' is used to describe measurement equality, which exists when the measure can be considered to measure the same construct(s) in the same way across different groups (the construct and its indicators do not vary). 'Measurement non-invariance', on the other hand, is used to describe the situation where measures do not measure the same constructs in the same way across groups (the construct and/or its indicators do vary). At the most basic level, the question we first seek to answer when considering measurement invariance is whether the measure displays the same structure (configural invariance) – that is, do the items represent the same constructs across the different contexts? Configural invariance is shown in Fig. 7.2a, where test items measure only one construct in both Group A and Group B. Conversely, measurement non-invariance is represented in Fig. 7.2b, which shows that items from a test measure one construct in Group A (the original context/culture), but two constructs in Group B (the new context/culture).

Research from the CRCD team has examined issues of configural invariance across contexts of the West where measures were created and locally within Singapore. Findings suggest that the answer to the question of whether a
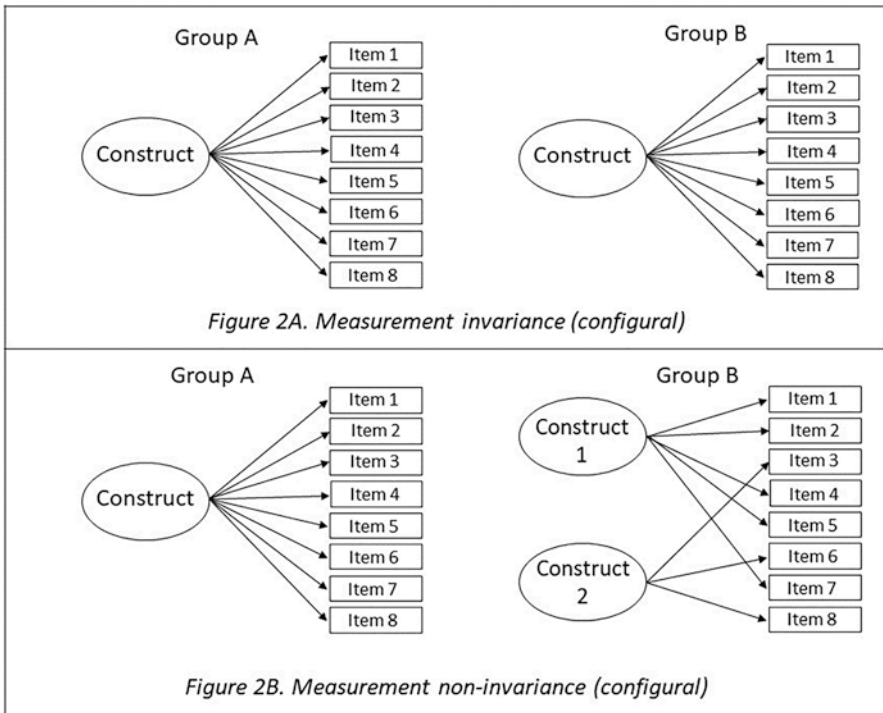


Fig. 7.2 (a) Measurement invariance (configural) (b) Measurement non-invariance (configural)

measurement instrument measures the same thing in Singapore as it did in its original context will likely depend on which measurement instrument is used. Here we consider three different self and other-report inventories previously used in studies of young children in Singapore: The Beach Center Family Quality of Life Scale (BCFQoL; Hoffman et al., 2006), the Family Outcomes Survey – Revised (FOS-R; Bailey et al., 2008), and the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997).

**BCFQoL** The BCFQoL scale was designed to measure the quality of life of families of children with developmental disabilities. It was developed in the United States and includes 25 statements addressing five different dimensions of family quality of life: family interaction, parenting, emotional well-being, physical and material well-being, and disability-related support. Parents or caregivers are required to indicate their satisfaction regarding the 25 statements on a scale from 1 to 5 (1 = very dissatisfied, 2 = dissatisfied, 3 = neither, 4 = satisfied, 5 = very satisfied). Recent research with the BCFQoL in Singapore has demonstrated that its structure can be replicated, indicating configural invariance and also that it exhibits adequate construct validity (Waschl et al., 2019). In this context, construct validity refers to evidence that the test's internal structure conforms to theoretical expectations (i.e. five factors measuring the five different dimensions) as well as evidence for theoretically expected relationships between the BCFQoL and other related constructs.

**FOS-R** Similar to the BCFQoL, the FOS-R was also developed in the United States and is a caregiver-completed measure designed to measure family outcomes of early intervention services for children with developmental disabilities. There are 24 questions, addressing five dimensions related to caregivers' outcome attainment: (1) understanding their child's strengths, abilities, and special needs, (2) knowing their rights and advocating effectively for their children, (3) helping their child develop and learn, (4) having support systems, and (5) accessing desired services, programs, and activities in the community. Parents or caregivers must indicate on a scale from 1 to 5 how strongly they agree with the 24 statements (1 = not at all, 2 = a little, 3 = somewhat, 4 = almost, 5 = completely). Like the BCFQoL, research with the FOS-R in Singapore has indicated that its structure can be replicated, supporting configural invariance, and also that it shows good reliability (Poon et al., 2014).

**SDQ** The SDQ is slightly different from the previous two measures. It was developed as a behavioural screener for children from age 4 to 16 years. The parent-completed SDQ contains 25 items, for which parents or caregivers must indicate how true the given statement is on a scale from 0 to 2 (0 = not true, 1 = somewhat true and 2 = certainly true). These 25 items are proposed to represent five separate dimensions: emotional symptoms, conduct problems, hyperactivity, peer relationship problems, and prosocial behaviour. Unlike the BCFQoL and the FOS-R, the SDQ contains both positively and negatively worded items, and some items require reverse-coding of the response because higher scores on those items were designed

to reflect lower levels of the targeted construct. Generally, in self- and other-report measurement instruments items requiring reverse-coding, use either opposite meaning wording (e.g. 'I am happy' to measure sadness) or negative wording (e.g. 'I am not sad' to measure sadness). In the SDQ specifically, items requiring reverse-coding typically use negative wording.

Use of items requiring reverse-coding is thought to cancel out the effects of response sets and response styles, such as a tendency to respond in a systematic manner showing agreement with all items regardless of item content or a tendency to respond to items in a socially desirable manner (Paulhus & Vazire, 2007; Podsakoff et al., 2012; Van Sonderen et al., 2013). However, use of reverse coding or a mixture of positively and negatively worded items can result in findings of a 'method factor' attributable to item wording (e.g. Lindwall et al., 2012; Wong et al., 2003; Xin & Chi, 2010). A method factor attributable to item wording signifies that there is a basic or shared difference between the set of positively worded items and the negatively worded items that is not related to the construct of interest.

There are thus two findings of interest with regard to the SDQ in Singapore as reported by Bull et al. (2016): (1) The finding of a method factor related to item wording and (2) differences in the proposed factor structure independent of any method effects. Regarding (1), other studies of the SDQ in Western contexts have also found some evidence for a method effect related to item wording (e.g. McCrory & Layte, 2012; Van Roy et al., 2008), indicating that this effect may not be unique to Singapore. Differences in the factor structure independent of the method effects are in line with findings from other Asian contexts. The best fitting model identified by Bull et al. (2016) for the SDQ in a Singapore sample was one similar to the four-factor model reported by Liu et al. (2013) in a Taiwanese sample, with the addition of the positive and negative method factors. This factor structure has recently been replicated by researchers at CRCD using a new dataset (Centre for Research in Child Development Database Team, 2019).

### 7.2.2   Micro-level Cultural Influences on Self- and Other-Report Inventories

There are some general considerations when using self- and other-report inventories cross-culturally. At a micro-level, it can be important to consider issues of item phrasing and its interaction with cultural norms and cultural values. If a single item is not appropriate for the context, its overall influence on measurement may be small. However, a measurement instrument containing many inappropriate items will not function well. Similarly, there is some evidence of cultural differences in responses to items using a Likert scale format that should be taken into account when considering cross-cultural measurement (Chen et al., 1995; Johnson et al., 2005; Wong et al., 2003). This section discusses considerations of item content, cultural differences in responses to Likert items, and method effects.

**Item Content**   One of the first things to consider when using a self- or other-report inventory (or any measurement instrument) in a new culture is the content of the items. Sometimes, item content can be quite specific to the cultural context in which the instrument was developed. For example, a widely used measure of childhood temperament, the Children's Behaviour Questionnaire – Very Short Form (CBQ-VSF; Putnam & Rothbart, 2006), includes an item asking if the child is 'afraid of burglars or the "boogie man"'. The term 'boogie man', referring to an imaginary monster used to frighten children into behaving well, is not a term commonly used in Singapore. Furthermore, given the low crime rate and generally safe atmosphere in Singapore (Singapore Police Force, 2018), burglars may be less of a concern in the Singapore context. Thus, although respondents may still have a general understanding of the question, its wording could potentially, though not necessarily, lead to certain misinterpretations or otherwise influence responses on such an item.

Another potential issue with regard to item content relates to the respondent's perception of the meaning of the item. For example, one item in the SDQ asks whether the child is 'able to get on better with adults than with other children'. In Goodman's (1997) original SDQ paper, this item was designed to measure the peer problems factor. However, in the Singapore context this item was found to be potentially more highly related to the 'prosocial' factor, although its loading was non-significant (Bull et al., 2016), suggesting a possible different interpretation of the item meaning or the value associated with the item.

**Culture and the Likert Scale**   Some research suggests that individuals from different cultures show different response styles to scales using a Likert format. For example, compared to North Americans of European background, East Asians have been shown to respond more moderately to Likert scales (e.g. Chen et al., 1995; Hamamura et al., 2008). Hamamura et al. (2008) present further evidence that the more moderate responses of individuals with greater exposure to East Asian culture may be attributed to different thinking patterns. Dialectical thinking, the tendency to accept contradiction, is a more common characteristic in East Asian than in Western cultures (Peng & Nisbett, 1999), and research shows this could moderate the tendency to endorse neutral options on a Likert scale (Hamamura et al., 2008). Other research has shown that cultural factors such as collectivism-individualism, uncertainty avoidance, power distance, and masculinity are related to Likert scale response styles such as extreme responding and acquiescence (Johnson et al., 2005). This evidence suggests that the Likert scale design, which was originally developed in Western countries largely for individuals of European background, may demonstrate differences when used in other cultures.

Some alternatives to the standard Likert scale have been suggested, such as the forced-choice format (choice between two substantive response options; Schuman & Presser, 1981) or the use of an expanded forced-choice format (each response option is replaced with a sentence; Zhang & Savalei, 2016). Measures using this type of item have been shown to have higher response consistency than measures using a Likert format (Kam, 2020). However, further research in cross-cultural

settings is needed to understand how this type of item might function in different cultural groups, although it may present a good alternative.

**Culture and Method Effects** Reverse-coding of items on measurement instruments using a Likert scale is used as a strategy to reduce response sets and response styles (e.g. acquiescence, responding in ways that are socially desirable or acceptable, etc.). To date there has been substantial interest in understanding the effect of using reverse-coded items, and the cross-cultural measurement implications of doing so. Research indicates there may be cultural differences in how individuals respond to reverse-worded items. For example, it has been suggested that individuals from East Asian cultures respond to reverse-worded items in a different way than individuals from Western cultures (e.g. Hamamura et al., 2008; Wong et al., 2003). According to Hamamura et al.'s (2008) research, in the East Asian context, contradictory responses (i.e. answering *agree* to the reverse-coded item [e.g. 'I am frequently unhappy'] and also answering *agree* to the corresponding non-reverse coded item [e.g. 'I am frequently happy']) are more likely. Because the use of reverse-coded items is predicated on the assumption that responses to these items will be the reverse of responses to items that are not reverse coded, this may present a problem to measurement. Again, this evidence of cross-cultural differences in response style suggests that reverse-coding of items may have different implications for measurement across different cultural contexts.

### 7.2.3   Summary and Implications

Current research into the appropriateness and applicability of self- and other-report inventories created in other contexts indicates that these measures may show validity for use in Singapore but may not always. Findings of different factor structure (e.g. SDQ) indicate that the validity of measures using this format should be confirmed before they are used. The results of psychometric analyses presented in this section indicate that, in some cases, simple adoption may be sufficient (e.g. FQoL, FOS-R); however in other cases, such as the SDQ, adaptation of scoring may need to be considered, and further adaptation or even assembly may also be good options to consider.

Because it may not always be clear when adaptation or assembly are required, a major implication for policy and practice with regard to the use of self- and other-report inventories is the need to ensure that any self- or other-report instrument used has been validated in the Singapore context; without this step, it is unclear whether scores on the measurement instrument would truly represent the construct that the measure was intended to measure. Specifically, there should be evidence for construct validity, in the form of evidence for the internal structure of the measure as well as expected relationships between scores on the measure and theoretically related external constructs. There should also be evidence of reliability. If reliability and validity evidence is not available for the Singapore population, this may be

problematic for the interpretation of scores. For example, results of Bull et al.'s (2016) analysis of the parent-report SDQ in Singapore indicate that this measure may be better interpreted in terms of four domain scores (prosocial, hyperactivity, internalizing, and conduct problems) rather than the original five.

## 7.3 Standardised Tests

Standardised tests are tests which are administered and scored in a consistent manner and for which all test takers are given the same, or a subset of the same, items. Typically such tests can be considered performance measures. In contrast to self- and other-report inventories, which quantify agreement with particular statements, performance measures seek to quantify whether or not an individual can achieve success on items proposed to be representative of the construct sought to be measured. An individual's performance can then be quantified by comparison to either a particular criterion (criterion-referenced) or a group of peers (norm-referenced). These two types of score referencing systems have different purposes and suit different aims; criterion-referenced scoring can be useful for determining a child's current level of performance and developing goals and objectives for improvement (e.g. the scoring by achievement levels in the current PSLE). Norm-referenced scoring can be used to benchmark children against the general population (e.g. the T-score used in the past PSLE) and therefore can be useful for purposes such as, for example, identifying children who may present with developmental delays and who may be eligible for special services. This section will cover an example of the adaptation process of a norm-referenced, standardised performance measure of child development in Singapore which may be used to identify children presenting with developmental delays.

### 7.3.1 IED-III Adaptation and Norming

Singapore's current guidelines for psychoeducational assessment, the *Professional Practice Guidelines on the Psycho-educational Assessment and Placement of Students with Special Educational Needs* (PPG; MOE, 2018) recommend the use of assessment tools with norms applicable to the local population (pp. 16). This is in line with the American Educational Research Association (AERA), American Psychological Association (APA), and National Council on Measurement in Education (NCME)'s guidelines for psychological assessment, *the Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014), which advise that norms should refer to populations including individuals 'to whom test users will ordinarily wish to compare their own examinees' (pp. 104).

The *Brigance Inventory of Early Development*, Third Edition Standardized (IED-III; French, 2013), is a norm-referenced assessment battery designed to

provide information regarding a child's overall development from birth to the age of 7 years, 11 months. The IED-III battery provides scores for five domains of development: physical, language, academic/cognitive, adaptive behaviour, and social-emotional skills. These five domains are further divided into narrower sub-domains (see Fig. 7.3). The IED-III was developed and standardised in the United States, with corresponding norms developed for that population.

The difference between test adoption, adaptation, and assembly was highlighted above. In the case of the IED-III, adaptation was used, given the potential for method and item biases in an adopted version of the IED-III. Furthermore, adaptation was preferred over assembly, given the time and resource-intensive nature of developing an entirely new battery of subtests to measure child development. Research indicating a similar structure of child development internationally (e.g. physical domain, language domain, etc.) based on previous international adaptations of test batteries additionally supported the use of adaptation rather than assembly. For example, adapted versions of the Bayley Scales of Infant Development (Bayley, 1969, 1993, 2006) have been shown to be valid and reliable for use in the Netherlands (Hoskens et al., 2018), Brazil (Madaschi et al., 2016), and Ethiopia (Hanlon et al., 2016), while adapted versions of the Ages and Stages Questionnaire (a developmental screening measure; Squires et al., 1997, 1999) have been shown to be valid and reliable for use in Iran (Vameghi et al., 2013), the Netherlands (Kerstjens et al., 2009), Brazil (Filgueiras et al., 2013), and Korea (Heo et al., 2007).

Despite a similar structure of child development cross-culturally, there may be some differences in the ages at which typically developing children reach certain milestones across countries and cultures (i.e. differences in mean scores at the same chronological age). For example, several researchers have identified mean score differences on the Ages and Stages Questionnaire among countries such as the United States, Norway, South Korea, South African, and Iran (Jansen & Squires, 2004; Kerstjens et al., 2009; Vameghi et al., 2013; Van Heerden et al., 2017). Other research with standardised, normed assessment tools in the area of intellectual
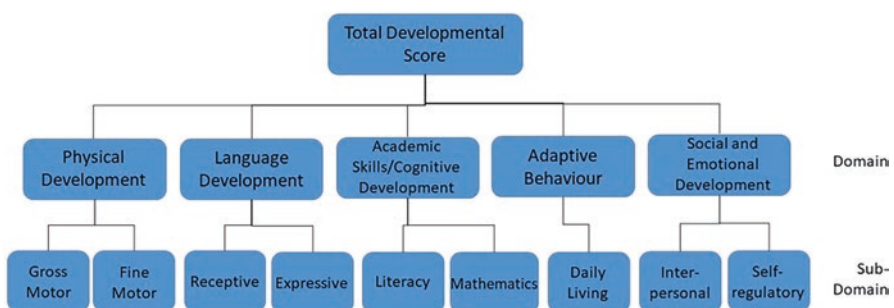


**Fig. 7.3** Brigance IED-III structure

abilities, such as the Wechsler Intelligence Scale for Children, Third Edition (WISC-III; Wechsler, 1991), and the Wechsler Intelligence Scale for Children, Fifth Edition (WISC-V; Wechsler, 2014), further supports some cross-national and cross-cultural differences in mean scores, although these differences may be generally small (e.g. Georgas et al., 2003; Van de Vijver et al., 2019).

Therefore, in order to develop locally appropriate normative information to assess child development, Singaporean data for an adapted version of the IED-III were collected during the years 2014 to 2016 from children aged 2 years, 0 months to 6 years, 11 months, as part of the Factors that Affect Child and Family Outcomes of EIPIC in Singapore (FACES) study (Poon et al., 2018). Based on these data, Singapore norms were created. Adaptations made to the US version of the IED-III and evidence for the construct equivalence (i.e. the absence of construct bias) of the IED-III in Singapore are considered below.

**Construct Bias and the IED-III**  One way of examining construct bias is to consider whether the internal structure of the measure (i.e. the number and nature of the constructs measured) can be replicated in the new context. Factor analysis of standard scores on the Singapore adaptation of the IED-III provided construct validity evidence for the test in Singapore: the model depicted in Fig. 7.3 fit the data well, indicating that the adapted IED-III displayed the same structure, with five broad domains and nine sub-domains, across the US and Singapore contexts.

**Method Bias and the IED-III**  Method bias can occur due to certain aspects of the administration of the measure. For example, instructions provided by the test or examiner in one context may be ambiguous in another context. In the case of the Singapore adaptation of the IED-III, it was found that for an auditory discrimination task requiring children to indicate whether two similar words were the same or different, children frequently misunderstood the prompt and interpreted the task as a rhyming task. This appeared to be an issue of some ambiguity in instructions and therefore the prompt was modified to more clearly indicate the task was a discrimination rather than rhyming task.

These biases can also occur within culture; one way in which method bias could manifest in the context of Singapore is through language of administration. Although the IED-III can most commonly be administered in English, there are children and caregivers for whom administration would be more appropriate in either Mandarin, Malay, or Tamil because this may be their primary language. For these children or caregivers whose primary language is not English, administration in English could result in contamination of test scores with construct-irrelevant variance, thereby compromising fairness for those children (AERA, APA, & NCME, 2014). Construct-irrelevant variance can be thought of as any variance in test performance caused by factors other than the construct being measured; for example, if the intention of the test is to measure fine motor skills, but the instructions are given in English and the child or caregiver consequently has trouble understanding the meaning of the task or question, some variance in test scores may be attributable to English language ability rather than fine motor skills. Construct-irrelevant variance may therefore

compromise fairness for families whose primary language is not English when their scores are compared with English-dominant peers. Therefore, another change required for the Singapore adaptation of the IED-III was the acceptance of administration in the other main languages of Singapore; all scales of the Brigance IED-III, except for the academic skills scales, can be administered in English, Mandarin, Malay, or Tamil to allow for the multi-lingual context of Singapore. This is similar to the US context, where during standardisation, children and caregivers whose primary language was Spanish were administered the test in Spanish (Moodie et al., 2014).

**Item Bias** Finally, reasons for which cross-cultural item bias can occur include poor translation, items which are inapplicable in the new culture, items that may introduce additional constructs into measurement due to cultural context, and items with ambiguous meaning in the new culture (He & van de Vijver, 2012). Some examples of the types of item modifications made in adapting the IED-III include modifications to unfamiliar terminology (e.g. 'write' instead of 'print'), modifications to unfamiliar stimuli (e.g. substituting a picture of a dog breed rarely seen in Singapore with a breed more commonly seen), and modifications for cultural applicability (e.g. 'fork *or spoon*' instead of just 'fork'). In these examples, the use of unfamiliar terminology could result in ambiguous item meaning, while the use of unfamiliar stimuli could result in introducing an additional (irrelevant) construct into measurement. Finally, to ensure item applicability, it was important to account for the common use of a spoon interchangeably with a fork in Singapore.

### 7.3.2   Summary and Implications

The IED-III norming highlights some important issues with regard to the cross-cultural use of standardised, norm-referenced assessments and provides a brief illustration of the types of practical issues faced during the process of adaptation. As demonstrated, measurement instruments developed in other contexts can show different kinds of biases when used in a new context, and these biases must be addressed to achieve appropriate measurement.

Similar to self- and other-report measures, it is important that standardised tests used in Singapore have reliability and validity information available regarding their use in the Singapore context. Particularly important with regard to the use of normative scores is that the normative information is derived from the local context. As highlighted above, previous research has shown cross-country and cross-cultural differences in mean scores at the same chronological age on certain aspects of child development. Thus, using international norms could result in either falsely identifying a child as displaying a developmental delay or failing to identify a child who does have a developmental delay. Furthermore, given cross-cultural issues of bias at the test and item level, and the examples illustrated in this section, it is important that standardised tests used in Singapore have been appropriately trialled and

adapted for the local context. In cases where this is not possible, for example, when there is no locally standardised and normed test available, caution should be exercised in the interpretation of test scores. If there is a locally standardised and normed test available, this should always be used in preference to an internationally standardised and normed test.

## 7.4 Computerised Adaptive Testing (CAT)

### 7.4.1 Theoretical and Statistical Logic of CAT

Computerised adaptive testing (CAT), also referred to as tailored testing, is a form of computer-administered test in which the next item or set of items selected to be administered depends on the respondent's responses to the most recent items administered. From the respondent's perspective, the difficulty of the test seems to tailor itself to their level of ability. For example, if a respondent gives a relatively high rating on an item of intermediate difficulty, he or she will then be presented with a more difficult question. Or, if the respondent gives a relatively low rating on an item of intermediate difficulty, he or she would be presented with an easier question. More technically, computerised adaptive testing (CAT) is deeply grounded in Item Response Theory (IRT) which refers to a family of latent trait models aiming to measure the underlying ability (or trait). In IRT the item statistics are sample-free since the examinees' ability (or trait) estimates do not depend on which items are administered, and in turn item parameters (e.g. difficulty, discrimination) do not depend on a particular sample of examinees. Many IRT models exist, and the simplest yet frequently used IRT model is the 1-parameter logistic model (1-PLM), also called as the Rasch model (Rasch, 1960). It formulates the probability of person $n$ succeeding on item $i$ ($P_{ni}$) and can be mathematically written as:

$$P_{ni} = \frac{e^{(\theta_n - \delta_i)}}{1 + e^{(\theta_n - \delta_i)}}$$

where $\theta_n$ denotes the ability of person $n$, and $\delta_i$ denotes the difficulty of item $i$. Hence, the Rasch model assumes that all scale items relate to the latent trait equally and items vary only in difficulty. There are other more complicated IRT models, such as 2-parameter logistic model (2-PLM; considering both the difficulty and discrimination parameters) and 3-parameter logistic model (3-PLM; considering three item parameters, that is, difficulty, discrimination, and guessing). Given the assumption about the dimensionality of a scale, there can be two types of IRT models: unidimensional IRT models and multidimensional IRT models.

Relying on a suitable IRT model, the basic logic of CAT is that subsequent to the administration of an item from a large item bank, a provisional estimate of a person's standing on the underlying ability (e.g. adaptive behaviour skills) and an

estimate of the uncertainty of the provisional estimate (i.e. standard error; SE) are computed. Then, the next most informative item from the large item bank will be presented. Based on the response to the second item, the ability estimate and uncertainty estimate are recomputed, and the process is continued until a predefined criterion has been met (i.e. the uncertainty estimate has reached an acceptable threshold).

In this manner, different from a fixed-length test in which the items are fixed in terms of both the content and number while allowing the precision of estimating the examinee's ability to vary, CAT usually holds the precision constant while allowing the items to vary. In other words, rather than administering a fixed number of items that provide limited information for any given individual, the CAT uses the test algorithm to select a small set but a varying number of items for each examinee from a large bank of test items, so as to more accurately locate each examinee's specific ability level. In building a CAT, there are five technical components including (1) a calibrated item bank or item pool, (2) starting point or entry level, (3) item selection algorithm, (4) scoring procedure, and (5) termination criterion (Weiss & Kingsbury, 1984). Among these five components, developing an item bank and determining an IRT model for item calibration is the fundamental step of all CAT projects, including when developing a new assessment tool or cross-culturally adapting an assessment tool.

This section aims to describe the background and initial outcomes of a project focusing on developing a CAT version of a measure of adaptive behaviour skills in the Singapore context. Compared to static multiple-choice measures with a fixed set of items administered to all respondents, CAT allows for more individualisation and overall requires fewer test items to arrive at equally accurate scores of the individuals' ability level. CAT has been reported to be effective in reducing the number of items administered by about 50%, with some reductions ranging from 80% to 90% while maintaining the measurement quality (Gibbons et al., 2008).

In addition to adapting, validating, and norming important measures regarding child development to the Singapore context, to ensure cultural equivalence for using these measures CRCD has also initiated efforts to develop new measures of important psychological constructs (e.g. adaptive behaviour skills) in the local Singapore context using advanced computerised adaptive testing (CAT) – the form of computer-based test described above that adapts to the examinee's ability level, so as to make the testing process more individualised and efficient. Applying psychometric technology to make testing more efficient echoes the Singapore government's advocacy of nurturing future-ready Singaporeans and integrating Information and Communications Technology (ICT) into education in Singapore (Ministry of Education Singapore, 2015).

### 7.4.2  Adaptive Behaviour Skills

Adaptive behaviour is the performance of an individual in daily activities pertaining to personal and social functioning. Importantly the requirements and manifestations of adaptive behaviour differ across cultures and contexts (Tan et al., 2014). Because adaptive behaviour refers to an individual's performance on a day-to-day basis during activities required for personal and social sufficiency, standardised assessments of adaptive behaviour assess what a person actually does, rather than what he or she is able to do. In order to determine the level of an individual's adaptive behaviour, someone who is familiar with that individual, such as a parent or a caregiver, is asked to describe his or her activities. The results are then compared to those of other people of the same age to determine which areas are average, above average, or in need of special help. Therefore, in addition to providing a general picture of an individual's personal and social functioning, standardised assessments of adaptive behaviour also provide diagnostic information about areas where an individual is deemed to have 'significant limitations' in adaptive behaviour. The presence of such severe limitations in adaptive behaviour skills is one of the key criteria for the diagnosis of intellectual disability, and such measures are used by clinicians, therapists, caregivers, and/or teachers.

To date, there are some well-known standardised measures of adaptive behaviour available to clinicians and researchers, such as the *Vineland Adaptive Behavior Scales*, *Third version* (VABS-III; Sparrow et al., 2016); the *Adaptive Behavior Assessment System*, *Third version* (Harrison & Oakland, 2015); and the *Scales of Independent Behavior*, *Revised* (SIB-R; Bruininks et al., 1996). In particular, the Vineland Adaptive Behavior Scales have been translated and adapted in several countries outside of the United States, including the Netherlands, France, South Africa, Vietnam, Greece, and Zambia (see de Bildt et al., 2005; Fombonne & Achard, 1993; Geldenhuys, 2001; Goldberg et al., 2009; Siaperas & Beadle-Brown, 2006; Tan et al., 2014, respectively). Due to the constraints from the publishers of these famous measurement tools for adaptive behaviour, it has been challenging to adapt these scales in Singapore and to develop local norms.

Therefore, the *Activities and Participation Rating Scale* (APRS) was developed in Singapore to meet the local imperative needs for an appropriate tool to measure adaptive behaviour skills of young children along with the implementation of the FACES project aforementioned (Poon et al., 2018). The APRS was also locally normed among young children aged from 2 to 6 years 11 months (Poon et al., 2018). With regard to the theoretical foundation, the APRS was developed by drawing 52 descriptors and nine domains from the activity and participation component of the International Classification of Functioning, Disability, and Health (ICF) published by the World Health Organization (2001). These descriptors and domains have been considered to be good indicators for adaptive behaviour skills. Thus, the APRS focuses on the parent or the caregiver assessing a child's ability to carry out tasks (activity) and their involvement in life (participation), so as to measure the child's adaptive behaviour skills. Specifically, in the ICF framework, the 93-item APRS

covers eight domains, including (1) learning and applying knowledge (24 items, e.g. 'listening to sounds or auditory events'), (2) managing general task and demands (general tasks) (9 items, e.g. 'handling stress and demands by managing decisions and carrying out activities at important points or during crises'), (3) communication (12 items, e.g. 'understanding non-spoken language by understanding gestures/body language'); (4) mobility (12 items, e.g. 'lifting and carrying objects'); (5) self-care (9 items, e.g. 'dressing-putting on clothes'); (6) domestic life (3 items, e.g. 'helping to prepare meals'); (7) interpersonal interactions and relationships (7 items, e.g. 'interacting with people in an appropriate manner by showing respect and warmth to others'); and (8) major life areas (17 items, e.g. 'using money to buy items'). These items can be further summarised into two aspects, that is, activities (66 items) and participation (27 items). All of the items are rated on a 5-point Likert scale. These items can be further mapped onto the conceptual, practical, and social domains in the American Association on Intellectual and Developmental Disabilities (AAIDD) model, including conceptual domain (42 items), social domain (20 items), and practical domain (31 items). The APRS has demonstrated sufficient reliability and validity evidence (Poon et al., 2018), as well as cultural appropriateness for Singapore, as a unique island city-state in Southeast Asia with mixes of languages and juxtapositions of cultures.

In spite of satisfactory psychometric evidence, as found with other well-established measures of adaptive behaviour skills that are normed in Western countries, there are two issues with the APRS. First, regarding administration time, it usually takes approximately 20–60 min for respondents (e.g. parents, caregivers, teachers) to complete the APRS tool. Second, regarding the target sample, the current APRS tool is more focused on young children aged 2 to around 7, thereby limiting its wider use given that adaptive behaviour skills are required across an individual's lifespan. Therefore, in order to (1) reduce participation burden and increase testing efficiency and (2) broaden the age coverage of the APRS tool, the APRS-CAT project is designed to develop a CAT version of the APRS adaptive behaviour skill measurement tool targeting primary school children (aged 7–12 years).

### 7.4.3 Developing CAT Version of the Activities and Participation Rating Scale (APRS)

As aforementioned, to develop a CAT version of any measure, a pre-calibrated item bank needs to be ready. To this end, the research team took six steps to systematically develop, pilot, and calibrate an item bank of adaptive behaviour skills for children aged 7–12 in Singapore (Chen et al., 2021). These six steps are (1) concept development; (2) initial item development; (3) item reviewing, consolidation, and refinement; (4) item distribution and test assembly; (5) piloting; and (6) field testing and item finalisation via Rasch analysis. Throughout this process, it was found that

the item pool of 310 items fit the unidimensionality assumption well. Due to five items demonstrating poor infit statistics, a total of 305 items were finalised for CAT development, and the item parameters were calibrated using Rating Scale Model (RSM).

Subsequently, programming rules were identified for CAT development. Specifically, the starting point entry is set at theta value of 1.29 (person mean), with 5 items that optimally represent theta value of 1.29 being selected and one of them being randomly chosen as a starting item. Maximum Fisher Information (MFI) was identified as next item selection algorithm and expected a posteriori (EAP) was identified as the approach for ability estimation. A CAT simulation was conducted in *R* software to determine the stopping rule (i.e. 0.3 or 0.2 as the standard error of estimation). The CAT simulation work revealed that the average number of items respondents need to take is about 23 items when 0.3 as the standard error of estimation is used as the stopping rule, which is at least half of the number (i.e. about 54) when 0.2 as the standard error of estimation is utilised as the stopping rule. Thus, 0.3 as the standard error of estimation is determined as the stopping rule for the CAT development. Currently using these parameters, CAT versions have been developed and data using the APRS-CAT is under collection.

## 7.4.4   Summary and Implications

Overall, this APRS-CAT project demonstrates the feasibility of developing a new measure of a well-established psychological construct via a computerised adaptive testing format within approximately 20 months, thus mollifying the concern with time-consuming test assembly. It exemplifies the possibility of applying CAT to developing other locally validated assessments of psychological traits (e.g. intelligence, executive functioning) and educational performance (e.g. math, receptive language, reading ability).

The development of CAT tests provides many benefits for the practical use of assessment tools; the CAT testing framework allows for decreased testing time, increased precision in scores, and greater flexibility in administration. Due to increased precision in scores, it allows practitioners to have greater confidence in the accuracy of obtained scores, particularly for scores at the lower and higher ends of the spectrum which are typically not captured reliably in a standard testing framework but are often the scores that practitioners are most interested in capturing accurately. Additionally, because of the greater flexibility of CAT testing, not every individual who completes the CAT will complete the same items, and each individual does not necessarily complete the same items over repeated testing sessions. This means that CAT also allows for repeated measurement with a decreased chance of practice effects (where individuals' scores improve due to familiarity with the items) and can also be useful in discouraging teaching to specific test items. Finally, the use of CAT can greatly enhance test assembly via developing item pools/banks of different educational and/or psychological constructs. This, in turn, will allow the

potential of equating more items of the same construct onto the same measurement scale, which could be promising in reducing the rate of item exposure while maintaining the testing effectiveness and efficiency.

## 7.5 Concluding Remarks

This chapter has highlighted several key issues faced in cross-cultural measurement in the unique context of Singapore, with regard to self- and other-report measures, standardised assessment tools, and the use of newer technologies such as computerised adaptive testing. As emphasized throughout this chapter, each measurement instrument may present new challenges for adoption or adaptation and may require different levels of adaptation in order to achieve valid measurement. For example, measures such as the BCFQoL scale and the FOS-R have been shown to function appropriately in Singapore with simple adoption, while the Brigance IED-III required some adaptation as well as the production of local norms to improve validity in Singapore. Furthermore, the development of the CAT for adaptive functioning has illustrated some strategies that can be used to tailor testing to the examinee in the case of a measurement instrument created (i.e. via assembly) specifically for the Singapore context.

The implications of this work speak to the importance of using measurement instruments that have been validated in the context where they will be used in order to obtain reliable and valid scores. Ideally, future testing in the educational and psychological field is also anticipated to be faster, smarter, and less expensive. As discussed at the beginning of this chapter, with the backdrop of globalization and increase in technology use and capabilities across the world, issues of cross-cultural adaptation and smarter testing are becoming increasingly pertinent. At a cross-road of Asian and Western cultures and with advanced technological infrastructure, Singapore stands out as an exciting environment to examine and highlight issues of cross-cultural measurement and assessment, as well as to develop smarter assessment tools.

Furthermore, through the adaptation and development of such assessment tools, meaningful contributions to understanding of different aspects of child development (see other chapters in this book) both locally in Singapore, and also internationally, can be made. Ultimately, validation of measurement instruments as well as creation of smarter assessments are important steps in ensuring we understand the constructs we seek to measure and are measuring them accurately; without this, it becomes challenging to develop and improve theories of child development both internationally and, specifically, in the Singapore context. Cross-cultural test validation, adaptation, and assembly will be an ongoing task as CRCD seeks to increase the number of measurement instruments validated for use in Singapore and to enhance the international collaboration across countries and cultures in the field of educational and psychological measurement and assessment.

# References

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (2014). *Standards for educational and psychological testing* (4th ed.). APA.

Azuma, H. (1984). Psychology in a non-Western country. *International Journal of Psychology, 19*, 45–55.

Bailey, D. B., Hebbeler, J., Olmstead, M. G., Raspa, M., & Bruder, M. B. (2008). Measuring family outcomes: Considerations for large-scale data collection in early intervention. *Infants and Young Children, 21*, 194–206.

Bayley, N. (1969). *Bayley scales of infant development*. Psychological Corporation.

Bayley, N. (1993). *Bayley scales of infant development* (2nd ed.). Psychological Corporation.

Bayley, N. (2006). *Bayley scales of infant and toddler development*. Psychological Corporation.

Beaton, D., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2002). Recommendations for the cross-cultural adaptation of health status measures. *New York: American Academy of Orthopaedic Surgeons, 12*, 1–9.

Bruininks, R. H., Woodcock, R. W., Weatherman, R. F., & Hill, B. K. (1996). *Scales of independent behavior – Revised comprehensive manual*. Riverside Publishing.

Bull, R., Lee, K., Koh, I. H. C., & Poon, K. K. L. (2016). Confirmatory factor analysis of the strengths and difficulties questionnaire in Singapore. *Child: Care, Health and Development, 42*, 109–116.

Centre for Research in Child Development. (2019). *Psychometric properties of the strengths and difficulties questionnaire, version 1*. Author.

Chan, S.-K. (2013). Multiculturalism in Singapore: The way to a harmonious society. *Singapore Academy of Law Journal, 25*, 84–109.

Chea, C. S., Li, J., Zhou, N., Yamamoto, Y., & Leung, C. Y. (2015). Understanding Chinese immigrant and European American mothers' expressions of warmth. *Developmental Psychology, 51*, 1802–1811.

Chen, C., Lee, S.-Y., & Stevenson, H. W. (1995). Response style and cross-cultural comparisons of rating scales among East Asian and North American students. *Psychological Science, 6*, 170–175.

Chen, M., Nah, Y. H., Waschl, N., Poon, K., & Chen, P. (2021). Developing and piloting a computerized adaptive test for a culturally appropriate measure of adaptive behavior. *Journal of Psychoeducational Assessment, 07342829211047005*.

Davie, S. (2015). *7 in 10 parents send their children for tuition: ST poll*. Retrieved from https://www.straitstimes.com/singapore/education/7-in-10-parents-send-their-children-for-tuition-st-poll

Davie, S. (2019). *Subject-based banding to replace streaming in schools*. Retrieved from https://www.straitstimes.com/singapore/education/subject-based-banding-to-replace-streaming-in-schools

de Bildt, A., Kraijer, D., Sytema, S., & Minderaa, R. (2005). The psychometric properties of the Vineland adaptive behavior scales in children and adolescents with mental retardation. *Journal of Autism and Developmental Disorders, 35*(1), 53–62.

Deterding, D. (2005). Emergent patterns in the vowels of Singapore English. *English WorldWide, 26*(2), 179–197.

Deterding, D. (2007). *Singapore English*. Edinburgh University Press.

Filgueiras, A., Pires, P., Maissonette, S., & Landeira-Fernandez, J. (2013). Psychometric properties of the Brazilian-adapted version of the Ages and Stages Questionnaire in public child daycare centers. *Early Human Development, 89*, 561–576.

Fombonne, E., & Achard, S. (1993). The Vineland adaptive behavior scale in a sample of normal French children: A research note. *Journal of Child Psychology and Psychiatry, 34*(6), 1051–1058.

French, B. F. (2013). *Inventory of early development III standardization and validation manual*. Curriculum Associates.

Geldenhuys, J. L. (2001). An investigation into possible developmental problems of African streets in South Africa. *Journal of Psychology in Africa, 11*(2), 126–143.

Georgas, J., Weiss, L. G., van de Vijver, F. J. R., & Saklofske, D. H. (2003). *Culture and children's intelligence: Cross-cultural analysis of the WISC-III*. Academic Press.

Gibbons, R. D., Weiss, D. J., Kupfer, D. J., Frank, E., Fagiolini, A., Grochocinski, V. J., Bhaumik, D. K., Stover, A., Bock, R. D., & Immekus, J. C. (2008). Using computerized adaptive testing to reduce the burden of mental health assessment. *Psychiatry Services, 59*(4), 361–368.

Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. (2000). *Behavior rating inventory of executive function professional manual*. Psychological Assessment Resources, Inc.

Goldberg, L. R. (1999). A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality psychology in Europe* (Vol. 7, pp. 7–28). Tilburg University Press.

Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. C. (2006). The international personality item Pool and the future of public-domain personality measures. *Journal of Research in Personality, 40*, 84–96.

Goldberg, M. R., Dill, C. A., Shin, J. Y., & Nhan, N. V. (2009). Reliability and validity of the Vietnamese Vineland adaptive behavior scales with preschool-age children. *Research in Developmental Disabilities, 30*(3), 592–602.

Goodman, R. (1997). The strengths and difficulties questionnaire: A research note. *Journal of Child Psychology and Psychiatry, 38*, 581–586.

Guillemin, F., Bombardier, C., & Beaton, D. (1993). Cross-cultural adaptation of health-related quality of life measures: Literature review and proposed guidelines. *Journal of Clinical Epidemiology, 46*, 1417–1432.

Gupta, A. F. (1994). *The step-tongue: Children's English in Singapore*. Multilingual Matters.

Hamamura, T., Heine, S., & Paulhus, D. (2008). Cultural differences in response styles: The role of dialectical thinking. *Personality and Individual Differences, 44*, 932–942.

Hanlon, C., Medhin, G., Worku, B., Tomlinson, M., Alem, A., Dewey, M., & Prince, M. (2016). Adapting the Bayley scales of infant and toddler development in Ethiopia: Evaluation of reliability and validity. *Child Care, Health and Development, 42*, 699–708.

Harrison, P. L., & Oakland, T. (2015). *Adaptive behavior assessment system* (3rd ed.). Western Psychological Services.

He, J., & van de Vijver, F. (2012). Bias and equivalence in cross-cultural research. *Online Readings in Psychology and Culture, 2*, 1–19.

Heo, K. H., Squires, J., & Yovanoff, P. (2007). Cross-cultural adaptation of a pre-school screening instrument: Comparison of Korean and US populations. *Journal of Intellectual Disability Research, 52*, 195–206.

Hoffman, L., Marquis, J., Poston, D., Summers, J. A., & Turnbull, A. P. (2006). Assessing family outcomes: Psychometric evaluation of the Beach Center Family Quality of Life Scale. *Journal of Marriage and Family, 68*, 1069–1083.

Hogan, D. (2014). *Why is Singapore's school system so successful, and is it a model for the West?* Retrieved from http://theconversation.com/why-is-singapores-school-system-so-successful-and-is-it-a-model-for-the-west-22917

Hoskens, J., Klingels, K., & Smits-Engelsman, B. (2018). Validity and cross-cultural differences of the Bayley scales of infant and toddler development, third edition in typically developing infants. *Early Human Development, 125*, 17–25.

Hwang, A., Ang, S., & Francesco, A. M. (2002). The silent Chinese: The influence of face and kiasuism on student feedback-seeking behaviors. *Journal of Management Education, 1*, 70–98.

Jansen, H., & Squires, J. (2004). Parent-completed developmental screening in a Norwegian population sample: A comparison with US normative data. *Acta Paediatrica, 93*, 1525–1529.

Johnson, T., Kulesa, P., Cho, Y. I., & Shavitt, S. (2005). The relation between culture and response styles: Evidence from 19 countries. *Journal of Cross-Cultural Psychology, 36*, 264–277.

Kam, C. C. S. (2020). Expanded format shows better response consistency than Likert-scale format in the measurement of optimism. *Personality and Individual Differences, 152*, 109606.

Kaur, T. (2018). *11 things you should know about Singaporean culture*. Retrieved from https://theculturetrip.com/asia/singapore/articles/11-things-you-should-know-about-singaporean-culture/

Kerstjens, J. M., Bos, A. F., ten Vergert, E. M. J., de Meer, G., Butcher, P. R., & Reijneveld, S. A. (2009). Support for the global feasibility of the Ages and Stages Questionnaire as developmental screener. *Early Human Development, 85*, 443–447.

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology, 140*, 1–55.

Lim, C. Y., Law, M., Khetani, M., Pollock, N., & Rosenbaum, P. (2016). Establishing the cultural equivalence of the Young Children's Participation and Environment Measure (YC-PEM) for use in Singapore. *Physical & Occupational Therapy in Pediatrics, 36*, 422–439.

Lindwall, M., Barkoukis, V., Grano, C., Luicidi, F., Raudsepp, L., Liukkonen, J., … Thogersen-Ntoumani, C. (2012). Method effects: The problem with negatively versus positively keyed items. *Journal of Personality Assessment, 94*, 196–204.

Liu, S. K., Chien, Y. L., Shang, C. Y., Lin, C. H., Liu, Y. C., & Gau, S. S. F. (2013). Psychometric properties of the Chinese version of strength and difficulties questionnaire. *Comprehensive Psychiatry, 54*, 720–730.

Loh, J. (2019). *Singapore slides to third place in 2018 sustainable trade index – Here's why the country is being held back from topping the list*. Retrieved from https://www.businessinsider.sg/singapore-slides-third-place-2018-sustainable-trade-index-country-held-back-topping-list/

Low, N. (2018). *Singaporeans feel safest in the world as country tops law and order index*. Retrieved from https://www.straitstimes.com/singapore/courts-crime/safe-singapore-tops-world-law-and-order-index

Madaschi, V., Pontrelli Mecca, T., Coutinho Macedo, E., & Silvestre Paula, C. (2016). Bayley-III scales of infant and toddler development: Transcultural adaptation and psychometric properties. *Paideia, 26*, 189–197.

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98*, 224–253.

McCrory, C., & Layte, R. (2012). Testing competing models of the Strengths and Difficulties Questionnaire's (SDQ) factor structure for the parent-informant instrument. *Personality and Individual Differences, 52*, 882–887.

Ministry of Education, Singapore [MOE]. (2015). *ICT masterplans in the Singapore education system*. Retrieved from http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/images/singapore.pdf

Ministry of Education, Singapore [MOE]. (2018). *Professional practice guidelines on the psycho-educational assessment and placement of students with special educational needs*. Ministry of Education, Singapore.

Ministry of Education, Singapore [MOE]. (2019). *Changes to the PSLE scoring and secondary one posting from 2021*. Retrieved from https://www.moe.gov.sg/microsites/psle/PSLE%20Scoring/psle-scoring.html

Moodie, S., Daneri, P., Goldhagen, S., Halle, T., Green, K., & LaMonte, L. (2014). *Early childhood developmental screening: A compendium of measures for children ages birth to five* (OPRE report 201411). Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services.

Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: Holistic versus analytic cognition. *Psychological Review, 108*, 291–310.

Organization for Economic Cooperation and Development [OECD]. (2015). *Mathematics performance (PISA)*. Retrieved from https://data.oecd.org/pisa/mathematics-performance-pisa.htm

Paulhus, D. L., & Vazire, S. (2007). The self-report method. In R. W. Robins, R. C. Fraley, & R. F. Krueger (Eds.), *Handbook of research methods in personality psychology* (pp. 224–239). The Guilford Press.

Peng, K., & Nisbett, R. E. (1999). Culture, dialectics, and reasoning about contradiction. *American Psychologist, 54*, 741–754.

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology, 63*, 539–569.

Poon, K. K., Ooi, N., Bull, R., & Bailey, D. B. B., Jr. (2014). Psychometric validation of the family outcome survey – Revised in Singapore. *Research in Developmental Disabilities, 35*, 1534–1543.

Poon, K., Bull, R., Xie, H., & Chen, M. (2018). *Factors that affect child and family outcomes of EIPIC in Singapore (FACES): Project closure report*. National Institute of Education.

Putnam, S. P., & Rothbart, M. K. (2006). Development of short and very short forms of the Children's behavior questionnaire. *Journal of Personality Assessment, 87*, 10–112.

Putnick, L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review, 41*, 71–90.

Rasch, G. (1960). *Probabilistic models for some intelligence and attainment tests*. Danmarks Paedagogiske Institut.

Rothbart, M. K., Ahadi, S. A., Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at 3-7 years: The Children's behavior questionnaire. *Child Development, 72*, 1394–1408.

Schuman, H., & Presser, S. (1981). *Questions and answers in attitude surveys: Experiments on question form, wording and context*. Academic.

Siaperas, P., & Beadle-Brown, J. (2006). A case study of the use of a structured teaching approach in adults with autism in a residential home in Greece. *Autism, 10*(4), 330–343.

Singapore Department of Statistics. (2018). *Population trends 2018*. https://www.singstat.gov.sg/-/media/files/publications/population/population2018.pdf

Singapore department of statistics, (2019). https://www.singstat.gov.sg/-media/files/publications/reference/sif2019.pdf

Singapore Police Force. (2018). *Annual crime brief 2018*. Retrieved from https://www.police.gov.sg/news-and-publications/statistics

Sparrow, S. S., Cicchetti, V. D., & Balla, A. D. (2016). *Vineland adaptive behavior scales* (3rd ed.). American Guidance Service.

Squires, J., Bricker, D., & Potter, L. (1997). Revision of a parent-completed development screening tool: Ages and stages questionnaires. *Journal of Pediatric Psychology, 22*, 313–328.

Squires, J., Bricker, D., & Potter, L. (1999). *Ages and stages questionnaires user's guide* (2nd ed.). Paul Brookes Publishing.

Tan, M., Reich, J., Hart, L., Thuma, P. E., & Grigorenko, E. L. (2014). Examining specific effects of context on adaptive behavior and achievement in rural Africa: Six case studies from Southern Province, Zambia. *Journal of Autism and Developmental Disorders, 44*, 271–282.

Vameghi, R., Sajedi, F., Kraskian Mojembari, A., Habiollahi, A., Lornezhad, H. R., & Delavar, B. (2013). Cross-cultural adaptation, validation and standardization of Ages and Stages Questionnaire (ASQ) in Iranian children. *Iranian Journal of Public Health, 42*, 522–528.

Van de Vijver, F., & Poortinga, Y. (1997). Towards an integrated analysis of bias in cross cultural assessment. *European Journal of Psychological Assessment, 13*, 29–37.

Van de Vijver, F., & Tanzer, N. (2004). Bias and equivalence in cross-cultural assessment: An overview. *Revue Europeenne de Psychologie Appliquee, 54*, 119–135.

Van de Vijver, F. J. R., Weiss, L. G., Saklofske, D. H., Batty, A., & Prifitera, A. (2019). A cross-cultural analysis of the WISC-V. In L. G. Weiss, D. H. Saklofske, J. A. Holdnack, & A. Prifitera (Eds.), *WISC-V. Clinical use and interpretation* (pp. 223–244). Academic.

Van Heerden, A., Hsiao, C., Matafwali, B., Louw, J., & Richter, L. (2017). Support for the feasibility of the ages and stages questionnaire as a developmental screening tool: A cross-sectional study of South African and Zambian children aged 2-60 months. *BMC Pediatrics, 17*, 55–63.

Van Roy, B., Veenstra, M., & Clench-Aas, J. (2008). Construct validity of the five-factor Strength and Difficulties Questionnaire (SDQ) in pre-, early, and late adolescence. *Journal of Child Psychology and Psychiatry, 49*, 1304–1312.

Van Sonderen, E., Sanderman, R., & Coyne, J. C. (2013). Ineffectiveness of reverse wording or questionnaire items: Let's learn from cows in the rain. *PLoS One, 8*, e68967.

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 2*, 4–69.

Waschl, N., Xie, H., Chen, M., & Poon, K. K. (2019). Construct, convergent, and discriminant validity of the beach center family quality of life scale for Singapore. *Infants and Young Children, 32*, 201–214.

Wechsler, D. (1991). *Wechsler intelligence scale for children* (3rd ed.). The Psychological Corporation.

Wechsler, D. (2014). *Wechsler intelligence scale for children* (5th ed.). Pearson.

Weiss, D. J., & Kingsbury, G. G. (1984). Application of computerized adaptive testing to educational problems. *Journal of Educational Measurement., 21*, 361–375. https://doi.org/10.1111/j.1745-3984.1984.tb01040.x

Widaman, K. F., & Reise, S. P. (1997). Exploring the measurement invariance of psychological instruments: Applications in the substance use domain. In K. J. Bryant, M. E. Windle, & S. G. West (Eds.), *The science of prevention: Methodological advances from alcohol and substance abuse research* (pp. 281–324). American Psychological Association.

Wong, N., Rindfleisch, A., & Burroughs, J. E. (2003). Do reverse-worded items confound measures in cross-cultural consumer research? The case of the material values scale. *Journal of Consumer Research, 30*, 72–91.

World Health Organization. (2001). *International classification of functioning, disability and health*. Retrieved from http://apps.who.int/iris/bitstream/10665/43737/1/9789241547321_eng.pdf

Xin, Z., & Chi, L. (2010). Wording effect leads to controversy over the construct of the social dominance orientation scale. *The Journal of Psychology, 144*, 473–488.

Zhang, X., & Savalei, V. (2016). Improving the factor structure of psychological scales: The expanded format as an alternative to the Likert scale format. *Educational and Psychological Measurement, 76*, 357–386.

# Chapter 8
# The Importance of Positive Environments on Infant and Early Childhood Neurodevelopment: A Review and Preview of Upcoming, "BE POSITIVE," Research

**Anne Rifkin-Graboi** ⓘ

**Abstract** Why do our brains change so much in early life? Why do they continue to develop over time? What are the implications of prolonged neural plasticity for interventions, learning, and childhood well-being? Humans live among ever-changing circumstances and therefore require extensive neurocircuitry supporting abilities to learn, regulate, and respond to information throughout life. Nevertheless, biological plasticity is energetically costly, and so it may be advantageous for infants to take a "best guess" at the type of environment in which they will likely be raised. Will it be dangerous? Will it be filled with unpredictability and a lack of control? Or, will it be comprised of support, certainty, and access to resources? These are important questions: different skills are necessary to succeed in different types of environments. In this chapter, we will consider how brain development unfolds, especially in early life. We will ask, why, from a biological standpoint, early experience impacts developmental trajectories. Next, we will specifically consider effects of the caregiving environment upon neurodevelopment and related implications for individual differences at school age. Gaps in the knowledge base, especially with regard to how such relationships unfold outside of low-risk North American and European homes and school systems, will be highlighted. The reader will learn about a new collaborative Singaporean study, "BE POSITIVE," that aims to address these gaps starting in children 4 months to 4 years. Finally, we will consider ways such research can be applied to shaping interventions and policies aimed at increasing educational success and well-being.

**Keywords** Neurodevelopment · Adaptation to context · Accelerated development · Sensitive parenting · Cultural expectations · BE POSITIVE

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It's easy to understand why, at the beginning of the school year, teachers send out lists for new school supplies. An old tube of green paint may have been perfect for drawing the plant-life emphasized in last year's biology class, but what happened to the basic blue and yellow necessary for the ocean and sun for this year's geography lesson? The old mathematics text may quickly flip to a discussion of place-value with whole numbers, but this may be a confusing reminder when first learning about decimals. Every year we use the supplies we have for the challenges at hand. Sometimes we can anticipate that these challenges will change, and we try to plan our supply lists accordingly. Often our best guesses are good enough; other times they aren't. In many cases, last year's supplies will work perfectly for this year's needs, but sometimes, despite their fit to last year's class, they may not gel with the current lesson plan. The human brain is not so different. It is shaped in accordance with its experience, often to best meet expectable environmental pressures. If the brain gets cues that the current environment is "positive," it may expect a "positive" future. If environmental cues signal harshness, the brain may similarly adapt accordingly. Importantly, the brain starts guessing about the environment well before school starts. In fact, work suggests such that the environment exerts an influence on brain development as early as the fetal stage (Rifkin-Graboi et al., 2015b).

Environmental influences may have their greatest impact during periods of change. With this in mind, it's important to consider that a great deal of neural development happens within the first few postnatal years (e.g., for reviews see Kolb & Gibb, 2011; Webb, 2001). By the third trimester, most neurons have been born (neurogenesis). Yet, neurogenesis is only the beginning of a neuron's life story. Subsequently, neurons travel, meet others like themselves, get jobs (neural migration and assignment), branch out (axonal and dendritic growth) and make connections (synaptogenesis), either develop their contacts, or let them fade away (pruning), and as part of this process, sometimes, they die of loneliness, while still other times they find ways to relay information quickly (myelination).

Still, despite a plethora of early life change, overall brain development is protracted. For example, substantial change in processes like myelination and pruning are observed into adulthood (Miller et al., 2012; Petanjek et al., 2011). Furthermore, the rate and peak period of change does not just vary from parameter to parameter but also from region to region. In general, areas supporting sensory processes develop earliest and those supporting complex activities like executive control the latest in life (e.g., Gogtay et al., 2004). As such, it's reasonable to think that the degree to which environmental change affects a particular sensory, cognitive, or emotional process may be influenced by whether or not the time of exposure coincides with substantial change in the brain regions that support the specific function. However, because regional development is interlinked, environmental exposures affecting early developing regions may also have secondary effects on higher-order processes.

## 8.1    Is There a "Benefit" to Prolonged Brain Development?

Why do our brains change so much in infancy, early childhood (Choe et al., 2013; Dean et al., 2015; Giedd et al., 2009; Gilmore et al., 2012; Hu et al., 2013; Uda et al., 2015; Uematsu et al., 2012), and even into adulthood (Miller et al., 2012; Petanjek et al., 2011)? Even in comparison to some of our closest relatives, aspects of human brain development appear especially protracted (Miller et al., 2012). Why, like some other species, aren't we born with more adult-like brains? Why do we have so much capacity to learn? Although, as a species, we are unique in that we have formal schooling, it is highly unlikely that this capacity to learn is a result of schooling. After all, formal schooling did not begin until the 1600s, 263 million of the world's children and youth are, in fact, not in school (UNESCO, 2018), and most of children's lives occur outside of the classroom. Even in Singapore, where there are 193 days of school with about 6 h per day, children are in school only about 13% of the year's hours (or, assuming they get roughly 10 h of sleep per night 23% of their waking time). Instead, our species is likely to have developed a protracted approach to learning and updating knowledge because, throughout our history, we humans have lived among complex social and ever-changing circumstances. We therefore require extensive neurocircuitry supporting abilities to learn, regulate, and respond to new information throughout life (Amici et al., 2008; Holekamp et al., 2015).

Nevertheless, biological plasticity is energetically costly. With this in mind, it may be advantageous for young infants to take a "best guess" at the type of environment in which they are likely be raised (for theory and reviews see e.g., Belsky, 1997; Belsky et al., 1991; Ellis et al., 2011, 2017), or in other words to initiate a "predictive adaptive response"[1] (Bateson et al., 2014; Gluckman et al., 2005). Will the future be dangerous? Will it be one filled with unpredictability and a lack of control? Or, will it be one with much support, certainty, and access to resources? These are important questions and can lead to differences in *which* domain general skills—skills like memory, attention, emotional understanding, regulation, flexibility, and inhibition—are prioritized as well as *when* the development of such skills are prioritized. Knowledge concerning why the development of such skills varies is important to early education for a variety of reasons. As will be discussed in subsequent chapters, domain general skills may be important to mathematical development (see Chap. 13 of this volume); may influence classroom behavior, general academic performance, and behavioral problems (see Chap. 12 of this volume); and may interactively impact language development (see Chap. 15 this volume).

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[1] In the "Predictive Adaptive Response" model, adaptations may be considered to be "immediate" responses to current environmental pressures or "predictive" responses to expectable environmental pressures. In some instances, a given behavior may be advantageous in both the concurrent and future environments.

## 8.2   Mechanisms

Across a number of fields, there is evidence that signals associated with environmental pressures shape development in a manner that, for much history, may have been advantageous for survival and reproduction. For example, as reviewed by Bateson and colleagues (Bateson et al., 2014), when pregnant women experience environmental adversity in the form of food scarcity, the fetus may begin developing enhanced abilities to search out food and store fat—important physiological and behavioral adaptations if the future is nutritionally uncertain.

Importantly, other aspects of environmental adversity may also be transmitted to offspring. When people encounter challenges that they feel ill-equipped to manage, when they feel marginalized, and/or when they do not feel in control, cortisol, a hormone that releases energy into the body, increases (Dickerson & Kemeny, 2004). Importantly, in addition to providing energy to muscles, cortisol exposure can have widespread other effects, including both chronic and acute effects on neurocircuitry supporting a variety of cognitive and emotional processes (McEwen et al., 2016; Wirth, 2015). While the exact mechanisms for intergenerational transmission are complex and not fully understood, one possibility is that the mother's own physiology influences the fine-tuning of set-points for future susceptibility to environmental influences and accompanying stress physiology, including the production and regulation of cortisol (Anacker et al., 2014; Cameron et al., 2005; O'Donnell & Meaney, 2017). Again, such changes may be adaptive when the current and future environments do, indeed, match the environment signaled by prior cues. If a baby is born into a dangerous environment, there's a pretty good chance that it might be useful to become an adult who reacts intensely to potential threats and be vigilant to change; in contrast, being emotionally regulated, slow to respond, and not easily distracted could have dire consequences.

Likewise, cortisol has also been suggested as a mechanism through which postnatal signals affect brain development. The first way to manage a challenge is with a behavioral response, if that doesn't work the sympathetic nervous system may engage; if that's still not effective, the hypothalamic-pituitary-adrenal (HPA) axis is engaged and releases cortisol (Rifkin-Graboi et al., 2009). Young children lack a number of physical, emotional, and cognitive resources to independently manage many challenges with a behavioral response. In early development, they are dependent upon others to help them with the challenges of everyday daily life (e.g., staying warm, getting food, obtaining an out of reach object of interest, etc.), as well as more exceptional situations (e.g., making new friends, navigating a new place, regulating following injury, etc.). In other words, the younger we are, the more limitations we have to engage in independent behavioral responses to challenge. Indeed, in early infancy, our behavioral options may be mostly constrained to our ability to signal needs. Whether or not these needs are subsequently attended and appropriately responded to is often dependent upon our caregivers. When the needs are not met, physiological responses to challenge may ensue. Over time, chronic increases in cortisol may, in turn, affect the neurophysiological axis that regulates cortisol

(i.e., the hypothalamic-pituitary-adrenal (HPA) axis), as well as brain regions influencing HPA regulation, including those important to emotion regulation, memory, and executive functioning.

### 8.2.1 Sensitive Parenting

"Sensitive" parenting encompasses parental attentiveness as well as responsiveness that is both contextually and temporally appropriate (Ainsworth, 1967). Sensitive parent-child interactions are, in many ways, akin to what is now increasingly called "serve and return" behavior, which refers to a child serving up a signal and a caregiver returning the behavior with a responsive and timely action of his/her own (Shonkoff & Bales, 2011). In addition, inherent to the concept of "sensitivity" is John Bowlby and Mary Ainsworth's idea that the caregiver is a "secure base" from which the child may explore the world. With this in mind, systems assessing sensitive behavior examine the extent to which caregivers appropriately respond to both attachment and exploratory signals and needs (e.g., Moran et al., 2009).

Sensitive parenting may be thought of as a cue that has been historically linked to environmental conditions. Just as physical and social resources are linked to parenting behavior in other species (Hokekamp & Smale, 2015; Perry et al., 2018), across cultures and within Singapore, socioeconomic status is linked to sensitive caregiving (Heng et al., 2018; Mesman et al., 2012; Perry et al., 2018).

In turn, sensitive caregiving and related constructs play a role in young children's exploration of the environment (e.g., Sorce & Emde, 1981) and socioemotional constructs (Dujardin et al., 2015). As discussed in Chap. 11 of this volume, exploratory behavior is itself important to future development and provides opportunities for learning and mastery. In addition, as discussed in this volume's Chap. 12, research finds sensitive caregiving associates with children's emotional understanding. Likewise, sensitive caregiving is often associated with children's stress physiology (Atkinson et al., 2013). Taken together, then, such research suggests that sensitive caregiving is part of one pathway in which likely environmental conditions are signaled to shape brain development.

## 8.3 Tradeoffs Among Skill Types: Street-Smart Versus Book-Smart

Although it is possible that environmental influences, such as insensitive care, are impeding normative brain development, it is also possible that they are influencing which pathways are prioritized (Frankenhuis et al., 2016; Frankenhuis & de Weerth, 2013). Indeed, the idea that some skills may be prioritized over others fits in with

informal ideas about the world's demands, as exemplified by expressions like "he's street-smart not book-smart." While cortisol and insensitive care may be "bad" for the development of regulatory behaviors and physiology, they may be "good" for other skills.

For example, rats that, as pups, were exposed to less licking and grooming (or in other words that had experienced less "rat sensitivity") have been found to show comparatively poor memory for emotionally neutral events both at the cellular (i.e., via long term potentiation) and behavioral level; however, when the rats' cells were first exposed to stress hormones, the rearing-related differences in long-term potentiation patterns normalize and/or reverse. What is more, rats which were exposed to less licking and grooming actually showed better memory for dangerous circumstances than their counterparts (Bagot et al., 2009; Champagne et al., 2008).

Similar findings have been observed in humans. Within human research, abuse is often related to cognitive sequelae, though relations may be complex (Dunn et al., 2016). Reminiscent of the aforementioned rodent findings and the suggestion that, in response to caregiving adversity, the brain prioritizes attending to signals associated with danger, in comparison to non-abused children, when viewing pictures of angry faces, abused children exhibit enhanced neural activity and better/faster identification with incomplete visual information (e.g., Pollak et al., 1997, 2001; Pollak & Sinha, 2002; Shackman et al., 2007, also see Chap. 12 of this volume for a more general discussion of parenting and emotional attentional biases). Similarly, as noted above, children from community samples who were likely exposed to comparatively less sensitive and/or comparatively more frightening early life care exhibit lower levels of cognitive flexibility and selective attention (Bernier et al., 2010; Bernier et al., 2012; Matte-Gagne et al., 2018) and, in early life, coordination between areas of the brain important to modulating emotional reactivity (Rifkin-Graboi et al., 2015a). However, in early life, children exposed to less sensitive care also exhibit greater memory (Rifkin-Graboi et al., 2018), enhanced coordination between areas of the brain important to memory as well as larger volumes of a region supporting memory and stress regulation (i.e., the hippocampus, Rifkin-Graboi et al., 2015a), and, during the preschool years, more fear learning (Tsotsi et al., 2018). As a final example, adolescents who report unpredictable early life experiences show worse performance on inhibition, but better performance in cognitive flexibility specifically when made to think that the current environment is itself unpredictable (Mittal et al., 2015). Thus, many have begun to suggest that whether or not experience is "beneficial" to brain development is partially dependent upon the contexts in which individuals subsequently encounter (e.g., Ellis et al., 2017; Frankenhuis et al., 2016; Frankenhuis & de Weerth, 2013).

## 8.4   Trade-Offs Among When Skills Prioritized: "Old Before Their Time"

Just as there may be trade-offs between what tasks we prioritize, there are also likely compromises with regard to when we prioritize certain aspects of neurodevelopment. This is conveyed with expressions such as "she had to grow up too quickly" and "old before his time," which convey that the pace at which development unfolds is related to environmental adversity. Generally, because aging is associated with mortality and cognitive decline, we tend to think of "acceleration" as bad—yet in early life, some forms of accelerated development may go unnoticed and/or be adaptive for survival and reproduction.

Returning to the example of poor nutrition, Gluckman and colleagues (Gluckman et al., 2013; Gluckman & Hanson, 2006) have extensively discussed evidence that reproductive age, at least in females, is sped up among women who experienced antenatal adversity but whose subsequent environments were rich in nutrients. Likewise, Jay Belsky (e.g., Belsky, 1997, 1999, 2000; Belsky et al., 1991) has written at length about similar ideas with regard to pubertal maturation and caregiving adversity. Belsky and colleagues argue that in response to signals of early life adversity, organisms expect later uncertainty and so prioritize developmental pubertal trajectories, as well as emotions, thoughts, and behaviors that may lead to early-and-often approaches to reproduction and accompanying romantic relationship styles. In support of this idea, Belsky and colleagues cite evidence linking early-life insecure attachment parent-child attachment relationships, externalizing behavior, and the onset of menstruation in girls. They propose that while externalizing behaviors may be perceived as "bad" by society, they are part and parcel of a reproductive strategy expected to, in conditions of adversity, maximize the likelihood that ones' genes are passed on in generations to come.

Inherent in such arguments, then, is also the idea that early adversity may shape brain development. After all, as with other steroid hormones, the axis governing sex steroids originates in the central nervous system (i.e., the hypothalamic-pituitary-gonadal axis). Moreover, increases in sex steroids themselves are responsible for the activation of neurocircuitry supporting certain behaviors at or after puberty, as well as, perhaps, more general neuroanatomical and functional change (Piekarski et al., 2017).

Recently, more work has begun to focus upon "accelerated" neurodevelopment in relation to fear and learning. Though the work varies in its methodologies, it generally points to the idea that offspring prioritize the development of learning strategies necessary for immediate and/or future (predicted) survival. If cues suggest that life is harsh and there is a need for self-reliance, adult learning strategies emerge comparatively early.

For example, as explained by Sullivan and Perry (2015), when rat pups have not been exposed to adverse forms of caregiving, they do not exhibit fear-learning even when they encounter other forms of threat. Why not? As explained above, overwhelming experiences often result in cortisol (or, in rodents, "corticosterone")

increases that can feed back to the amygdala, a brain region important to fear and emotion. In fact, fear learning may be partially dependent upon corticosterone signaling the amygdala (Aubry et al., 2016). However, in rats, the extent to which exposure to frightening stimuli results in corticosterone release follows a developmental progression: first, frightening stimuli may only result in increased corticosterone and so fear learning when the pup has been out of contact with its mother for a rather prolonged period of time; as the pup gets older, frightening stimuli may only result in increased corticosterone and so fear learning when the mother is not present; finally, in even later development, frightening stimuli may result in increased corticosterone and fear learning regardless of whether the mother is present. Sullivan and Perry (2015) explain that the mechanisms behind this maternal buffering may be multifold—including input from regions important to basic functioning (i.e., the brain stem), executive control (i.e., the prefrontal cortex), associative memory (i.e., the hippocampus), and the amygdala itself. When pups experience adverse forms of caregiving, corticosterone is increased in response to frightening stimuli regardless of the mother's presence comparatively earlier in life, and so earlier fear learning may also occur. Such early life fear learning may then further change patterns of activity between the amygdala and regions important to vigilance and control, including the prefrontal cortex.

Relatedly, there is evidence that early life adversity may also speed up processes related to fear regulation and learning in humans. Drawing on knowledge that resting state amygdala-prefrontal connectivity is expected to increase in late childhood and adolescence, Thijssen et al. (2017) wanted to determine whether this normative spurt might occur earlier in development among children (i.e., 6–10 year olds) who had been exposed to insensitive care during preschool. Indeed, they found that increased connectivity associated with age among six-to-ten-year-olds exposed to comparatively low parental sensitivity but not in a group exposed to higher parental sensitivity. In addition, evidence comparing those who have experienced extreme early life adversity also suggests that early life experience influences the pace at which neurocircuitry important to fear regulation and learning develops. For example, Gee et al. (2013) found that children, who have experienced early life institutionalization, demonstrate more "mature" connectivity patterns between the prefrontal cortex and the amygdala, which together regulate fear. That is, unlike Thijssen et al. (2017) who measured brain activity "at rest," Gee et al. (2013) examined connectivity when participants viewed fear faces. They found that children who have never been institutionalized demonstrated positive amygdala-prefrontal cortex co-activation, and teens who have never been institutionalized demonstrated negative amygdala-prefrontal cortex co-activation. However, when viewing fear faces, previously institutionalized children showed more "teenage-like" patterns at earlier stages of life. Furthermore, their work suggests that these patterns may also be beneficial to children as they manage their current environments. Though previously institutionalized children on average showed greater separation anxiety than non-previously institutionalized children, among those who were previously institutionalized, there were fewer symptoms found in those children who showed the more "accelerated" pattern.

Such "acceleration" following early institutional care has also been found with fear *learning*. Silvers and colleagues (Silvers et al., 2016) found that children aged 7–16 who had been institutionalized in early life demonstrated a more adult-like neural activity pattern (i.e., greater co-activation of the prefrontal cortex and the (a) amygdala and (b) hippocampus) while taking part in an aversive learning paradigm than did their never institutionalized counterparts. Moreover, as with the findings concerning fear regulation above, although prior institutionalization was associated with anxiety, among prior institutionalized children, the more advanced neural activation pattern during fear learning predicted a relative decrease in anxiety over time.

Beyond processes important to fear regulation and learning, other forms of learning may also be accelerated. For example, Thomas and colleagues (Thomas et al., 2016) focused on "reversal learning" in mice. They presented mice with buckets that contained a (visually hidden) reward and an associated odor. They then assessed how many trials it took mice to choose, based on the bucket's odor, the bucket containing the reward. After it was clear that the mice had learned the initial odor-reward pairing, the authors assessed how many trials it took the mice to inhibit old information (i.e., to not dig into the bucket with the old reward odor cue) and act on newly updated information (i.e., to dig into the bucket with the new reward odor cue). When tested as adults, mice showed perseverative errors by continuing to dig into the bucket with the old-reward-odor cue. From an ecological perspective, this may make sense: in the wild adult mice live in stable territories, and so once an association is learned they may require considerable input about the rewarding (or perhaps aversive) quality of an experience before re-evaluating. However, this same strategy may not be useful to juveniles. As they explain, the juvenile period is a transitory time for mice—one in which they are required to explore new areas and assess whether these locations are suitable to be used as a new home territory. Thus, at this stage of development, being open to ever-changing input may actually be advantageous. Indeed, Thomas and colleagues observed that juvenile animals showed fewer perseverative errors in the odor-reward task, if they had not been exposed to early life adversity. If they had experienced early life adversity, juvenile mice displayed the same types of perseverative errors as did adult mice. In other words, mice exposed to early life adversity may display "accelerated" reversal learning.

Likewise, work with human infants suggests that early life adversity may speed up the pace at which learning develops. For example, in a sample of 184 Singaporean infants, Rifkin-Graboi and colleagues (Rifkin-Graboi et al., 2018) found that exposure to less sensitive maternal care at 6 months was associated with better performance during an eye-tracking task designed to assess relational memory, thought to be underpinned by the hippocampus. Likewise, in related Singaporean research, less sensitive care has been associated with larger hippocampal volumes at 6 months and more mature hippocampal microstructure values at 4.5 and 6 years (A. Lee et al., 2019). Similarly, less sensitive care has also been found related to larger hippocampal volume at 10 years in a Canadian sample (Bernier et al., 2019), and less parental nurturance at 4 years of age has been found predictive of larger hippocampal volume among 13–16-year-olds (Rao et al., 2010). However, other work

examining the relation between maternal caregiving adversity and hippocampal volume during childhood and adolescence has reported nil (Kok et al., 2015) or opposite effects (Luby et al., 2012; Luby et al., 2016). To truly understand whether associative learning, and relatedly hippocampal development, is accelerated by adversity, it is necessary to repeatedly measure during time points of rapid growth and decline, ideally, within the same sample.

## 8.5   Mismatch, Culture, and the Local Context

Adults of different cultures can use specific cues to indicate very different things: moving the head side-to-side may signify "yes" to an Indian national but "no" to a Westerner. Saying "that's quite interesting" signals "keep on talking" to Americans but conveys a substantially different meaning to the British. Nevertheless, if we accept that in early life basic cues concerning adversity and resources—things such as parental sensitivity, (over)protection, nutrition, and the complexity of environmental exposure—may signal likely environmental conditions across a variety of species, it is difficult to imagine that such cues do not also signal historically expectable environmental differences across humans living among different cultures. This is not to say, however, that the accompanying changes in neurodevelopment are equally beneficial for children growing up across all stages of human history, cultures, or contexts.

Gluckman and colleagues have written about the ways in which modern noncommunicable diseases can be traced to a "mismatch" in what constituted adversity throughout most of human history and today's circumstances. One area that they focus upon concerns differences in nutritional resources. For most of human history, adversity was likely associated with nutritional restriction. However, within many developed countries, fatty calorie-rich food is often the cheapest option. Thus, adaptations associated with early life cortisol signaling (e.g., "be on the lookout for rewards," "require a lot of calories before satiated," etc.) may actually lead to increased rates of obesity in the modern environment. Likewise, although adversity may have historically been associated with a need to be hyper-vigilant to environmental cues, in the modern day, classroom-sustained attention is more beneficial than distractibility.

Beyond potential historical clashes, other forms of mismatch may also occur. For example, the fetus may be exposed to heightened cortisol for reasons beyond environmental adversity, such as that occurs when pregnant women eat large quantities of licorice, which has properties that disrupt the inactivation of cortisol (e.g, Räikkönen et al., 2017; Strandberg et al., 2001). Because it's unlikely that modern day licorice consumption is systematically linked to environmental harshness, the associated cortisol message may not be conveying useful information. As another example, a mismatch can occur when well-meaning caregivers, who are themselves concerned about a child's academic performance, create overwhelming academic expectations inducing prolonged cortisol exposure within a child. Regardless of its

origin, a similar endocrine message may be conveyed: "prioritize skills such as hypervigilance, distractibility, and reactivity to distress." Unfortunately, research in the West suggests that these skills are in opposition to the ones often required for school success.

As alluded to above, research abroad and within Singapore suggests that working memory, which is supported by sustained attention, predicts a number of academic outcomes including mathematical performance (Lee & Bull, 2016). This skill, along with related aspects of executive functioning- cognitive flexibility as well as emotional and cognitive regulation and error monitoring, is associated with sensitive caregiving and/or secure attachment relationships (Bernier et al., 2010; Bernier et al., 2012; Fearon & Belsky, 2004; Matte-Gagne et al., 2018). Not surprisingly, secure attachment—which is predicted by caregiving sensitivity (De Wolff & van IJzendoorn, 1997) and defined by the child's ability to flexibly move between the pursuit of exploratory and affectional needs (Main, 2000)—is also associated with teachers' impressions of preschoolers (reviewed in Sroufe et al., 2005). For example, in Sroufe and colleagues' longitudinal study, children with histories of secure attachment were less demanding of their teachers, more empathetic, more positively engaged in social interactions with peers, and likely to be treated by their teachers in nurturing and engaged ways but also with age-appropriate expectations for compliance, as indicated by both teacher ratings and observational assessments. In sum, children with secure histories had better relationships with peers and teachers, which could easily then lead to differences in subsequent stress exposure. Moreover, such research suggests that the child's home histories may be important to their own classroom experience and may also have an impact on the teachers themselves. As will be discussed in Chap. 8 of this volume, classroom demands may influence preschool teacher's own stress exposure, which may influence the manner in which they engage with children. Both acute and prolonged stress in adults is also found predictive of abilities to regulate and attend (McEwen et al., 2016; Shields et al., 2016).

Indeed, considering the preschool teachers' experiences, resources, and expectations is an important aspect of determining whether there is a "mismatch" between children's skills and their concurrent school environment. As discussed in this volumes' Chap. 11, there are differences in the ways adults teach children, with some focusing more upon instruction (and so imitation) and others upon exploration (and so executive functioning). Some of these differences may arise due to cultural beliefs about learning; others may also be dependent upon whether the adult is able to affectively contingently respond to the changing nature of children's play. As noted above, executive functioning, a correlate of "positive" early life signals, and presumably required for goal-directed learning, is one of the best predictors of later life success (Israel et al., 2014; Moffitt et al., 2011). However, it remains unclear whether this exact same pattern will hold true for children living in countries where, at least in early life, faithful imitation is more greatly emphasized. For example, we cannot necessarily expect that insensitive caregiving associates with poor school learning across countries emphasizing different pedagogical practices, even if we know that across cultures, adversity associates with insensitivity, and are

increasingly certain that insensitivity associates with poor executive functioning (but greater early memory development).

Likewise, pedagogical systems differ with regard to expectations for school readiness. In Finland, children are not taught to read until age seven, and so provided that, by the age of seven, adversity related differences in the pace of memory development normalize, accelerated early life memory capabilities may not be an educational benefit. However, in cultures that expect early literacy by school entry, an inability to easily remember words and their meaning may be met with criticism and relatedly stress, which could ironically lead to higher levels of stress hormones and subsequent difficulties in stress regulation and executive functioning. Thus, it is easy to imagine that "accelerated" development may be more beneficial in some cultures than others.

To determine whether early life adversity helps to create a brain that is more or less in sync with society's expectations and goals, it is important to repeatedly assess early environmental signals and related differences in neurodevelopment in interaction with concurrent societal and pedagogical expectations. For such reasons, the "**BE POSITIVE**" (**B**eginning **E**arly: Singa**P**ore's **O**ngoing **S**tudy starting in **I**nfancy of **T**wenty-first-century skills, **I**ndividual differences, and **V**ariance in the **E**nvironment) study will focus upon environmental quality, memory, and regulatory abilities and will collect data from approximately 1000 families at multiple points in time when underlying brain regions are likely to be exhibiting rapid growth(Rifkin-Graboi et al., 2019). In addition, BE POSITIVE will strive to collect information from child care workers and preschool teachers concerning their expectations regarding age-appropriate knowledge, learning ability, regulatory control, and perspective taking skills.

Because BE POSITIVE includes a variety of potential influences, both universal in nature and culturally specific, we will be better able to understand the degree to which specific environmental influences affect neurodevelopment and when their influences may be most pronounced. Both the type and timing of experience may be especially important (Del Giudice et al., 2011; Ellis et al., 2017; Frankenhuis & de Weerth, 2013).

By collecting data from a variety of different domains (e.g., relational memory, regulatory control, language acquisition), it will be possible to determine how environmental exposures influence trade-offs in which skills to prioritize at a given time point. By repeatedly assessing constructs over time, it will be possible to determine how environmental exposures influence trade-offs with regard to when to prioritize a given skill. In other words, it is not just the timing of exposure, but also the timing of assessment that may influence relations. As with infancy, there are other points in time, marked by changes in adrenal and sex steroids, during which the brain may be especially likely to change (Del Giudice et al., 2009; Piekarski et al., 2017). Some have argued that these stages are also times at which, in accordance with new environmental experience, strategies and skills are re-prioritized. Interestingly, these times often coincide with changes in the educational environment, e.g., 6–8 years of age and during adolescence.

By considering societal expectations, it will be possible to determine the types of pedagogical environments and practices that most readily lead to success among children exposed to more (and less) environmental adversity. BE POSITIVE, then, will augment findings reported in both international and local Singaporean studies of preschool functioning (e.g., see Chaps. 13 and 14 of this volume for a discussion of mathematical and language functioning in the "Singapore Kindergarten Impact Project [SKIP]"). More specifically, BE POSITIVE will help to inform the nature of differences at the start of preschool and provide a framework to better understand why an intervention conducted within one preschool environment may assist some children but negatively impact others.

Finally, by collecting a variety of exposure types, it may also be possible to better examine moderating influences. Ultimately, in any study of environmental exposure, it will be important to consider the role of genetics, prior neuronal functioning, and environmental lability. In addition, it is also important to consider the impact of interventions—both those that are planned and those that naturally occur. For example, Singapore is a multilingual society with most adults reporting fluency in two or more languages. Nevertheless, there is variance in early life bilingual exposure. Considering that bilingual exposure is considered to strengthen executive functioning, Goh et al. (2020) recently examined whether bilingual exposure in Singaporean toddlers could protectively enhance executive functioning, among those at risk for attentional problems. Interestingly, Goh et al. (2020) did find a moderating effect of bilingualism on preschool attentional problems, but this did not appear to be driven by differences in executive functioning. They therefore suggest the need to examine whether bilingually exposed children encounter differential social environments and expectations in early life. Such questions, of course, require the complex assessment of multiple domains and exposures in early life, as will be captured in the BE POSITIVE study.

## 8.6    How, When, and Should We Intervene?

A main goal of child development research is to improve children's lives. Here, we have presented much research suggesting that early life experiences signaling a "positive" environment are likely to lead to a more "positive" future. Thus, perhaps the key to improve well-being across a number of domains is simply to alter the immediate cues that children receive. Indeed, a number of randomized controlled trials demonstrate the effectiveness of interventions that aim to enhance parenting sensitivity on a diversity of outcomes such as executive functioning, socioemotional behavior, stress physiology, and even language and literacy (Bakermans-Kranenburg et al., 2008a, b; Bernard et al., 2012, 2015a, b, 2017; Dozier et al., 2008, 2011; Grube & Liming, 2018; Klein Velderman et al., 2006a, b; Lewis-Morrarty et al., 2012; Lind et al., 2017; Raby et al., 2018; Velderman et al., 2006). Moreover, in many cases such interventions are found more impactful than those targeted at specific academic skills (Bernard et al.,

2017; Lewis-Morrarty et al., 2012; Lind et al., 2017). Intervening with parents may be beneficial for other reasons as well—the effects may transfer to their approach with other children, interventions may be implemented at earlier stages before compounding effects arise, and the interventions may improve the parents' own well-being. Nevertheless, there are potential drawbacks for early interventions with parents, including the cost of implementing individualized parent-child programs. Other solutions, then, which are currently being explored involve creating similar caregiving sensitivity interventions with preschool and primary school teachers (Groeneveld et al., 2011, 2016; Werner et al., 2016, 2018)—however, whether these programs are equally effective is yet to be determined.

Another approach is to focus the intervention at the level of the child, e.g., by trying to boost regulatory skills and decrease distractibility and threat sensitivity. However, there may be some concerns with these strategies as well. Assuming that, in some cases, such "skills" are beneficial in the non-school environment, it is unclear whether improving them will come at a cost outside of the classroom. Likewise, increasing pre-academic knowledge may also be useful—however, if this also increases feelings of helplessness, a lack of belonging, or less time for exploration, it may too come at a cost. Another approach is to acknowledge the usefulness of certain skills and build on them (Frankenhuis & de Weerth, 2013). For example, Ellis and colleagues (Ellis et al., 2017) suggest taking advantage of biases toward negative social information to help focus attention toward key concepts (e.g., before teaching A > B > C therefore A > C, try John is tougher than Ed and Ed is tougher than George, therefore John is tougher than George). As another example, given research suggesting that prior experience with uncertainty leads to better flexibility during times of uncertainty (Mittal et al., 2015), try teaching in a variety of certain and uncertain contexts to give a relative advantage to different types of learners, and so promote feelings of self-esteem.

Likewise, educators can vary learning techniques to account for differences in the pace of development. As reviewed by Piekarski et al. (2017), the manner in which we form memories and learn rules varies with developmental stage. Given that, as reviewed above, developmental stage is not simply equivalent to chronological age and may vary according to prior experience with adversity, it may be important for teachers to consider altering pedagogical styles for different same chronologically aged, but different neurodevelopmentally aged, individuals to enhance learning experiences. Of course, this strategy may too have its drawbacks—including implantation considerations and the fact that harnessing strengths for learning does not necessarily substantially improve quality of life within the home. Indeed, it is likely that a variety of approaches may be needed across different situations, ages, and contexts. How such interventions interact is an important area for future research.

## 8.7 Summary

Albert Einstein said, "*I never teach my pupils, I only attempt to provide the conditions in which they can learn.*" To understand the conditions that are best suited to helping children learn, it is important to also appreciate why the differences exist and how they enfold over time. In accordance with arguments advanced by Frankenhuis, del Giudice, and Ellis (e.g., Del Giudice et al., 2011; Ellis et al., 2017) and consistent with those offered by Belsky, Gluckman, and others (e.g., Belsky et al., 1991; Gluckman et al., 2005), this chapter has approached the development of differences in cognitive and emotional skills likely needed for school success from an evolutionary standpoint, highlighting research suggesting that cues for environmental harshness (low parental sensitivity, overprotection, poor nutrition) may signal the developing brain to prepare for a difficult future. Whether or not the skills are, in fact, advantageous depends on the future's actual requirements. An educational "mismatch" may occur when the skills valued by teachers are different from those that the children possess. Research such as the upcoming BE POSITIVE study, then, is essential to understanding the ways in which our early and subsequent experiences interact to influence outcomes and may foster greater acceptance of learning differences. It may also help as we determine the best ways to intervene—change the circumstances in which the child develops, change the child, change the pedagogical approach, or some combination of all these.

## References

Ainsworth, M. D. (1967). *Infancy in Uganda: Infant care and the growth of love*. Johns Hopkins Press.

Amici, F., Aureli, F., & Call, J. (2008). Fission-fusion dynamics, behavioral flexibility, and inhibitory control in primates. *Current Biology, 18*(18), 1415–1419. https://doi.org/10.1016/j.cub.2008.08.020

Anacker, C., O'Donnell, K. J., & Meaney, M. J. (2014). Early life adversity and the epigenetic programming of hypothalamic-pituitary-adrenal function. *Dialogues in Clinical Neuroscience, 16*(3), 321–333.

Atkinson, L., Gonzalez, A., Kashy, D. A., Santo Basile, V., Masellis, M., Pereira, J., … Levitan, R. (2013). Maternal sensitivity and infant and mother adrenocortical function across challenges. *Psychoneuroendocrinology, 38*(12), 2943–2951. https://doi.org/10.1016/j.psyneuen.2013.08.001

Aubry, A. V., Serrano, P. A., & Burghardt, N. S. (2016). Molecular mechanisms of stress-induced increases in fear memory consolidation within the amygdala. *Frontiers in Behavioral Neuroscience, 10*, 191–191. https://doi.org/10.3389/fnbeh.2016.00191

Bagot, R. C., van Hasselt, F. N., Champagne, D. L., Meaney, M. J., Krugers, H. J., & Joels, M. (2009). Maternal care determines rapid effects of stress mediators on synaptic plasticity in adult rat hippocampal dentate gyrus. *Neurobiology of Learning and Memory, 92*(3), 292–300. S1074-7427(09)00067-7 [pii]. https://doi.org/10.1016/j.nlm.2009.03.004

Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Mesman, J., Alink, L. R., & Juffer, F. (2008a). Effects of an attachment-based intervention on daily cortisol moderated by dopamine receptor D4: A randomized control trial on 1- to 3-year-olds screened for externaliz-

ing behavior. *Development and Psychopathology, 20*(3), 805–820. https://doi.org/10.1017/s0954579408000382

Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Pijlman, F. T. A., Mesman, J., & Juffer, F. (2008b). Experimental evidence for differential susceptibility: Dopamine D4 receptor polymorphism (DRD4 VNTR) moderates intervention effects on toddlers' externalizing behavior in a randomized controlled trial. *Developmental Psychology, 44*(1), 293–300. https://doi.org/10.1037/0012-1649.44.1.293

Bateson, P., Gluckman, P., & Hanson, M. (2014). The biology of developmental plasticity and the predictive adaptive response hypothesis. *The Journal of Physiology, 592*(11), 2357–2368. https://doi.org/10.1113/jphysiol.2014.271460

Belsky, J. (1997). Attachment, mating, and parenting: An evolutionary interpretation. *Human Nature, 8*(4), 361–381. https://doi.org/10.1007/BF02913039

Belsky, J. (1999). Modern evolutionary theory and patterns of attachment. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 141–161). The Guilford Press.

Belsky, J. (2000). Conditional and alternative reproductive strategies: Individual differences in susceptibility to rearing experiences. In J. L. Rodgers, D. C. Rowe, & W. B. Miller (Eds.), *Genetic influences on human fertility and sexuality*. Springer.

Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Development, 62*(4), 647–670. https://doi.org/10.2307/1131166

Bernard, K., Dozier, M., Bick, J., Lewis-Morrarty, E., Lindhiem, O., & Carlson, E. (2012). Enhancing attachment organization among maltreated children: Results of a randomized clinical trial. *Child Development, 83*(2), 623–636. https://doi.org/10.1111/j.1467-8624.2011.01712.x

Bernard, K., Dozier, M., Bick, J., & Gordon, M. K. (2015a). Intervening to enhance cortisol regulation among children at risk for neglect: Results of a randomized clinical trial. *Development and Psychopathology, 27*(3), 829–841. https://doi.org/10.1017/s095457941400073x

Bernard, K., Hostinar, C. E., & Dozier, M. (2015b). Intervention effects on diurnal cortisol rhythms of child protective services-referred infants in early childhood: Preschool follow-up results of a randomized clinical trial. *JAMA Pediatrics, 169*(2), 112–119. https://doi.org/10.1001/jamapediatrics.2014.2369

Bernard, K., Lee, A. H., & Dozier, M. (2017). Effects of the ABC intervention on foster children's receptive vocabulary: Follow-up results from a randomized clinical trial. *Child Maltreatment, 22*(2), 174–179. https://doi.org/10.1177/1077559517691126

Bernier, A., Carlson, S. M., & Whipple, N. (2010). From external regulation to self-regulation: Early parenting precursors of young children's executive functioning. *Child Development, 81*(1), 326–339. https://doi.org/10.1111/j.1467-8624.2009.01397.x

Bernier, A., Carlson, S. M., Deschenes, M., & Matte-Gagne, C. (2012). Social factors in the development of early executive functioning: A closer look at the caregiving environment. *Developmental Science, 15*(1), 12–24. https://doi.org/10.1111/j.1467-7687.2011.01093.x

Bernier, A., Dégeilh, F., Leblanc, É., Daneault, V., Bailey, H. N., & Beauchamp, M. H. (2019). Mother–infant interaction and child brain morphology: A multidimensional approach to maternal sensitivity. *Infancy, 24*(2), 120–138. https://doi.org/10.1111/infa.12270

Cameron, N. M., Champagne, F. A., Parent, C., Fish, E. W., Ozaki-Kuroda, K., & Meaney, M. J. (2005). The programming of individual differences in defensive responses and reproductive strategies in the rat through variations in maternal care. *Neuroscience and Biobehavioral Reviews, 29*(4–5), 843–865. https://doi.org/10.1016/j.neubiorev.2005.03.022

Champagne, D. L., Bagot, R. C., van Hasselt, F., Ramakers, G., Meaney, M. J., De Kloet, E. R., … Krugers, H. (2008). Maternal care and hippocampal plasticity: Evidence for experience-dependent structural plasticity, altered synaptic functioning, and differential responsiveness to glucocorticoids and stress. *Journal of Neuroscience, 28*(23), 6037–6045.

Choe, M. S., Ortiz-Mantilla, S., Makris, N., Gregas, M., Bacic, J., Haehn, D., … Grant, P. E. (2013). Regional infant brain development: An MRI-based morphometric analysis in 3 to 13 month olds. *Cerebral Cortex, 23*(9), 2100–2117. https://doi.org/10.1093/cercor/bhs197

De Wolff, M. S., & van IJzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68*(4), 571–591.

Dean, D. C., 3rd, O'Muircheartaigh, J., Dirks, H., Waskiewicz, N., Walker, L., Doernberg, E., … Deoni, S. C. (2015). Characterizing longitudinal white matter development during early childhood. *Brain Structure & Function, 220*(4), 1921–1933. https://doi.org/10.1007/s00429-014-0763-3

Del Giudice, M., Angeleri, R., & Manera, V. (2009). The juvenile transition: A developmental switch point in human life history. *Developmental Review, 29*(1), 1–31. https://doi.org/10.1016/j.dr.2008.09.001

Del Giudice, M., Ellis, B. J., & Shirtcliff, E. A. (2011). The adaptive calibration model of stress responsivity. *Neuroscience and Biobehavioral Reviews, 35*(7), 1562–1592. https://doi.org/10.1016/j.neubiorev.2010.11.007

Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin, 130*(3), 355–391. https://doi.org/10.1037/0033-2909.130.3.355

Dozier, M., Peloso, E., Lewis, E., Laurenceau, J. P., & Levine, S. (2008). Effects of an attachment-based intervention on the cortisol production of infants and toddlers in foster care. *Development and Psychopathology, 20*(3), 845–859. https://doi.org/10.1017/s0954579408000400

Dozier, M., Bick, J., & Bernard, K. (2011). Intervening with Foster parents to enhance biobehavioral outcomes among infants and toddlers. *Zero Three, 31*(3), 17–22.

Dujardin, A., Bosmans, G., De Raedt, R., & Braet, C. (2015). Children's attentional exploration of threatening information as related to trust in maternal support. *Developmental Psychology, 51*(10), 1341–1350. https://doi.org/10.1037/a0039500

Dunn, E. C., Busso, D. S., Raffeld, M. R., Smoller, J. W., Nelson, C. A., Doyle, A. E., & Luk, G. (2016). Does developmental timing of exposure to child maltreatment predict memory performance in adulthood? Results from a large, population-based sample. *Child Abuse & Neglect, 51*, 181–191. https://doi.org/10.1016/j.chiabu.2015.10.014

Ellis, B. J., Boyce, W. T., Belsky, J., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2011). Differential susceptibility to the environment: An evolutionary–neurodevelopmental theory. *Development and Psychopathology, 23*(1), 7–28. https://doi.org/10.1017/s0954579410000611

Ellis, B. J., Bianchi, J., Griskevicius, V., & Frankenhuis, W. E. (2017). Beyond risk and protective factors: An adaptation-based approach to resilience. *Perspectives on Psychological Science, 12*(4), 561–587. https://doi.org/10.1177/1745691617693054

Fearon, R. M., & Belsky, J. (2004). Attachment and attention: Protection in relation to gender and cumulative social-contextual adversity. *Child Development, 75*(6), 1677–1693. https://doi.org/10.1111/j.1467-8624.2004.00809.x

Frankenhuis, W. E., & de Weerth, C. (2013). Does early-life exposure to stress shape or impair cognition? *Current Directions in Psychological Science, 22*(5), 407–412. https://doi.org/10.1177/0963721413484324

Frankenhuis, W. E., Panchanathan, K., & Nettle, D. (2016). Cognition in harsh and unpredictable environments. *Current Opinion in Psychology, 7*, 76–80. https://doi.org/10.1016/j.copsyc.2015.08.011

Gee, D. G., Gabard-Durnam, L. J., Flannery, J., Goff, B., Humphreys, K. L., Telzer, E. H., … Tottenham, N. (2013). Early developmental emergence of human amygdala-prefrontal connectivity after maternal deprivation. *PNAS Proceedings of the National Academy of Sciences of the United States of America, 110*(39), 15638–15643. https://doi.org/10.1073/pnas.1307893110

Giedd, J. N., Lalonde, F. M., Celano, M. J., White, S. L., Wallace, G. L., Lee, N. R., & Lenroot, R. K. (2009). Anatomical brain magnetic resonance imaging of typically developing children and adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry, 48*(5), 465–470. https://doi.org/10.1097/CHI.0b013e31819f2715

Gilmore, J. H., Shi, F., Woolson, S. L., Knickmeyer, R. C., Short, S. J., Lin, W., … Shen, D. (2012). Longitudinal development of cortical and subcortical gray matter from birth to 2 years. *Cerebral Cortex, 22*(11), 2478–2485. https://doi.org/10.1093/cercor/bhr327

Gluckman, P. D., & Hanson, M. A. (2006). Evolution, development and timing of puberty. *Trends in Endocrinology and Metabolism, 17*(1), 7–12. https://doi.org/10.1016/j.tem.2005.11.006

Gluckman, P. D., Hanson, M. A., & Spencer, H. G. (2005). Predictive adaptive responses and human evolution. *Trends in Ecology & Evolution, 20*(10), 527–533. https://doi.org/10.1016/j.tree.2005.08.001

Gluckman, P. D., Beedle, A. S., Hanson, M. A., & Low, F. M. (2013). Human growth: Evolutionary and life history perspectives. *Nestle Nutrition Institute Workshop Series, 71*, 89–102. https://doi.org/10.1159/000342572

Gogtay, N., Giedd, J. N., Lusk, L., Hayashi, K. M., Greenstein, D., Vaituzis, A. C., … Thompson, P. M. (2004). Dynamic mapping of human cortical development during childhood through early adulthood. *Proceedings of the National Academy of Sciences of the United States of America, 101*(21), 8174–8179. https://doi.org/10.1073/pnas.0402680101

Goh, S. K. Y., Yang, H., Tsotsi, S., Qiu, A., Chong, Y.-S., Tan, K. H., … Rifkin-Graboi, A. (2020). Mitigation of a prospective association between early language delay at toddlerhood and ADHD among bilingual preschoolers: Evidence from the GUSTO cohort. *Journal of Abnormal Child Psychology*. https://doi.org/10.1007/s10802-10019-00607-10805, https://doi.org/10.1007/s10802-019-00607-5

Groeneveld, M. G., Vermeer, H. J., van IJzendoorn, M. H., & Linting, M. (2011). Enhancing home-based child care quality through video-feedback intervention: A randomized controlled trial. *Journal of Family Psychology, 25*(1), 86–96. https://doi.org/10.1037/a0022451

Groeneveld, M. G., Vermeer, H. J., Van Ijzendoorn, M. H., & Linting, M. (2016). Randomized video-feedback intervention in home-based childcare: Improvement of Children's wellbeing dependent on time spent with trusted caregiver. *Child & Youth Care Forum, 45*, 587–606. https://doi.org/10.1007/s10566-015-9344-8

Grube, W. A., & Liming, K. W. (2018). Attachment and biobehavioral catch-up: A systematic review. *Infant Mental Health Journal, 39*(6), 656–673. https://doi.org/10.1002/imhj.21745

Heng, J., Quan, J., Sim, L. W., Sanmugam, S., Broekman, B., Bureau, J. F., … Rifkin-Graboi, A. (2018). The role of ethnicity and socioeconomic status in Southeast Asian mothers' parenting sensitivity. *Attachment & Human Development, 20*(1), 24–42. https://doi.org/10.1080/14616734.2017.1365912

Hokekamp, K. E., & Smale, L. (2015). Dominance acquisition during mammalian social development: The "inheritance" of maternal Rank1. *Integrative and Comparative Biology, 31*(2), 306–317. https://doi.org/10.1093/icb/31.2.306

Holekamp, K. E., Dantzer, B., Stricker, G., Shaw Yoshida, K. C., & Benson-Amram, S. (2015). Brains, brawn and sociality: A hyaena's tale. *Animal Behaviour, 103*, 237–248. https://doi.org/10.1016/j.anbehav.2015.01.023

Hu, S., Pruessner, J. C., Coupe, P., & Collins, D. L. (2013). Volumetric analysis of medial temporal lobe structures in brain development from childhood to adolescence. *NeuroImage, 74*, 276–287. https://doi.org/10.1016/j.neuroimage.2013.02.032

Israel, S., Caspi, A., Belsky, D. W., Harrington, H., Hogan, S., Houts, R., … Moffitt, T. E. (2014). Credit scores, cardiovascular disease risk, and human capital. (1091–6490 (Electronic)). *Proceedings of the National Academy of Sciences of the United States of America, 111*, 17087–17092.

Klein Velderman, M., Bakermans-Kranenburg, M. J., Juffer, F., & van IJzendoorn, M. H. (2006a). Effects of attachment-based interventions on maternal sensitivity and infant attachment: Differential susceptibility of highly reactive infants. *Journal of Family Psychology, 20*(2), 266–274. https://doi.org/10.1037/0893-3200.20.2.266

Klein Velderman, M., Bakermans-Kranenburg, M. J., Juffer, F., van IJzendoorn, M. H., Mangelsdorf, S. C., & Zevalkink, J. (2006b). Preventing preschool externalizing behavior

problems through video-feedback intervention in infancy. *Infant Mental Health Journal, 27*(5), 466–493. https://doi.org/10.1002/imhj.20104

Kok, R., Thijssen, S., Bakermans-Kranenburg, M. J., Jaddoe, V. W. V., Verhulst, F. C., White, T., … Tiemeier, H. (2015). Normal variation in early parental sensitivity predicts child structural brain development. *Journal of the American Academy of Child & Adolescent Psychiatry, 54*(10), 824–831. https://doi.org/10.1016/j.jaac.2015.07.009

Kolb, B., & Gibb, R. (2011). Brain plasticity and behaviour in the developing brain. *Journal of the Canadian Academy of Child and Adolescent Psychiatry = Journal de l'Academie canadienne de psychiatrie de l'enfant et de l'adolescent, 20*(4), 265–276.

Lee, K., & Bull, R. (2016). Developmental changes in working memory, updating, and math achievement. *Journal of Educational Psychology, 108*(6), 869–882. https://doi.org/10.1037/edu0000090

Lee, A., Poh, J. S., Wen, D. J., Tan, H. M., Chong, Y.-S., Tan, K. H., … Qiu, A. (2019). Maternal care in infancy and the course of limbic development. *Developmental Cognitive Neuroscience, 40*, 100714. https://doi.org/10.1016/j.dcn.2019.100714

Lewis-Morrarty, E., Dozier, M., Bernard, K., Terracciano, S. M., & Moore, S. V. (2012). Cognitive flexibility and theory of mind outcomes among foster children: Preschool follow-up results of a randomized clinical trial. *Journal of Adolescent Health, 51*(2, Suppl), S17–S22. https://doi.org/10.1016/j.jadohealth.2012.05.005

Lind, T., Lee Raby, K., Caron, E. B., Roben, C. K., & Dozier, M. (2017). Enhancing executive functioning among toddlers in foster care with an attachment-based intervention. *Development and Psychopathology, 29*(2), 575–586. https://doi.org/10.1017/s0954579417000190

Luby, J. L., Barch, D. M., Belden, A., Gaffrey, M. S., Tillman, R., Babb, C., … Botteron, K. N. (2012). Maternal support in early childhood predicts larger hippocampal volumes at school age. *Proceedings of the National Academy of Sciences of the United States of America, 109*(8), 2854–2859. https://doi.org/10.1073/pnas.1118003109

Luby, J. L., Belden, A., Harms, M. P., Tillman, R., & Barch, D. M. (2016). Preschool is a sensitive period for the influence of maternal support on the trajectory of hippocampal development. *Proceedings of the National Academy of Sciences of the United States of America, 113*(20), 5742–5747. https://doi.org/10.1073/pnas.1601443113

Main, M. (2000). The organized categories of infant, child, and adult attachment: Flexible vs inflexible attention under attachment-related stress. *Journal of the American Psychoanalytic Association, 48*(4), 1055–1096. https://doi.org/10.1177/00030651000480041801

Matte-Gagne, C., Bernier, A., Sirois, M. S., Lalonde, G., & Hertz, S. (2018). Attachment security and developmental patterns of growth in executive functioning during early elementary school. *Child Development, 89*(3), e167–e182. https://doi.org/10.1111/cdev.12807

McEwen, B. S., Nasca, C., & Gray, J. D. (2016). Stress effects on neuronal structure: Hippocampus, amygdala, and prefrontal cortex. *Neuropsychopharmacology, 41*(1), 3–23. https://doi.org/10.1038/npp.2015.171

Mesman, J., van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2012). Unequal in opportunity, equal in process: Parental sensitivity promotes positive child development in ethnic minority families. *Child Development Perspectives, 6*(3), 239–250. https://doi.org/10.1111/j.1750-8606.2011.00223.x

Miller, D. J., Duka, T., Stimpson, C. D., Schapiro, S. J., Baze, W. B., McArthur, M. J., … Sherwood, C. C. (2012). Prolonged myelination in human neocortical evolution. *Proceedings of the National Academy of Sciences of the United States of America, 109*(41), 16480–16485. https://doi.org/10.1073/pnas.1117943109

Mittal, C., Griskevicius, V., Simpson, J. A., Sung, S., & Young, E. S. (2015). Cognitive adaptations to stressful environments: When childhood adversity enhances adult executive function. *Journal of Personality and Social Psychology, 109*(4), 604–621. https://doi.org/10.1037/pspi0000028

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., … Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety.

*Proceedings of the National Academy of Sciences of the United States of America, 108*(7), 2693–2698. https://doi.org/10.1073/pnas.1010076108

Moran, G., Pederson, D. R., & Bento, S. (2009). Maternal Behavior Q-Sort (MBQS) – Overview, available materials and support. *The Selected Works of Greg Moran.* Retrieved from http://works.bepress.com/gregmoran/48

O'Donnell, K. J., & Meaney, M. J. (2017). Fetal origins of mental health: The developmental origins of health and disease hypothesis. *The American Journal of Psychiatry, 174*(4), 319–328. https://doi.org/10.1176/appi.ajp.2016.16020138

Perry, R. E., Finegood, E. D., Braren, S. H., Dejoseph, M. L., Putrino, D. F., Wilson, D. A., … Blair, C. (2018). Developing a neurobehavioral animal model of poverty: Drawing cross-species connections between environments of scarcity-adversity, parenting quality, and infant outcome. *Development and Psychopathology*. https://doi.org/10.1017/S095457941800007X

Petanjek, Z., Judaš, M., Šimic, G., Rasin, M. R., Uylings, H. B. M., Rakic, P., & Kostovic, I. (2011). Extraordinary neoteny of synaptic spines in the human prefrontal cortex. *Proceedings of the National Academy of Sciences of the United States of America, 108*(32), 13281–13286. https://doi.org/10.1073/pnas.1105108108

Piekarski, D. J., Johnson, C., Boivin, J. R., Thomas, A. W., Lin, W. C., Delevich, K., … Wilbrecht, L. (2017). Does puberty mark a transition in sensitive periods for plasticity in the associative neocortex? *Brain Research, 1654*(Pt B), 123–144. https://doi.org/10.1016/j.brainres.2016.08.042

Pollak, S. D., & Sinha, P. (2002). Effects of early experience on children's recognition of facial displays of emotion. *Developmental Psychology, 38*(5), 784–791. https://doi.org/10.1037/0012-1649.38.5.784

Pollak, S. D., Cicchetti, D., Klorman, R., & Brumaghim, J. T. (1997). Cognitive brain event-related potentials and emotion processing in maltreated children. *Child Development, 68*(5), 773–787. https://doi.org/10.2307/1132032

Pollak, S. D., Klorman, R., Thatcher, J. E., & Cicchetti, D. (2001). P3b reflects maltreated children's reactions to facial displays of emotion. *Psychophysiology, 38*(2), 267–274. https://doi.org/10.1017/S0048577201990808

Raby, K. L., Freedman, E., Yarger, H. A., Lind, T., & Dozier, M. (2018). Enhancing the language development of toddlers in foster care by promoting foster parents' sensitivity: Results from a randomized controlled trial. *Developmental Science, 22*, e12753. https://doi.org/10.1111/desc.12753

Räikkönen, K., Martikainen, S., Pesonen, A.-K., Lahti, J., Heinonen, K., Pyhälä, R., … Kajantie, E. (2017). Maternal licorice consumption during pregnancy and pubertal, cognitive, and psychiatric outcomes in children. *American Journal of Epidemiology, 185*(5), 317–328. https://doi.org/10.1093/aje/kww172

Rao, H., Betancourt, L., Giannetta, J. M., Brodsky, N. L., Korczykowski, M., Avants, B. B., … Farah, M. J. (2010). Early parental care is important for hippocampal maturation: Evidence from brain morphology in humans. *NeuroImage, 49*(1), 1144–1150. https://doi.org/10.1016/j.neuroimage.2009.07.003

Rifkin-Graboi, A., Borelli, J., & Bosquest, M. (2009). Neurobiology of stress in infancy. In C. Zeanah (Ed.), *Handbook of infant mental health* (pp. 59–79). Guilford Press.

Rifkin-Graboi, A., Kong, L., Sim, L. W., Sanmugam, S., Broekman, B. F., Chen, H., … Qiu, A. (2015a). Maternal sensitivity, infant limbic structure volume and functional connectivity: A preliminary study. *Translational Psychiatry, 5*, e668. https://doi.org/10.1038/tp.2015.133

Rifkin-Graboi, A., Meaney, M. J., Chen, H., Bai, J., Hameed, W. B., Tint, M. T., … Qiu, A. (2015b). Antenatal maternal anxiety predicts variations in neural structures implicated in anxiety disorders in newborns. *Journal of the American Academy of Child and Adolescent Psychiatry, 54*(4), 313–321.e312. https://doi.org/10.1016/j.jaac.2015.01.013

Rifkin-Graboi, A., Quan, J., Richmond, J., Goh, S. K. Y., Sim, L. W., Chong, Y. S., … Qiu, A. (2018). Greater caregiving risk, better infant memory performance? *Hippocampus, 28*(7), 497–511. https://doi.org/10.1002/hipo.22949

Rifkin-Graboi, A., Khng, K. H., Cheung, P., Tsotsi, S., Sun, H., Kwok, F., … Tan, N. C. (2019). Will the future be positive? Early life experience as a signal to the developing brain pre school entry. *Learning: Research and Practice, 5*(2), 99–125. https://doi.org/10.1080/23735082.2019.1674907

Shackman, J. E., Shackman, A. J., & Pollak, S. D. (2007). Physical abuse amplifies attention to threat and increases anxiety in children. *Emotion, 7*(4), 838–852. https://doi.org/10.1037/1528-3542.7.4.838

Shields, G. S., Sazma, M. A., & Yonelinas, A. P. (2016). The effects of acute stress on core executive functions: A meta-analysis and comparison with cortisol. *Neuroscience and Biobehavioral Reviews, 68*, 651–668. https://doi.org/10.1016/j.neubiorev.2016.06.038

Shonkoff, J. P., & Bales, S. N. (2011). Science does not speak for itself: Translating child development research for the public and its policymakers. *Child Development, 82*(1), 17–32. https://doi.org/10.1111/j.1467-8624.2010.01538.x

Silvers, J. A., Lumian, D. S., Gabard-Durnam, L., Gee, D. G., Goff, B., Fareri, D. S., … Tottenham, N. (2016). Previous institutionalization is followed by broader amygdala-hippocampal-PFC network connectivity during aversive learning in human development. *The Journal of Neuroscience, 36*(24), 6420–6430. https://doi.org/10.1523/jneurosci.0038-16.2016

Sorce, J. F., & Emde, R. N. (1981). Mother's presence is not enough: Effect of emotional availability on infant exploration. *Developmental Psychology, 17*(6), 737–745. https://doi.org/10.1037/0012-1649.17.6.737

Sroufe, L. A., Egeland, B., Carlson, E. A., & Collins, W. A. (2005). Adaptation in the preschool period: The emergence of the coherent personality. In L. A. Sroufe, B. Egeland, E. A. Carlson, & W. A. Collins (Eds.), *The development of the person: The Minnesota of risk and adaptation from birth to adulthood* (pp. 121–147). Guilford Press.

Strandberg, T. E., Järvenpää, A. L., Vanhanen, H., & McKeigue, P. M. (2001). Birth outcome in relation to licorice consumption during pregnancy. *American Journal of Epidemiology, 153*(11), 1085–1088. https://doi.org/10.1093/aje/153.11.1085

Sullivan, R. M., & Perry, R. E. (2015). Mechanisms and functional implications of social buffering in infants: Lessons from animal models. *Social Neuroscience, 10*(5), 500–511. https://doi.org/10.1080/17470919.2015.1087425

Thijssen, S., Muetzel, R. L., Bakermans-Kranenburg, M. J., Jaddoe, V. W. V., Tiemeier, H., Verhulst, F. C., … van IJzendoorn, M. H. (2017). Insensitive parenting may accelerate the development of the amygdala–medial prefrontal cortex circuit. *Development and Psychopathology, 29*(2), 505–518. https://doi.org/10.1017/S0954579417000141

Thomas, A. W., Caporale, N., Wu, C., & Wilbrecht, L. (2016). Early maternal separation impacts cognitive flexibility at the age of first independence in mice. *Developmental Cognitive Neuroscience, 18*, 49–56. https://doi.org/10.1016/j.dcn.2015.09.005

Tsotsi, S., Borelli, J., Binte Abdulla, N., Tan, H. M., Sim, L. W., Sanmugam, S., … Rifkin-Graboi, A. (2018). Maternal sensitivity during infancy and the regulation of startle in preschoolers. *Attachment & Human Development, 22*, 207–224.

Uda, S., Matsui, M., Tanaka, C., Uematsu, A., Miura, K., Kawana, I., & Noguchi, K. (2015). Normal development of human brain white matter from infancy to early adulthood: A diffusion tensor imaging study. *Developmental Neuroscience, 37*(2), 182–194. https://doi.org/10.1159/000373885

Uematsu, A., Matsui, M., Tanaka, C., Takahashi, T., Noguchi, K., Suzuki, M., & Nishijo, H. (2012). Developmental trajectories of amygdala and hippocampus from infancy to early adulthood in healthy individuals. *PLoS One, 7*(10), e46970. https://doi.org/10.1371/journal.pone.0046970

UNESCO. (2018). *One in five children, adolescents, and youth is out of school*. (UIS/FS/2018/ED/48). Retrieved from http://uis.unesco.org/sites/default/files/documents/fs48-one-five-children-adolescents-youth-out-school-2018-en.pdf

Velderman, M. K., Bakermans-Kranenburg, M. J., Juffer, F., van IJzendoorn, M. H., Mangelsdorf, S. C., & Zevalkink, J. (2006). Preventing preschool externalizing behavior problems through

video-feedback intervention in infancy. *Infant Mental Health Journal, 27*(5), 466–493. https://doi.org/10.1002/imhj.20104

Webb, S. J. (2001). Mechanisms of postnatal neurobiological development: Implications for human development. *Developmental Neuropsychology, 19*(2), 147–171. https://doi.org/10.1207/S15326942DN1902_2

Werner, C. D., Linting, M., Vermeer, H. J., & Van, I. M. H. (2016). Do intervention programs in child care promote the quality of caregiver-child interactions? A meta-analysis of randomized controlled trials. *Prevention Science, 17*(2), 259–273. https://doi.org/10.1007/s11121-015-0602-7

Werner, C. D., Vermeer, H. J., Linting, M., & Van IJzendoorn, M. H. (2018). Video-feedback intervention in center-based child care: A randomized controlled trial. *Early Childhood Research Quarterly, 42*, 93–104. https://doi.org/10.1016/j.ecresq.2017.07.005

Wirth, M. M. (2015). Hormones, stress, and cognition: The effects of glucocorticoids and oxytocin on memory. *Adapt Human Behav Physiol, 1*(2), 177–201. https://doi.org/10.1007/s40750-014-0010-4

# Chapter 9
# Mindfulness in Early Childhood: Developing 21st Century Competencies

**Kiat Hui Khng** (ORCID)

**Abstract** Mindfulness-based programs and techniques have become some of the most examined and validated prevention/intervention approaches. With the rising movement on holistic education, they are increasingly being used in schools around the world, including in Singapore, to support the development of socio-emotional competencies and cognitive, emotional, and behavioral self-regulation in students. These skills underlie the "21st Century Competencies" regarded to be important for children to survive and thrive in a fast-changing world. This chapter begins with an introduction to mindfulness and how it can be cultivated in young children. This is followed by a discussion of how mindfulness-based practices can foster self-regulation and socio-emotional competencies underlying 21st century skills and how mindfulness in teachers/teaching and parents/parenting can also influence child outcomes. The chapter concludes with a section on recommendations and implications for policy and practice, including a brief discussion of mindfulness in the local school settings and the need for future studies examining systems-level approaches involving teachers and parents.

**Keywords** Early childhood · Mindfulness · 21st century skills · Socio-emotional competencies · Self-regulation · Teaching · Parenting

A major purpose of education is to equip children with knowledge and skills to survive and thrive in the world. One of the goals of Singapore's education system is to develop our children to be future-ready individuals equipped with competencies to thrive in a fast-changing world driven by forces such as globalization and changing demographics. These "21st Century Competencies" (21CC) are defined as comprising critical and inventive thinking, civic literacy, global awareness and

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cross-cultural skills, and communication, collaboration, and information skills. Underlying these emergent skills are proposed to be the core values of integrity, respect, care, resilience, responsibility, and harmony, as well as the social emotional competencies of self-awareness, self-management, responsible decision-making, relationship management, and social awareness (www.moe.gov.sg). Along with the Ministry of Education's policy initiatives toward this purpose, schools are integrating the cultivation of 21CC both within core academic disciplines and additionally with various co-curricular activities and programs. A particular type of program showing great potential in contributing toward these outcomes is mindfulness-based programs, increasingly being used in schools around the world to support the development of socio-emotional competencies and attentional, emotional, and behavioral self-regulation in their students.

This chapter describes how cultivating mindfulness can contribute toward the development of 21CC in children from early childhood. The first section begins with an introduction to mindfulness and mindfulness programs for young children, followed by a discussion of how it relates to developing 21CC in children. The next section describes how mindfulness in the child's environment, that is, in teachers/teaching and parents/parenting, can also influence child outcomes. The last section presents recommendations for policy and practice relevant to the provision of home and school environments that will be conducive for children's development of these competencies.

## 9.1 Mindfulness and Direct Mindfulness-Based Training for Young Children

With rising recognition of the importance of holistic development and the need to equip children with future-ready skills, schools—including preschools and kindergartens—worldwide are increasingly incorporating mindfulness-based practices in varying degrees to support the development of competencies such as socio-emotional skills (e.g., resilience and self and social awareness), emotional and behavioral self-regulation (e.g., anger management, anxiety, and stress), cognitive regulation (e.g., attention and executive functioning), and academic achievement in students (see, e.g., Bender, Roth, Zielenski, Longo, & Chermak, 2018; Khng, 2018; Semple et al., 2017). For instance, the US-based Mindful Schools program is a school-based mindfulness training curriculum for children from kindergarten to grade 12 that has reportedly been used in states throughout the USA and in more than a hundred countries worldwide (http://www.mindfulschools.org).

Although the adoption of mindfulness-based programs/practices in Singapore schools has been slower and less widespread compared to countries such as the UK, Australia, and the USA, there is rising interest in understanding how mindfulness can be applied to help with the holistic development of and to improve outcomes in children (Khng, 2018). An article in the national newspaper reported that, as of 2017, no less than ten schools (primary and secondary) have introduced some form of mindfulness-based practice into their schools (Toh, 2017a, b). A growing number

of preschools in Singapore have also begun to incorporate mindfulness in their curriculum (e.g., "Preschools with Mindfulness Programmes," n.d.). This is in addition to "older" existing early childhood education curricula such as the Montessori, which includes practices for young children that align with mindfulness (Lillard, 2011).

What exactly is mindfulness and how can it be cultivated in young children? How can cultivating mindfulness contribute toward the development of 21CC in young children?

### 9.1.1  Mindfulness

Several conceptualizations of mindfulness exist, but mindfulness generally refers to a quality of attention that is fully focused on the whole spectrum of the present moment's experience, in an open, curious, and non-judgmental manner (Kabat-Zinn, 2003). This quality or state of attention fosters an accepting, unbiased, and non-reactive awareness, which can contribute to cognitive, emotional, and behavioral self-regulation by allowing for reflective responding instead of reflexive reacting (see, e.g., Chiesa et al., 2011), as well as facilitating self- and other-compassion. The attitude of acceptance encouraged in mindfulness is not one of passive resignation, but an openness to and acknowledgement of one's current experience as it is—even if it may involve unpleasantness or difficulty (Creswell, 2017). In the same way, even though there is an element of nonattachment or "decentering" (see, e.g., Bernstein et al., 2015) arising from the attitude of openness and non-biasedness, it is not a denial, rejection, nor turning away from life or its experiences, but, rather, an openness to fully experience them. As it refers to a certain quality of attention or way of paying attention, mindfulness is a natural, inherent quality in everyone. That is, everyone naturally pays attention in a more or less mindful manner. A popular conceptualization of mindfulness comprises facets such as observing (i.e., noticing or paying attention to sensations/feelings/thoughts/perceptions), describing (i.e., labeling inner experience with words), non-judging of experience, non-reactivity to inner experience, and acting with awareness (Five-Facet Mindfulness Questionnaire, FFMQ; Baer et al., 2006). A more mindful individual may thus be more likely to "pay attention to sensations, such as the wind in my hair or sun on my face" ("observing") and be less likely to "do jobs or tasks automatically without being aware of what I'm doing" ("acting with awareness").

One's ability to operate in a mindful state of attention and awareness can be enhanced with mindfulness-based practices—predominantly sensory-based, mind-body integrative practices. Most mindfulness-based practices involve the direction of one's attention to an object of focus (e.g., the physical sensations of one's breathing) and sustaining that attention in an open, curious, and non-judgmental manner. Paying attention fully on the present moment's focus necessitates not engaging with other distractions or thoughts that may arise (such as attaching the present moment's experience to past memories or onto future expectancies). This involves noticing

when attention has shifted away to these thoughts/distractions and gently, without judgment (e.g., feeling bad that one has "failed" to maintain attention), directing attention back to the object of focus (e.g., sensations of the breath). Commonly used mindfulness-based practices include exercises such as mindful breathing, mindful eating, mindful listening, mindful walking, or mindful movement, in which one's attention is directed to the sensations of one's breathing or to environmental sounds—basically the present-moment sensations from any activity such as walking and eating—and redirecting one's attention back to the object(s) of focus whenever the mind wanders. Body scan is also often practiced, where one sweeps one's attention over the various parts of the body (e.g., from the tip of the toes to the top of the head), noticing and being aware of the sensations experienced in each part of the body. Mindfulness programs sometimes also include explicit practices targeted at self- and other-compassion (e.g., sending kind thoughts to the self or others). Other than such formal mindfulness-based practices, once acquainted with the technique, one can also engage in informal mindfulness practice by applying mindful attention to one's activities and interactions in everyday life (Meiklejohn et al., 2012).

### 9.1.2   Mindfulness Programs for Young Children

Mindfulness-based practices were introduced to the clinical setting by Dr. Jon Kabat-Zinn in the late 1970s with the 8-week mindfulness-based stress reduction (MBSR) program, initially developed to teach present-moment attention as a self-regulatory tool for chronic pain management (Kabat-Zinn, 1982). Since MBSR, many variants have been developed for various applications, including mindfulness programs for schools and young children. Mindfulness-based programs for children are predominantly based on the MBSR, involving similar exercises such as mindful breathing, listening, eating, walking/movement, and caring and kindness practices, though they typically comprise more age-appropriate adaptations and movement-based activities, and are of shorter durations. Instruction and exercises for very young children often make use of things children are familiar with to make them fun and engaging. For example, "Sitting Still Like a Frog" (Snel et al., 2013) uses a simple story about a frog to teach children from the age of 5 stillness and mindful attention in a sitting practice and the analogy of firm, uncooked versus soft, cooked spaghetti ("The Spaghetti Test") to teach children body awareness and relaxation. The CalmSpace program (Janz et al., 2019) similarly uses a children's story with familiar analogies ("Mindful Monkey, Happy Panda"; Alderfer & MacLean, 2011, in Janz et al., 2019) to introduce the concept of mindfulness to young children. Mindfulness activities are given fun labels such as "balloon belly breathing," "rainbow walk," and "glitter jar." In "glitter jar," for example, children make their own glitter jars, which are then used to help them practice focused attention and controlled breathing as they watch the glitter settle—just as their calm breathing helps settle their busy minds. The jars are also used to help children express, and for others to understand, how they may be feeling at a point in time.

Different mindfulness-based programs for children vary in their specific structure and content, though all will include most, if not all, the core mindfulness-based practices previously described (for a description and review of several K–12 programs, see Semple et al., 2017). Examples of manualized, school-based, full-mindfulness curricula include Mindful Schools (for K–12 students) and ".b" from the UK (for 7–18-year-olds; http://mindfulnessinschools.org/)—two widely used programs that have also been used in Singapore (Khng, 2018). Other curricula such as the Montessori early childhood curriculum (Lillard, 2011), Promoting Alternative Thinking Strategies (*PATHS®*; for PreK–6; http://www.pathstraining.com/), MindUP (for PreK–8; https://mindup.org/), and Social, Emotional, and Ethical Learning (SEE Learning; for K–12; https://seelearning.emory.edu) programs, among others, also incorporate mindful-attention practices.

In the school setting, selective mindfulness-based practices are sometimes practiced in an ad hoc fashion or are combined with or incorporated into broader positive psychology and social and emotional learning (SEL) or executive functioning training programs/interventions (see Felver et al., 2016; Khng, 2018; Maynard et al., 2017; Meiklejohn et al., 2012; Semple et al., 2017; Zenner et al., 2014). For instance, the SEE Learning program, recently developed at Emory University, combines best practices from SEL programs with mindfulness and other evidence-based techniques to include components such as attention training and the cultivation of self- and other-compassion, resilience, and non-sectarian ethics. The MindUP curriculum is informed by research in mindfulness, contemplative science, developmental neuroscience, SEL, and positive psychology (Schonert-Reichl et al., 2015).

Many of these mindfulness (and mindfulness incorporated) programs for children extend into the preschool or kindergarten age range, with similar curricula adapted to suit the different age groups. For example, Mindful Schools has a K–5 curriculum (ages 5–12) and a grade 6–12 curriculum (ages 12–17), while the *PATHS®* curriculum has separate grade-specific classroom kits for PreK/Kindergarten (from age 3), Grade 1, Grade 2, Grade 3, Grade 4, and Grade 5/6. To illustrate what a mindfulness-based program for early childhood education may look like, a sample implementation of the MindUP program for PreK/Kindergarten children, described in a study by Thierry, Bryant, Nobles, and Norris (2016), is briefly summarized here. Fifteen mindfulness-based lessons of approximately 20–30 min each were taught over the children's prekindergarten year. The first nine lessons focused on building the children's self-awareness and self-regulation skills. In the first lesson, children learned about parts of the brain involved in attention, learning, and emotional regulation and how what they think and feel can affect their brain and behavior. The second lesson introduced children to the concept of mindfulness (vs. mindlessness). Children learned how to focus their attention, using mindful listening and mindful breathing exercises in the third lesson, and learned to apply this mindful attention to their other senses in the subsequent six lessons (i.e., mindful seeing, listening, tasting, smelling, and movement). In the lesson on mindful seeing, for example, children practiced focusing their visual attention on an external object and described its visual details, as well as the importance of paying attention to detail. Mindful movement spanned two lessons, in which children practiced focusing their attention on the internal sensations of their

body, describing the signals their bodies gave them under different emotional states (e.g., excitement and nervousness), practicing mindful movement activities, and describing/discussing how the experience differed (from their regular way of moving). The remaining six lessons focused on building students' relationship skills, such as perspective taking, optimism, happiness, acts of kindness, and gratitude. Children also discuss how they can make a positive difference with mindful choices and actions. In addition to these lessons, children practiced deep breathing with mindful-focused listening (e.g., sound of a chime) three times a day, starting with short practices (~30s) and gradually progressing to longer practices (~60s). In Thierry et al.'s (2016) study, the children continued with the daily mindful breathing practice over the kindergarten year.

Building on previous studies and curricula, a mindfulness-based program, "Mini-Mind," specifically for preschool-aged children was recently developed and piloted (Wood et al., 2018). Mini-Mind is a 6-week program comprising 12 sessions of 25 minutes each, with mindful breathing, yoga, and compassionate activities in each session. Similar to other implementations for young children, the program utilizes interactive and concrete activities to help children develop mindful attention and awareness via sight, sound, taste, touch, smell, movement, emotions, and loving-kindness. Each lesson has a specific focus, with suggested home practices for parents and children based on the week's focus. Activities such as "rainbow challenge" and "glitter jar" are also used in this program (for details, see Wood et al., 2018). The program was trialed in a randomized controlled pilot on 12 children (with a control group of 15 children) attending preschool and prekindergarten in a university campus-based center in the USA. Although the study found mostly nonsignificant, small-to-medium effects of the intervention on teachers' blind ratings of the children's executive functioning (and no effect on social skills), this may be due to the low power to detect significant effects in the small sample. Nevertheless, the program was rated as highly feasible and acceptable by the children, parents, teachers, and facilitators. Future studies could examine the effects of the program with a larger sample and psychometrically validated instruments.

### 9.1.3 Studied Effects of Mindfulness Training in Young Children

An exponentially expanding body of research is fast making mindfulness-based interventions one of the most scrutinized classes of interventions (see, e.g., Van Dam et al., 2018). Although most studies examining the effects of mindfulness-based training in childhood have focused on older children, a handful of studies focused on preschool-aged children. This includes a study conducted with preschoolers in Singapore that found a single 15-min session of mindfulness practice to enhance their attentional control, relative to an active control group. The single session, comprising 5 minutes each of mindful breathing, listening, and movement,

reduced perceptual processing biases (attentional bias) in 4- to 6-year-old children (Lim & Qu, 2017). Other studies outside of Singapore have examined the effects of longer-term, school-based mindfulness practice in early childhood education settings. Most examined effects on children's executive functions (EF) and socio-emotional skills—competencies hypothesized to be enhanced by mindfulness training (discussed in greater detail in the next section). Evaluating benefits for socioeconomically disadvantaged or at-risk children is also often of interest.

The pilot evaluation of Mini-Mind was reported in the previous section. In another study, young children (preparatory/kindergarten to grade 2) in a low social economic region of Australia receiving the CalmSpace mindfulness program over two terms were found to show improved executive functioning (attention and cognitive flexibility), and teacher-reported behavioral and emotional regulation (e.g., conduct problems and hyperactivity/attention and emotional symptoms), relative to a waitlist control group (Janz et al., 2019). Zelazo, Forston, Masten, and Carlson (2018) examined immediate and delayed effects of a 6-week, daily, small group pull-out mindfulness-combined-with-reflection-training intervention for low-income preschoolers in two US cities, comparing their gains in EF, literacy, and theory of mind against an active control (an established pre-literacy training program) and a passive control group (business-as-usual). Only the mindfulness-reflection-training group significantly outperformed the passive control group on EF at delayed post-test, though their gains were not significantly larger than that of active controls. Gains in EF were the most obvious when comparing children's relative standing in the combined groups: the mindfulness-and-reflection group showed a continuous upward climb from pretest through to delayed follow-up, while the passive control group continuously declined, and the active control group remained relatively stable (around the mean). It was suggested that the intervention shows promise for improving EF skills in low-income preschool children, though effects may take some time to become apparent.

Similarly, the study by Thierry et al. (2016) found additional gains in the longer term for low-income minority children who learned and practiced the MindUP program over the prekindergarten year and continued with daily mindful breathing practice over their kindergarten year (described in the previous section). By the end of prekindergarten, the children showed improvements in executive functioning related to working memory and planning and organization, while students in a comparable control group declined in these skills. By the end of their kindergarten year, MindUP children showed higher reading scores and vocabulary than controls. It should be noted that the business-as-usual curriculum given to the control group in Thierry et al.'s (2016) study also included support for children's self-regulation, such as an organized and positive classroom environment, and activities to promote students' perspective-taking and emotional understanding—lacking mainly the mindfulness component given to the MindUP group. Corroborating with Zelazo et al. (2018), Thierry et al.'s (2016) findings suggest that some benefits of mindfulness practice (e.g., academic gains) may only be observed with longer-term practice.

In addition, findings from some studies suggest that mindfulness-based training may benefit some young children more than others: specifically, children with poorer starting states. For example, in a randomized controlled study, Flook,

Goldberg, Pinger, and Davidson (2015) found a 12-week mindfulness-based kindness curriculum to promote self-regulation and prosocial behavior in preschoolers, with larger improvements in social competence for children who started with poorer social competence and EF. Another quasi-experimental controlled study with children aged 3 to 5 showed similar findings: a yearlong mindfulness-based yoga intervention improved targeted self-regulatory skills (attention, inhibitory control, and delay of gratification), with evidence suggesting larger benefits for children with poorer starting status (Razza et al., 2015).

Though studies focused on very young children are limited, reviews of studies examining the effects of school-based mindfulness programs for children in general report cognitive, psychological, and social benefits, including improvements in cognitive performance (e.g., attention, academic performance, creativity, and mind wandering), stress and coping, resilience, and well-being (e.g., affect, self-concept, self-esteem, and social and relationship skills) (for reviews, see Felver et al., 2016; Maynard et al., 2017; Meiklejohn et al., 2012; Zenner et al., 2014). Although substantial variabilities in program content and delivery, dosage, and measured effects are noted, reviews suggest the effects of mindfulness-based training in primary and secondary school students to be generally consistent despite variations in implementation across studies (Maynard et al., 2017). Thus, across a range of cultural contexts and age groups, mindfulness training appears efficacious in impacting positive cognitive and socio-emotional outcomes for children. Notably, important factors that may moderate or accentuate effects include children's incoming "state," socioeconomic background, and length of practice. This section included an overview of what mindfulness is and how it can be cultivated in young children. The next section addresses how mindfulness can cultivate 21CC in children.

### 9.1.4  From the Inside Out: Mindfulness and 21st Century Child Outcomes

It has been said that "mindfulness practice enhances the very qualities and goals of education in the 21st century," including "not only attentional and emotional self-regulation, but also prosocial dispositions such as empathy and compassion, self-representations, ethical sensitivity, creativity, and problem solving skills," and "enable children to deal with future challenges of the rapidly changing world" (Zenner et al., 2014, p. 2). Although both SEL and mindfulness-based programs can foster socio-emotional competencies, one fundamental difference between the approaches is that, while SEL (and many other intervention/prevention support programs) teach skills "from the outside in," mindfulness-based approaches teach skills "from the inside out" (Semple et al., 2017).

A core mechanism of change in mindfulness practice is attentional regulation. As William James wrote in *The Principles of Psychology*:

the faculty of voluntarily bringing back a wandering attention, over and over again, is the very root of judgment, character, and will. No one is *compos sui* if he have it not. An education which should improve this faculty would be *the* education *par excellence*. But it is easier to define this ideal than to give practical directions for bringing it about. (James, 1890/1950, p. 424)

James argued that the mark of a superior education would be its ability to enhance students' capacity to regulate/control their attention. Indeed, we often demand that children and students pay attention, but rarely, if ever, do we teach them how to do so, likewise with demands for their self-regulation, particularly of their emotions and behavior. Back in 1890, James admitted that we do not quite know how we can go about instructing or training children/students to harness their wandering attention. But with the introduction of formalized mindfulness-based practices in MBSR, we actually do.

With its emphasis on the repeated practice of direction and redirection of attention, sustaining attentional focus, and awareness/monitoring of attentional drifts, mindfulness-based practices have also been described as mindful attention training (e.g., Desbordes et al., 2012). Importantly, what is being trained or strengthened is one's ability to regulate one's attention or the voluntary control over one's attention. Attentional regulation is intimately related to executive functioning—prefrontal lobe, top-down cognitive control functions that are involved in higher-order competencies such as problem-solving, reasoning, and planning. Likened to an air traffic control system, EF supports adaptive, goal-directed behaviors with its primary groups of functions: working memory (updating and monitoring of information), shifting (metal set shifting; switching or cognitive flexibility), and inhibition (resisting impulses or other inappropriate, prepotent response tendencies or interference from irrelevant information) (Diamond, 2013; Miyake et al., 2000).

Executive functions are essential for the self-regulation of emotions, thoughts, and actions and underlie a wide range of skills and behaviors on all levels ranging from acquiring a motor schema like driving; staying focused and engaged in a task; resisting distractions, temptations, and habitual reactions; and regulating stress and affect, sustained play, and interpersonal relations to physical and mental well-being (Diamond, 2013). Self-regulation is often also studied as self-control and other related constructs (Moffitt et al., 2011) and has been regarded "a key to success in life" (Baumeister et al., 2002, p.117). Early measures of self-regulatory skills have been found to be even more predictive of later outcomes—such as achievement, health, and quality of life—than socioeconomic status or intelligence (e.g., Moffitt et al., 2011). Neurodevelopmental disorders, such as attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorder (ASD), and learning disorders, such as in language and mathematics, are often associated with EF deficits (Gathercole et al., 2006; Geary, 2003). Executive functions have been found to be important for school readiness, more than IQ or entry-level reading or math, and to predict success in various outcomes from preschool through to university (see, e.g., Diamond & Ling, 2016), including in terms of social functioning (e.g., Diamantopoulou et al., 2007) and moral development (Kochanska et al., 1997).

Executive functions are repeatedly exercised during mindful attention training: sustaining attentional focus requires goal maintenance and monitoring, inhibiting the allocation of attention to internal and external distractors, and, when distracted, shifting attention back to the object of focus. Improvement in EF is frequently documented in studies of mindfulness programs/interventions (see reviews, e.g., Chiesa et al., 2011; Diamond & Ling, 2016; Maynard et al., 2017; Meiklejohn et al., 2012) and is regarded an efficacious approach (with sufficient practice) for enhancing EF (Diamond & Ling, 2016). Findings of enhanced neural connectivity between bottom-up sensory networks and top-down cognitive control following 8 weeks of mindful attention training in adults suggest an enhanced regulatory system on the brain-based level (Kilpatrick et al., 2011).

What one pays attention to, and how, has important implications for subsequent perception and action, influencing thoughts, emotions, and behavior; "each of us literally *chooses*, by his ways of attending to things, what sort of a universe he shall appear to himself to inhabit" (James, 1890/1950, p. 424). For example, for learning to occur during a classroom lesson, or for contents of a lesson to be processed for retention in memory, one needs to first pay (and sustain) attention (on) to the material to be learned; for a person (e.g., a teacher) to be able to help another (e.g., a child), one needs to first pay attention to the other in order to notice or be aware that help is required; likewise, emotional and behavioral self-regulation requires being able to notice one's inner experience—thoughts, physiological sensations, and emotions—as they arise. Attention is thus also an important first step in self- and other-awareness, emotional and behavioral self-regulation, and self- and other-compassion (you cannot be compassionate toward something that you do not "see"!).

In mindfulness practice, one is also practicing how one pays attention—that is, the quality and attitude of openness and curiosity, non-judgment, and acceptance (non-reactivity). Most of us do not typically pay attention in an open and non-judgmental way. Our attention and perception is often guided/biased by top-down influences, such as expectancies about the future, for example, arising from contexts or motivation, or experiences from the past, including our knowledge and beliefs about the world (i.e., preconceptions). In other words, we tend to see things not as they are, but as we are (for a more extensive discussion, see Khng, 2017). With the aid of top-down inferences, we often do not need to pay full attention to what we are attending to as our brains are capable of making perceptual *judgments* and *reacting* by triggering established schemas (i.e., automatized scripts for action) based on just partial cues. Granted, this allows for efficiency and quick reactions. However, it can also lead to perceptual sets—prepotent or automatic tendencies to perceive a stimulus in a particular way (Bernstein, 2011), resulting in thoughts, emotions, and behaviors that are tied to one's biases, prejudice, fears/anxieties, or expectations, and reflexive (over)reactions rather than more considered responses based on a full (open, curious, and accepting) experience of what is presently occurring.

As Kabat-Zinn (2003, p. 148) describes, our experience tends to be "severely edited and often distorted through the routinized, habitual, and *unexamined* [emphasis added] activity of our thoughts and emotions, often involving significant alienation from direct experience of the sensory world and the body," while mindfulness

is "an invitation to know the inner and outer landscape of the *direct experience* [emphasis added] in each moment." A major element of mindfulness practice is noticing and observing, not just the experience of our current actions/activity but also the emotions and thoughts that arise. Being aware of how our own fears/biases/ expectations are influencing our thoughts/emotions/actions inserts a space between stimulus and response, allowing for responding in a more appropriate, balanced, or calm manner. This, together with the attitudes of openness, curiosity, non-judgment, and acceptance that is practiced in mindfulness-based practices, can contribute to self- and other-awareness and self- and other-compassion, emotional and behavioral regulation, cognitive flexibility, and intra- and interpersonal relationships and well-being and fosters curiosity and openness to experience.

Furthermore, in mindfulness practice, one is repeatedly experiencing that one can always start over again, without blaming or judging ourselves. In mindful breathing, for instance, when one notices that one has failed to maintain attentional focus on the sensations of the breath, one simply starts again, without admonishing the self for failing to sustain attention. And one will experience this many times over in a simple few minutes of practice. Realizing that we have the option and ability to begin again, without self-blame, can be very empowering. Being able to anchor one's attention back to what is right here, right now—for example, the sensations of the breath—in times of overwhelming emotions or thoughts is also a powerful emotion regulatory tool. These aspects of the practice together can contribute toward resiliency.

Following the maturation of and growth in connections among underlying brain regions, the development of EF and self-regulation begins in infancy, developing rapidly in early childhood and more gradually into adolescence and early adulthood (Diamond, 2002; Weintraub et al., 2013). Teaching and cultivating these "healthy habits of mind" (Bahnsen, 2013) in children from early childhood—when EFs supporting self-regulation are still rapidly developing—can help to build regulatory competencies that not only foster 21CC but also enhance children's ability to benefit from formal education. "Mindfulness can be understood as the foundation and basic pre-condition for education. Children need to learn to stop their mind wandering and regulate attention and emotions, to deal with feelings of frustration, and to self-motivate" (Zenner et al., 2014, p. 2).

The mindfulness approach, therefore, provides direction on teaching children the "how" of paying attention by focusing on skills development "from the inside out." The attentional regulation skills at the core of mindfulness training share an intimate interrelation with the child's executive control system. It is predominantly through this system that 21CC skills such as the self-regulation of one's prepotent responses and emotions and the other-awareness underlying prosocial development are believed to be cultivated. Yet, children do not develop in a vacuum. Beyond their own regulatory systems, children's outcomes are a reflection of their interactive environment, especially with the adults in their lives—teachers and parents. The next sections detail teacher/parent mindfulness and mindful teaching/parenting and how these can also influence child outcomes.

## 9.2    Mindfulness in the Child's Environment: Parents and Teachers

The influence of mindfulness on child outcomes is not restricted to the direct effects of mindfulness-based practices on the children who practice them. Research has also studied the effects of mindfulness in a child's environment on child functioning and development—specifically, mindfulness in parents and teachers. Mindfulness in parents/teachers can impact the children they interact with in similar ways.

Recall that mindfulness refers to a quality of attention that is fully focused on the whole spectrum of the present moment's experience, in an open, curious, and non-judgmental manner (Kabat-Zinn, 2003). The accepting and non-reactive awareness that results contributes to cognitive, emotional, and behavioral regulation by enabling one to respond reflectively rather than react reflexively and facilitates self- and other-compassion. This suggests that, compared to someone lower in dispositional mindfulness, a parent or teacher who is higher in dispositional mindfulness would be more present and attentive to a child, better able to observe/notice what the child is presenting (greater other-awareness), and doing so more accurately by maintaining an open, curious, and non-judgmental attitude that is facilitated by greater self-awareness and regulation of his/her own internal experience (e.g., frustration, biases) and then responding in a more sensitive and compassionate manner. At the same time, the effects of mindfulness practice on the self-regulation of negative emotionality, stress, and anxiety support parents'/teachers' well-being and resiliency, contributing to their ability to effectively function in the often stressful context of parenting/teaching. Furthermore, if we are trying to teach a child mindfulness skills, it can be especially important that mindfulness is also embodied in the child's influential caregivers—that is, parents and teachers—as children often learn through modeling adults' behaviors (Bandura & Walters, 1977; Ohene et al., 2006).

### 9.2.1    Mindfulness in Teachers

Meiklejohn et al. (2012) proposed that mindfulness can be incorporated into schools/education via directly training students in mindfulness skills (i.e., mindfulness-based practices/programs for children/adolescents) and/or indirectly via enhancing teachers' mindfulness—who then interact and teach with mindfulness attributes. Around the world, schools are increasingly introducing mindfulness-based practices/programs to teachers as part of their professional development to enhance their self-care, well-being, socio-emotional competencies, and the "qualities and dispositions … required to be a good teacher" (Frank et al., 2016, p. 156). These may be the standard MBSR program, or mindfulness-based programs developed specifically for teachers, such as the Cultivating Awareness and Resilience in Education (CARE for Teachers) professional development program designed to

help teachers' stress management and performance (Jennings et al., 2011). Although effects can vary across programs and studies, research findings generally suggest that mindfulness-based practices can improve cognitive, socio-emotional, and behavioral self-regulation. Benefits have been demonstrated in diverse outcomes ranging from increased empathy, self-compassion, and resilience, to reduced anxiety/stress, depression, and psychological distress, to improved attention and executive functions (for reviews, see, e.g., Chiesa et al., 2011; Creswell, 2017; Dunning et al., 2018; Keng et al., 2011; Meiklejohn et al., 2012).

### 9.2.1.1  Teacher Mindfulness Training Models

Jennings and Greenberg (2009) proposed with the *Prosocial Classroom Model* that teachers' social and emotional competence (SEC) and well-being are reflected in their classroom behavior, including their teaching and management style and interactions with students. Better teacher SEC and well-being are hypothesized to translate to healthy teacher-student relationships and effective classroom management and SEL implementation, contributing to a positive classroom climate, and eventually impacting students' emotional, social, and academic outcomes. It was proposed that teachers' SEC included mindfulness and that teachers' SEC and well-being can be enhanced by mindfulness-based training/practices (Jennings, 2016; Jennings & Greenberg, 2009).

Further logic models have explicitly highlighted how mindfulness training for teachers may lead to better student outcomes. Broadly, Roeser et al.'s (2013; see also Roeser et al., 2012) *Teacher mindfulness training logic model and theory of change* hypothesizes that, given program integrity and participant engagement, teacher programs (i.e., mindfulness training) enhances teacher skills and mindsets (i.e., mindfulness and self-compassion) leading to better teacher coping and resilience (i.e., stress, burnout, anxiety, depression, absenteeism) and better classroom outcomes (i.e., emotionally supportive climate, positive teacher-student relationships, and effective classroom management), which in turn lead to better student outcomes (i.e., sense of belonging, learning motivation and engagement, and prosocial classroom conduct)—some of which transact back into influencing classroom (i.e., relationships and climate)- and teacher-level variables (e.g., stress). Specific to the mindfulness-based CARE for Teachers program, Jennings' (2016) *CARE logic model* hypothesizes that an intervention program for K–12 teachers combining mindfulness/stress reduction practices, emotion skills learning, and caring and listening practices can influence students' socio-emotional and academic outcomes directly and indirectly via improving teacher mindfulness, well-being, efficacy, and classroom instructional and emotional support and organization.

Some support for the hypothesized links from teacher mindfulness to student outcomes have been found. For example, higher teachers' dispositional mindfulness have been found to be correlated with the higher levels of emotional support in the classroom and more supportive attitudes toward students with challenging behaviors (Jennings, 2015) and higher classroom emotional support and lower levels of

occupational burnout, job stress, and anxiety/depressive symptoms in teachers (Braun et al., 2019). It has been suggested that teachers' mindfulness may affect interactions with students in classroom directly and indirectly through reductions in burnout, which was negatively related to emotional support and classroom organization (Braun et al., 2019). Mindfulness-based training for teachers have been found to enhance classroom emotional support, and dispositional mindfulness, focused attention and working memory capacity, occupational self-compassion, and adaptive emotional regulation, and reduce burnout, occupational stress, and psychological distress in teachers (Jennings et al., 2017; Roeser et al., 2013).

### 9.2.1.2 Interpersonal Mindfulness: Mindful Teaching

In addition to dispositional mindfulness, which is largely *intrapersonal* in nature (i.e., focused more on one's own thoughts, feelings, and behavior), recent research has also started examining *interpersonal* mindfulness—that is, teacher mindfulness in the specific context of student-teacher interactions. Interpersonal mindfulness has been described as involving (1) listening to others with full attention; (2) present-centered awareness of emotions experienced by self and others during interactions; (3) openness, acceptance, and receptivity to others' thoughts and feelings; (4) self-regulation (including low emotional and behavioral reactivity and automaticity in responses to the behavior of others); and (5) self- and other-compassion (Duncan et al., 2009).

The Mindfulness in Teaching Scale (MTS), developed to reflect mindfulness in the context of school/teaching in K–12 teachers, for instance, was found to comprise an intrapersonal and an interpersonal mindfulness factor (Frank et al., 2016). Items on the scale relate to aspects such as teachers' attention during instruction and school activities, emotional awareness, self-regulation, and responsivity and sensitivity during interactions with students. Items reflecting intrapersonal mindfulness are similar to those on dispositional mindfulness scales such as the FFMQ, for example, "When I am teaching it seems I am running on automatic, without much awareness of what I am doing" or "When I'm really struggling with teaching, I tend to feel like other teachers must be having an easier time of it." Items reflecting interpersonal mindfulness relate specifically to teachers' awareness and regulation of their internal experience when interacting with students. For instance, "Even when it makes me uncomfortable, I allow my students to express their feelings"; "I listen carefully to my student's ideas, even when I disagree with them"; and "I am aware of how my moods affect the way I treat my students." Teacher interpersonal mindfulness correlated positively with teachers' sense of personal accomplishment, and self-efficacy in socio-emotional and behavior management, and negatively with depersonalization and emotional exhaustion (Frank et al., 2016). A similar two-factor structure was also found in Asian populations, with a Korean version of the MTS (MTS-K). Both intra- and interpersonal mindfulness correlated negatively with job stress and burnout and positively with dispositional mindfulness, teacher efficacy, and job satisfaction (Kim & Singh, 2018).

"Improving public education involves, in significant measure, the improvement of the quality of teaching and teachers' professional development" (Roeser et al., 2012). Though research in this field is still nascent, tools for measurement and teacher training programs are rapidly emerging and being developed and refined. A comprehensive, systematic investigation of how including teacher mindfulness training as a core component of teachers' professional development can eventually benefit child development and outcomes is in sight.

### 9.2.2  Mindfulness in Parents

Outside of school, parents can play a part in cultivating mindfulness in their children. This may be particularly relevant in early childhood, where a child spends more time at home or with their parents. For example, resources are available that teach mindfulness exercises for children (as young as age 5) and their parents (Snel et al., 2013). As previously described, some mindfulness programs for young children, such as Mini-Mind, also include suggested home practices for parents to practice with their children. Although most mindfulness programs for children start from around preschool age, parents of even younger children (and of any age) can foster positive outcomes for their children by cultivating mindfulness in themselves. With more present-moment awareness, parents can be expected to be more attentive to their children's emotions and behaviors, as well as to their own cognitive and emotional responses to those emotions and behaviors, during parent-child interactions. They should also be better able to regulate their own emotions that may arise in interactions with their children and to better cope with parenting stress, enabling them to adopt more responsive (less reactive) and effective parenting practices.

As with teacher mindfulness, recent research has shown higher parent mindfulness to be related to better parenting behavior, parental well-being, parent-child relationships, and child outcomes. For instance, parents with higher levels of dispositional mindfulness were found to be more attuned and responsive to their child's needs, mediated by lower levels of parenting stress (Campbell et al., 2017). Maternal mindfulness is also positively associated with better mother-child relationships (i.e., higher attachment, involvement, and parenting confidence; lower discipline practice and relational frustration), resulting in better child outcomes (lower emotional symptoms, conduct problems, hyperactivity, and peer problems; higher prosocial behavior) (Siu et al., 2016). Parental mindfulness can affect child outcomes even before birth: maternal mindfulness assessed during pregnancy was found to impact the child's later temperament and socio-emotional development, with higher mindfulness during pregnancy associated with less infant self-regulation problems and negative emotionality, mediated by maternal anxiety (Van den Heuvel et al., 2015).

### 9.2.2.1 Interpersonal Mindfulness: Mindful Parenting

In addition to parents' intrapersonal mindfulness (i.e., parent mindfulness), recent research also focused on parents' interpersonal mindfulness in the context of parenting (i.e., mindful parenting). Mindful parenting has been described as a present-centered, non-judgmental, and compassionate approach to parenting that features mindful awareness in everyday parent-child interactions (Bögels & Restifo, 2013; Duncan et al., 2009; Kabat-Zinn & Kabat-Zinn, 1997). According to Duncan et al.'s (2009) model of mindful parenting, parent-child relationships, and youth outcomes, mindful parenting involves dimensions such as listening with full attention to the child, emotional awareness and non-judgmental acceptance of self and child, self-regulation in parenting, and compassion for self and child. It is hypothesized that mindful parenting influences parental well-being (e.g., emotional health, psychological symptoms) and parenting attributes (e.g., communication, self-efficacy, realistic goals and expectations), which influence child management practices (e.g., reasoning, monitoring, and consistent discipline) and parent-child affective relationship (e.g., affect and responsiveness), which in turn influences youth outcomes (e.g., child well-being and self-regulation, substance use, and conduct problems).

Several scales have been developed to measure mindful parenting, mainly the Interpersonal Mindfulness in Parenting (IM-P) scale (Duncan, 2007; see also Coatsworth et al., 2010; Duncan et al., 2015) and the more recent Mindfulness In Parenting Questionnaire (MIPQ) (McCaffrey et al., 2017). The IM-P was initially used as a 10-item scale but later expanded to a fuller 31-item scale in a Dutch version to capture the five theoretical dimensions of mindful parenting in the Duncan et al. (2009) model (de Bruin et al., 2014). The larger scale has since been translated and validated in several languages and populations, including Portuguese (Moreira & Canavarro, 2017), Hong Kong Chinese (Lo et al., 2018), and Korean (Kim et al., 2018), and used with parents of children as young as 1 year to 18 years of age. Parent dispositional mindfulness and mindful parenting have been found to be correlated but distinct (de Bruin et al., 2014; Kim et al., 2018; Lo et al., 2018; McCaffrey et al., 2017).

Mindful parenting has been found to be related to parent well-being and parenting styles and practices, parent-child interactions/relationships, and child outcomes. More mindful parenting is associated with less parenting stress (e.g., Gouveia et al., 2016), higher involvement in childcare (MacDonald & Hastings, 2010), more adaptive parenting styles (e.g., more authoritative, less authoritarian, and permissive) (Gouveia et al., 2016; Williams & Wahler, 2010), more positive parenting practices and dyadic parent-child interactions (e.g., supportive communication, warmth and affection, positive reinforcement, autonomy-encouraging), and fewer negative parenting practices (e.g., hostility, coercive and ineffective discipline, and reactive and intrusive parenting) (e.g., de Bruin et al., 2014; Duncan et al., 2015; Parent et al., 2016). Mindful parenting is also associated negatively with anxiety and depressive symptoms in parents, and positively with child well-being, via more secure attachment (Medeiros et al., 2016).

Building upon the prior work by Bögels and Restifo (2013), Dumas (2005), Duncan et al. (2009), and Kabat-Zinn and Kabat-Zinn (1997), Parent et al. (2016) proposed and tested a theoretical process model of how parent dispositional mindfulness may influence youth psychosocial outcomes (i.e., internalizing/externalizing problems) via mindful parenting and parenting practices (i.e., positive/negative practices). It was found that across children of different age groups ranging from 3 to 17 years, higher parent mindfulness was consistently found to be related to lower child internalizing and externalizing problems, through higher mindful parenting and lower negative parenting practices. A recent study supported the hypothesis that higher parental dispositional mindfulness contributes to better emotion regulation in preschoolers via more mindful parenting and better parent-child attachment (Zhang et al., 2019).

Findings thus far suggest that enhancing either or both parent mindfulness and mindful parenting in parents could promote better child outcomes. While parent mindfulness can be enhanced with standard programs such as the MBSR, specific mindful parenting programs have also been developed. For instance, the mindful parenting program used in Bögels, Hellemans, van Deursen, Römer, and van der Meulen (2014) retains the basic structure and content of the MBSR and MBCT programs, but with added instructions and exercises for application to the specific context of parenting and parenting activities; Coatsworth et al. (2010) infused mindfulness principles and mindful parenting practices to an existing parenting program. Both studies concluded that there were added benefits compared to the standard parenting programs. Although research on mindful parenting interventions is still nascent, some evidence suggests positive intrapersonal changes, for example, in parent mindfulness and well-being (e.g., self-compassion, stress, negative mood, and anger management), and interpersonal changes in parenting (e.g., parent-child interactions, discipline practices, empathic concern, and family functioning), as well as child well-being outcomes (e.g., internalizing and externalizing psychopathology symptoms) (see Benn et al., 2012; Bögels et al., 2014; Coatsworth et al., 2015; Van der Oord et al., 2012). In children with ASD and other developmental disabilities, mindful parenting intervention—often conducted together with mindfulness-based intervention for the child—shows promise for improving child outcomes such as decreased aggression, noncompliance, self-injury, and increased social skills (Singh et al., 2006, 2007).

## 9.3  Implications and Recommendations for Policy and Practice

How can we better harness mindfulness-based practices to help our children develop self-regulation and 21CC? Let us take a brief look at where we are now, in providing opportunities for direct child mindfulness training in schools, the state of mindfulness in teachers and parents, and where we can go from here.

### 9.3.1  Mindfulness in Singapore: Schools and Parents

A number of schools in Singapore have started adopting mindfulness-based programs or practices in the recent years, reporting (largely anecdotally) benefits such as improved attentional focus, alertness, and calmness in students (Khng, 2018; Toh, 2017a, b). Varying degrees of adoption range from full standardized mindfulness programs as part of the core curriculum for all students, to the incorporation of piecemeal practices such as mindful breathing/listening during recess or in between classes, to selective practices incorporated as part of larger positive psychology/education or SEL programs. Short-term workshops or program implementations are usually led by mindfulness facilitators external to the school, while selective/piecemeal practices integrated into regular classes are often conducted by school teachers. Some schools have teachers or counsellors with a more extensive background in mindfulness and are certified facilitators of the mindfulness programs they teach in their schools. This variability is similar to that reported in other parts of the world. Although most of these schools are primary level and above, some of these are international schools with programs extending down to children in the preschool/kindergarten years (Khng, 2018). As earlier described, some preschools in Singapore also offer curricula that include mindfulness-based practices.

Although school-based implementations of mindfulness-based training have yet to be evaluated in Singapore preschools (other than the brief, single session in Lim & Qu, 2017), a 15-week school-based Mindful Schools intervention for at-risk early adolescents and a .b program for older adolescents have been piloted in Singapore schools and show promise (see Khng, 2018). Many of these schools in Singapore also offer some form of mindfulness training or exposure for their teachers, from engaging external vendors to conduct mindfulness introductory talks or workshops for staff to foundation or full courses (e.g., .b or MBSR). Little is known about the state of mindfulness in parents in Singapore. There appear to be no known studies in the local setting on the effects of teacher or parent mindfulness on child outcomes.

### 9.3.2  Going Forward

Though future studies assessing effects are warranted, it is believed that a "systems approach," where mindfulness is practiced by not just the child but also stakeholders in the child's environment, is likely to be the most effective in cultivating mindfulness and its benefits (Roeser et al., 2012).

Parents can start with cultivating mindfulness in themselves. Mindfulness programs such as the MBSR are available in Singapore via various organizations with certified instructors, including in established universities. Courses designed specifically for mindful parenting are also available. These personal development courses are eligible for subsidized rates under the Singapore government's workforce development scheme to encourage skills upgrading in citizens (i.e., SkillsFuture Credit).

Mindfulness-based courses listed on the SkillsFuture portal (at the time of writing) include the MBSR, a mindful grandparenting course (both available in English/Mandarin), and a mindfulness-incorporated course for parents/teachers working with children/adolescents with ADHD. Parents of children in schools with mindfulness practice can also reinforce the school practices by practicing the exercises at home with their children. Toh's (2017a) news article on mindfulness in Singapore schools quoted a parent who was inspired to start practicing mindfulness at home with her children and became more mindful of her own behavior after her child learned mindful breathing in school. Mindfulness in children is also positively impacting their parents! Regardless of whether the child's school practices mindfulness, parents can also practice simple mindfulness activities with their children (for activities, see Snel et al., 2013; Toh, 2017a).

As highlighted by Roeser et al. (2012) and Frank et al. (2016), there is increasing interest in incorporating mindfulness-based approaches into teacher professional development. Learning about mindfulness and its place in education could become a part of teacher preparation and training for preservice teachers and continuing professional development for in-service teachers. Schools can provide support for cultivating mindfulness in teachers and in children both directly and indirectly via mindfulness in teachers. Teacher mindfulness can be supported with programs available here, such as the MBSR. Local vendors are also available to teach school-based mindfulness programs for children such as Mindful Schools and .b. There are many more mindfulness-based school curricula suitable for early childhood settings that can be adopted, some of which were described earlier. Of particular interest may be integrated programs designed for a system-wide implementation. For instance, the Mindfulness and Mind-Body Skills for Children (MMBS), supported by the Israeli Ministry of Education, is a "whole-school curriculum" that trains and supports preschool teachers (with continual, monthly training) to teach formal mindfulness practices to students and integrate informal mindfulness practices into daily classroom activities and interactions with children, provides appropriate facilities and equipment, and includes workshops for other school staff and parents to "extend the culture of mindfulness to the entire school community" (Semple et al., 2017, p. 9).

Some schools in Singapore are already going in this direction. One primary school is particularly successful in infusing mindfulness into routines incorporated into staff and students' daily life at school to create a system-wide culture for enhancing self-regulation and awareness: time is set aside where students are instructed to and practice applying mindful attention to routine school activities such as reading and cleaning, in addition to formal mindfulness-based exercises such as mindful breathing, walking, and eating. In this school, mindful training is also given to teachers and staff, and mindful teaching and communication are emphasized. Another international school provides all staff with introductory in-service training in mindfulness, supports selected staff for further training, and offers optional mindfulness courses/activities to all staff, students, and parents. Introductory mindfulness sessions are included as part of students' Personal, Social,

Health, and Citizenship Education (see Khng, 2018). It may be worthwhile to study practices in these schools and their effects on child outcomes.

## 9.4   Conclusions

In this chapter, I discussed how mindfulness-based practices can contribute toward cultivating self-regulation and key socio-emotional competencies underlying 21CC skills in (but not limited to) children from early childhood. That mindfulness is a technique that cultivates these skills/competencies/qualities from the "inside out" is an especially welcomed approach to supplement the increasing amount of skills and knowledge that children already need to learn from the "outside in." The knowledge required to be learned to practice mindfulness is minimal—breathing, walking, eating, and listening—there is little new that needs to be learned except for the attitude to which we bring to these everyday activities. And then practice. Getting extensive practice is actually not difficult to achieve as the same attitude and way of paying attention can be applied to any everyday activity or interaction.

It has been said that it takes a village to raise a child. Developing healthy habits of mind is the easiest and most efficient when it starts in early childhood and is best achieved when the child grows up in an environment where such healthy habits of mind are also exhibited by peers and adults. Healthy habits of mind are beneficial not just to children but to any individual and extending to society as a whole. And it is never too late to start.

## References

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*(1), 27–45.

Bahnsen, M. (Writer) & M. Bahnsen (Director). (2013). *Healthy habits of mind*. Persona Films.

Bandura, A., & Walters, R. H. (1977). *Social learning theory* (Vol. 1). Prentice-hall.

Baumeister, R. F., Leith, K. P., Muraven, M., & Bratslavsky, E. (2002). Self-regulation as a key to success in life. In D. Pushkar, W. M. Bukowski, A. E. Schwartzman, D. M. Stack, & D. R. White (Eds.), *Improving competence across the lifespan: Building interventions based on theory and research* (pp. 117–132). Springer US.

Bender, S. L., Roth, R., Zielenski, A., Longo, Z., & Chermak, A. (2018). Prevalence of mindfulness literature and intervention in school psychology journals from 2006 to 2016. *Psychology in the Schools, 55*(6), 680-692.

Benn, R., Akiva, T., Arel, S., & Roeser, R. W. (2012). Mindfulness training effects for parents and educators of children with special needs. *Developmental Psychology, 48*(5), 1476.

Bernstein, D. A. (2011). Sensation and perception. In *Essentials of psychology* (5th ed., pp. 83–136). Wadsworth Cengage Learning.

Bernstein, A., Hadash, Y., Lichtash, Y., Tanay, G., Shepherd, K., & Fresco, D. M. (2015). Decentering and related constructs: A critical review and metacognitive processes model. *Perspectives on Psychological Science, 10*(5), 599–617.

Bögels, S., & Restifo, K. (2013). *Mindful parenting: A guide for mental health practitioners*. Springer-Verlag.

Bögels, S. M., Hellemans, J., van Deursen, S., Römer, M., & van der Meulen, R. (2014). Mindful parenting in mental health care: Effects on parental and child psychopathology, parental stress, parenting, coparenting, and marital functioning. *Mindfulness, 5*(5), 536–551. https://doi.org/10.1007/s12671-013-0209-7

Braun, S. S., Roeser, R. W., Mashburn, A. J., & Skinner, E. (2019). Middle school teachers' mindfulness, occupational health and well-being, and the quality of teacher-student interactions. *Mindfulness, 10*(2), 245–255. https://doi.org/10.1007/s12671-018-0968-2

Campbell, K., Thoburn, J. W., & Leonard, H. D. (2017). The mediating effects of stress on the relationship between mindfulness and parental responsiveness. *Couple and Family Psychology: Research and Practice, 6*(1), 48.

Chiesa, A., Calati, R., & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review, 31*(3), 449–464. https://doi.org/10.1016/j.cpr.2010.11.003

Coatsworth, J. D., Duncan, L. G., Greenberg, M. T., & Nix, R. L. (2010). Changing parent's mindfulness, child management skills and relationship quality with their youth: Results from a randomized pilot intervention trial. *Journal of Child and Family Studies, 19*(2), 203–217.

Coatsworth, J. D., Duncan, L. G., Nix, R. L., Greenberg, M. T., Gayles, J. G., Bamberger, K. T., … Demi, M. A. (2015). Integrating mindfulness with parent training: Effects of the mindfulness-enhanced strengthening families program. *Developmental Psychology, 51*(1), 26.

Creswell, J. D. (2017). Mindfulness interventions. *Annual Review of Psychology, 68*(1), 491–516. https://doi.org/10.1146/annurev-psych-042716-051139

de Bruin, E. I., Zijlstra, B. J. H., Geurtzen, N., van Zundert, R. M. P., van de Weijer-Bergsma, E., Hartman, E. E., … Bögels, S. M. (2014). Mindful parenting assessed further: Psychometric properties of the Dutch version of the Interpersonal Mindfulness in Parenting Scale (IM-P). *Mindfulness, 5*(2), 200–212. https://doi.org/10.1007/s12671-012-0168-4

Desbordes, G., Negi, L., Pace, T., Wallace, B., Raison, C., & Schwartz, E. (2012). Effects of mindful-attention and compassion meditation training on amygdala response to emotional stimuli in an ordinary, non-meditative state. *Frontiers in Human Neuroscience, 6*(292). https://doi.org/10.3389/fnhum.2012.00292

Diamantopoulou, S., Rydell, A.-M., Thorell, L. B., & Bohlin, G. (2007). Impact of executive functioning and symptoms of attention deficit hyperactivity disorder on children's peer relations and school performance. *Developmental Neuropsychology, 32*(1), 521–542.

Diamond, A. (2002). Normal development of prefrontal cortex from birth to young adulthood: Cognitive functions, anatomy, and biochemistry. In D. T. Stuss & R. T. Knight (Eds.), *Principles of frontal lobe function* (pp. 466–503). Oxford University Press.

Diamond, A. (2013). Executive functions. *Annual Review of Psychology, 64*(1), 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

Diamond, A., & Ling, D. S. (2016). Conclusions about interventions, programs, and approaches for improving executive functions that appear justified and those that, despite much hype, do not. *Developmental Cognitive Neuroscience, 18*, 34–48. https://doi.org/10.1016/j.dcn.2015.11.005

Dumas, J. E. (2005). Mindfulness-based parent training: Strategies to lessen the grip of automaticity in families with disruptive children. *Journal of Clinical Child and Adolescent Psychology, 34*(4), 779–791. https://doi.org/10.1207/s15374424jccp3404_20

Duncan, L. G. (2007). *Assessment of mindful parenting among parents of early adolescents: Development and validation of the Interpersonal Mindfulness in Parenting scale.* (Unpublished dissertation), The Pennsylvania State University.

Duncan, L. G., Coatsworth, J. D., & Greenberg, M. T. (2009). A model of mindful parenting: Implications for parent–child relationships and prevention research. *Clinical Child and Family Psychology Review, 12*(3), 255–270. https://doi.org/10.1007/s10567-009-0046-3

Duncan, L. G., Coatsworth, J. D., Gayles, J. G., Geier, M. H., & Greenberg, M. T. (2015). Can mindful parenting be observed? Relations between observational ratings of mother-youth

interactions and mothers' self-report mindful parenting. *Journal of Family Psychology, 29*(2), 276–282. https://doi.org/10.1037/a0038857

Dunning, D. L., Griffiths, K., Kuyken, W., Crane, C., Foulkes, L., Parker, J., & Dalgleish, T. (2018). Research review: The effects of mindfulness-based interventions on cognition and mental health in children and adolescents–a meta-analysis of randomized controlled trials. *Journal of Child Psychology and Psychiatry*.

Felver, J. C., Celis-de Hoyos, C. E., Tezanos, K., & Singh, N. N. (2016). A systematic review of mindfulness-based interventions for youth in school settings. *Mindfulness, 7*(1), 34–45. https://doi.org/10.1007/s12671-015-0389-4

Flook, L., Goldberg, S. B., Pinger, L., & Davidson, R. J. (2015). Promoting prosocial behavior and self-regulatory skills in preschool children through a mindfulness-based kindness curriculum. *Developmental Psychology, 51*(1), 44. https://doi.org/10.1037/a0038256

Frank, J. L., Jennings, P. A., & Greenberg, M. T. (2016). Validation of the mindfulness in teaching scale. *Mindfulness, 7*(1), 155–163. https://doi.org/10.1007/s12671-015-0461-0

Gathercole, S. E., Alloway, T. P., Willis, C., & Adams, A.-M. (2006). Working memory in children with reading disabilities. *Journal of Experimental Child Psychology, 93*(3), 265–281. https://doi.org/10.1016/j.jecp.2005.08.003

Geary, D. C. (2003). Learning disabilities in arithmetic: Problem-solving differences and cognitive deficits. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.), *Handbook of learning disabilities* (pp. 199–212). The Guilford Press.

Gouveia, M., Carona, C., Canavarro, M., & Moreira, H. (2016). Self-compassion and dispositional mindfulness are associated with parenting styles and parenting stress: The mediating role of mindful parenting. *Mindfulness, 7*(3), 700–712. https://doi.org/10.1007/s12671-016-0507-y

James, W. (1950). *Principles of psychology* (Vol. 1). Dover Publications. (Original work published 1890).

Janz, P., Dawe, S., & Wyllie, M. (2019). Mindfulness-based program embedded within the existing curriculum improves executive functioning and behavior in young children: A waitlist controlled trial. *Frontiers in Psychology, 10*(2052). https://doi.org/10.3389/fpsyg.2019.02052

Jennings, P. A. (2015). Early childhood teachers' well-being, mindfulness, and self-compassion in relation to classroom quality and attitudes towards challenging students. *Mindfulness, 6*(4), 732–743. https://doi.org/10.1007/s12671-014-0312-4

Jennings, P. A. (2016). CARE for teachers: A mindfulness-based approach to promoting teachers' social and emotional competence and well-being. In K. A. Schonert-Reichl & R. W. Roeser (Eds.), *Handbook of mindfulness in education: Integrating theory and research into practice* (pp. 133–148). Springer.

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

Jennings, P. A., Snowberg, K. E., Coccia, M. A., & Greenberg, M. T. (2011). Improving classroom learning environments by cultivating awareness and resilience in education (CARE): Results of two pilot studies. *The Journal of Classroom Interaction, 46*(1), 37–48.

Jennings, P. A., Brown, J. L., Frank, J. L., Doyle, S., Oh, Y., Davis, R., … Cham, H. (2017). Impacts of the CARE for Teachers program on teachers' social and emotional competence and classroom interactions. *Journal of Educational Psychology, 109*(7), 1010. https://doi.org/10.1037/edu0000187

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry, 4*(1), 33–47.

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice, 10*(2), 144–156. https://doi.org/10.1093/clipsy.bpg016

Kabat-Zinn, M., & Kabat-Zinn, J. (1997). *Everyday blessings: The inner work of mindful parenting*. Hyperion.

Keng, S.-L., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review, 31*(6), 1041–1056. https://doi.org/10.1016/j.cpr.2011.04.006

Khng, K. H. (2017). The importance of being upside-down. In M. Powietrzyńska & K. Tobin (Eds.), *Weaving complementary knowledge systems and mindfulness to educate a literate citizenry for sustainable and healthy lives* (pp. 253–263). SensePublishers.

Khng, K. H. (2018). Mindfulness in education: The case of Singapore. *Learning: Research and Practice, 4*(1), 52–65. https://doi.org/10.1080/23735082.2018.1428120

Kilpatrick, L. A., Suyenobu, B. Y., Smith, S. R., Bueller, J. A., Goodman, T., Creswell, J. D., … Naliboff, B. D. (2011). Impact of mindfulness-based stress reduction training on intrinsic brain connectivity. *NeuroImage, 56*(1), 290–298. https://doi.org/10.1016/j.neuroimage.2011.02.034

Kim, E., & Singh, N. N. (2018). Psychometric properties of the Korean version of the mindfulness in teaching scale. *Mindfulness, 9*(1), 344–351. https://doi.org/10.1007/s12671-017-0871-2

Kim, E., Krägeloh, C. U., Medvedev, O. N., Duncan, L. G., & Singh, N. N. (2018). Interpersonal Mindfulness in Parenting Scale: Testing the psychometric properties of a korean version. *Mindfulness*. https://doi.org/10.1007/s12671-018-0993-1.

Kochanska, G., Murray, K., & Coy, K. C. (1997). Inhibitory control as a contributor to conscience in childhood: From toddler to early school age. *Child Development, 68*(2), 263–277.

Lillard, A. (2011). Mindfulness practices in education: Montessori's approach. *Mindfulness, 2*(2), 78–85. https://doi.org/10.1007/s12671-011-0045-6

Lim, X., & Qu, L. (2017). The effect of single-session mindfulness training on preschool children's attentional control. *Mindfulness, 8*(2), 300–310. https://doi.org/10.1007/s12671-016-0600-2

Lo, H. H. M., Yeung, J. W. K., Duncan, L. G., Ma, Y., Siu, A. F. Y., Chan, S. K. C., … Ng, S. M. (2018). Validating of the interpersonal mindfulness in parenting scale in Hong Kong Chinese. *Mindfulness*, 1–12. https://doi.org/10.1007/s12671-017-0879-7

MacDonald, E. E., & Hastings, R. P. (2010). Mindful parenting and care involvement of fathers of children with intellectual disabilities. *Journal of Child and Family Studies, 19*(2), 236–240. https://doi.org/10.1007/s10826-008-9243-9

Maynard, B. R., Solis, M., Miller, V., & Brendel, K. E. (2017). Mindfulness-based interventions for improving cognition, academic achievement, behavior and socio-emotional functioning of primary and secondary students. *Campbell Systematic Reviews, 13*. https://doi.org/10.4073/csr.2017.5

McCaffrey, S., Reitman, D., & Black, R. (2017). Mindfulness In Parenting Questionnaire (MIPQ): Development and validation of a measure of mindful parenting. *Mindfulness, 8*(1), 232–246. https://doi.org/10.1007/s12671-016-0596-7

Medeiros, C., Gouveia, M. J., Canavarro, M. C., & Moreira, H. (2016). The indirect effect of the mindful parenting of mothers and fathers on the child's perceived well-being through the child's attachment to parents. *Mindfulness, 7*(4), 916–927.

Meiklejohn, J., Phillips, C., Freedman, M. L., Griffin, M. L., Biegel, G., Roach, A., … Saltzman, A. (2012). Integrating mindfulness training into K-12 education: Fostering the resilience of teachers and students. *Mindfulness, 3*(4), 291–307. https://doi.org/10.1007/s12671-012-0094-5

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology, 41*(1), 49–100. https://doi.org/10.1006/cogp.1999.0734

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., … 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

Moreira, H., & Canavarro, M. C. (2017). Psychometric properties of the interpersonal mindfulness in parenting scale in a sample of portuguese mothers. *Mindfulness, 8*(3), 691–706. https://doi.org/10.1007/s12671-016-0647-0

Ohene, S.-A., Ireland, M., McNeely, C., & Borowsky, I. W. (2006). Parental expectations, physical punishment, and violence among adolescents who score positive on a psychosocial screening test in primary care. *Pediatrics, 117*(2), 441–447. https://doi.org/10.1542/peds.2005-0421

Parent, J., McKee, L. G., Rough, J. N., & Forehand, R. (2016). The association of parent mindfulness with parenting and youth psychopathology across three developmental stages. *Journal of Abnormal Child Psychology, 44*(1), 191–202. https://doi.org/10.1007/s10802-015-9978-x

Preschools with Mindfulness Programmes. (n.d.). from https://thenewageparents.com/preschools-with-mindfulness-programmes-singapore/

Razza, R. A., Bergen-Cico, D., & Raymond, K. (2015). Enhancing preschoolers' self-regulation via mindful yoga. *Journal of Child and Family Studies, 24*(2), 372–385. https://doi.org/10.1007/s10826-013-9847-6

Roeser, R. W., Skinner, E., Beers, J., & Jennings, P. A. (2012). Mindfulness training and teachers' professional development: An emerging area of research and practice. *Child Development Perspectives, 6*(2), 167–173. https://doi.org/10.1111/j.1750-8606.2012.00238.x

Roeser, R. W., Schonert-Reichl, K. A., Jha, A., Cullen, M., Wallace, L., Wilensky, R., … Harrison, J. (2013). Mindfulness training and reductions in teacher stress and burnout: Results from two randomized, waitlist-control field trials. *Journal of Educational Psychology, 105*(3), 787. https://doi.org/10.1037/a0032093

Schonert-Reichl, K. A., Oberle, E., Lawlor, M. S., Abbott, D., Thomson, K., Oberlander, T. F., & Diamond, A. (2015). Enhancing cognitive and social–emotional development through a simple-to-administer mindfulness-based school program for elementary school children: A randomized controlled trial. *Developmental Psychology, 51*(1), 52. https://doi.org/10.1037/a0038454

Semple, R. J., Droutman, V., & Reid, B. A. (2017). Mindfulness goes to school: Things learned (so far) from research and real-world experiences. *Psychology in the Schools, 54*(1), 29–52. https://doi.org/10.1002/pits.21981

Singh, N. N., Lancioni, G. E., Winton, A. S., Fisher, B. C., Wahler, R. G., Mcaleavey, K., … Sabaawi, M. (2006). Mindful parenting decreases aggression, noncompliance, and self-injury in children with autism. *Journal of Emotional and Behavioral Disorders, 14*(3), 169–177.

Singh, N. N., Lancioni, G. E., Winton, A. S., Singh, J., Curtis, W. J., Wahler, R. G., & McAleavey, K. M. (2007). Mindful parenting decreases aggression and increases social behavior in children with developmental disabilities. *Behavior Modification, 31*(6), 749–771.

Siu, A. F., Ma, Y., & Chui, F. W. (2016). Maternal mindfulness and child social behavior: The mediating role of the mother-child relationship. *Mindfulness, 7*(3), 577–583.

Snel, E., Kabat-Zinn, J., & Kabat-Zinn, M. (2013). *Sitting still like a frog: Mindfulness exercises for kids (and their parents)*. Shambhala.

Thierry, K. L., Bryant, H. L., Nobles, S. S., & Norris, K. S. (2016). Two-year impact of a mindfulness-based program on preschoolers' self-regulation and academic performance. *Early Education and Development, 27*(6), 805–821. https://doi.org/10.1080/10409289.2016.1141616

Toh, W. L. (2017a). Kids find inner calm through mindful breathing. In *The straits times*. Retrieved March 14, 2017, from http://www.straitstimes.com/singapore/education/kids-find-inner-calm-through-mindful-breathing

Toh, W. L. (2017b, March 14). Kids find inner calm through mindful breathing. *The Straits Times,* p. B1.

Van Dam, N. T., van Vugt, M. K., Vago, D. R., Schmalzl, L., Saron, C. D., Olendzki, A., … Meyer, D. E. (2018). Mind the hype: A critical evaluation and prescriptive agenda for research on mindfulness and meditation. *Perspectives on Psychological Science, 13*(1), 36–61. https://doi.org/10.1177/1745691617709589

Van den Heuvel, M., Johannes, M., Henrichs, J., & Van den Bergh, B. (2015). Maternal mindfulness during pregnancy and infant socio-emotional development and temperament: The mediating role of maternal anxiety. *Early Human Development, 91*(2), 103–108.

Van der Oord, S., Bögels, S. M., & Peijnenburg, D. (2012). The effectiveness of mindfulness training for children with ADHD and mindful parenting for their parents. *Journal of Child and Family Studies, 21*(1), 139–147.

Weintraub, S., Dikmen, S. S., Heaton, R. K., Tulsky, D. S., Zelazo, P. D., Bauer, P. J., … Gershon, R. C. (2013). Cognition assessment using the NIH toolbox. *Neurology, 80*(11 Suppl 3), S54–S64. https://doi.org/10.1212/wnl.0b013e3182872ded

Williams, K. L., & Wahler, R. G. (2010). Are mindful parents more authoritative and less authoritarian? An analysis of clinic-referred mothers. *Journal of Child and Family Studies, 19*(2), 230–235. https://doi.org/10.1007/s10826-009-9309-3

Wood, L., Roach, A. T., Kearney, M. A., & Zabek, F. (2018). Enhancing executive function skills in preschoolers through a mindfulness-based intervention: A randomized, controlled pilot study. *Psychology in the Schools, 55*(6), 644–660. https://doi.org/10.1002/pits.22136

Zelazo, P. D., Forston, J. L., Masten, A. S., & Carlson, S. M. (2018). Mindfulness plus reflection training: Effects on executive function in early childhood. *Frontiers in Psychology, 9*, 208. https://doi.org/10.3389/fpsyg.2018.00208

Zenner, C., Herrnleben-Kurz, S., & Walach, H. (2014). Mindfulness-based interventions in schools—A systematic review and meta-analysis. *Frontiers in Psychology, 5*, 603. https://doi.org/10.3389/fpsyg.2014.00603

Zhang, W., Wang, M., & Ying, L. (2019). Parental mindfulness and preschool children's emotion regulation: The role of mindful parenting and secure parent-child attachment. *Mindfulness*, 1–11. https://doi.org/10.1007/s12671-019-01120-y

# Chapter 10
# Using Guided Play to Facilitate Young Children's Exploratory Learning

**Yue Yu**

**Abstract**  Children often learn about the world through exploratory play. Research shows that adults can either facilitate or impede children's learning through exploratory play, depending on the manner in which they get involved: For example, directly instructing children what to do when facing a novel artifact may discourage them from further exploration and discovery learning (Bonawitz E, Shafto P, Gweon H, Goodman ND, Spelke E, Schulz L, Cognition 120(3):322–330, 2011. https://doi.org/10.1016/j.cognition.2010.10.001), while reframing the instruction into "pedagogical questions" may facilitate exploration (Yu Y, Landrum AR, Bonawitz E, Shafto P, Dev Sci 21(6):e12696, 2018a). How to balance between child-directed play and adult-directed instruction for optimal learning? In this chapter, I discuss the framework of guided play, which combines child autonomy with adult guidance in a playful setting (Weisberg DS, Hirsh-Pasek K, Golinkoff RM, Kittredge AK, Klahr D, Curr Dir Psychol Sci 25(3):177–182, 2016). Empirical studies suggest that guided play is effective in helping children develop numeracy, spatial, language, and literacy skills, as well as the capacity for self-directed learning. In the Singapore context, guided play shares common principles with purposeful play and iTeach recommended by the Nurturing Early Learners (NEL) framework (Ministry of Education, Nurturing early learners: a curriculum framework for kindergartens in Singapore. Ministry of Education, Singapore, 2012). It has the potential to help educators, caregivers, and policy makers create a child-friendly and purposefully designed environment that promotes exploratory learning.

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**Keywords** Guided play · Exploratory play · Early childhood education · Direct instruction · Free play · Pedagogical questions

MOE's "Thinking Schools, Learning Nation" and "Teach Less, Learn More" policy initiatives have pointed out the necessity for employing student-centered pedagogy to encourage students' active learning and inquisition (Ministry of Education, 2013; Tan et al., 2008). Specific to early childhood education, the Nurturing Early Learners (NEL) framework has emphasized a child-centered, play-based approach to nurture kindergarteners to become, among other things, "curious and able to explore" (Ministry of Education, 2012). However, such an approach does not imply leaving children alone to play by themselves—adults still serve a critical role in guiding children's playful experience to accomplish certain learning goals (Kirschner et al., 2006). How to balance between child-led play and adult-led instruction? The *guided play* framework aims to provide a theory that is empirically grounded, computationally precise, and ecologically valid (Weisberg et al., 2013; Yu, Shafto, et al., 2018b). This chapter will first review research on how young children learn through exploratory play and describe experiments showing how various pedagogical methods have different effects on children's exploratory learning. Then, the definition and principles of *guided play* will be introduced, along with empirical evidence comparing the effects of direct instruction, guided play, and free play on children's learning outcomes. The chapter will conclude with a discussion about issues related to applying guided play in the Singapore context.

## 10.1  Young Children Learn Through Exploratory Play

Infants and young children spend most of their awake time playing, and play supports the acquisition of various cognitive, social, and motor skills (Bjorklund & Brown, 1998; Hirsh-Pasek et al., 2004; Hutt & Bhavnani, 1972; Pellegrini & Smith, 1998; Singer et al., 2006; Yogman et al., 2018; Youngblade & Dunn, 1995). In particular, starting from as young as 5 months of age, infants engage in "exploratory play" where they manipulate novel objects, which is different from the way they play with familiar objects (Ruff et al., 1992). This type of "exploratory play" is particularly relevant to learning because infants and children are more likely to gather new information during the process.

Research shows that exploratory play indeed facilitates children's learning about the physical and social world (Libertus & Needham, 2010; Rakison & Krogh, 2012). For example, exploratory can help infants learn vocabulary (Ruddy & Bornstein, 1982), develop causal reasoning (Rakison & Krogh, 2012), acquire mental rotation skills (Schwarzer et al., 2013), and understand goal-directed actions (Gerson & Woodward, 2014; Sommerville et al., 2005). Exploratory play can also help toddlers and preschoolers develop spatial cognition (Oudgenoeg-Paz et al.,

2015), learn hypothesis testing (Legare, 2014), and form higher-order generalizations (Sim & Xu, 2017).

Longitudinal studies showed that early exploratory play may predict later developmental outcomes. Yarrow et al. (1975) found that the duration of exploratory play at 6 months, measured by how long infants manipulated a novel object, was predictive of Binet IQ when they were 3.5 years. Muentener et al. (2018) showed that the efficiency of infants' exploratory play, measured by how many functions infants discovered on a novel toy per minute, was predictive of vocabulary size and IQ (measured by WPPSI) at age 3.

Moreover, exploratory play can be used to predict and diagnose developmental disorders. Differences in exploratory play have been found between typically developing infants and infants at risk of Down syndrome (de Campos et al., 2013; Loveland, 1987) and autism spectrum disorders (ASD, Kaur et al., 2015; Koterba et al., 2014) or born prematurely (Sigman, 1976; Zuccarini et al., 2016). The clinical diagnosis of attention deficit hyperactivity disorder (ADHD) and ASD is also partly based on children's engagement in atypical exploratory play, such as distracted/disorganized play in ADHD and restricted/repetitive play in ASD (American Psychiatric Association, 2013).

In sum, research shows that children engage in exploratory learning in their everyday activities—they acquire cognitive, social, and motor skills as well as gain content knowledge through exploratory play, and their engagement in exploratory play is related to later developmental outcomes.

## 10.2  Adult Involvement Can Either Facilitate or Hinder Children's Exploratory Learning: Examples from Laboratory Experiments

How can adults facilitate children's learning through exploratory play? Research shows that enriched environments and sensitive caregiving practices can boost infants' and children's exploratory play (Bornstein & Putnick, 2019; Needham et al., 2002). However, not all types of involvement are created equal. Indeed, certain types of involvement from adults, such as directly instructing children what to do when facing something new, may restrain their exploration and discovery.

Bonawitz, Shafto, and colleagues (2011) exemplified this point through a laboratory experiment. An experimenter presented 4- and 5-year-olds with a novel toy, which, unbeknownst to children, had four non-obvious causal functions (Fig. 10.1). One of the functions (pulling a tube to produce a squeak sound) was selected as the target function. In the *direct instruction* condition, the experimenter said that she knew all about the toy and deliberately taught children the target function (pulling the tube while saying "Wow, see that? This is how my toy works!"). In the *baseline* condition, the experimenter simply looked at the toy
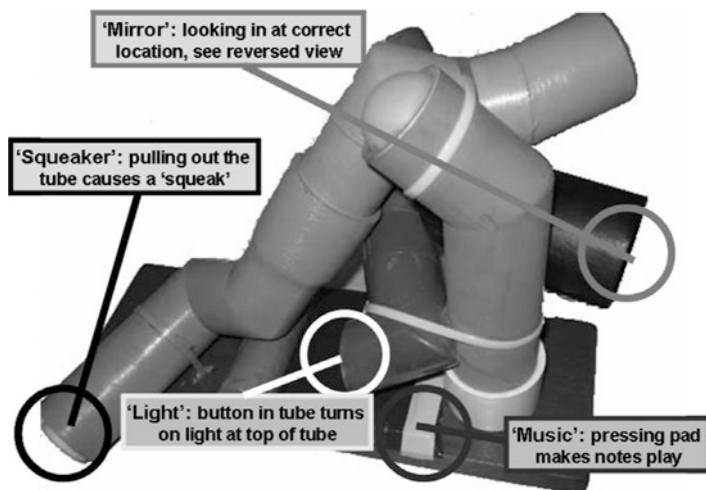
**Fig. 10.1** Stimuli used in the novel toy paradigm (Bonawitz et al., 2011)
*Note.* This paradigm is used to measure how variably and efficiently children explore a novel artifact and discover its non-obvious causal functions. Reprinted with permission from Elsevier

while saying "Wow, see this toy? Look at this!". In both conditions, children were then left alone to play with the toy. Compared to baseline, children who received direct instructions explored and discovered less about the toy—they spent less time playing with the toy, performed fewer types of actions, and discovered fewer of the other, non-target functions of the toy. These children instead restricted their focus on the target function, resulting in a significantly higher proportion of time playing with the tube. Additional experimental conditions have confirmed that such a constraining effect on exploratory learning is specifically caused by a knowledgeable teacher directly instructing children on the target function and nothing else—children did not explore less when the teacher got interrupted after teaching the target function (implying she may have more to teach), when a naïve person who did not know anything about the toy demonstrated the target function, or when someone activated the target function without looking at or talking to the child (implying she was not teaching). On the other hand, children's exploration was restrained when they overheard a knowledgeable teacher teaching another child about the target function only. These results suggest that direct instructions from knowledgeable teachers may limit children's exploratory learning by implying that the instruction has covered everything that is worth learning and anything left out from the instruction is not important. This intuition is captured and supported by formal computational models of pedagogical reasoning during teaching and learning (Shafto et al., 2012; Yang et al., 2018), which takes into account the learner's inferences about how evidence was selected to be used in an instruction.

This study exemplified a case where *teaching more* has led to *learning less*—adults' direct instructions about one aspect of a novel artifact hindered children's exploration and discovery of the other aspects. However, this study also suggests

that these constraining effects are not because of adult involvement *per se*, but rather depend on *how* adults are involved. Specifically, limited exploratory learning may be caused by deliberate instructions in a closed-ended manner, which precludes alternative possibilities. What, then, could be a reasonable substitute? One intuitive solution is to replace direct instructions with questions, which are more open-ended and are shown to lead to improved learning outcomes in classroom settings (for meta-analyses, see Redfield & Rousseau, 1981; K. C. Wise & Okey, 1983).

To examine whether this intuition is true, Yu et al. (2018a) replicated the original study with additional conditions involving children being questioned instead of instructed. Again, a novel toy was presented to 4- and 5-year-old children. This time, the novel toy had five functions, of which the target function was to push a button to make the tower light up (Fig. 10.2a). Children were randomly assigned to one of the four conditions. For all conditions, the novel toy was presented to children by two adults, one experimenter and one confederate. The experimenter first explained that she knew all about the toy and the confederate knew nothing. The *direct instruction* condition replicated the previous study, in which the knowledge-able experimenter intentionally taught children to push the button (Fig. 10.2b). In the *pedagogical question* condition, the experimenter pointed to the button and asked, "What does this button do?" (Fig. 10.2c). Because it was explained first that the experimenter knew all about the toy, it was clear from the context that the question was pedagogical (for a formal definition of pedagogical questions, see Yu et al., 2019). In the *naïve question-overheard* condition (Fig. 10.2e), children heard the exact same question, but from the naïve confederate. During pilot testing, the authors figured that if the naïve confederate directly asked the question, some children would still assume that the confederate was trying to teach them. So instead, in this condition, the confederate asked the question toward the experimenter, and the child overheard it. Finally, a fourth condition was included to control for the effect of whether children were asked versus overheard the question. In this condition, the same pedagogical question was asked by the experimenter toward the confederate, and the child overheard it (*pedagogical question-overheard* condition, Fig. 10.2d). Based on the pedagogical reasoning model (Shafto et al., 2014) which suggests that children interpret information based on the knowledge state of the questioner and not who the question was addressed to, we hypothesize that children's responses would be similar whether they were asked or overheard a pedagogical question, but that should be different from when they overheard a naïve question. For all conditions, the experimenter then left the child alone to explore the toy, and video recording was coded with regard to whether children learned the target function and whether they explored the toy more broadly.

Results indicated that a similar number of children activated the target function after receiving direct instructions, being asked pedagogical questions, or overhearing pedagogical questions. However, children who overheard naïve questions activated the target function significantly less (Fig. 10.2f). This suggests that pedagogical questions, but not naïve questions, were similarly effective as direct instructions in transmitting information. In addition, children in both of the pedagogical question conditions played longer, attempted more types of actions, and discovered more
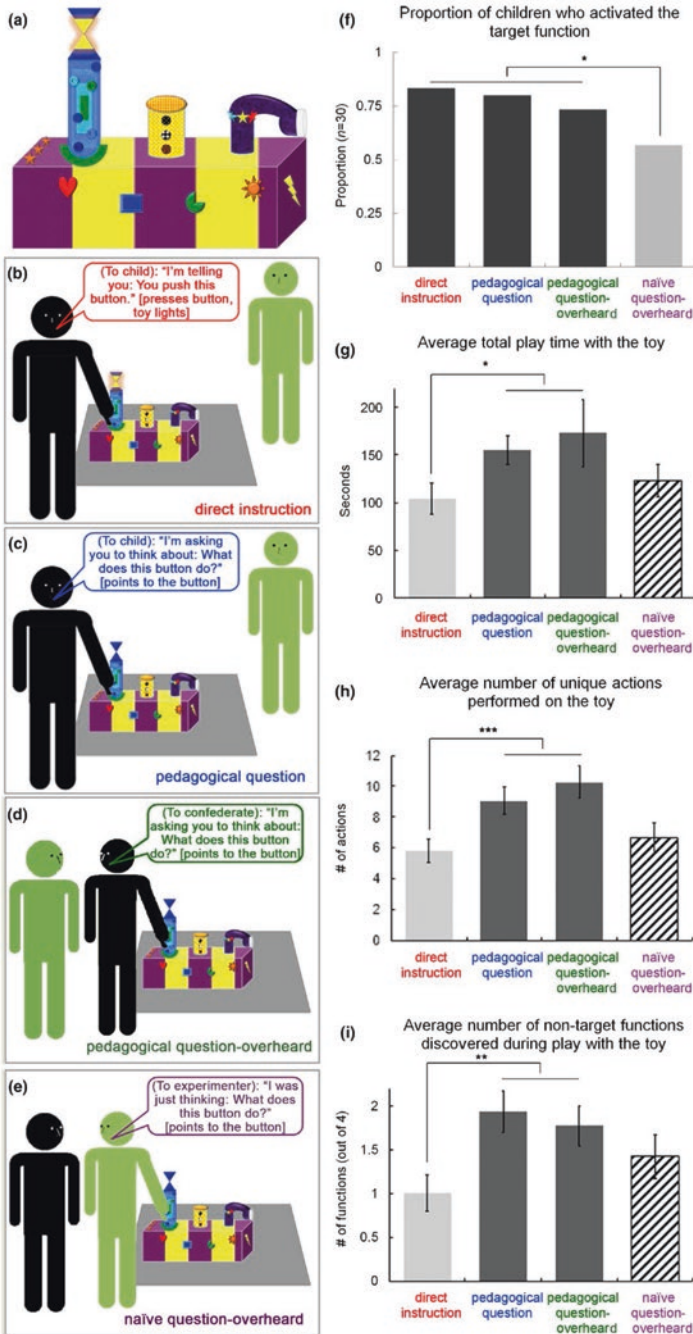
**Fig. 10.2** Stimuli (**a**), procedure (**b–e**), and results (**f–i**) of experiment 1 in Yu et al. (2018a)
*Note.* *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Reprinted with permission from John Wiley and Sons

built-in, non-target functions than did those in the direct instruction condition (Fig. 10.2g–i). This suggests that the constraining effect on exploratory learning disappeared when direct instructions were reframed as questions. Moreover, pedagogical questioning (including those overheard) also led to children performing more unique actions compared to naïve questioning, which suggests that the knowledge state of the questioner matters. When children heard questions from a teacher who presumably knew the answer and intended to teach it, they inferred that the toy was interesting and worth exploring and therefore learned and explored both the target function that was questioned and the toy more broadly. On the other hand, when they heard questions from a naïve person who knew nothing about the toy, they may have reasonably inferred that the question expressed personal interest but did not necessarily convey any information about the toy. Therefore, these children's exploratory learning did not increase.

Similar results have also been found in a recent training study about children's learning of causal relations (Daubert et al., 2020). This study targeted 42- to 54-month-old children who did not yet understand the causal mechanisms underlying psychosomatic phenomena (that psychological factors can cause physical changes). Seventy-two children were randomly assigned to one of the three training conditions, in which an experimenter read children storybooks that either explained psychosomatic events with direct instructions, asked children about these events in pedagogical questions, or contained no information about these events (control). Results indicated that compared to the other two conditions, children from the pedagogical question condition demonstrated both improved psychosomatic understanding and greater memory for relevant storybook details. This indicates that pedagogical questions may facilitate learning by raising children's attention and memory for relevant information. Another study showed that pedagogical questioning may also empower children to persist when facing a difficult learning task (Jean et al., 2019): When 4- to 6-year-old children were asked to find out the correct setting for a "blicket detector" to work, children who were asked pedagogical questions ("what happens if you change these sliders?") attempted significantly more hypothesis-test interventions in order to make the machine work, compared to children who received direct instruction or naïve questions.

These findings have demonstrated the *immediate* effects of different types of adult involvement. But does the cumulation of these effects have long-term consequences? For example, will children who are accustomed to receiving direct instructions from their parents exhibit comparatively more restraint when someone else tries to engage them in exploring a novel artifact? Will children who are used to pedagogical questions explore comparatively more in similar situations? Yu et al. (2020) examined these questions by pairing the novel toy paradigm with an observation of naturalistic parent-child interactions. They replicated the pedagogical question condition in the study mentioned above (Yu et al., 2018a) and added an observation phase before that, during which a brief naturalistic parent-child interaction, which did not include the novel toy, was coded in terms of the frequencies of the direct instructions and pedagogical questions from the parent to the child. Results suggested that the frequency of pedagogical questions, but not that of the

direct instructions, positively predicted children's variability and efficiency when exploring the novel toy (Fig. 10.3). These results indicate a cumulative effect of pedagogical questions—that children who are used to these questions from everyday conversations with their parents are also more explorative when hearing similar questions from an unfamiliar experimenter.

In sum, this line of research showcased the complicated relation between adult involvement and children's exploratory learning. Even in a highly controlled environment in which the content and length of adult involvement are kept constant, the *manner* of the involvement can still lead to opposite effects—direct instructions hindered exploratory learning, while pedagogical questions facilitated exploratory learning. These effects are further moderated by contextual factors such as children's assumptions about the adult's knowledge state, intention, and whether the involvement was interrupted. Moreover, these effects could also cumulate to produce long-term consequences on children's tendencies to explore when facing novel situations. Taken together, these research findings highlight the need to situate teaching and learning in a social context, especially in the case of exploratory learning—children are sensitive to adults' social cues to decide whether they can or should explore, how much to explore, and what to learn from exploring. While open-ended, inviting, and deliberate questions (like "Hmm… I'm just wondering, what does this button do?") can often stir children's curiosity, a close-ended, imperative, and deliberate instruction ("You press the button to make the toy work") can prohibit their exploration as easily.
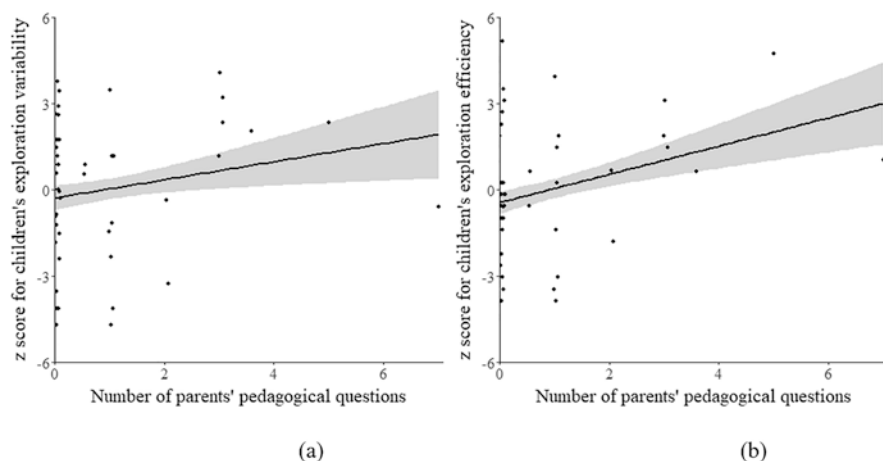


**Fig. 10.3** Results from Yu et al. (2020)

*Note.* Results showed that children whose parents asked more pedagogical questions explored more variably during the whole playing period (a) and also explored more efficiently during the first minute of play (b). The gray area depicts the 95% confidence interval. This figure was published by the MIT Press under a Creative Commons Attribution 4.0 International (CC BY 4.0) license <https://creativecommons.org/licenses/by/4.0/legalcode>

## 10.3   Balancing Between Child-Led Play and Adult-Led Instruction: The *Guided Play* Framework

The idea that adult involvement can be a double-edged sword for children's exploratory learning is neither a new nor an isolated finding. Indeed, there was a longstanding debate among researchers in education, developmental psychology, and cognitive science with regard to whether learning is better facilitated by teacher-driven, objective-directed instructions or student-driven, self-directed exploration (Bruner, 1961; Tobias & Duffy, 2009). This debate has also been framed as instructionism vs. constructivism (Duffy & Jonassen, 1992); as direct instruction vs. discovery, problem-based, experiential, and inquiry-based learning (Kirschner et al., 2006; Kolb, 1984; Kuhn et al., 2000); or as work vs. play (Hirsh-Pasek et al., 2008). Pitting these two traditions against each other has not been productive in furthering our understanding about how to optimize learning (A. F. Wise & O'Neill, 2009). Instead, more and more evidence has suggested that learning is most effective when it includes both children's autonomy and adult guidance (Chi, 2009; Kagan & Lowenstein, 2004; Lillard, 2013). Many early childhood curriculum guidelines and programs around the world follow this principle. Some examples are *purposeful play*[1] and *iTeach*[2] recommended by Nurturing Early Learners (NEL), *Montessori*[3], *play pedagogy*[4], *pedagogy of play*[5], and *sensory play*[6].

Although there is general consensus that good early childhood curriculums should incorporate both child-led play and adult-led instructions, how to integrate and strike a balance between the two remains an important problem for researchers

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[1] *Purposeful play* is the type of play recommended by the Nurturing Early Learners (NEL) framework (Ministry of Education, 2012). In purposeful play, the teacher intentionally plans children's play experiences and organizes the environment according to certain learning objectives. Children are given the opportunity to initiate and lead the play, during which the teacher provides encouragement and guidance to facilitate children to reach the intended objectives.

[2] *iTeach* is an acronym which encapsulates NEL's six principles of early childhood education: (1) integrated learning, (2) teachers as supporters of learning, (3) engaging children in learning through play, (4) ample opportunities for interactions, (5) children as active learners, and (6) holistic development (Pre-school Education Branch, 2008).

[3] The *Montessori* method of education, developed by Maria Montessori, is a child-centered educational approach which emphasizes children's discovery learning through playing with specialized educational materials in a thoughtfully prepared environment (Montessori, 1912/2013).

[4] *Play pedagogy* is an approach developed by Swedish scholar Gunilla Lindqvist and disseminated in preschools in Sweden, Finland, the USA, and Japan (Lindqvist, 1995). It advocates adult and child joint play that promotes children's cognitive, emotional, and social development while respecting their culture, creativity, and spontaneity.

[5] The *pedagogy of play* project is a research collaboration between Project Zero from Harvard Graduate School of Education and the LEGO Foundation, with the aims to understand, articulate, and advocate for the role of play in learning and schools (Mardell et al., 2016).

[6] Sensory play refers to playful activities that stimulate young child's senses, so that they can learn by exploration.

and educators (Hirsh-Pasek & Golinkoff, 2011). One attempt to theorize this problem is the *guided play* framework proposed by US scholars Deena Weisberg, Kathy Hirsh-Pasek, Roberta Golinkoff, and their colleagues (Weisberg et al., 2016; Weisberg et al., 2013). Inspired by the Vygotskian concept of *scaffolding* (Vygotsky & Cole, 1930/1978) and Barbara Rogoff's theory of *guided participation* (Rogoff et al., 1993), *guided play* is formally defined as "learning experiences that combine the child-directed nature of free play with a focus on learning outcomes and adult mentorship" (Weisberg et al., 2016, pp. 177). In terms of child autonomy, guided play emphasizes children's leading role throughout the playful experience, so that they remain an active agent of the learning process and not a passive recipient. In terms of adult guidance, adults subtly steer children's play toward certain learning goals through setting up the learning environment, asking questions, and encouraging children's thinking and discovery. Guided play is both *interactive* and *dynamic* (Yu, Shafto, et al., 2018b): Child play and adult guidance are influenced by one another, and adult guidance needs to be contingent on child behavior at the moment of occurrence.

Guided play can be one of two forms. The first form (planned activity) is similar to purposeful play and the Montessori method. That is, adults plan out a setting with a learning objective in mind while ensuring that children can take the lead when exploring the setting. This can be a preschool classroom activity where children are provided with different beads to try on a "special machine" to discover various causal relationships (Cook et al., 2011) or a museum exhibit where children use building blocks to build sturdy skyscrapers to learn about basic principles of engineering (Haden et al., 2015). Research suggests that when the activity is designed at a level that is appropriate for the target age, children's relatively free exploration can lead to experimentations that generate transferrable knowledge (van Schijndel et al., 2015).

The second form of guided play (guidance on-the-spot) is more "opportunistic" in the sense that it is not necessarily planned out by adults from the start. Instead, adults get involved in child-led play and find opportunities to make comments, ask questions, or demonstrate actions to guide children toward accomplishing certain learning objectives. This form of guided play can be as simple as providing object labels during infants' active exploration of their environment (Pereira et al., 2014) or demonstrating object functions when infants are pointing to the object (Begus et al., 2014). For preschoolers, some examples might be adults following up on children's storytelling by acting out the story with them (Nicolopoulou et al., 2006) or adults joining children's pretend play (Ashiabi, 2007). It is also very common for guided play to combine planned activity with guidance on-the-spot. For example, an adult may plan out a shape-sorting game which aims to help children learn about geometric shapes and then guide them through the game by providing encouragement and feedback that are specifically designed according to each individual child's progress (Fisher et al., 2013).

It should be noted that in both forms of guided play, the learning objectives are broadly defined. Guided play can be used to help children to learn certain knowledge or master certain skills, but it can also aim to boost children's self-efficacy and

facilitate their independent inquiry and discovery by providing them with an opportunity to control, enjoy, and reflect upon their own learning process (Yu, Shafto, et al., 2018b). On the reverse side, child-directed play also leaves room for children to make errors, get confused, get distracted, and fail, while adult guidance can help provide feedback, lower their cognitive load, get them back on track when needed, and encourage them to become persistent. Finally, the inherent joy and feelings related to bonding experienced by both children and adults engaged in guided play are also beneficial for other aspects of child development (see Chaps. 7 and 12 of this volume).

## 10.4  Empirical Evidences Comparing the Effects of Guided Play, Direct Instruction, and Free Play

Research in developmental psychology and education has examined the effect of guided play in a number of domains of development, including both traditional learning areas such as numeracy and literacy and twenty-first-century competencies such as self-directed learning (Trilling & Fadel, 2009). Many studies also included direct instruction and free play as comparison groups, to isolate the effects of child autonomy and adult guidance. Here, I review research in each of these domains, with a focus on studies conducted with toddlers and preschool children.

### 10.4.1  Numeracy and Spatial Skills

Numeracy and spatial skills are central components of intellect and exhibit marked individual differences beginning in early life. Here, I discuss three examples of applications of guided play that aim to promote children's numeracy and spatial skills, including instructional games, a shape-sorting task, and parent-child play with blocks.

Instructional games are a type of guided play in which adults plan playful activities in advance and then let children take the lead when playing them. Several studies found that instructional games can be effective in helping children learn concepts in mathematics. Ramani and Siegler (2008) showed that compared to playing games without a numerical component, playing a linear number board game increased low-income preschoolers' numerical knowledge measured by counting, numeral identification, number line estimation, and numerical magnitude comparison. Similarly, Clements and Sarama (2007) demonstrated that a mathematics curriculum called "Building Blocks," which featured mathematics games designed for children from Pre-K through grade 2, was more effective in promoting children's numerical knowledge on measures of counting, geometry, and number

combinations compared to a traditional mathematics curriculum. The effectiveness of these instructional games has been attributed to an increase in children's attention and motivation due to the playful and engaging elements of the games (Garris et al., 2002).

Fisher et al. (2013) compared the effects of guided play, didactic instructions, and free play in the context of a shape-sorting task. This task was designed for preschoolers to learn the properties of different shapes. In their study, all children were presented with a set of bendable sticks as well as cards showing typical shapes (e.g., equilateral triangles) and atypical shapes (e.g., triangles with one very wide internal angle). Children were then randomly assigned to one of the three training conditions. In the *guided play* condition, the experimenter asked children questions and encouraged them to explore, in order to help them figure out the properties of the shapes. In the *didactic instruction* condition, the experimenter explored the properties of the shapes, and the child watched passively. In the *free play* condition, children chose what to do with the materials, and the experimenter did not intervene. In the testing phase that followed, the experimenter asked children to select the real shapes from a set of typical shapes, atypical shapes, and non-shapes. Results reviewed that both guided play and didactic instruction improved children's shape knowledge about typical shapes compared to free play, but children in the guided play condition were significantly better at transferring their knowledge to atypical shapes compared to children in the didactic instruction condition. The same pattern held when children were assessed again 1 week later. These results suggest that children's active participation, combined with appropriate guidance from an adult, allowed them to better learn about shapes.

Ferrara et al. (2011) have investigated the effect of parent-child play with blocks on children's learning of spatial words. Thirty-six parent-child dyads were assigned to one of the three conditions: *free play*, *guided play*, or *preassembled play structures*. In the *free play* condition, the dyad was told to play with a set of blocks as they would at home. In the *guided play* condition, the dyad was given photographs depicting five steps to build a structure and was encouraged to try it out. In the *preassembled play* condition, a glued-together model of the structure was given to the dyad. Results indicated that compared to parents in the free play or preassembled play conditions, parents in the guided play condition produced significantly higher proportions of spatial talk. Children in the guided play condition also produced significantly higher proportions of spatial talk than their peers in the free play condition. Further study showed that the proportions of spatial words during any of the conditions are higher than baseline levels in everyday parent-child conversations. In sum, this study suggests that parent-child play with blocks elicits more spatial language, especially when components of guidance and play are both present.

## 10.4.2 *Language and Literacy*

Several types of child-directed play are commonly used to promote preschoolers' vocabulary acquisition and narrative development, including dramatic play, thematic-fantasy play, and story-acting activities. Adult guidance has been shown to play a critical role in the effectiveness of all these activities.

When preschoolers engage in dramatic play, providing literacy materials and letting teachers encourage children to incorporate those materials into their play have been found to improve their performance in literacy assessments (Christie & Enz, 1992; Christie & Roskos, 2006; Neuman & Roskos, 1990). In Neuman and Roskos's study (1990), for example, 13 preschool and kindergarten classrooms were randomly assigned to 1 of the 4 conditions. In the *guided play-literacy* condition, teachers provided materials related to literacy, modeled how to use them in dramatic play, and reminded children to use them during their play. In the *guided play-thematic play* condition, teachers provided thematic materials and guided children's use of them in a similar way. In the *free play with thematic materials* condition, the setup was the same, just without adult guidance. Finally, in the *traditional curriculum play* condition, no changes were made in the classrooms. Results revealed that compared to the other two conditions, the two guided play conditions improved both the quantity and quality of children's literacy activities—they engaged longer and also displayed more complex literacy behavior such as pretending to read and write. These findings speak to the importance of adult guidance for children to fully utilize teaching materials during play.

In thematic-fantasy play, children enact stories that are read to them. Thematic-fantasy play is the kind of dramatic play that focuses more on roles, events, and themes that players have not experienced (Galda, 1984). Research on thematic-fantasy play has tested how adult guidance interacts with children's age and comprehension abilities in predicting children's narrative gains. Pellegrini (1984), for example, found that preschoolers, but not kindergarteners, benefited more from adult guidance in story comprehension, as compared to peer guidance. Similarly, Silvern et al. (1986) found that younger children benefited more from adult guidance in making sense of both familiar and unfamiliar stories, whereas older children benefited from adult guidance only for unfamiliar stories. Taken together, these studies suggest that in thematic-fantasy play, adult guidance is most helpful for younger children and when the task at hand is challenging.

A third type of language-related play is storytelling and story-acting (Nicolopoulou & Richner, 2004; Paly, 1990). Research shows that storytelling activities that are child-directed and adult-guided can promote children's narrative skills (Nicolopoulou et al., 2006). For example, Toub et al. (2018) explored the effects of different story-acting activities on children's vocabulary growth. In their first study, 249 preschoolers were randomly assigned to *free play*, *directed play*, or *guided play* conditions after reading a book containing 10 target vocabulary words together with an experimenter. In the *free play* condition, children freely played with toys that were related to the book they just read. In the *directed play* condition,

the experimenter followed scripted language to direct children when reenacting the book's story. In the *guided play* condition, children were allowed to choose what to do during their play, and the experimenter joined. The experimenter naturally incorporated the target vocabulary during the play. Results showed that children in both directed play and guided play conditions gained significantly more target vocabulary words than children in the free play condition. A second study replicated these findings when the procedures were implemented by classroom teachers instead of researchers. These results suggest the importance of adult support when play-based activities are used to promote children's vocabulary growth.

### 10.4.3   Self-Directed Learning

Learning in preschool is not limited to content knowledge in areas such as numeracy and literacy. An equally if not more important goal of early childhood education is to cultivate children into future-ready learners who are both *motivated* and *capable* of engaging in self-directed learning (Dweck, 2009). Regarding *motivation*, the abovementioned research showed that asking pedagogical questions, which is considered a core practice of guided play, encourages children to explore more variably and efficiently when facing a new situation (Yu et al., 2018a, 2020). In this section, I discuss the effects of guided play on two core *capabilities* of self-directed learning: experimentation and generalization.

Experimentation is the bedrock of human's generation of knowledge. One central scientific reasoning skill for experimentation is the mastery of the *control-of-variables strategy* (CVS, National Research Council, 1996). CVS is the method to create a single contrast between different experimental conditions, in order to make valid causal inferences (Klahr & Simon, 1999). Although formal principle of CVS is typically learned after children entered elementary school (Klahr & Nigam, 2004), preschool children are already able to design informative experiments to disambiguate causal structures if the problem is presented in a playful, age-appropriate setting (Cook et al., 2011; Schulz & Bonawitz, 2007). For example, in Cook et al.'s (2011) experiment, 3- to 5-year-old children were presented with a "special machine" that activates when certain beads are put on it. In one of the conditions, the experimenter first demonstrated that some, but not all, beads could activate the machine. The experimenter then brought out two new beads that were stuck together and showed that the machine activated when both were put on it. Children were then left alone to play without any explicit instructions. The experimenter left children with a situation that was ambiguous: Was the machine activated by one of the beads? If so, which one? Given that the two beads were stuck together, it seems that the puzzle was unsolvable. Yet, 45% of children performed the intervention that was closest to disambiguating the situation: They put the beads on the machine vertically so that only one of the beads touched the machine. Further control conditions found that this type of intervention did not occur by chance nor did children see the beads oriented this way during demonstration. These findings suggest that

when presented with ambiguous evidence in a playful and child-friendly setting, preschoolers are both willing to and capable of using CVS to create their own experiments to isolate potential causes.

For more complicated causal problems, adult help is needed for children to learn the best way to experiment (Klahr & Nigam, 2004). In these cases, research shows that allowing children to explore the problem first is more helpful than directly instructing them from the start. In Sobel and Sommerville (2010), for example, children were presented with a lightbox that has four buttons and four corresponding lights (Fig. 10.4a). The lights were wired in such a way that the whole lightbox represented either a common cause model (Fig. 10.4b) or a chain model (Fig. 10.4c). Sixty-one 4-year-olds were randomly assigned to one of the three conditions. In the *discovery* condition, children first freely played with the lightbox, before an experimenter demonstrated the lightbox by pressing each button exactly once while narrating the efficacy of each button press. In the *confirmation* condition, children saw the same demonstration before they could play with the lightbox. In the *observation* condition, children watched the demonstration without getting a chance to play by themselves. Results indicated that children in the *discovery* condition were more likely to identify the correct causal structure than children from the other two conditions and they also pressed more buttons than children in the *confirmation* condition. This study highlights the guided play principle that children need to "own" their learning experience. That is, the children learned better when they were the ones to first discover the efficacy of the buttons as opposed to when the efficacy was first demonstrated to them by someone else. One possible reason for that is children treat their own discoveries as more rewarding and memorable than discoveries made by others (Bruner, 1961).



(a)  (b)  (c)
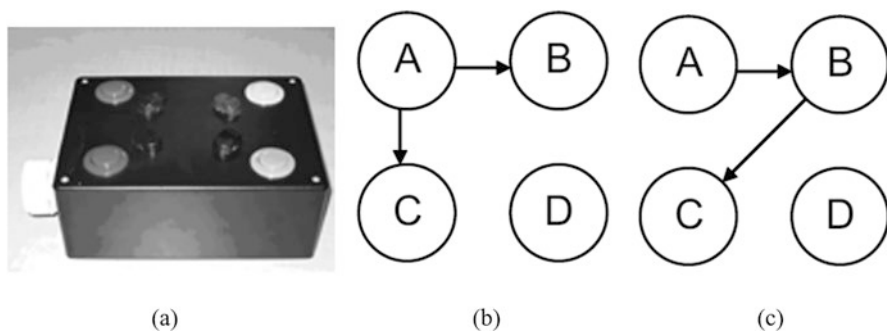
**Fig. 10.4** Stimulus used in Sobel and Sommerville (2010)
*Note.* The lightbox has four lights which can be activated by the corresponding buttons next to them (a). The lights were wired in such a way that pressing one button may activate one or more lights. For example, in the common cause model (b), pressing the button corresponding to A will activate A, B, and C. Pressing the other buttons will only activate their corresponding lights. In the chain model (c), pressing the button corresponding to A will still activate A, B, and C. The difference is that pressing the button corresponding to B will activate both B and C. This figure was published by Frontiers Media SA under a Creative Commons Attribution 4.0 International (CC BY 4.0) license <https://creativecommons.org/licenses/by/4.0/legalcode>

Just like experimentation, the ability to generalize from specific exemplars to a general rule is critical to children's inductive reasoning and conceptual development. Generalizations are ordered in a hierarchy (Xu et al., 2009). Imagine you see a circular block activating two circular machines, a triangular block activating two triangular machines, and a rectangular block activating two rectangular machines (Fig. 10.5, top). A first-order generalization could be that *all rectangular blocks* activate rectangular machines (Fig. 10.5, middle). A second-order generalization
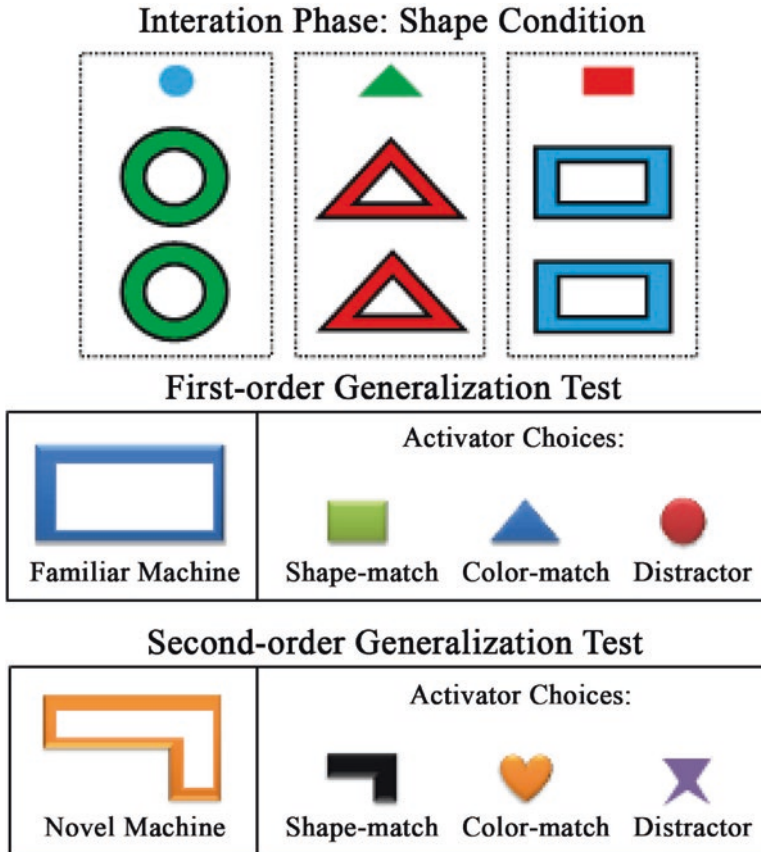


**Fig. 10.5** Stimuli and procedure used in Sim and Xu (2015), using the shape-matching rule as an example
*Note.* After learning that a circular block can activate a circular machine, a triangular block can activate a triangular machine, and a rectangular block can activate a rectangular machine (top), 19-month-old children infer not only that all rectangular blocks activate rectangular machines (first-order generalization, middle) but also that all blocks activate machines of the same shape (second-order generalization, bottom). However, this was only possible when children's generation of evidence during the learning phase was facilitated by an adult. This figure was published by the Cognitive Science Society under a Creative Commons Attribution 4.0 International (CC BY 4.0) license <https://creativecommons.org/licenses/by/4.0/legalcode>

could be that *all blocks* activate machines of the same shape (Fig. 10.5, bottom). One may even form a third-order generalization that blocks activate machines if they share a certain feature (shape in this case, but can be color or other features). These high-order generalizations are important in children's formulation of abstract rules and concepts, such as learning that objects with the same shape often share the same label (Smith et al., 2002) or that animal taxonomy follows a tree structure (Kemp & Tenenbaum, 2009). Can adults help children manage high-order generalizations? Sim and Xu (2015, 2017) trained 19-month-olds, 2-year-olds, and 3-year-olds in either the shape-matching rule (Fig. 10.5) or the color-matching rule, and children were randomly assigned to one of the five conditions. These conditions differ in who generated the evidence by putting blocks on the machines during the learning phase: *didactic instruction* (experimenter generated evidence), *experimenter-facilitated play* (experimenter guided children to generate evidence), *parent-facilitated play* (parent guided children to generate evidence), *free play* (children generated evidence), or *baseline* (no evidence was generated). Results showed that 2- and 3-year-olds passed both first- and second-order generalization tests in all conditions except for baseline (Sim & Xu, 2017). Nineteen-month-old children, however, were only successful in the experimenter- and parent-facilitated play conditions, but not the didactic instruction or free play conditions (Sim & Xu, 2015). These results suggest that while older children can learn high-order generalizations from facilitated play, didactic instructions, and free play, young children may require more support in the form of adult-facilitated, child-directed play.

## 10.5   What Makes Guided Play Effective?

Empirical studies listed above have repeatedly illustrated that the two components of guided play—child autonomy and adult guidance—oftentimes work in synergy to create an ideal learning experience. With regard to the child autonomy component, guided play respects children's leading roles and their pride in discovery, which separates it from direct instruction. Children learn best when they are active and engaged (Chi, 2009): They (as well as adults) treat the actively discovered information as more rewarding and memorable than the same information observed passively (Feldman & Acredolo, 1979; Markant et al., 2016; Partridge et al., 2015; Sim & Xu, 2015). Compared to direct instruction, guided play also tends to elicit positive emotions like joy, pride, and excitement (Gopnik, 1998; Hirsh-Pasek et al., 2008), which are emotions known to drive attentional focus and creativity (Ashby & Isen, 1999; Fredrickson & Branigan, 2005). Finally, as explained in the beginning of this chapter, direct instructions may inhibit children's further exploratory learning because children may infer that all important information has already been instructed (Bonawitz et al., 2011). Guided play, in contrary, facilitates exploratory learning by implying that there is more to be discovered (Yu et al., 2018a).

With regard to the adult guidance component, guided play emphasizes adult involvement both in planning the playful activity according to learning objectives

and in subtly pushing children toward those objectives. This separates guided play from unassisted free play. The problem for unassisted free play is that, without a clearly defined objective, children often struggle to figure out the relevant dimensions for them to explore and learn. Even with the objective defined, pure discovery learning could still be a daunting task for a novice without external support (Mayer, 2004). Adult guidance may increase the effectiveness of children's playful learning by splitting a complex task into manageable steps (Nadolski et al., 2005), demonstrating worked examples (Sweller & Cooper, 1985), lowering the cognitive load from all the information gained during exploration (Sweller, 1988), probing questions and self-explanations (Chi et al., 1994; Siegler, 2002), and providing encouragement and feedback (Honomichl & Chen, 2012). It should be noted that in guided play, adults intervene in a way that is both subtle and contingent on children's current progress, which is not necessarily the case in direct instruction. Yu, Shafto, et al. (2018b) emphasized that guidance needs to be contingent on individual children's mental states, which can often be inferred from their eye gaze, pointing, language, etc. For example, labelling an object can help infants learn the word when the infant is focusing on that object, but it can be confusing when the infant is focusing on multiple objects (Pereira et al., 2014). Similarly, infants learn about objects' functions better if adults demonstrate the functions when infants are pointing to the objects, than if adults demonstrate before or after infants' pointing (Begus et al., 2014). Adult guidance is more effective when it fits what the child needs at the moment.

Weisberg et al. (2014) summarized how guided play works with the French phrase *mise en place*. Originally used in culinary, this phrase refers to a confluence of environmental and psychological factors that gently shape one's experience toward a given outcome without being noticed. In guided play, the goal of adult guidance is to create the right *mise*—the structures and cues which subtly funnel children's play toward certain learning goals—while letting children take the center of the stage. Just like French cuisine, guided play may take skill and dedication to prepare, but can result in a joyful experience toward fulfillment.

## 10.6 Applying Guided Play to the Singapore Context

### 10.6.1 The Role of Culture and Socioeconomic Status

Cultural traditions and socioeconomic status have major impacts on people's perception and practice of different teaching and learning methods (Gutiérrez & Rogoff, 2003), which could in turn moderate their effects on children's learning outcome. Research shows that this is true for the effects of direct instructions, guided play, and free play. For example, Shneidman et al. (2016) have replicated the novel toy paradigm (Bonawitz et al., 2011) in five Yucatec-Mayan villages to investigate whether the constraining effect of direct instructions is also present in

a society where children mainly learn from observing others and not from being taught (Correa-Chávez & Rogoff, 2009; Shneidman & Goldin-Meadow, 2012). Results indicated that 2- and 3-year-olds in both cultures showed restricted exploration after direct instruction. Moreover, Mayan children, but not children from the USA, showed more restriction with age. These findings suggest both cross-cultural similarities and differences regarding the effect of direct instructions on children's explorative learning. Regarding socioeconomic status, Yu et al. (2019) found that in the USA and UK, parents from middle-class families ask significantly more pedagogical questions to their children than parents from working-class families. Ridge et al. (2015) reported an intervention study in which signages containing pedagogical questions were displayed in supermarkets that served either low-SES or middle-SES neighborhoods. Results showed that these signages increased both the amount and the quality of talk between adults and children in low-SES supermarkets, but not in middle-SES ones. One possible reason is that parent-child talk at the baseline (sign-down condition) is less frequent in low-SES supermarkets compared to middle-SES ones, so there is more room for improvement.

In many East and South-East Asian countries, including Singapore, parents often place premium value on children's academic achievement in order to meet the demands of a highly competitive education system (Ebbeck & Gokhale, 2004). Given that most formats of playful learning, including guided play, originate in Western cultures, it is not surprising that some parents and educators are not fully convinced about the appropriateness of these approaches for children in Asian countries (Lim-Ratnam, 2013; E. M. Lim, 2004; McMullen et al., 2005). For example, Ebbeck and Gokhale (2004) interviewed 40 Singaporean parents about their attitudes toward early childhood education. Among these parents, 85% rated academic skills as the important aspect of an early childhood program, and many questioned whether informal format of teaching is sufficient in preparing their children for formal schooling. Similar resistance toward play-based curricula has also been documented in preschool educators in mainland China, Hong Kong SAR, and Singapore (Grieshaber, 2016; C. Lim & Torr, 2008; Rao et al., 2010). These findings highlight the need to conduct locally valid studies to verify the effect of play-based pedagogy on Singaporean children's academic achievement and school readiness and also to convince parents about the importance of children's non-academic skills such as self-directed learning and social-emotional development. Notably, because Singapore is a diverse society, these local studies would need to take into account factors like children's ethnicity, language, and socioeconomic status.

### 10.6.2 Implications for Educators, Caregivers, and Policy Makers in Singapore

As a pedagogical approach for early childhood education, the principles of guided play are very much in line with purposeful play and iTeach recommended by NEL (Ministry of Education, 2012). The guided play framework aims to provide a theory that is empirically grounded, computationally precise, and ecologically valid, which means that it has the potential to generate empirical and computational work to support using specific types of pedagogical methods in specific contexts. For example, existing research has suggested that asking pedagogical questions may be preferable to directly instructing children when introducing them to a novel artifact (Yu et al., 2018a) and that letting children explore a complex causal problem before a teacher demonstrating it may be preferable than the reverse order (Sobel & Sommerville, 2010). These studies may be translated to educational applications, after future endeavors are made in three key directions: (1) to cumulate empirical evidence that systematically evaluates the effects of guided play on different learning domains; (2) to automate the identification of optimal guidance using computational modelling and data science tools (Yu & Chua, in press); and (3) to evaluate the effects of guided play with regard to the Singapore context as well as to the differences between social groups and individual children.

Much of guided play research also applies to caregiver-child interactions (e.g., Ferrara et al., 2011; Yu et al., 2020). Since most infants and preschoolers spend much more time with their caregivers compared to educators and peers, it could be potentially more cost-effective to help children's learning by promoting caregiver's use of guided play. Such goals may be achieved using home-based, community-based, or even mobile app-based intervention programs. Several studies demonstrated that even small changes in the environment may potentially promote caregiver-child guided play. For example, Hanner et al. (2019) found that putting signs with math-related content in grocery stores can prompt parent-child conversation about math (see Ridge et al., 2015, for similar results). Well-designed museum exhibits can also promote parent-child play that facilitates children's learning about mathematics (Braham et al., 2018), causal knowledge (Willard et al., 2019), and principles of engineering (Haden et al., 2015). Finally, location-aware mobile apps could potentially be used to push notifications to parents and children when they are close to certain points of interest, prompting them to engage in playful activities to help children's learning about the area.

More broadly, guided play can be applied city-wide when educators and psychologists collaborate with policy makers and architects. Kathy Hirsh-Pasek, Roberta Golinkoff, and other major proponents of guided play have first launched the Learning Landscapes initiative in 1998. Learning Landscapes aims to reshape urban public facilities to carefully plan out play experiences that also serves various learning goals, especially for children and families from under-resourced communities (Hassinger-Das et al., 2018). Their successful examples include the "Ultimate Block Party" which brought over 50,000 people to New York's Central Park to

engage in guided play activities, the "Urban Thinkscape" which transformed a bus stop and adjacent lot in Philadelphia into a hub for playful learning while families were waiting for public transportation, and the "Parkopolis" in Philadelphia which is a life-size human board game that fosters STEM learning and reasoning skills. Bringing similar projects to Singapore is in line with MOE's "Thinking Schools, Learning Nation" and "Teach Less, Learn More" policy initiatives (Ministry of Education, 2013) and could potentially have an island-wide impact on promoting children's (and adults') explorative learning.

# References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Publications.

Ashby, F. G., & Isen, A. M. (1999). A neuropsychological theory of positive affect and its influence on cognition. *Psychological Review, 106*(3), 529.

Ashiabi, G. S. (2007). Play in the preschool classroom: Its socioemotional significance and the teacher's role in play. *Early Childhood Education Journal, 35*(2), 199–207.

Begus, K., Gliga, T., & Southgate, V. (2014). Infants learn what they want to learn: Responding to infant pointing leads to superior learning. *PloS One, 9*(10), e108817.

Bjorklund, D. F., & Brown, R. D. (1998). Physical play and cognitive development: Integrating activity, cognition, and education. *Child Development, 69*(3), 604–606.

Bonawitz, E., Shafto, P., Gweon, H., Goodman, N. D., Spelke, E., & Schulz, L. (2011). The double-edged sword of pedagogy: Instruction limits spontaneous exploration and discovery. *Cognition, 120*(3), 322–330. https://doi.org/10.1016/j.cognition.2010.10.001

Bornstein, M. H., & Putnick, D. L. (2019). *The architecture of the child mind: G, Fs, and the hierarchical model of intelligence*. Routledge.

Braham, E. J., Libertus, M. E., & McCrink, K. (2018). Children's spontaneous focus on number before and after guided parent–child interactions in a children's museum. *Developmental Psychology, 54*(8), 1492. https://doi.org/10.1037/dev0000534

Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review*.

Chi, M. T. (2009). Active-constructive-interactive: A conceptual framework for differentiating learning activities. *Topics in Cognitive Science, 1*(1), 73–105.

Chi, M. T., De Leeuw, N., Chiu, M.-H., & LaVancher, C. (1994). Eliciting self-explanations improves understanding. *Cognitive Science, 18*(3), 439–477. https://doi.org/10.1016/0364-0213(94)90016-7

Christie, J. F., & Enz, B. (1992). The effects of literacy play interventions on preschoolers' play patterns and literacy development. *Early Education and Development, 3*(3), 205–220.

Christie, J. F., & Roskos, K. (2006). Standards, science, and the role of play in early literacy education. In D. Singer, R. M. Golinkoff, & K. Hirsh-Pasek (Eds.), *Play=Learning: How play motivates and enhances children's cognitive and social-emotional growth* (pp. 57–73). Oxford University Press.

Clements, D. H., & Sarama, J. (2007). Effects of a preschool mathematics curriculum: Summative research on the Building Blocks project. *Journal for research in Mathematics Education*, 136–163. https://doi.org/10.2307/30034954

Cook, C., Goodman, N. D., & Schulz, L. E. (2011). Where science starts: Spontaneous experiments in preschoolers' exploratory play. *Cognition, 120*(3), 341–349.

Correa-Chávez, M., & Rogoff, B. (2009). Children's attention to interactions directed to others: Guatemalan Mayan and European American patterns. *Developmental Psychology, 45*(3), 630. https://doi.org/10.1037/a0014144

Daubert, E. N., Yu, Y., Grados, M., Shafto, P., & Bonawitz, E. (2020). Pedagogical questions promote causal learning in preschoolers. *Scientific Reports, 10*(1), 1–8.

de Campos, A. C., da Costa, C. S. N., Savelsbergh, G. J. P., & Rocha, N. A. C. F. (2013). Infants with Down syndrome and their interactions with objects: Development of exploratory actions after reaching onset. *Research in Developmental Disabilities, 34*(6), 1906–1916. https://doi.org/10.1016/j.ridd.2013.03.001

Duffy, T. M., & Jonassen, D. H. (1992). Constructivism: New implications for instructional technology. In T. M. Duffy & D. H. Jonassen (Eds.), *Constructivism and the technology of instruction: A conversation* (pp. 1–16). Erlbaum.

Dweck, C. (2009). Who will the 21st-century learners be? *Knowledge Quest, 38*(2), 8–10.

Ebbeck, M., & Gokhale, N. (2004). Child-rearing practices in a selected sample of parents with children in childcare in Singapore. *Contemporary Issues in Early Childhood, 5*(2), 194–206. https://doi.org/10.2304/ciec.2004.5.2.6

Feldman, A., & Acredolo, L. (1979). The effect of active versus passive exploration on memory for spatial location in children. *Child Development*, 698–704. https://doi.org/10.2307/1128935

Ferrara, K., Hirsh-Pasek, K., Newcombe, N. S., Golinkoff, R. M., & Lam, W. S. (2011). Block talk: Spatial language during block play. *Mind, Brain, and Education, 5*(3), 143–151.

Fisher, K. R., Hirsh-Pasek, K., Newcombe, N., & Golinkoff, R. M. (2013). Taking shape: Supporting preschoolers' acquisition of geometric knowledge through guided play. *Child Development, 84*(6), 1872–1878.

Fredrickson, B. L., & Branigan, C. (2005). Positive emotions broaden the scope of attention and thought-action repertoires. *Cognition & Emotion, 19*(3), 313–332. https://doi.org/10.1080/02699930441000238

Galda, L. (1984). Narrative competence: Play, storytelling, and story comprehension. In A. D. Pellegrini & T. D. Yawk (Eds.), *The development of oral and written language in social contexts* (pp. 105–117). Ablex.

Garris, R., Ahlers, R., & Driskell, J. E. (2002). Games, motivation, and learning: A research and practice model. *Simulation & gaming, 33*(4), 441–467.

Gerson, S. A., & Woodward, A. L. (2014). The joint role of trained, untrained, and observed actions at the origins of goal recognition. *Infant behavior and development, 37*(1), 94–104.

Gopnik, A. (1998). Explanation as orgasm. *Minds and machines, 8*(1), 101–118. https://doi.org/10.1023/A:1008290415597

Grieshaber, S. J. (2016). Play and policy in early childhood education in the Asia Pacific region. *Asia-Pacific Journal of Research in Early Childhood Education, 10*(2), 7–28. https://doi.org/10.17206/apjrece.2016.10.2.7

Gutiérrez, K. D., & Rogoff, B. (2003). Cultural ways of learning: Individual traits or repertoires of practice. *Educational researcher, 32*(5), 19–25. https://doi.org/10.3102/0013189X032005019

Haden, C. A., Cohen, T., Uttal, D. H., & Marcus, M. (2015). Building learning: Narrating and transferring experiences in a children's museum. In D. Sobel & J. Jipson (Eds.), *Cognitive development in Museum settings: Relating research and practice* (pp. 84–103). Routledge.

Hanner, E., Braham, E. J., Elliott, L., & Libertus, M. E. (2019). Promoting math talk in adult–child interactions through grocery store signs. *Mind, Brain, and Education, 13*(2), 110–118. https://doi.org/10.1111/mbe.12195

Hassinger-Das, B., Bustamante, A., Hirsh-Pasek, K., & Golinkoff, R. (2018). Learning landscapes: Playing the way to learning and engagement in public spaces. *Education Sciences, 8*(2), 74. https://doi.org/10.3390/educsci8020074

Hirsh-Pasek, K., & Golinkoff, R. M. (2011). The great balancing act: Optimizing core curricula through playful pedagogy. In E. Zigler, W. Gilliam, & S. Barnett (Eds.), *The pre-K debates: Current controversies and issues* (pp. 110–116). Paul H. Brookes.

Hirsh-Pasek, K., Golinkoff, R. M., Berk, L. E., & Singer, D. (2008). *A mandate for playful learning in preschool: Applying the scientific evidence*. Oxford University Press.

Hirsh-Pasek, K., Golinkoff, R. M., & Eyer, D. (2004). *Einstein never used flash cards: How our children really learn--and why they need to play more and memorize less*. Rodale Books.

Honomichl, R. D., & Chen, Z. (2012). The role of guidance in children's discovery learning. *Wiley Interdisciplinary Reviews: Cognitive Science, 3*(6), 615–622.

Hutt, C., & Bhavnani, R. (1972). Predictions from play. *Nature, 237*(5351), 171.

Jean, A., Daubert, E., Yu, Y., Shafto, P., & Bonawitz, E. (2019). *Pedagogical questions empower exploration.* Paper presented at the Proceedings of the Annual Conference of the Cognitive Science Society.

Kagan, S. L., & Lowenstein, A. E. (2004). School readiness and children's play: Contemporary oxymoron or compatible option. In E. Zigler, D. G. Singer, & S. Bishop-Josef (Eds.), *Children's play: The roots of reading* (pp. 59–76). Zero to Three Press.

Kaur, M., Srinivasan, S. M., & Bhat, A. N. (2015). Atypical object exploration in infants at-risk for autism during the first year of life. *Frontiers in Psychology, 6*, 798.

Kemp, C., & Tenenbaum, J. B. (2009). Structured statistical models of inductive reasoning. *Psychological Review, 116*(1), 20. https://doi.org/10.1037/a0014282

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1

Klahr, D., & Nigam, M. (2004). The equivalence of learning paths in early science instruction effects of direct instruction and discovery learning. *Psychological Science, 15*(10), 661–667. https://doi.org/10.1111/j.0956-7976.2004.00737.x

Klahr, D., & Simon, H. A. (1999). Studies of scientific discovery: Complementary approaches and convergent findings. *Psychological Bulletin, 125*(5), 524. https://doi.org/10.1037/0033-2909.125.5.524

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.

Koterba, E. A., Leezenbaum, N. B., & Iverson, J. M. (2014). Object exploration at 6 and 9 months in infants with and without risk for autism. *Autism, 18*(2), 97–105.

Kuhn, D., Black, J., Keselman, A., & Kaplan, D. (2000). The development of cognitive skills to support inquiry learning. *Cognition and Instruction, 18*(4), 495–523. https://doi.org/10.1207/S1532690XCI1804_3

Legare, C. H. (2014). The contributions of explanation and exploration to children's scientific reasoning. *Child Development Perspectives, 8*(2), 101–106.

Libertus, K., & Needham, A. (2010). Teach to reach: The effects of active vs. passive reaching experiences on action and perception. *Vision Research, 50*(24), 2750–2757.

Lillard, A. S. (2013). Playful learning and Montessori education. *NAMTA Journal, 38*(2), 137–174.

Lim-Ratnam, C. (2013). Tensions in defining quality pre-school education: The Singapore context. *Educational Review, 65*(4), 416–431. https://doi.org/10.1080/00131911.2012.707641

Lim, C., & Torr, J. (2008). Teaching literacy in English language in Singaporean preschools: Exploring teachers' beliefs about what works best. *Contemporary Issues in Early Childhood, 9*(2), 95–106. https://doi.org/10.2304/ciec.2008.9.2.95

Lim, E. M. (2004). Looking at education through a Deweyan lens: how play could take shape in Singapore's preschools. *Contemporary Issues in Early Childhood, 5*(3), 396–401. https://doi.org/10.2304/ciec.2004.5.2.14

Lindqvist, G. (1995). *The aesthetics of play: A didactic study of play and culture in preschools*. Coronet Books.

Loveland, K. A. (1987). Behavior of young children with Down syndrome before the mirror: Exploration. *Child Development*, 768–778.

Mardell, B., Wilson, D., Ryan, J., Ertel, K., Krechevsky, M., & Baker, M. (2016). *Towards a pedagogy of play*. Retrieved from http://pz.harvard.edu/resources/towards-a-pedagogy-of-play

Markant, D. B., Ruggeri, A., Gureckis, T. M., & Xu, F. (2016). Enhanced memory as a common effect of active learning. *Mind, Brain, and Education, 10*(3), 142–152. https://doi.org/10.1111/mbe.12117

Mayer, R. E. (2004). Should there be a three-strikes rule against pure discovery learning? *American Psychologist, 59*(1), 14. https://doi.org/10.1037/0003-066X.59.1.14

McMullen, M., Elicker, J., Wang, J., Erdiller, Z., Lee, S.-M., Lin, C.-H., & Sun, P.-Y. (2005). Comparing beliefs about appropriate practice among early childhood education and care professionals from the US, China, Taiwan, Korea and Turkey. *Early Childhood Research Quarterly, 20*(4), 451–464. https://doi.org/10.1016/j.ecresq.2005.10.005

Ministry of Education. (2012). *Nurturing early learners: A curriculum framework for kindergartens in Singapore*. Ministry of Education.

Ministry of Education. (2013). *Engaging our learners: teach less, learn more*. Ministry of Education.

Montessori, M. (1912/2013). *The montessori method*. Frederick Stokes Co..

Muentener, P., Herrig, E., & Schulz, L. (2018). The efficiency of infants' exploratory play is related to longer-term cognitive development. *Frontiers in Psychology, 9*.

Nadolski, R. J., Kirschner, P. A., & Van Merriënboer, J. J. (2005). Optimizing the number of steps in learning tasks for complex skills. *British Journal of Educational Psychology, 75*(2), 223–237. https://doi.org/10.1348/000709904X22403

National Research Council. (1996). *National science education standards*. National Academy of Sciences.

Needham, A., Barrett, T., & Peterman, K. (2002). A pick-me-up for infants' exploratory skills: Early simulated experiences reaching for objects using 'sticky mittens' enhances young infants' object exploration skills. *Infant behavior and development, 25*(3), 279–295.

Neuman, S. B., & Roskos, K. (1990). *Literacy objects as cultural tools: Effects on children's literacy behaviors in play*.

Nicolopoulou, A., McDowell, J., & Brockmeyer, C. (2006). Narrative play and emergent literacy: Storytelling and story-acting. In D. Singer, R. Golinkoff, & K. HirshPasek (Eds.), *Play= learning: How play motivates and enhances children's cognitive and social-emotional growth* (pp. 124–155). Oxford University Press.

Nicolopoulou, A., & Richner, E. S. (2004). "When your powers combine, I am Captain Planet": The developmental significance of individual-and group-authored stories by preschoolers. *Discourse Studies, 6*(3), 347–371.

Oudgenoeg-Paz, O., Leseman, P. P., & Volman, M. (2015). Exploration as a mediator of the relation between the attainment of motor milestones and the development of spatial cognition and spatial language. *Developmental Psychology, 51*(9), 1241.

Paly, V. (1990). *The boy who would be a helicopter: The uses of storytelling in the classroom*. Harvard University Press.

Partridge, E., McGovern, M. G., Yung, A., & Kidd, C. (2015). Young children's self-directed information gathering on touchscreens. In R. Dale, C. Jennings, P. Maglio, T. Matlock, D. Noelle, A. Warlaumont, & J. Yoshimi (Eds.), *Proceedings of the 37th annual conference of the cognitive science society*. Cognitive Science Society.

Pellegrini, A. D. (1984). Identifying causal elements in the thematic-fantasy play paradigm. *American Educational Research Journal, 21*(3), 691–701.

Pellegrini, A. D., & Smith, P. K. (1998). Physical activity play: The nature and function of a neglected aspect of play. *Child Development, 69*(3), 577–598.

Pereira, A. F., Smith, L. B., & Yu, C. (2014). A bottom-up view of toddler word learning. *Psychonomic Bulletin & Review, 21*(1), 178–185. https://doi.org/10.3758/s13423-013-0466-4

Pre-school Education Branch. (2008). *Kindergarten curriculum guide*. Ministry of Education.

Rakison, D. H., & Krogh, L. (2012). Does causal action facilitate causal perception in infants younger than 6 months of age? *Developmental science, 15*(1), 43–53.

Ramani, G. B., & Siegler, R. S. (2008). Promoting broad and stable improvements in low-income children's numerical knowledge through playing number board games. *Child Development, 79*(2), 375–394.

Rao, N., Ng, S. S., & Pearson, E. (2010). Preschool pedagogy: A fusion of traditional Chinese beliefs and contemporary notions of appropriate practice. In C. K. K. Chan & N. Rao (Eds.),

*Revisiting the Chinese learner: Changing contexts, changing education* (pp. 255–279). The University of Hong Kong.

Redfield, D. L., & Rousseau, E. W. (1981). A meta-analysis of experimental research on teacher questioning behavior. *Review of Educational Research, 51*(2), 237–245. https://doi.org/10.3102/00346543051002237

Ridge, K. E., Weisberg, D. S., Ilgaz, H., Hirsh-Pasek, K. A., & Golinkoff, R. M. (2015). Supermarket speak: Increasing talk among low-socioeconomic status families. *Mind, Brain, and Education, 9*(3), 127–135. https://doi.org/10.1111/mbe.12081

Rogoff, B., Mistry, J., Artin, G., Mosier, C., Chavajay, P., & Heath, S. B. (1993). Guided participation in cultural activity by toddlers and caregivers. *Monographs of the Society for Research in Child Development, 58*(8), i–179. https://doi.org/10.2307/1166109

Ruddy, M. G., & Bornstein, M. H. (1982). Cognitive correlates of infant attention and maternal stimulation over the first year of life. *Child Development*, 183–188.

Ruff, H. A., Saltarelli, L. M., Capozzoli, M., & Dubiner, K. (1992). The differentiation of activity in infants' exploration of objects. *Developmental Psychology, 28*(5), 851.

Schulz, L. E., & Bonawitz, E. B. (2007). Serious fun: Preschoolers engage in more exploratory play when evidence is confounded. *Developmental Psychology, 43*(4), 1045. https://doi.org/10.1037/0012-1649.43.4.1045

Schwarzer, G., Freitag, C., & Schum, N. (2013). How crawling and manual object exploration are related to the mental rotation abilities of 9-month-old infants. *Frontiers in Psychology, 4*, 97.

Shafto, P., Goodman, N. D., & Frank, M. C. (2012). Learning from others: The consequences of psychological reasoning for human learning. *Perspectives on Psychological Science, 7*(4), 341–351. https://doi.org/10.1177/1745691612448481

Shafto, P., Goodman, N. D., & Griffiths, T. L. (2014). A rational account of pedagogical reasoning: Teaching by, and learning from, examples. *Cognitive Psychology, 71*, 55–89. https://doi.org/10.1016/j.cogpsych.2013.12.004

Shneidman, L. A., & Goldin-Meadow, S. (2012). Language input and acquisition in a Mayan village: How important is directed speech? *Developmental science, 15*(5), 659–673. https://doi.org/10.1111/j.1467-7687.2012.01168.x

Shneidman, L. A., Gweon, H., Schulz, L. E., & Woodward, A. L. (2016). Learning from others and spontaneous exploration: A cross-cultural investigation. *Child Development, 87*(3), 723–735. https://doi.org/10.1111/cdev.12502

Siegler, R. S. (2002). *Microgenetic studies of self-explanation*. Cambridge University Press.

Sigman, M. (1976). Early development of preterm and full-term infants: Exploratory behavior in eight-month-olds. *Child Development*, 606–612.

Silvern, S. B., Taylor, J. B., Williamson, P. A., Surbeck, E., & Kelley, M. F. (1986). Young children's story recall as a product of play, story familiarity, and adult intervention. *Merrill-Palmer Quarterly (1982-)*, 73–86.

Sim, Z. L., & Xu, F. (2015). Toddlers learn with facilitated play, not free play. *Proceedings of the 37th Annual Conference of the Cognitive Science Society*, pp. 2200–2205.

Sim, Z. L., & Xu, F. (2017). Learning higher-order generalizations through free play: Evidence from 2-and 3-year-old children. *Developmental Psychology, 53*(4), 642. https://doi.org/10.1037/dev0000278

Singer, D., Golinkoff, R. M., & Hirsh-Pasek, K. (2006). *Play= Learning: How play motivates and enhances children's cognitive and social-emotional growth*. Oxford University Press.

Smith, L. B., Jones, S. S., Landau, B., Gershkoff-Stowe, L., & Samuelson, L. (2002). Object name learning provides on-the-job training for attention. *Psychological Science, 13*(1), 13–19.

Sobel, D., & Sommerville, J. (2010). The importance of discovery in children's causal learning from interventions. *Frontiers in Psychology, 1*, 176.

Sommerville, J. A., Woodward, A. L., & Needham, A. (2005). Action experience alters 3-month-old infants' perception of others' actions. *Cognition, 96*(1), B1–B11.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1016/0364-0213(88)90023-7

Sweller, J., & Cooper, G. A. (1985). The use of worked examples as a substitute for problem solving in learning algebra. *Cognition and Instruction, 2*(1), 59–89. https://doi.org/10.1207/s1532690xci0201_3

Tan, K., Tan, C., & Chua, J. (2008). The 'Teach Less, Learn More' initiative in Singapore schools. In J. E. Larkley & V. B. Maynhard (Eds.), *Innovation in education* (pp. 153–171). Nova Science Publishers.

Tobias, S., & Duffy, T. M. (2009). *Constructivist instruction: Success or failure?* Routledge.

Toub, T. S., Hassinger-Das, B., Nesbitt, K. T., Ilgaz, H., Weisberg, D. S., Hirsh-Pasek, K., … Dickinson, D. K. (2018). The language of play: Developing preschool vocabulary through play following shared book-reading. *Early Childhood Research Quarterly, 45*, 1–17.

Trilling, B., & Fadel, C. (2009). *21st Century Skills: Learning for life in our times*. Wiley.

van Schijndel, T. J., Visser, I., van Bers, B. M., & Raijmakers, M. E. (2015). Preschoolers perform more informative experiments after observing theory-violating evidence. *Journal of Experimental Child Psychology, 131*, 104–119.

Vygotsky, L. S., & Cole, M. (1930/1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Weisberg, D. S., Hirsh-Pasek, K., Golinkoff, R. M., Kittredge, A. K., & Klahr, D. (2016). Guided play: Principles and practices. *Current Directions in Psychological Science, 25*(3), 177–182.

Weisberg, D. S., Hirsh-Pasek, K., Golinkoff, R. M., & McCandliss, B. D. (2014). Mise en place: setting the stage for thought and action. *Trends in Cognitive Sciences, 18*(6), 276–278. https://doi.org/10.1016/j.tics.2014.02.012

Weisberg, D. S., Hirsh-Pasek, K., & Golinkoff, R. M. (2013). Guided play: Where curricular goals meet a playful pedagogy. *Mind, Brain, and Education, 7*(2), 104–112.

Willard, A. K., Busch, J. T., Cullum, K. A., Letourneau, S. M., Sobel, D. M., Callanan, M., & Legare, C. H. (2019). Explain this, explore that: A study of parent–child interaction in a children's Museum. *Child Development*. https://doi.org/10.1111/cdev.13232

Wise, A. F., & O'Neill, K. (2009). Beyond more versus less: A reframing of the debate on instructional guidance. In S. Tobias & T. M. Duffy (Eds.), *Constructivist instruction: Success or failure?* (pp. 82–105). Routledge/Taylor & Francis Group.

Wise, K. C., & Okey, J. R. (1983). A meta-analysis of the effects of various science teaching strategies on achievement. *Journal of Research in Science Teaching, 20*(5), 419–435. https://doi.org/10.1002/tea.3660200506

Xu, F., Dewar, K., & Perfors, A. (2009). Induction, overhypotheses, and the shape bias: Some arguments and evidence for rational constructivism. In B. M. Hood & L. R. Santos (Eds.), *The origins of object knowledge* (pp. 263–284). Oxford University Press.

Yang, S. C.-H., Yu, Y., Givchi, A., Wang, P., Vong, W. K., & Shafto, P. (2018). Optimal cooperative inference. *Proceedings of the 21st international conference on Artificial Intelligence and Statistics (AISTATS)*.

Yarrow, L. J., Klein, R. P., Lomonaco, S., & Morgan, G. (1975). Cognitive and motivational development in early childhood. In B. Z. Friedlander, G. M. Sterritt, & G. Kirk (Eds.), *Exceptional infant* (Vol. 3, pp. 491–502). Brunner/Mazel.

Yogman, M., Garner, A., Hutchinson, J., Hirsh-Pasek, K., Golinkoff, R. M., & Committee on Psychosocial Aspects of Child and Family Health, & Council on Communications and Media. (2018). The power of play: A pediatric role in enhancing development in young children. *Pediatrics, 142*(3), e20182058.

Youngblade, L. M., & Dunn, J. (1995). Individual differences in young children's pretend play with mother and sibling: Links to relationships and understanding of other people's feelings and beliefs. *Child Development, 66*(5), 1472–1492.

Yu, Y., Bonawitz, E., & Shafto, P. (2019). Pedagogical questions in parent-child conversations. *Child Development, 90*(1), 147–161. https://doi.org/10.1111/cdev.12850

Yu, Y., & Chua, J. J. E. (in press). Optimizing adult guidance to facilitate children's learning: Recent advances in developmental and computational cognitive sciences. In D. Hung,

A. Jamaludin, & A. A. Rahman (Eds.), *Applying the science of learning to education: An insight into the mechanisms that shape learning*. Springer.

Yu, Y., Landrum, A. R., Bonawitz, E., & Shafto, P. (2018a). Questioning supports effective transmission of knowledge and increased exploratory learning in pre-kindergarten children. *Developmental science, 21*(6), e12696.

Yu, Y., Shafto, P., & Bonawitz, E. (2020). Inconvenient samples: Modeling biases related to parental consent by coupling observational and experimental results. *Open Mind, 4*, 13–24.

Yu, Y., Shafto, P., Bonawitz, E., Yang, S. C.-H., Golinkoff, R. M., Corriveau, K. H., … Xu, F. (2018b). The theoretical and methodological opportunities afforded by guided play with young children. *Frontiers in Psychology, 9*, 1152.

Zuccarini, M., Sansavini, A., Iverson, J. M., Savini, S., Guarini, A., Alessandroni, R., … Aureli, T. (2016). Object engagement and manipulation in extremely preterm and full term infants at 6 months of age. *Research in Developmental Disabilities, 55*, 173–184. https://doi.org/10.1016/j.ridd.2016.04.001

# Chapter 11
# Master Your Feelings: Emotional Competence in Early Childhood Parent-Related Antecedents and Child Outcomes

**Stella Tsotsi and Yang Yang**

**Abstract** Both researchers and practitioners increasingly realize that socioemotional competence is important to many child developmental outcomes. In this chapter, we first describe three major components of children's emotional competence: emotion understanding, emotion regulation, and empathy. Then, we discuss emotional competence's (1) typical development; (2) relation with other child outcomes, such as social competence, internalizing and externalizing problems, and education, internationally and within Singapore; and (3) variance as a function of parent-related factors, including parental mental health, parents' sensitive caregiving, parent-child attachment, parent-child conversations, parental reactions to children's emotions, and parenting styles and practices. The importance and need for more studies on children's emotional competence in Singapore are discussed. Toward the end of the chapter, we provide tips for parents and teachers in an effort to help them promote emotional competence in their children and students.

**Keywords** Emotional competence · Parents · Educators · Internalizing problems · Externalizing problems

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Think one of the following scenarios:

- Helen is friends with Thomas who just got a toy truck as a gift. One of their classmates steals the toy truck. How does Helen feel about this situation? Does she recognize how Thomas feels? What can she do to help Thomas? Should she react as if nothing happened or rather try to find the culprit and ask them to return the toy truck?
- Melvin and Angela work together on a coloring activity in the classroom. Melvin reaches out and grabs one of the pencils Angela has picked to use next. What is more, this is the third time Melvin has acted like this today. Angela feels angry. How will she express her anger? Are there socially appropriate ways? What is Melvin's understanding of the situation?
- Sophia is very happy because she and her dad are going to watch a musical performance later today. Her friend Nora is sad because her pet has gone missing. Will Sophia express her joy? Or rather will she feel for her friend and hold back?

The answers to these questions are dependent on Helen's, Angela's, Melvin's, and Sophia's emotional competence, i.e., whether they are apt in recognizing others' emotions and understanding a given social situation, how they express and regulate their own emotions, and whether they can comprehend and resonate with others' emotions. Moreover, they may influence the manifestation of a specific behavior instead of an alternative one, which may further determine the outcome of a social interaction.

In the next sections, we elaborate upon three aspects of emotional competence: children's emotion understanding, emotion regulation, and empathy. We then discuss relations between emotional competence and child developmental outcomes (i.e., internalizing, externalizing problems, and education-related outcomes) from infancy to the preschool years. Then, we consider how parental factors (i.e., caregiver sensitivity and attachment, parent-child conversation about emotions, parental reactions to children's emotions, parenting practices, marital conflict or aggression, and parental mental health) may impact the development of emotional competence. Finally, we discuss the importance of studies on children's emotional competence in Singapore and give concrete example activities that caregivers can adopt to promote children's emotional competence in early childhood.

## 11.1 Defining Emotional Competence

Emotional competence encompasses functions related to the communication of emotions, i.e., experiencing emotions and sending or receiving emotion-related messages (Halberstadt et al., 2001). Within this chapter, we will focus on three emotional competence skills, emotion understanding, emotion regulation, and empathy. Emotion understanding incorporates two components: *emotion recognition*, i.e., the ability to recognize others' discrete emotional expressions based on expressive signals and behavior, and *situation understanding*, i.e., the ability to
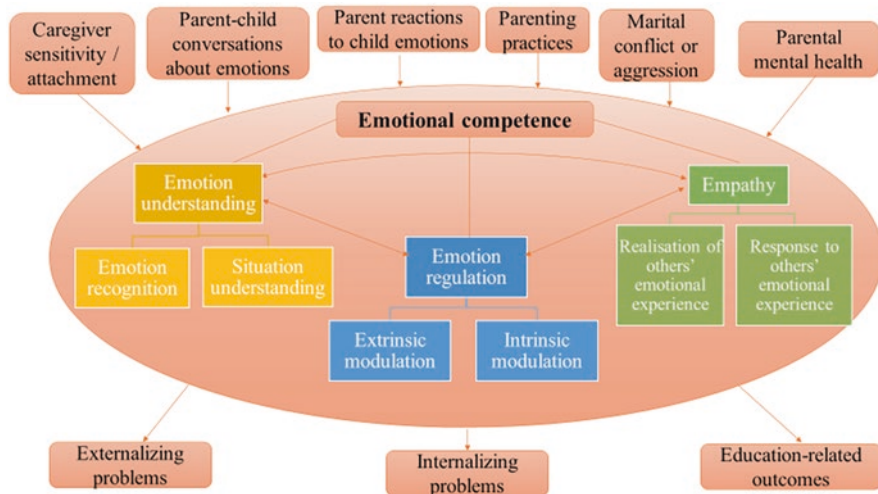
**Fig. 11.1** Emotional competence structure

comprehend situations that trigger certain emotions (Denham, 1998). Emotion regulation refers to intrinsic and extrinsic processes involved in the modulation of emotional reactions in order to adapt to environmental demands and changes and accomplish one's goals (Thompson, 1994). Empathy is the ability to realize or even experience an emotional response that is similar to that of another person and respond with concern and consideration to others' emotional experiences (Spinrad & Eisenberg, 2014).

These three skills are interdependent (Fig. 11.1). For example, emotion understanding involves familiarity with emotion experiences, while empathy relies on emotion understanding in order to interpret a situation and respond accordingly. Likewise, emotion regulation entails managing one's emotional reactions, but this may also involve understanding the specific situation that triggered the emotions in the first place. Emotion understanding, emotion regulation, and empathy also share two features. First, they start developing in infancy and continue to do so well into adolescence (Saarni, 2000). Second, they constitute the building blocks of prosocial skills and social competence (Denham, 1998).

## 11.2  Emotional Competence: Development from Infancy to Preschool Years

### 11.2.1  Emotion Understanding

Emotion understanding is crucial in social interactions because it provides immediate social feedback about our own behaviors, along with information regarding what to do next.

#### 11.2.1.1 Emotion Recognition

Among different components of emotion understanding, emotion recognition is the most basic facet and a prerequisite of more complex aspects of emotion understanding, such as understanding the mental states associated with displays of emotions, display rules (i.e., when it is culturally appropriate to display certain emotions), and mixed emotions (e.g., one may feel happy and sad at the same time; Izard, 2001; Pons et al., 2004). In the first year of life, infants demonstrate a preference for human faces and voices and start to be able to differentiate photographs with various facial expressions (Field et al., 1982; Serrano et al., 1992; Walker-Andrews, 1997). As young as 3 months, babies are able to differentiate facial expressions based on specific facial features (e.g., an open mouth). Around 7 months of age, their ability to discriminate between different facial expressions becomes more refined as they are increasingly able to use affect-related facial information in a more unified manner, i.e., recognizing the unique combination of facial features that consistently comprise an emotional expression (e.g., the overall facial expression of fear; Walker-Andrews, 1997). By the end of the first year, infants use emotional expressions as a social reference and behave accordingly based on their caregiver's facial expression in ambiguous situations (Sorce et al., 1985). During the toddler years, with the emergence of language, children start to be able to recognize and label basic facial expressions of emotions, such as happy, sad, scared, and angry (Pons & Harris, 2019; Pons et al., 2004). Children's emotion recognition skills continuously develop across preschool years (Pons et al., 2004). By the end of preschool years, the majority of children can label surprise and disgust in addition to the emotions mentioned above (Pons & Harris, 2019). In addition to facial expressions, children gradually develop the ability to recognize emotions from auditory cues. Infants respond to positive and negative speech prosody appropriately (Fernald, 1993). However, when vocal tone is in conflict with verbal context, toddlers and young preschoolers are not able to consistently use pitch cues to infer emotions (Morton & Trehub, 2001; Quam & Swingley, 2012). From 4 to 10 years of age, children gradually develop the ability to judge emotions based on paralanguage (e.g., vocal tone; Morton & Trehub, 2001; Sauter et al., 2013).

#### 11.2.1.2 Emotion Situation Knowledge

In addition to emotion recognition, understanding the situations that elicit certain emotions is another important aspect of emotion understanding (Harris et al., 1987). From the age of 2 to 3 years, children start to understand that certain situations can have an impact on one's emotions (Pons & Harris, 2019). For example, people are likely to feel happy when they receive a gift or sad when they lose their favorite toy. By the end of the preschool years, most children understand a range of situations that can elicit certain emotions (Pons & Harris, 2019; Pons et al., 2004). Recent research among infants suggests that children may start building correlations between emotions and their causes very early in life. For example, Wu and her

colleagues (2017) showed that by the second year of life, toddlers could link the most relevant probable cause with a given positive affective vocalization.

### 11.2.2    Emotion Regulation

Starting in early infancy and throughout the first years of life, children learn how to navigate their own emotional experience and others' emotional expressions and behaviors through socialization processes when interacting with their caregivers (Thompson, 2014). Through these interactions, children learn how to adjust their emotional arousal in response to different stimuli and experience efficient regulation of that arousal. Across the first years of life, the source of regulation shifts from external to internal. In infancy, emotional arousal is primarily experienced as a physical reaction to an internal (e.g., ache) or external (e.g., a very loud noise) stimulus. Although some internal regulation emerges in the form of self-soothing behaviors, in principle, children rely on external regulation by the caregiver (Sroufe, 1996), from covering basic needs (e.g., feeding) to managing aspects of the environment (e.g., hiding a frightening toy). Finger sucking and head-banging are examples of self-soothing behaviors; hugging, rocking, swaddling, and singing are examples of caregiver-led regulatory behaviors.

During the toddler years, children are increasingly more aware of their emotional responses and needs, can stay focused for short periods of time, and have developed motor and language skills that facilitate control over some aspects of the environment; for example, they can move away from a frightening stimulus. However, as these skills may be inadequate for some emotions, assistance from caregivers is still required. Through co-regulation processes (i.e., the interactive process through which mothers and infants modify their actions and behaviors toward each other based on the ongoing and anticipated cues they receive from each other), caregivers model emotional reactions and regulatory behaviors, start labeling and distinguishing emotions, and are still a source of comfort when toddlers are distressed.

During the preschool years, brain areas involved in self-regulatory processes (e.g., attention, executive functions) develop rapidly. As such, children start acquiring the "hardware" that will allow them to learn and perform more intentional and/or planned self-regulation and inhibit automatic reactions (Diamond, 2002). More advanced language skills also allow them to verbally express and regulate emotions and ask for help. Through modeling, prompting, and active teaching and practicing, caregivers start demonstrating emotion problem-solving and specific regulatory strategies, such as deep breathing techniques or "mood-booster" activities (e.g., singing, drawing, or jumping rope). Over time, children rely on all the information they picked up during interactions with their caregivers to form their own internal emotion-related representations that they employ when triggering events occur (Cassidy, 1994), especially in the absence of their caregivers.

### *11.2.3   Empathy*

Although the ability to properly understand that others' emotional experiences and thoughts may differ from oneself does not fully develop until the age of 6 or 7 years, a very basic form of empathic responses is already present in infancy. In specific, infants may exhibit reactive behaviors in response to others' expressed emotion, for example, crying when another infant cries, but this results from contagion or imitation rather than a conscious differentiation between oneself and others (Santi, 2014). During the second year of life, the phase of egocentric empathy emerges; toddlers are increasingly able to distinguish others' emotions from their own and may actively try to alleviate another's distress. However, as toddlers are insufficiently mature cognitively, they are likely to try comforting another person based on what is comforting for them, and, thus, these attempts for alleviation of another's distress may not always be effective. Starting around the age of 2 or 3 and during the preschool and kindergarten years, as children learn to recognize others' emotional expressions and develop more advanced perspective-taking skills, they progressively develop insight into others' emotional states and needs. They also start differentiating between themselves and others clearly and even experience empathic concern for people who are not physically present (Spinrad & Eisenberg, 2014). The preschool years are important in the development of empathy as children start learning through social interactions and the foundations for moral development are established. Frequently, during this period, children start attending more structured schooling which may serve as a ground for advancing their empathy skills. The development of empathy continues until adolescence when most of the skills are fully acquired.

## 11.3   Relations Between Emotional Competence and Child Outcomes

Across development, children's emotion understanding, emotion regulation, and empathy play an important role in a wide array of their behavioral, social, and cognitive development. For example, earlier studies have repeatedly identified emotion understanding as a key contributor to children's social competence (Denham, 2006; Ensor et al., 2011), fewer behavioral problems (Trentacosta & Fine, 2010), and better academic outcomes (Denham, 2006; Izard et al., 2001). Emotion regulation contributes to children's adaptability to environmental demands, but it also predicts the emergence of behavior problems or psychopathology (Eisenberg et al., 2010), peer rejection (Trentacosta & Shaw, 2009), and classroom maladjustment (Spritz et al., 2010). Likewise, empathy is likely to be related with externalizing problems, whereas prosociality seems to be the construct most frequently investigated in relation to academic outcomes. Most importantly, emotional competence in early childhood predicts well-being-related outcomes, namely, education level, stable

employment, substance abuse, delinquency, and mental health difficulties, in adolescence and adulthood (Jones et al., 2015). Identifying individual variation and difficulties in emotional competence in early childhood could also be central in curriculum planning as a means of enriching these skills and/or crafting personalized interventions for children with such difficulties.

### 11.3.1  Externalizing Problems

Externalizing problems refer to problem behaviors directed toward the external world, such as hyperactivity, aggression, and delinquency. Both theoretical perspectives and empirical data suggest a correlation between emotional competence and externalizing problems. Arsenio and Lemerise (2010) suggest that difficulties in recognizing emotions may affect the formation of accurate attributions of others' intentions and in turn lead to hostile attributional biases and aggressive behaviors. For example, if a child misreads a peer's emotional cues as anger, she or he is more likely to attribute hostile intent and behave aggressively in such situations. Studies with clinical samples showed that children with emotion recognition deficits have higher levels of conduct problems (e.g., Cadesky et al., 2000). Among community samples, studies also reported the association between emotion understanding and externalizing problems (e.g., Denham et al., 2002). A recent meta-analysis showed that the correlation between emotion understanding and externalizing problems was small to medium (Trentacosta & Fine, 2010).

Emotion regulation difficulties may contribute to the development of externalizing problems through inefficient modulation of one's emotional arousal and associated behaviors. For example, by 6 months of age, Crockenberg et al. (2008) showed that infants exhibiting difficulty disengaging from a frustrating event had a higher chance of being aggressive at the age of 2.5 years compared to those who disengaged easily. Similar associations have been reported in preschoolers (Halligan et al., 2013). Early evidence (Eisenberg et al., 2001) indicated emotion-specific associations between poor regulation of frustration, anger, or irritability and externalizing problems. More recently, less efficient regulation of negative emotions, including sadness, was associated with externalizing problems in preschoolers (Halligan et al., 2013). In Singapore, although such work has not been conducted extensively in the preschool years, such associations have been observed in secondary school students (Wong & Ang, 2007), highlighting the need for such investigations in early childhood.

Within the context of externalizing problems, emotion regulation plays a critical role in the peer victimization cycle. Although both victimized children and bullies may be comparatively less skilled in regulating negative emotions (Buckley & Saarni, 2014), the specific nature of their difficulties may differ (Garner & Hinton, 2010). On top of other mechanisms that may be at play in relation to victimization (e.g., social preference, peer rejection), victimized children seem to lack knowledge for emotional display rules and/or implement displays incorrectly, perhaps further

misinterpreting bullies' intentions. This difficulty may be further exacerbated in victimized children who react with anger, rather than fear or embarrassment, to peer aggression. Unfortunately, such assertive-regulation strategies, such as revenge-seeking, may lead to further victimization. On the contrary, bullies and bullies-victims may experience negative emotions intensely and, as their emotion regulation skills may be inefficient, express them intensely as well. Both groups of children will benefit from training or intervention programs that include management of emotion reactivity and emotion problem-solving.

When children observe other people being in distress, they may experience an empathic response reflected by elevated arousal, which can also be experienced as aversive. Indeed, starting at the age of 3, children who exhibit high levels of affective empathy (i.e., sharing others' emotional states and experience similar physiological arousal) are at lower risk for externalizing difficulties. In contrast, links between cognitive empathy (i.e., understanding others' emotional states but without automatically sharing them in terms of physiological arousal) and externalizing difficulties are less consistently reported (Noten et al., 2019). These findings suggest that children who exhibit elevated aggression can understand what other children are feeling but this understanding does not incite an emotional reaction in them. Within the context of the peer victimization cycle described earlier, on top of difficulties in regulating their own negative emotions, bullies may also lack appropriate emotional reactivity in response to other's feelings. In addition, empathic children may be more skillful in encoding and internalizing emotional and social cues, ultimately acquiring a more advanced understanding of how to promote positive social interactions.

### 11.3.2 Internalizing Problems

Internalizing problems refer to behavioral problems directed toward oneself, such as anxiety, depressive mood, and somatization. Difficulties in emotion understanding may contribute to the development of internalizing problems as children with poor emotion understanding may connect inappropriate emotions to a given social situation and, consequently, experience and exhibit inappropriate emotions when they themselves are in these social situations (Halberstadt et al., 2001; Mostow et al., 2002). Overtime, these children may experience increased social difficulties or isolation and develop enduring patterns of negative emotions, such as anxiety or depression (Fine et al., 2003). On the other hand, children with social anxiety may make less eye contact and have difficulties or fewer opportunities to gather emotional information from the social environment and develop a lower level of emotion understanding as a result of poor social interactions (McClure & Nowicki, 2001). These deficits in emotion understanding may worsen existing social deficits and increase the frequency and intensity of negative emotions leading to internalizing problems. Empirical studies supported the theoretical account of

intercorrelations between emotion understanding and internalizing problems. For example, children with greater emotion understanding tended to have fewer internalizing problems (McClure & Nowicki, 2001), and social anxiety was correlated with a lower level of recognizing vocal emotional cues (Fine et al., 2003; Izard et al., 2001).

Emotion regulation difficulties in relation to child internalizing difficulties can be explained within the context of maladaptive attention mechanisms. Children who exhibit attention bias toward negative or threatening stimuli are at increased risk for anxiety and affective difficulties (Waters et al., 2008). On top of this attention bias, greater difficulties in attentional control and inhibition in preschoolers with anxiety and depressive symptoms suggest that these children have difficulty disengaging from negative stimuli or situations and shifting their attention to more positive or pleasant things (Kertz et al., 2016). As children get older, their attentional control difficulties can also influence the type of coping strategies they use. For example, they may prefer self-blame and catastrophizing to positive refocusing, further exacerbating depressive mood and worry (Garnefski et al., 2007). These children may benefit from mindfulness training programs.

### 11.3.3   Education-Related Outcomes

Recognizing emotional cues and understanding their possible causes in the social environment have been shown to promote academic achievement. Izard et al. (2001) showed that the ability to recognize and label emotions was associated with academic achievement for children. In another study, preschoolers' emotion recognition and emotion situation knowledge were both measured and integrated to a composite score of emotion understanding. Emotion understanding was found as a unique and significant predictor of children's early academic success (Leerkes et al., 2008). Similar associations have previously emerged with regard to empathy and education-related outcomes, such as reading and math skills, and general achievement tests (Caprara et al., 2000). In Singapore, emotion understanding and empathy have been associated positively with primary school students' academic scores in English, math, and science (Zhou & Ee, 2012); however, such associations have not been extensively investigated in early childhood.

Although these associations may seem a bit arbitrary, there are probably combined mechanisms at play that mediate them. The contribution of emotion understanding and empathy, however, in the development of prosocial skills and overall social competence is likely the main mechanism involved. Having positive interactions in school is important as learning is a social process; children learn from and in collaboration with others (Zins et al., 2007). Studies focusing on the association between emotion understanding and social competence have highlighted that children who are able to understand emotions in peer interactions appropriately tend to be more prosocial, receive increased peer acceptance and are well adjusted in the

classroom environment (Ensor et al., 2011; Izard et al., 2001). For example, they experience positive, constructive interactions with their teachers and participate fittingly in structured activities (Shields et al., 2001). Likewise, children who are more empathic may exhibit better cooperation in the classroom and are less likely to get involved in child-teacher conflicts. Consequently, they may be more likeable by teachers and peers, eventually forming closer and more stable relationships and receiving more assistance, instruction, or positive attention from them (Nurmi, 2012). Similar evidence has emerged in Singapore but only in adolescent samples (Caleon et al., 2017). Positive attention from teachers may further act as a reinforcer for prosocial children to be more proactive and confident in their learning. For example, Doctoroff et al. (2006) showed that prosocial preschoolers exhibited better emergent literacy skills than their less prosocial counterparts, likely due to higher occurrence of prosocial interactions in the prosocial group.

It is also possible that the association between emotional competence and academic achievement is explained by other factors, such as children's attention or self-regulation or problem-solving skills, or attachment security. Rhoades et al. (2011) found that children's attentional skills during kindergarten mediated the effect of emotion understanding in preschool on their school success at the first grade. They argued that children's emotion understanding may facilitate appropriate responding to their own emotional arousal, which may in turn help them to better utilize the attentional resources in learning.

Within the school setting, children also need to regulate a variety of emotions relevant to learning processes. Studies have shown links between emotion regulation and teacher-student relationships peer likeability, team spirit, cooperation in the classroom and persistence and attitudes toward learning (Denham et al., 2012b). Three mechanisms may be at play in terms of emotion regulation and education-related outcomes during the preschool years:

1. Reciprocal relationships between emotion regulation and executive functions may influence the extent to which children engage and stay focused during learning activities and digest the learning material (Denham et al., 2012a).
2. Children with good emotion regulation skills are more likely to form positive relationships with teachers as they may be more compliant and do not require extensive monitoring (Graziano et al., 2007).
3. Poor emotional regulation may also influence academic performance indirectly through externalizing and internalizing difficulties that may already be present in early childhood (Graziano et al., 2007).

According to meta-analytic evidence in kindergarten and elementary school children, academic achievement increased by 11% in terms of grades and school test scores in students who underwent training in socioemotional learning (Durlak et al., 2011).

## 11.4   The Impact of Parental Factors on Emotional Competence

Among the factors that affect children's emotional competence, parents play an important role in socializing with their children, thus guiding them towards understanding and regulating emotions and empathizing with others, especially in early childhood.

### 11.4.1   Caregiver Sensitivity and Attachment

As throughout early childhood children rely on the caregivers for developing emotional competence, the quality of caregiving can impact on the quality of the parent-child relationship and children's emotional development. High-quality, sensitive caregiving is characterized by active monitoring, detection, and interpretation of child signals, especially during distress, and timely responsiveness to these signals, ultimately alleviating distress (Ainsworth, 1967). Through sensitive caregiving, children learn that emotional experiences can be shared with others and that they can count on the caregiver for external regulation of their arousal (Cassidy, 1994), ultimately building high-quality parent-child relationships characterized by secure attachment and low tension (Stevenson-Hinde et al., 2013). A secure attachment with the caregiver may also provide a safe environment for children to communicate emotions and facilitate children's emotion understanding (Bowlby, 1969). Additionally, secure mother-child attachment may further promote children's interactions in other close relationships, increasing the opportunities for emotion exchange and assisting the development of emotion understanding (Laible & Thompson, 1998). Similar to emotion understanding and regulation, caregiver sensitivity and attachment security may contribute to the development of empathy. This is not surprising as besides empathic behaviors being modelled or communicated by the caregiver, young children learn about such behaviors as they themselves are receiving them (Stern & Cassidy, 2018).

Indeed, studies have repeatedly reported positive associations between caregiver sensitivity and offspring emotion-related regulation during distress and empathic responding in toddlers, preschoolers, and school-aged children (Spinrad & Eisenberg, 2014). For example, increased maternal sensitivity contributed to shorter duration of infant immunization-related distress (Jahromi & Stifter, 2007) and predicted infants' empathy-related observed responses toward their mother being in distress, a distressed stranger, and a crying baby doll (Spinrad & Stifter, 2006). Likewise, higher maternal sensitivity related to more efficient regulation of fear-related responses in Singaporean preschoolers (Tsotsi et al., 2020). Within the context of caregiver sensitivity, parental warmth (i.e., responding in an affectionate and contingent manner to one's child and cultivating relatedness in one's children) has also been positively associated with the development of empathy skills at 18 months

of age (Daniel et al., 2016). Similar findings have been reported with secure (versus insecure) attachment. Specifically, secure mother-child attachment was correlated with mother-child conversations about emotions, which, in turn, facilitated children's emotion understanding (Raikes & Thompson, 2006), and more efficient mother-reported emotion regulation skills in preschoolers (Qu et al., 2016). Meta-analytic evidence has also suggested a medium and significant correlation between the security of mother-child attachment and children's emotion understanding (Cooke et al., 2016).

### 11.4.2   Parent-Child Conversation About Emotions

One important practice for socializing children's emotion understanding is emotional conversations. Discussion about emotional states or other internal states can help children reflect on their own emotions and try to interpret others' emotions. Such reflections can make emotional states more explicit and facilitate children's expressing, understanding, and regulating their emotions (Garner et al., 1997). Discussions about emotional experiences between parents and children further helps children learn about emotional expressions, situations, and causes (Dunn et al., 1995). In contrast, other conversations, such as those entirely focused upon behavior, without a connection to emotional state, may draw children's attention outward, hindering children's emotion understanding. Taumoepeau and Ruffman examined the longitudinal relations between children's emotion understanding and maternal references to mental states during mother-child conversations. They found that maternal talk about desires when children were 15 months old uniquely predicted children's emotion understanding at age 24 months (Taumoepeau & Ruffman, 2006) and that maternal references to cognitive terms, such as "think" or "know," positively predicted children's emotion understanding at age 33 months (Taumoepeau & Ruffman, 2008). Studies among preschoolers revealed that maternal references to mental states, including desires, cognition, and emotions, predicted children's emotion understanding (e.g., Doan & Wang, 2010).

### 11.4.3   Parental Reactions to Children's Emotions

Parents' reactions to their children's emotions, especially their negative emotions, may operate in two ways. First, how parents themselves respond to the situation is a direct form of emotion socialization, and it may indirectly communicate a specific style of dealing with emotions. Second, how parents support their children during distress is a more direct way of communicating emotion regulation skills. Some parental reactions have been considered supportive, such as helping children solve a problem (problem-focused reactions), comforting children (emotion-focused reactions), and encouraging children to express their emotions (emotion expressive

encouragement). Within a supportive context, children get more access to their emotions and have more opportunities to learn about the relations between emotions and the responding situations and how to regulate their emotions and express them appropriately (Denham et al., 2012c). Other parental reactions are considered relatively non-supportive, such as minimizing the significance of children's emotions (minimization) and punishing children's negative emotions (punitive reactions) (Fabes et al., 2002). Parents exhibiting non-supportive reactions tend to control or change their children's emotions rather than seizing the opportunity to teach children emotion-management skills (Gottman et al., 1997). Thus, children learn to suppress their expressions, may lose opportunities to learn recognizing emotions or exploring the causal relations between certain situations and emotions, or infer that negative emotions are unacceptable or unjustifiable, thus having difficulty regulating them. In line with this, Perlman et al. (2008) found that children of parents who encouraged children's expressions had greater emotion understanding when compared to those with parents who reported using more non-supportive reactions. Non-supportive responding to the child's distress was predictive of less efficient emotion regulation skills (Hurrell et al., 2015).

### 11.4.4 Parenting Practices

Certain parenting behaviors or styles or the emotional climate in the family may hamper the development of efficient child emotional competence directly or indirectly through influences on caregiver sensitivity. Overcontrolling or intrusive parenting style is characterized by parental intervention in advance of a child's attempt at regulating emotions. Overcontrolling parenting, then, reduces children's opportunities to practice emotion regulation independently (Fox & Calkins, 2003). Further repercussions of this may be:

1. Fewer opportunities for children to understand which emotional responses are appropriate in a given situation and to explore efficient ways to cope with these emotions.
2. Fewer opportunities for children to build an assortment of internalized emotion regulation skills to utilize when the caregiver is absent.
3. Fewer opportunities for parents to create teaching moments for managing emotions in distressing situations.

Research demonstrates that higher levels of both maternal (Perry et al., 2018) and paternal (Stevenson & Crnic, 2013) overcontrol were related to increased levels of emotion dysregulation in preschoolers in the context of cognitively challenging and potentially frustrating tasks.

Harsh parenting involves unfavorable attitudes toward children's emotions and punitive discipline practices, including physical or abusive threats or physical punishment. Young children who are exposed to harsh parenting may experience increased levels of emotion reactivity that they do not yet know how to regulate.

Additionally, parental support to help them with regulation may be lacking. Moreover, they may learn that emotions are destructive and intimidating, ultimately developing ineptness in dealing with their own and other's emotions. Although harsh parenting practices are frequently examined in relation to child aggressive behaviors and the development of callous and unemotional traits, evidence has also revealed links with child empathy. Children who reported high levels of parental punitive behavior, including corporal punishment, also reported lower levels of empathic concern and perspective-taking (Shen et al., 2013).

### 11.4.5   Marital Conflict or Aggression

Marital conflict is frequently characterized by verbal and/or physical exchanges of anger. It may influence the development of child emotion regulation in two ways (Crockenberg et al., 2007):

1. Children learn that this type of exchanges constitutes an acceptable (or even appropriate) way of communicating and dealing with negative emotions.
2. These feelings and associated exchanges may further transfer in the parent-child relationship.

Research findings have shown that elevated marital conflict was predictive of maladaptive emotion regulation in infants (Crockenberg et al., 2007) and toddlers (Frankel et al., 2015). Maladaptive emotion regulation was characterized by more intense distress reactivity and extreme self-soothing, potentially even inflicting pain.

### 11.4.6   Parental Mental Health

Parents' mental health may affect children's emotional competence both directly and indirectly. Parental clinical depression or depressive mood is the most frequently studied parental mental health difficulty in the context of emotional competence. Parents with depressive symptoms were more likely to have children who over-identified sadness (Martin et al., 2015); exhibited increased dysregulation of positive emotion (Feng et al., 2008), frustration or anger (Halligan et al., 2013), and fear (Olino et al., 2010); and scored lower on empathy and prosocial behaviors (Apter-Levy et al., 2013) both in and out of the school setting.

Parental clinical depression or depressive symptomatology may impact the development of child emotional competence involving, but not limited to, four main mechanisms:

1. Reduced sensitivity to children's emotional signals that may lead to inadequate support or soothing (Newland et al., 2016).
2. Impaired emotion recognition and regulation skills in the depressed mother influence what she models for or trains her child to use (Silk et al., 2006).

3. Emotion socialization may focus on negative or even blunted, instead of positive, affect that may be picked up by the child (Shaw et al., 2006).
4. Maternal depression may lead to harsh parenting practices (Wolford et al., 2019) which, as explained earlier, have a negative effect on child emotional competence. Most importantly, this association seems to be longitudinal, with the impact beginning in infancy.

Parental anxiety is not as well studied in the context of child emotional competence in early childhood. Besides the pathways outlined above for parental depression, evidence from Singapore suggests that parents with elevated anxiety may experience increased parenting stress which makes them feel that they cannot cope with the demands of the parenting role (Tsotsi et al., 2019). Increased emotion dysregulation during negative emotional contexts, such as during a challenging and potentially frustrating task, has been observed in infants (Granat et al., 2017) and school-aged children (Borelli et al., 2018) who are exposed to elevated parental anxiety.

## 11.5 The Importance of Studies on Children's Emotional Competence in Singapore

The majority of existing studies on emotional competence were conducted among Western, especially European American, children, ignoring the important role of culture in children's emotional development. Existing cross-cultural studies suggest that culture shapes children's emotional competence through shaping parenting practices and moderates the relationships among parent-related antecedences, emotional competence, and other child outcomes (Yang & Wang, 2019). Firstly, culture shapes the way parents interact with children, which in turn influences children's emotional development. For instance, Doan and Wang (2010) found that Chinese immigrant mothers made fewer references to internal states when reading storybooks with their children than did European American mothers. Fewer maternal internal-state references, in turn, led to Chinese immigrant preschoolers' comparatively lower levels of emotion knowledge, although Chinese immigrant children's emotion knowledge caught up later around age 8 (Yang & Wang, 2016). Secondly, culture moderates the relations between parental factors and children's emotional competence. Maternal supportive reactions to children's emotions were associated children's greater adaptive skills and fewer behavioral problems for both European American and Chinese immigrant children. However, non-supportive reactions tended to have a negative impact on children's emotional well-being in European American children, but did not have a significant effect on Chinese immigrant children (Song et al., 2019; Yang et al., 2020). Furthermore, culture also moderates the associations between emotional competence and other outcomes. Doan and Wang (2018) found that emotion knowledge was negatively related to internalizing problems for European American children, but not for Chinese immigrant children.

Therefore, the extensive findings in previous research in Western cultures may not necessarily apply in Singapore context. Much remains unknown regarding emotional competence and its correlates among children in Singapore. Several ongoing projects and future projects in the Centre for Research in Child Development (CRCD) at Singapore's National Institute of Education aim to fill this gap by investigating Singaporean children's emotional development. For example, the BEdok-Punggol Ongoing Singaporean study beginning in Infancy: Twenty-first century skills, Individual differences, and Variance in the Environment (BE POSITIVE) study will examine the influence of parental factors, such as parents' mental health, parents' reactions to children's emotions, parent-child interactions and conversations, and caregiving sensitivity on aspects of child development, including emotion understanding and regulation, from infancy to preschool years. Another project will examine Singaporean children's understanding of emotional cues from facial expressions and speech and the relations between emotion understanding and children's anxiety and academic outcomes in the Singapore context. In addition, researchers at CRCD are working toward identifying and adapting emotion regulation measures that are appropriate for Singaporean preschoolers and school-aged children. The findings will help practitioners to design programs to promote children's emotional competence in Singapore context.

## 11.6 Ways That Parents and Educators May Promote Emotional Competence in Early Childhood

As noted above, children acquire emotional competence through socialization processes wherein parents frequently serve as models of certain behaviors or emotions. However, educators may also convey emotion-related information in similar ways as parents. Therefore, the research findings reviewed above may also to some extent be applied to educators and other individuals who work or interact with children. For each emotional competence skill, we outline a broad area for potential improvement and then provide specific examples of activities for home and classroom settings.

### *11.6.1 Emotion Understanding*

During everyday conversations or book reading activities, making more references to one's own and others' internal states, such as desire, cognition, and emotions, may contribute to children's emotion understanding. For example:

- During snack time, caregivers can ask their toddler's preferences, "Which fruit do you prefer?", or make comments about their desires, "You want grapes!". These references can scaffold toddlers' understanding of emotions later.

- After an outing or party, caregivers can reminisce and talk about the event they experienced together with the child. During the conversation, caregivers can discuss the child's and others' emotions, ask or explain why they have such emotions, and prompt children to give other example situations that may elicit these emotions.
- During story time or circle time, teachers can make references to the characters' internal states, such as what the characters may be thinking about and what emotions they feel, and explain the reasons for the internal states.
- In a classroom, teachers can ask children to take photographs of classmates or bring their own photos with emotion(s) expressed. Then the teachers can use the photographs with children's expressed emotions to have a discussion with them about these emotions. They can ask children what emotion(s) are expressed in the pictures and what are the possible causes for the emotion(s).

## 11.6.2 Emotion Regulation

It is important for children to understand the distinction between emotions and behaviors and learn how to express their own emotions in socially appropriate ways.

- When a child is angry, parents and teachers can explain that it is OK to feel this emotion but hitting other children because of anger is not OK. They can work together with the child to channel the anger to more appropriate types of behavioral expression, for example, playing with a pet or a soothing toy or releasing their anger through running or jumping on a trampoline or similar physical activities.
- It is advisable for parents and teachers to explain the difference between a manifested behavior and the emotions that triggered the behavior. These explanations should be at an age-appropriate level so that children can understand them. For example, it should be clear that although it is OK to be angry, it is not OK to express the anger by hitting a sibling/classmate.

Although children may have internalized emotion regulation patterns, sometimes it may still be necessary to have a plan that will help children learn how to regulate their emotions.

- This may involve doing some problem-solving with the child. For example, if the child frequently responds to losing in a game with crying, then this may make her unpopular. Working around these emotions and finding strategies together that may lead to soothing may contribute to alleviating this issue.
- Another way to address this is through calming behaviors such as deep breathing or counting to calm down. These methods will help with regulating the physiological arousal that usually comes with distress and intense emotions, ultimately helping the child overcome distress.

### 11.6.3  Empathy

As was explained earlier, children start developing more advanced perspective-taking skills around the age of 2 or 3. Before that age, parents and educators can help children develop empathic concern by promoting emotion understanding, specifically recognizing basic emotions or emotional cues in others and realizing that one's own emotions and associated behaviors may influence and be influenced by other people's emotions. In this context, the suggested activities for emotion understanding may also serve as building blocks for empathy. These activities can also be combined with pretend play wherein parents can use toys, such as stuffed animals, to talk about emotions and indicate ways that a child can display empathy.

As children grow older, parents and educators can use stories or real-life examples, e.g., in the playground or during recess, to highlight non-verbal emotional cues and empathic behaviors in other people. Moreover, pretend play may become role-play. Role-plays are particularly relevant in the classroom setting as they provide a good opportunity for both actors (children actively participating in the role-play) and observers to learn about empathic behaviors. Finally, children may benefit when they are tasked to perform "small acts of kindness," for example, to help someone who has dropped something or to craft a compliment card for a fellow student. Acts of kindness can even be extended to donating one's old toys or books to an orphanage or helping with house chores. Teachers can create "kindness" challenges wherein each child is supposed to complete a given list of acts of kindness within a certain amount of time.

In sum, early childhood is a critical period for the development of children's emotional competence. As emotional competence is influenced by several caregiver-related factors across development and has impacts on children's later emotional well-being and education-related outcomes, researchers, parents, educators, practitioners, and other caregivers may work together to promote children's emotional competence and, in consequence, their overall well-being and academic achievement. Although empirical evidence related to emotional competence is currently limited in Singapore, upcoming investigations will contribute toward filling in some of the gaps.

## References

Ainsworth, M. D. S. (1967). *Infancy in Uganda: Infant care and the growth of love*. The Johns Hopkins Press.

Apter-Levy, Y., Feldman, M., Vakart, A., Ebstein, R. P., & Feldman, R. (2013). Impact of maternal depression across the first 6 years of life on the child's mental health, social engagement, and empathy: The moderating role of oxytocin. *The American Journal of Psychiatry, 170*, 1161–1168. https://doi.org/10.1176/appi.ajp.2013.12121597

Arsenio, W. F., & Lemerise, E. A. (2010). *Emotions, aggression, and morality in children: Bridging development and psychopathology*. American Psychological Association. https://doi.org/10.1037/12129-000

Borelli, J. L., Burkhart, M. L., Rasmussen, H. F., Smiley, P. A., & Hellemann, G. (2018). Children's and mothers' cardiovascular reactivity to a standardized laboratory stressor: Unique relations with maternal anxiety and overcontrol. *Emotion, 18*(3), 369–385. https://doi.org/10.1037/emo0000320

Bowlby, J. (1969). *Attachment and loss* (Vol. 1). The Hogarth Press and the Institute of Psycho-Analysis.

Buckley, M., & Saarni, C. (2014). Emotion regulation: Implications for positive youth development. In M. J. Furlong, R. Gilman, & E. S. Huebner (Eds.), *Educational psychology handbook series. Handbook of positive psychology in schools* (pp. 99–114). Routledge/Taylor & Francis Group.

Cadesky, E. B., Mota, V. L., & Schachar, R. J. (2000). Beyond words: How do children with ADHD and/or conduct problems process nonverbal information about affect? *Journal of the American Academy of Child & Adolescent Psychiatry, 39*(9), 1160–1167. https://doi.org/10.1097/00004583-200009000-00016

Caleon, I. S., Wui, M. G. L., Chiam, C. L., King, R. B., Tan, J. P.-L., & Tan, C. S. (2017). Personal strengths and perceived teacher support as predictors of Singapore students' academic risk status. *Educational Psychology, 37*(8), 983–1000. https://doi.org/10.1080/01443410.2016.1259460

Caprara, G. V., Barbaranelli, C., Pastorelli, C., Bandura, A., & Zimbardo, P. G. (2000). Prosocial foundations of children's academic achievement. *Psychological Science, 11*(4), 302–306. https://doi.org/10.1111/1467-9280.00260

Cassidy, J. (1994). Emotion regulation: Influences of attachment relationships. *Monographs of the Society for Research in Child Development, 59*, 228–283.

Cooke, J. E., Stuart-Parrigon, K. L., Movahed-Abtahi, M., Koehn, A. J., & Kerns, K. A. (2016). Children's emotion understanding and mother–child attachment: A meta-analysis. *Emotion, 16*(8), 1102–1106. https://doi.org/10.1037/emo0000221

Crockenberg, S. C., Leerkes, E. M., & Barrig-Jo, P. S. (2008). Predicting aggressive behavior in the third year from infant reactivity and regulation as moderated by maternal behavior. *Development and Psychopathology, 20*, 37–54. https://doi.org/10.1017/S0954579408000023

Crockenberg, S. C., Leerkes, E. M., & Lekka, S. K. (2007). Pathways from marital aggression to infant emotion regulation: The development of withdrawal in infancy. *Infant Behavior & Development, 30*(1), 97–113. https://doi.org/10.1016/j.infbeh.2006.11.009

Daniel, E., Madigan, S., & Jenkins, J. (2016). Paternal and maternal warmth and the development of prosociality among preschoolers. *Journal of Family Psychology, 30*(1), 114–124. https://doi.org/10.1037/fam0000120

Denham, S. A. (1998). *Emotional development in young children*. Guildford Press.

Denham, S. A. (2006). Social-emotional competence as Support for school readiness: What is it and how do we assess it? *Early Education and Development, 17*(1), 57–89. https://doi.org/10.1207/s15566935eed1701_4

Denham, S. A., Bassett, H., Way, E., Mincic, M., Zinsser, K., & Graling, K. (2012a). 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., Thayer, S. K., Mincic, M. S., Sirotkin, Y. S., & Zinsser, K. (2012b). Observing preschoolers' social-emotional behavior: Structure, foundations, and prediction of early school success. *The Journal of Genetic Psychology: Research and Theory on Human Development, 173*(3), 246–278. https://doi.org/10.1080/00221325.2011.597457

Denham, S. A., Bassett, H. H., & Zinsser, K. (2012c). Early childhood teachers as socializers of young children's emotional competence. *Early Childhood Education Journal, 40*(3), 137–143. https://doi.org/10.1007/s10643-012-0504-2

Denham, S. A., Caverly, S., Schmidt, M., Blair, K., DeMulder, E., Caal, S., … Mason, T. (2002). Preschool understanding of emotions: Contributions to classroom anger and aggression. *Journal of Child Psychology and Psychiatry, 43*(7), 901–916. https://doi.org/10.1111/1469-7610.00139

Diamond, A. (2002). Normal development of prefrontal cortex from birth to young adulthood: Cognitive functions, anatomy, and biochemistry. In D. T. Stuss & R. T. Knight (Eds.), *Principles of frontal lobe function* (pp. 466–503). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195134971.003.0029

Doan, S. N., & Wang, Q. (2010). Maternal discussions of mental states and behaviors: Relations to emotion situation knowledge in European American and immigrant Chinese children. *Child Development, 81*(5), 1490–1503. https://doi.org/10.1111/j.1467-8624.2010.01487.x

Doan, S. N., & Wang, Q. (2018). Children's emotion knowledge and internalizing problems: The moderating role of culture. *Transcultural Psychiatry, 55*(5), 689–709. https://doi.org/10.1177/1363461518792731

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

Dunn, J., Slomkowski, C., Donelan, N., & Herrera, C. (1995). Conflict, understanding, and relationships: Developments and differences in the preschool years. *Early Education & Development, 6*(4), 303–316. https://doi.org/10.1207/s15566935eed0604_2

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

Eisenberg, N., Cumberland, A., Spinrad, T. L., Fabes, R. A., Shepard, S. A., Reiser, M., … Guthrie, I. K. (2001). The relations of regulation and emotionality to children's externalizing and internalizing problem behavior. *Child Development, 72*(4), 1112–1134. https://doi.org/10.1111/1467-8624.00337

Eisenberg, N., Spinrad, T. L., & Eggum, N. D. (2010). Emotion-related self-regulation and its relation to children's maladjustment. *Annual Review of Clinical Psychology, 6*, 495–525. https://doi.org/10.1146/annurev.clinpsy.121208.131208

Ensor, R., Spencer, D., & Hughes, C. (2011). 'You feel sad?' Emotion understanding mediates effects of verbal ability and mother–child mutuality on prosocial behaviors: Findings from 2 years to 4 years. *Social Development, 20*(1), 93–110. https://doi.org/10.1111/j.1467-9507.2009.00572.x

Fabes, R. A., Poulin, R. E., Eisenberg, N., & Madden-Derdich, D. A. (2002). The Coping with Children's Negative Emotions Scale (CCNES): Psychometric properties and relations with children's emotional competence. *Marriage & Family Review, 34*(3–4), 285–310. https://doi.org/10.1300/J002v34n03_05

Feng, X., Shaw, D. S., Kovacs, M., Lane, T., O'Rourke, F. E., & Alarcon, J. H. (2008). Emotion regulation in preschoolers: The roles of behavioral inhibition, maternal affective behavior, and maternal depression. *Journal of Child Psychology and Psychiatry, 49*(2), 132–141. https://doi.org/10.1111/j.1469-7610.2007.01828.x

Fernald, A. (1993). Approval and Disapproval: Infant Responsiveness to Vocal Affect in Familiar and Unfamiliar Languages. *Child Development, 64*(3), 657–674. https://doi.org/10.1111/j.1467-8624.1993.tb02934.x

Field, T. M., Woodson, R., Greenberg, R., & Cohen, D. (1982). Discrimination and imitation of facial expressions by neonates. *Science, 218*(4568), 179–181. https://doi.org/10.1126/science.7123230

Fine, S. E., Izard, C. E., Mostow, A. J., Trentacosta, C. J., & Ackerman, B. P. (2003). First grade emotion knowledge as a predictor of fifth grade self-reported internalizing behaviors in children from economically disadvantaged families. *Development and Psychopathology, 15*(2), 331–342. https://doi.org/10.1017/S095457940300018X

Fox, N. A., & Calkins, S. D. (2003). The Development of Self-Control of Emotion: Intrinsic and Extrinsic Influences. *Motivation & Emotion, 27*(1), 7–26. https://doi.org/10.1023/A:1023622324898

Frankel, L. A., Umemura, T., Jacobvitz, D., & Hazen, N. (2015). Marital conflict and parental responses to infant negative emotions: Relations with toddler emotional

regulation. *Infant Behavior and Development, 40*, 73–83. https://doi.org/10.1016/j.infbeh.2015.03.004

Garnefski, N., Rieffe, C., Jellesma, F., Meerum Terwogt, M., & Kraaij, V. (2007). Cognitive emotion regulation strategies and emotional problems in 9-11-year-old children: The development of an instrument. *European Child & Adolescent Psychiatry, 16*(1), 1–9. https://doi.org/10.1007/s00787-006-0562-3

Garner, P. W., & Hinton, T. S. (2010). Emotional display rules and emotion self-regulation: Associations with bullying and victimization in community-based after school programs. *Journal of Community & Applied Social Psychology, 20*(6), 480–496. https://doi.org/10.1002/casp.1057

Garner, P. W., Jones, D. C., Gaddy, G., & Rennie, K. M. (1997). Low-income mothers' conversations about emotions and their children's emotional competence. *Social Development, 6*(1), 37–52. https://doi.org/10.1111/j.1467-9507.1997.tb00093.x

Gottman, J. M., Katz, L. F., & Hooven, C. (1997). *Meta-emotion: How families communicate emotionally*. Lawrence Erlbaum.

Granat, A., Gadassi, R., Gilboa-Schechtman, E., & Feldman, R. (2017). Maternal depression and anxiety, social synchrony, and infant regulation of negative and positive emotions. *Emotion, 17*(1), 11–27. https://doi.org/10.1037/emo0000204

Graziano, P. A., Reavis, R. D., Keane, S. P., & Calkins, S. D. (2007). The role of emotion regulation in children's early academic success. *Journal of School Psychology, 45*(1), 3–19. https://doi.org/10.1016/j.jsp.2006.09.002

Halberstadt, A. G., Denham, S. A., & Dunsmore, J. C. (2001). Affective social competence. *Social Development, 10*(1), 79–119. https://doi.org/10.1111/1467-9507.00150

Halligan, S. L., Cooper, P. J., Fearon, P., Wheeler, S. L., Crosby, M., & Murray, L. (2013). The longitudinal development of emotion regulation capacities in children at risk for externalizing disorders. *Development and Psychopathology, 25*(2), 391–406. https://doi.org/10.1017/S0954579412001137

Harris, P. L., Olthof, T., Terwogt, M. M., & Hardman, C. E. (1987). Children's Knowledge of the Situations that Provoke Emotion. *International Journal of Behavioral Development, 10*(3), 319–343. https://doi.org/10.1177/016502548701000304

Hurrell, K. E., Hudson, J. L., & Schniering, C. A. (2015). Parental reactions to children's negative emotions: Relationships with emotion regulation in children with an anxiety disorder. *Journal of Anxiety Disorders, 29*, 72–82. https://doi.org/10.1016/j.janxdis.2014.10.008

Izard, C. E. (2001). Emotional intelligence or adaptive emotions? *Emotion, 1*(3), 249–257. https://doi.org/10.1037/1528-3542.1.3.249

Izard, C. E., Fine, S., Schultz, D., Mostow, A., Ackerman, B., & Youngstrom, E. (2001). Emotion knowledge as a predictor of social behavior and academic competence in children at risk. *Psychological Science, 12*(1), 18–23. https://doi.org/10.1111/1467-9280.00304

Jahromi, L. B., & Stifter, C. A. (2007). Individual differences in the contribution of maternal soothing to infant distress reduction. *Infancy, 11*(3), 255–269. https://doi.org/10.1111/j.1532-7078.2007.tb00226.x

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

Kertz, S. J., Belden, A. C., Tillman, R., & Luby, J. (2016). Cognitive control deficits in shifting and inhibition in preschool age children are associated with increased depression and anxiety over 7.5 years of development. *Journal of Abnormal Child Psychology, 44*(6), 1185–1196. https://doi.org/10.1007/s10802-015-0101-0

Laible, D. J., & Thompson, R. A. (1998). Attachment and emotional understanding in preschool children. *Developmental Psychology, 34*(5), 1038–1045. https://doi.org/10.1037/0012-1649.34.5.1038

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. https://doi.org/10.1353/mpq.2008.0009

Martin, S. E., Williamson, L. R., Kurtz-Nelson, E. C., & Boekamp, J. R. (2015). Emotion understanding (and misunderstanding) in clinically referred preschoolers: The role of child language and maternal depressive symptoms. *Journal of Child and Family Studies, 24*(1), 24–37. https://doi.org/10.1007/s10826-013-9810-6

McClure, E. B., & Nowicki, S., Jr. (2001). Associations between social anxiety and nonverbal processing skill in preadolescent boys and girls. *Journal of Nonverbal Behavior, 25*(1), 3–19. https://doi.org/10.1023/A:1006753006870

Morton, J. B., & Trehub, S. E. (2001). Children's understanding of emotion in speech. *Child Development, 72*(3), 834–843. https://doi.org/10.1111/1467-8624.00318

Mostow, A. J., Izard, C. E., Fine, S. E., & Trentacosta, C. J. (2002). Modeling emotional, cognitive, and behavioral predictors of peer acceptance. *Child Development, 73*(6), 1775–1787. https://doi.org/10.1111/1467-8624.00505

Newland, R. P., Parade, S. H., Dickstein, S., & Seifer, R. (2016). The association between maternal depression and sensitivity: Child-directed effects on parenting during infancy. *Infant Behavior and Development, 45*, 47–50. https://doi.org/10.1016/j.infbeh.2016.09.001

Noten, M. M. P. G., Van der Heijden, K. B., Huijbregts, S. C. J., Van Goozen, S. H. M., & Swaab, H. (2019). Indicators of affective empathy, cognitive empathy, and social attention during emotional clips in relation to aggression in 3-year-olds. *Journal of Experimental Child Psychology, 185*, 35–50. https://doi.org/10.1016/j.jecp.2019.04.012

Nurmi, J.-E. (2012). Students' characteristics and teacher–child relationships in instruction: A meta-analysis. *Educational Research Review, 7*(3), 177–197. https://doi.org/10.1016/j.edurev.2012.03.001

Olino, T. M., Klein, D. N., Dyson, M. W., Rose, S. A., & Durbin, C. E. (2010). Temperamental emotionality in preschool-aged children and depressive disorders in parents: Associations in a large community sample. *Journal of Abnormal Psychology, 119*(3), 468–478. https://doi.org/10.1037/a0020112

Perlman, S. B., Camras, L. A., & Pelphrey, K. A. (2008). Physiology and functioning: Parents' vagal tone, emotion socialization, and children's emotion knowledge. *Journal of Experimental Child Psychology, 100*(4), 308–315. https://doi.org/10.1016/j.jecp.2008.03.007

Perry, N. B., Dollar, J. M., Calkins, S. D., Keane, S. P., & Shanahan, L. (2018). Childhood self-regulation as a mechanism through which early overcontrolling parenting is associated with adjustment in preadolescence. *Developmental psychology, 54*(8), 1542–1554. https://doi.org/10.1037/dev0000536

Pons, F., & Harris, P. L. (2019). Children's understanding of emotions or Pascal's "Error": Review and prospects. In V. LoBue, K. Pérez-Edgar, & K. A. Buss (Eds.), *Handbook of Emotional Development* (pp. 431–449). Springer.

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

Qu, J., Leerkes, E. M., & King, E. K. (2016). Preschoolers' distress and regulatory behaviors vary as a function of infant-mother attachment security. *Infant Behavior and Development, 44*, 144–147. https://doi.org/10.1016/j.infbeh.2016.06.008

Quam, C., & Swingley, D. (2012). Development in children's interpretation of pitch cues to emotions. *Child Development, 83*(1), 236–250. https://doi.org/10.1111/j.1467-8624.2011.01700.x

Raikes, H. A., & Thompson, R. A. (2006). Family emotional climate, attachment security and young children's emotion knowledge in a high risk sample. *British Journal of Developmental Psychology, 24*(1), 89–104. https://doi.org/10.1348/026151005X70427

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

Saarni, C. (2000). Emotional competence: A developmental perspective. In R. Bar-On & J. D. A. Parker (Eds.), *The handbook of emotional intelligence* (1st ed., pp. 68–91). Josset-Bass Inc.

Santi, E. A. (2014). The development of empathy in pre-schoolers. *Romanian Journal of School Psychology, 7*(14), 32–38.

Sauter, D. A., Panattoni, C., & Happé, F. (2013). Children's recognition of emotions from vocal cues. *British Journal of Developmental Psychology, 31*(1), 97–113. https://doi.org/10.1111/j.2044-835X.2012.02081.x

Serrano, J. M., Iglesias, J., & Loeches, A. (1992). Visual discrimination and recognition of facial expressions of anger, fear, and surprise in 4- to 6-month-old infants. *Developmental Psychobiology, 25*(6), 411–425. https://doi.org/10.1002/dev.420250603

Shaw, D. S., Schonberg, M., Sherrill, J., Huffman, D., Lukon, J., Obrosky, D., & Kovacs, M. (2006). Responsivity to offspring's expression of emotion among childhood-onset depressed mothers. *Journal of Clinical Child and Adolescent Psychology, 35*(4), 490–503. https://doi.org/10.1207/s15374424jccp3504_1

Shen, Y.-L., Carlo, G., & Knight, G. P. (2013). Relations between parental discipline, empathy-related traits, and prosocial moral reasoning: A multicultural examination. *The Journal of Early Adolescence, 33*(7), 994–1021. https://doi.org/10.1177/0272431613479670

Shields, A., Dickstein, S., Seifer, R., Giusti, L., Dodge Magee, K., & Spritz, B. (2001). Emotional competence and early school adjustment: A study of preschoolers at risk. *Early Education and Development, 12*(1), 73–96. https://doi.org/10.1207/s15566935eed1201_5

Silk, J. S., Shaw, D. S., Skuban, E. M., Oland, A. A., & Kovacs, M. (2006). Emotion regulation strategies in offspring of childhood-onset depressed mothers. *Journal of Child Psychology & Psychiatry, 47*(1), 69–78. https://doi.org/10.1111/j.1469-7610.2005.01440.x

Song, Q., Yang, Y., Doan, S. N., & Wang, Q. (2019). Savoring or dampening? Maternal reactions to children's positive emotions in cultural contexts. *Culture and Brain, 1-18*. https://doi.org/10.1007/s40167-019-00080-3

Sorce, J. F., Emde, R. N., Campos, J. J., & Klinnert, M. D. (1985). Maternal emotional signaling: Its effect on the visual cliff behavior of 1-year-olds. *Developmental Psychology, 21*(1), 195–200. https://doi.org/10.1037/0012-1649.21.1.195

Spinrad, T. L., & Eisenberg, N. (2014). Empathy, prosocial behavior, and positive development in schools. In M. J. Furlong, R. Gilman, & E. S. Huebner (Eds.), *Handbook of positive psychology in schools* (2nd ed., pp. 82–98). Routledge.

Spinrad, T. L., & Stifter, C. A. (2006). Toddlers' empathy-related responding to distress: Predictions from negative emotionality and maternal behavior in infancy. *Infancy, 10*(2), 97–121. https://doi.org/10.1207/s15327078in1002_1

Spritz, B. L., Sandberg, E. H., Maher, E., & Zajdel, R. T. (2010). Models of emotion skills and social competence in the Head Start classroom. *Early Education and Development, 21*(4), 495–516. https://doi.org/10.1080/10409280902895097

Sroufe, L. A. (1996). *Emotional development: The organization of emotional life in the early years*. Cambridge University Press.

Stern, J. A., & Cassidy, J. (2018). Empathy from infancy to adolescence: An attachment perspective on the development of individual differences. *Developmental Review, 47*, 1–22. https://doi.org/10.1016/j.dr.2017.09.002

Stevenson-Hinde, J., Chicot, R., Shouldice, A., & Hinde, C. A. (2013). Maternal anxiety, maternal sensitivity, and attachment. *Attachment & Human Development, 15*, 618–636. https://doi.org/10.1080/14616734.2013.830387

Stevenson, M., & Crnic, K. (2013). Intrusive fathering, children's self-regulation and social skills: A mediation analysis. *Journal of Intellectual Disability Research*, (6), 500. https://doi.org/10.1111/j.1365-2788.2012.01549.x

Taumoepeau, M., & Ruffman, T. (2006). Mother and infant talk about mental states relates to desire language and emotion understanding. *Child Development, 77*(2), 465–481. https://doi.org/10.1111/j.1467-8624.2006.00882.x

Taumoepeau, M., & Ruffman, T. (2008). Stepping stones to others' minds: Maternal talk relates to child mental state language and emotion understanding at 15, 24, and 33 months. *Child Development, 79*(2), 284–302. https://doi.org/10.1111/j.1467-8624.2007.01126.x

Thompson, R. A. (1994). Emotion regulation: A theme in search of definition. *Monographs of the Society for Research in Child Development, 59*(2-3), 25–52.

Thompson, R. A. (2014). Socialization of emotion and emotion regulation in the family. In J. J. Gross (Ed.), *Handbook of emotion regulation* (2nd ed., pp. 173–186). Guildford Press.

Trentacosta, C. J., & Fine, S. E. (2010). Emotion knowledge, social competence, and behavior problems in childhood and adolescence: A meta-analytic review. *Social Development, 19*(1), 1–29. https://doi.org/10.1111/j.1467-9507.2009.00543.x

Trentacosta, C. J., & Shaw, D. S. (2009). Emotional self-regulation, peer rejection, and antisocial behavior: Developmental associations from early childhood to early adolescence. *Journal of Applied Developmental Psychology, 30*(3), 356–365. https://doi.org/10.1016/j.appdev.2008.12.016

Tsotsi, S., Borelli, J. L., Abdulla, N. B., Tan, H. M., Sim, L. W., Sanmugam, S., … Rifkin-Graboi, A. (2020). Maternal sensitivity during infancy and the regulation of startle in preschoolers. *Attachment and Human Development, 22*(2), 207–224. https://doi.org/10.1080/14616734.2018.1542737

Tsotsi, S., Broekman, B. F. P., Sim, L. W., Shek, L. P., Tan, K. H., Chong, Y. S., Qiu, A., Chen, H. Y., Meaney, M. J., & Rifkin-Graboi, A. (2019). Maternal anxiety, parenting stress, and preschoolers' behavior problems: The role of child self-regulation. *Journal of Developmental & Behavioral Pediatrics, 40*(9), 696–705. https://doi.org/10.1097/DBP.0000000000000737

Walker-Andrews, A. S. (1997). Infants' perception of expressive behaviors: Differentiation of multimodal information. *Psychological Bulletin, 121*(3), 437–456. https://doi.org/10.1037/0033-2909.121.3.437

Waters, A. M., Neumann, D. L., Henry, J., Craske, M. G., & Ornitz, E. M. (2008). Baseline and affective startle modulation by angry and neutral faces in 4-8-year-old anxious and non-anxious children. *Biological Psychology, 78*, 10–19. https://doi.org/10.1016/j.biopsycho.2007.12.005

Wolford, S. N., Cooper, A. N., & McWey, L. M. (2019). Maternal depression, maltreatment history, and child outcomes: The role of harsh parenting. *American Journal of Orthopsychiatry, 89*(2), 181–191. https://doi.org/10.1037/ort0000365

Wong, S. S., & Ang, R. P. (2007). Emotional competencies and maladjustment in Singaporean adolescents. *Personality and Individual Differences, 43*(8), 2193–2204. https://doi.org/10.1016/j.paid.2007.06.033

Wu, Y., Muentener, P., & Schulz, L. E. (2017). One- to four-year-olds connect diverse positive emotional vocalizations to their probable causes. *Proceedings of the National Academy of Sciences, 114*(45), 11896. https://doi.org/10.1073/pnas.1707715114

Yang, Y., Song, Q., Doan, S. N., & Wang, Q. (2020). Maternal reactions to children's negative emotions: The relations to psychological adjustment, emotion knowledge, and coping in cultural contexts. *Transcultural Psychiatry, 57*(3), 408–420. https://doi.org/10.1177/1363461520905997

Yang, Y., & Wang, Q. (2016). The relation of emotion knowledge to coping in European American and Chinese immigrant children. *Journal of Child and Family Studies, 25*(2), 452–463. https://doi.org/10.1007/s10826-015-0224-5

Yang, Y., & Wang, Q. (2019). Culture in emotional development. In *Handbook of emotional development* (pp. 569–593). Springer International Publishing.

Zhou, M., & Ee, J. (2012). Development and validation of the Social Emotional Competence Questionnaire (SECQ). *The International Journal of Emotional Education, 4*(2), 27–42.

Zins, J. E., Payton, J. W., Weissberg, R. P., & O'Brien, M. U. (2007). Social and emotional learning for successful school performance. In *The science of emotional intelligence: Knowns and unknowns* (pp. 376–395). Oxford University Press.

# Chapter 12
# The Development of Early Arithmetic Skills: What, When, and How?

**Pierina Cheung, David Munez, Ee Lynn Ng, Kiat Hui Khng, and Rebecca Bull**

**Abstract**  Arithmetic skills – the ability to add, subtract, multiply, and divide – are the building blocks of mathematics. Poor arithmetic skills can lead to poor job prospects and life outcomes. It is thus important to investigate the development of arithmetic skills. What constitute the foundations for arithmetic skills? When do they develop? Previous studies have highlighted the importance of the toddler and preschool period as providing foundations for later math learning. In this chapter, we provide an overview of key factors across domain-specific and domain-general areas that support the development of arithmetic skills. We then draw on existing data from the Singapore Kindergarten Impact Project (SKIP) and describe the performance of basic numeracy skills at entry to kindergarten that are relevant for arithmetic learning. These skills include counting, informal arithmetic, and the reading and writing of Arabic digits. Finally, we conclude with guidelines for promoting the development of early mathematical knowledge in the classroom and at home.

**Keywords**  Arithmetic · Early numeracy · Singapore · Preschool · Counting · Digits · Informal arithmetic

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## 12.1   Arithmetic Skills in Singaporean Children: What, When, and How?

If chicken rice costs $3 and an extra 20 cents is needed for a take-away container, how much does it cost for one take-away order? What about four orders of chicken rice? And if two people want to cover the cost, how much does each person have to pay? Arriving at an answer to these questions requires basic arithmetic skills – addition, subtraction, multiplication, and division. Such skills are important not only for children at school entry but also for adults later in life. Indeed, poor arithmetic skills can lead to negative consequences for job prospects and quality of life (Bynner, 1997; Parsons & Bynner, 1997; Rivera-Batiz, 1992). It is thus important to investigate the development of arithmetic skills. What constitute the foundations for arithmetic skills? When do foundational skills develop? And how can we support children's learning of early arithmetic?

In this chapter, we address the development of arithmetic in early childhood. In the first section, we review key factors across domain-specific and domain-general areas that may support the learning and development of arithmetic skills. In the second section, we describe children's performance on aspects of numerical knowledge that are important for learning arithmetic, using data from children who are at the beginning of kindergarten in the Singapore Kindergarten Impact Project (SKIP; Ng & O'Brien, 2020). Specifically, we focus on basic numeracy skills, such as counting, informal arithmetic, and the reading and writing of Arabic digits, and discuss how these skills support the learning of early arithmetic. Finally, we present a set of guidelines for developing teacher education programs and for enriching the home environment that would help children develop early arithmetic knowledge.

## 12.2   Early Numerical Foundations

### 12.2.1   Arithmetic Abilities in Infancy

Although children do not learn formal arithmetic (e.g., solving mathematical problems such as "3 + 5" or "10 − 8") until around ages 6 to 7, research has shown that infants have a rudimentary understanding of arithmetic operations, suggesting that formal arithmetic has its roots early in development. Such early arithmetic understanding in the first year of life is possible because infants are capable of representing the numerosity of a collection of objects approximately, as mental magnitudes, using the approximate number system (ANS; Dehaene, 1997; Feigenson et al., 2004; Gallistel & Gelman, 1992, 2000; Xu & Spelke, 2000). This system exhibits behavioral signatures that follow Weber's law – i.e., our ability to detect differences between collections of objects is based on the ratio between the number of items of the two collections and not on the total number of items. For example, 6-month-old infants can compare a collection of 8 dots and that of 16 dots, but they fail to

compare a collection of 8 to that of 12, because the former represents a more favorable ratio (1:2 ratio) than the latter (2:3 ratio; Xu & Spelke, 2000).[1] The acuity of ratio discrimination improves over time, such that, by around ages 3 to 4, children can discriminate collections that differ by a 3:4 ratio and, in adulthood, an 11:12 ratio (Halberda & Feigenson, 2008).

Importantly, this system has been shown to support arithmetic operations, including addition, subtraction, multiplication, and division, in infants and preschoolers (Barth et al., 2005, 2006; McCrink & Spelke, 2010, 2016; McCrink & Wynn, 2004, 2009). For example, in one study, 9-month-old infants were shown an addition event representing a 5 + 5 problem. To illustrate this event, infants first saw a display of 5 elements. Then an occluder covered the elements, and another collection of 5 elements moved behind the occluder, one element at a time. Following this, the occluder was removed to reveal either the expected result (i.e., 10 elements) or an unexpected result (e.g., 5 elements). Under this paradigm, researchers compare how long infants look at the expected and unexpected result to infer their numerical abilities. They found that in both the addition and subtraction events, infants looked longer at the unexpected outcome (McCrink & Wynn, 2004), suggesting that children have a basic notion of addition and subtraction in the first year of life.

Nevertheless, the ANS represents number only approximately. For example, it cannot reliably represent the numerical difference between 20 and 21 elements. The infants who looked longer at the unexpected outcomes when shown animated displays of addition or subtraction events were not representing 5 + 5 equals exactly 10 or 10 − 5 equals exactly 5. They were drawing on the ANS, and the sums were within the acuity of their ratio discrimination. This leaves open the question about when children can compute exact sums and whether they do so before learning the meaning of number words ("five," "ten") or Arabic digits (e.g., "5," "10"), both of which are examples of symbolic number.

Some studies have suggested that infants can solve exact arithmetic problems in the first year of life but only for small collections of objects (Simon et al., 1995; Uller et al., 1999; Wynn, 1992a). For example, Wynn (1992a) showed that 5-month-old infants can do simple addition and subtraction with 1 or 2 elements (e.g., 1 + 1, 2 − 1). The mechanism that supports infants' ability to perform arithmetic calculations is debated. A growing body of results and findings from other paradigms suggest that what underlies infants' exact arithmetic performance is a domain-general system for representing and tracking individual objects and not a system dedicated to representing the numerosity of collections (Feigenson et al., 2004; Simon et al., 1995; Uller et al., 1999). Regardless of the mechanism, there are limitations to infants' arithmetic abilities: they cannot solve exact arithmetic for large collections of objects.

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[1] Throughout this chapter, Arabic digits (e.g., 2) are used to indicate numerosities, italicized words are used to represent number words (e.g., *two*), and double quotations around Arabic digits are used to represent the actual digit (e.g., "65"). For example, the digit "2" and the number word "two" are both numerical symbols that refer to the numerosity of a collection of 2 objects.

## *12.2.2* *Arithmetic Abilities in Preschoolers*

### 12.2.2.1 Solving Exact Arithmetic Problems Presented Non-symbolically and Symbolically

Similar findings have been reported for preschoolers. In particular, research suggests that children can compute exact arithmetic for small collections and only later do they develop arithmetic abilities for reasoning about large collections. For example, Levine et al. (1992) presented addition and subtraction problems to children between the ages of 4 and 6 using a hidden object game. In this game, children were shown a number of objects under a mat, and then the experimenter added objects to, or removed objects from, the mat. Children were asked to place objects on his/her own mat to indicate the number of objects that were under the experimenter's mat. Levine et al. (1992) found that 4-year-olds could often correctly reproduce the sums when they involved small numerosities (< 4), but not for large ones. Children solved the hidden object game non-symbolically, as no number words or digits were presented in the game. This study, along with more recent studies, suggests that children's ability to solve similar problems with larger numerosities non-symbolically develops later (Cheung & Le Corre, 2015; Huttenlocher et al., 1994; Jara-Ettinger et al., 2016; Levine et al., 1992).

If children can solve arithmetic problems non-symbolically, can they do so symbolically? That is, can children solve similar problems when presented with number words (e.g., "two," "three") or digits ("1," "3")? Research shows that they can, but performance on symbolic problems is worse than that on non-symbolic problems. This is regardless of whether the symbolic problems are presented with a narrative context (e.g., Mike had N balls and he got M more. How many did he have altogether?) or without it (e.g., How many is N and M altogether?) (Hughes, 1986; Levine et al., 1992; see also Zur & Gelman, 2004). This may not be surprising as solving arithmetic problems presented symbolically requires children to understand the meaning of numerical symbols (e.g., "two" refers to 2 objects) and their relations (e.g., "one" more than "two" is "three"). How do children develop arithmetic abilities for symbolic number?

### 12.2.2.2 The Role of Counting in Solving Exact Arithmetic Problems Presented Symbolically

Counting may allow children to recognize exact numbers and the relations between them. For example, shown a set of 3 disks, and 1 disk added to it, children can use counting to determine that there are now 4 disks. To learn counting, children learn to use a list of number words in a stable order (e.g., "one, two, three, four" and not "one, two, three, five") and assigning one number word to each object (Frye et al., 1989; Fuson, 1988; Gelman & Gallistel, 1978). In addition to these procedural rules, numerous studies have shown that children learn how to use counting to

generate sets of objects at around ages 3–4 (for a review, see Cheung & Ansari, 2020). That is, they understand that the last word of a counted set represents the total number of objects in the set, and this is termed the cardinal principle (Le Corre et al., 2006; Sarnecka & Carey, 2008; Wynn, 1990, 1992a, b). Children who have acquired the cardinal principle can use counting to fix an incorrect quantity to a correct one (e.g., a child who incorrectly gives 5 objects when asked for "six" knows that she can add one to make it "six"; Le Corre et al., 2006). Being able to count collections of objects may thus allow children to recognize numerical differences between numbers.

Studies that have directly examined children's counting and arithmetic operations also support this view (Zur & Gelman, 2004; Fuson, 1988; see also Geary & van Marle, 2016). They show that children can use counting to perform arithmetic operations on small collections as young as the age of 3 and the ability to use counting to determine the sizes of large collections increases with age (Zur & Gelman, 2004). For example, Zur and Gelman (2004) tested whether children use counting to check the numerosity of collections of objects after addition and subtraction. For example, after one item was taken away from a collection of five, children were asked to predict, without counting, how many were left. Critically, children were asked to check whether their prediction was correct and had to decide whether counting would be relevant for answering the "check" question. They found that 3-year-olds can use counting to do N+1 and N−1 problems for set sizes that go up to 3. Four-year-olds were mostly accurate on small collections (e.g., 1 + 2), and some of them were able to use counting to check the numerosity of collections after addition and subtraction for large sets (e.g., 6 − 3, 7 − 1). These findings suggest that through counting, children begin to compute exact sums, which likely sets the stage for learning formal arithmetic.

### 12.2.2.3 Digit Literacy

Formal arithmetic (e.g., solving problems such as "3 + 5") requires an understanding of Arabic digits in addition to arithmetic operations. Digits (including single and multi-digits) are one of the basic ingredients for formal arithmetic. Children cannot compute simple sums such as 1 + 2 if they do not understand what "1" and "2" mean. Indeed, studies have found that being able to identify Arabic digits is a predictor of arithmetic knowledge (Geary & van Marle, 2016; Göbel et al., 2014).

What is required to learn the meaning of digits? Learning the digits 1 to 9 and 0 requires learning the name of the symbol (i.e., mapping number word onto digits) and its numerical meaning (i.e., mapping digits onto numerical quantities). To learn that the name of the symbol "2" is "two" and refers to 2 objects requires rote memorization. There is nothing in the symbol "2" that says its verbal label should be "two"; it could well be "zav."

Learning the meaning of multi-digits, however, requires more than rote memorization. In fact, learning the number names of multi-digits requires some understanding of the combinatorial rules that underlie large numbers. For example, to learn the

name of "31," a child needs to know that it is a 2-digit number and thus a decade term should be used, and to name "314," she/he needs to know that it contains a value word such as "hundred." Consistent with this, previous studies show that children form bidirectional mappings between single digits and number words starting at ages 3 to 4 (Benoit et al., 2013; Hurst et al., 2017), but similar mappings for multi-digits emerge later, at around ages 5–6 (Cheung & Ansari, 2021; Mix et al., 2014; Yuan et al., 2019). Regardless, these findings suggest that preschoolers have the capacity to learn the names of Arabic digits.

## 12.3 Domain-General Abilities

The evidence reviewed thus far suggests that by around ages 3 to 4, children have mastered informal arithmetic for small collections and can use counting to compute exact sums. Studies also suggest that children begin to acquire written symbols of number (e.g., identifying single digits). In addition to acquiring knowledge related to non-symbolic or symbolic number, domain-general factors are also important for later mathematics. For example, executive functions (EF) have been shown to affect the acquisition and development of arithmetical knowledge (Gathercole & Pickering, 2000).

Executive functioning encompasses a variety of top-down control and monitoring processes, such as attentional control, planning, and the regulation of action. It is usually conceptualized according to three classes of functions: switching, or the ability to alternate between different sets of mental operations; inhibition, or the ability to resist inappropriate responses or interference from competing information; and updating, or the ability to refresh and maintain information in working memory (WM) (Miyake et al., 2000). Although the development (and differentiation) of these EF components continues into adolescence and early adulthood (Blakemore & Choudhury, 2006), some authors have found that a unitary construct of executive functioning better fits the data on working memory and inhibitory control in a group of preschool children (Hughes et al., 2010; Wiebe et al., 2008). Others have reported that executive functioning is differentiated into two domains consisting of updating and an amalgamated inhibition/shifting factor in children ages 5–13 (Lee et al., 2013; see Muller & Kerns, 2015, for a review).

Regardless of how one conceptualizes executive functioning, there is evidence that some components of executive functioning are related to mathematical performance. First, developmental studies have consistently found a relationship between children's updating capacity/WM and the development of numerical skills and arithmetic in preschoolers (Bull et al., 2008; Lan et al., 2011; Purpura et al., 2017; see Bull & Lee, 2014, for a review). One possible explanation for this relation is that updating capacity/WM may affect holding and retrieving relevant information in memory while solving math problems or counting objects. Having a large updating capacity may provide children with greater opportunities to integrate existing information. Second, some aspects of inhibition may also be particularly relevant for

learning math, as it is required when children need to suppress inappropriate strategies or heuristics (e.g., addition vs. subtraction), prepotent number representations (e.g., whole number bias in fractions), or irrelevant information in a mathematical problem (Bull & Lee, 2014). There is some evidence that inhibitory skills predict basic numeracy measures including counting and subitizing (e.g., Purpura et al., 2017; Lan et al., 2011) and support the transition from arithmetic to algebra (Khng & Lee, 2009). One explanation is that inhibitory skills are needed when children progress from learning rudimentary to more advanced mathematical concepts and strategies, which often involves resisting interference from previously learned knowledge.

### 12.3.1 Working Memory and Anxiety

Children's domain-general capabilities may also be related to their mathematical performance via other factors such as performance anxiety. A few meta-analyses concluded that there is a negative relation between elementary students' math performance and their anxiety levels (Hembree, 1990; Ma, 1999), including test anxiety (e.g., feeling anxious about failing an exam) and math anxiety (e.g., feeling anxious about doing math problems and failing a math exam).

While it may not be surprising that children's academic performance is related to test anxiety, readers may not be familiar with math anxiety. Math anxiety is a relatively new topic of interest in the field of education and psychology, and recent studies suggest that math anxiety emerges early in development. For example, in one study, first and second graders were asked "How do you feel when taking a big test in your math class?" or "How do you feel when getting your math book and seeing all the numbers in it?". Using a child-friendly Likert scale, children indicated their feelings toward these questions (Ramirez et al., 2013). Nearly 50% of students reported some level of anxiety surrounding doing math. Importantly, they also measured whether children's anxiety level is related to their math performance. Not surprisingly, children who performed better on math tests reported lower math anxiety, and those who performed poorer reported a higher level of math anxiety.

It may be tempting to conclude that children with math anxiety are simply poor at math and that the two constructs are in fact two sides of the same coin (i.e., math anxiety = poor math). Recent studies, however, suggest that we cannot simply equate math anxiety with poor math abilities. Indeed, these studies suggest that working memory may play a mediating role between math performance and math anxiety (e.g., Beilock & Willingham, 2014). Recall that working memory allows us to store and manipulate information temporarily, with a limited capacity. Anxious thoughts can occupy working memory resources that can otherwise be used to do other tasks. In the context of math problem-solving, a child who is anxious about doing math will have less working memory resources to work through math problems (e.g., Vukovic et al., 2013; for a review, see Ng & Lee,

2019). These effects are also observed with more general forms of anxiety such as trait anxiety and test anxiety, where high-anxious individuals tend to be more susceptible to cognitive interference from task-irrelevant distractors such as worrying thoughts (see, e.g., Eysenck et al., 2007). Math performance can thus be influenced not only by domain-general factors such as WM/updating capacity or inhibition but also by children's evaluation of their own performance. In the Recommendations section, we discuss how teachers can help children with math anxiety in the classroom.

## 12.4   Children's Performance on Early Arithmetic Skills

In this section, we draw on data collected as part of the Singapore Kindergarten Impact Project (SKIP) to examine the development of numerical knowledge that may support the learning of formal arithmetic. The primary goal of SKIP is to investigate the role of classroom quality (with a focus on teacher-child interactions) on children's development in various domains (i.e., mathematical, language, socioemotional learning). Over 1500 children were recruited from 80 preschools across a range of social strata and geographical areas.

The study began when children entered kindergarten and ended when they were in Primary 1. Children completed a battery of tasks at four time points. In this chapter, we focus on data from the first wave, when children first entered kindergarten. This sample included 1198 children, with an average age of 57.6 months, or 4 years 9 months (*Range* = 49–67 months). The current study analyzed data from the Test of Early Mathematics Ability – 3rd Edition (TEMA-3; Ginsburg & Baroody, 2003), which was used as a measure of early numeracy as part of a larger battery of tests on children's development (see Yao et al., 2017, for findings on the psychometric properties of TEMA-3 based on a subset of the sample reported here).

TEMA-3 is a measure of early numeracy for children between the ages of 3 and 8. TEMA-3 contains 72 items, with items assessing various types of numerical knowledge, including counting skills, number comparisons, arithmetic problems presented with tokens or number words, reading and writing of Arabic digits, and fluency with arithmetic facts. Some items require the use of tokens, fingers, and the publisher's picture book to administer.

In TEMA-3, items are grouped by age for entry points such that the first item for each child depends on their age at testing. TEMA-3 follows a staircased administration procedure. The test continued until children failed on five consecutive items. This is the upper limit of testing, or the ceiling. The lower limit, or the basal, consists of the lowest five items that children answer correctly. The unadministered items that would have come before the basal item are scored as correct, and those that appear after the ceiling item are

scored as incorrect. TEMA-3 showed good psychometric properties in this sample of Singaporean kindergartners, and the ordering of item difficulty generally aligns with the item ordering determined with the US sample (Yao et al., 2017).

A recent factor analysis of TEMA-3 items suggests that children's performance was better fit by a model with multiple types of numerical knowledge than a unitary structure (Ryoo et al., 2015). We thus created three categories of selected items from TEMA-3: Counting Skills, Informal Arithmetic, and Digit Literacy. These categories were chosen based on the item design in TEMA-3 and past literature as reviewed in the previous section. There were 6–12 items selected for each category, for a total of 24 items. Table 12.1 presents a list of selected items.

**Table 12.1** Selected items from TEMA-3 for the descriptive analysis. Item numbers are based on TEMA-3 Form A

| Entry point (age) | Item number | Item description | Category |
|---|---|---|---|
| 3 | 3 | Verbal counting by ones: 1–5 | Counting Skills |
| 3 | 5 | Nonverbal production: 1–4 | Counting Skills |
| 3 | 6 | Enumeration 1–5 | Counting Skills |
| 4 | 7 | Cardinality rule | Counting Skills |
| 4 | 9 | Number constancy | Counting Skills |
| 4 | 10 | Produce sets: up to 5 | Counting Skills |
| 4 | 12 | Verbal counting by ones: 1–10 | Counting Skills |
| 5 | 21 | Verbal counting by ones: to 21 | Counting Skills |
| 6 | 23 | Enumeration: 6–10 | Counting Skills |
| 6 | 28 | Produce sets of 19 | Counting Skills |
| 6 | 31 | Verbal counting by ones, to 42 | Counting Skills |
| 7 | 38 | Enumeration 11–20 | Counting Skills |
| 4 | 8 | Nonverbal (concrete) + & − | Informal Arithmetic |
| 5 | 16 | Concretely modelling word problems: sums up to 9 | Informal Arithmetic |
| 5 | 17 | Part-whole concept | Informal Arithmetic |
| 6 | 25 | Equal-partitioning of discrete quantities | Informal Arithmetic |
| 6 | 26 | Mental addition: sums 5–9 | Informal Arithmetic |
| 7 | 32 | Counting on from larger addend | Informal Arithmetic |
| 4 | 14 | Reading single digits | Digit Literacy |
| 5 | 15 | Writing single digits | Digit Literacy |
| 5 | 18 | Written representation of sets up to 5 | Digit Literacy |
| 6 | 29 | Reading teens numerals | Digit Literacy |
| 6 | 30 | Writing 2-digit numbers | Digit Literacy |
| 7 | 35 | Reading 2-digit numerals | Digit Literacy |

### 12.4.1 Descriptive Analysis for Selected Items at Wave 1

**Counting Skills**  As shown in Fig. 12.1, at the start of the study, children performed well on questions that assess their cardinality understanding. Average accuracy on counting-related questions was 73.8% (*SD* = 19.4%). The violin plot in Fig. 12.1 also suggests that a majority of children performed well on counting-related questions, suggesting that at the average age of 4 years 9 months, most Singaporean children have learned how to count and use counting to identify the numerosity of collections, consistent with findings of previous studies from other countries (see Cheung & Ansari, 2020, for a review). Specifically, children understand the last word of a count refers to the total quantity of a collection of objects and can use it to generate small sets such as 2 and 3 and large sets up to 19. In contrast, children's performance on the other two categories was weaker. One possibility is that items that fall under the Counting Skills category have an earlier entry point and thus were considered easier relative to those that fall under Informal Arithmetic and Digit Literacy.

To further test whether children's better performance on cardinality was merely because cardinality questions have an earlier entry point, we examined items with
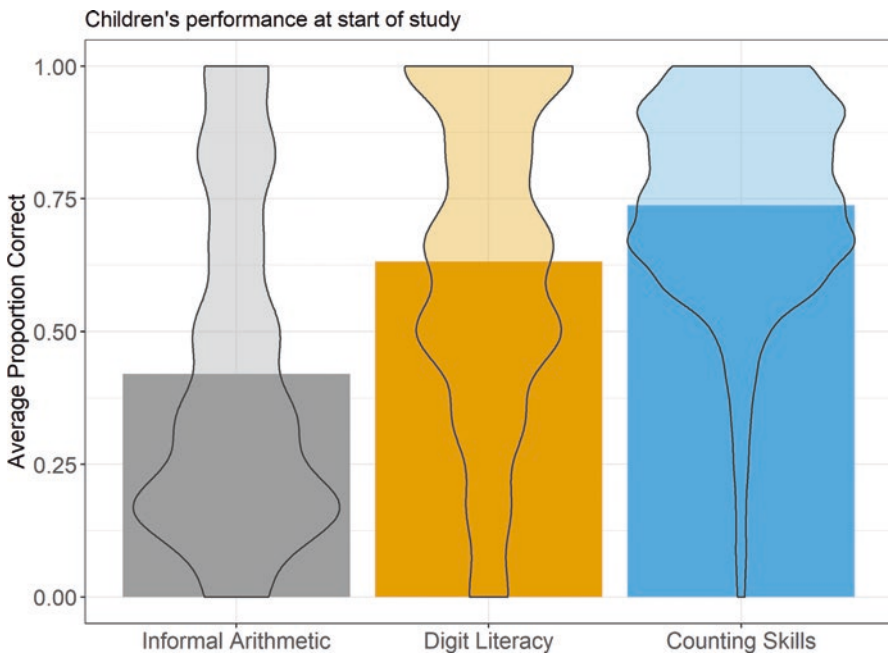


**Fig. 12.1** Children's overall performance at the first time point of testing on the three TEMA categories. Violin plots are used to present the distribution and probability density of the data; the shape of the violin plots represents frequencies of values. The thicker part of a violin plot represents values of higher frequency than the thinner part

an entry point that ranges from ages 4 to 6. We thus removed items that may be too easy (entry point = 3) or too hard (entry points = 7 or 8). This analysis yielded a similar pattern of results. Singaporean children demonstrated solid Counting Skills ($M = 72.2\%$, $SD = 23.9\%$) and showed weaker knowledge for Informal Arithmetic ($M = 47.8\%$, $SD = 33.2\%$). Many of them also answered questions related to Digit Literacy correctly ($M = 69.8\%$, $SD = 29.6\%$). This follow-up analysis indicates that Singaporean children know how to count and can identify Arabic digits by around age 5, or at the beginning of kindergarten.

**Informal Arithmetic** Children performed poorly on arithmetic problems presented with number words, despite that children are allowed to use tokens or fingers to solve addition and subtraction problems. To take a closer look at the potential source of difficulty, we focused on items with an entry point of age 5 and that are thus considered age-appropriate for children at the beginning of kindergarten. This included three items. One of the items asked children to create the sum of simple addition and subtraction problems (e.g., $1 + 3$, $4 − 3$) using tokens, without any accompanying language, presented in a manner similar to Levine et al.'s (1992) hidden object game. The second item included similar sums (e.g., $1 + 2$, $4 + 3$) but presented in a story context (e.g., "Joey has 1 token and he gets 2 more."). The third item asked children to work backward to solve a question (e.g., "Angie bought some candies. Her mother bought three more candies. Now Angie has five candies. How many candies did Angie buy?", or solve for x, when $x + 3 = 5$). Both the first and second items demonstrate problems in which both numbers in the equation are known. Almost all children responded correctly to the first question (89.7%). Only half of the children answered the second question correctly (52.6%). In the third item, one of the numbers in the equation was unknown, and the sum was provided. Children performed poorly on this question, with only 34.7% answering correctly. These results suggest that, consistent with previous findings, the notion of how addition and subtraction affect numerosities of collections emerges early, but children have difficulty with solving arithmetic problems presented with symbolic number (i.e., number words in this case).

**Digit Literacy** For digit literacy, Singaporean children appear to demonstrate strong foundations, earlier than their North American counterparts (Yao et al., 2017). A closer inspection of the data shows that 80% of SKIP children could read and write single digits and, as expected, fewer children answered questions on teens and double-digit numbers correctly (average proportion ranges from 29.7 to 56.8%). Despite this, children in Singapore are more likely to be able to read multi-digits compared to children from other countries.

## 12.4.2   Discussion of Findings

These results show that children acquire counting skills relatively early, but their ability to perform arithmetic on collections of objects or to solve simple arithmetic problems presented verbally is relatively limited at the beginning of kindergarten. If children can count collections of objects, why can't they use counting to solve simple arithmetic questions?

One possibility is that children do not interpret a story problem such as "Joey has 1 token and he gets 2 more. How many does he have altogether?" as an addition problem. If children do not interpret it as a numerical problem, then it may not be surprising that children do not count or use other numerical strategies to solve one plus two, or the addition or subtraction of any two numbers. Another possibility is that children correctly interpret a story problem as an arithmetic question, but they do not know counting is relevant in this particular context. In other words, children know how to count, but do not know *when* counting is relevant. In support of this, previous studies have shown that young children who can use counting to respond to a "how many" question may not use counting to compare two collections of objects (Sophian, 1987, 1988). This suggests that having solid counting skills is only one step toward *using* it to solve numerical questions. Future studies can explore how to guide children to apply what they know to solve story problems in early numeracy.

In addition, we show that Singaporean children can read single digits by the age of 4–5, but struggle with multi-digits (see also Yao et al., 2017). Arabic digits are one form of symbolic number representation, and their acquisition is critical for learning formal arithmetic. Solving problems such as "3 + 5" or "Mary has 3 apples and bought 5 more. How many does Mary have now?" requires children to identify Arabic digits and understand that the digit "3" refers to the same quantity as the number word "three." Given the importance of Arabic digits in arithmetic learning, teachers and parents can potentially focus on larger numbers in decades past twenty in their daily activities, because of a clearer correspondence relation between the written numeral (e.g., "25," "35") and the verbal label (e.g., "twenty-five," "thirty-five") relative to numbers in the teens (e.g., "15" and "fifteen") in English – the primary language of instruction in Singapore.

## 12.5   Recommendations and Implications for Early Math Education

Some hold the view that children's understanding of numbers (e.g., counting five objects, counting up to one hundred, one plus one equals two, etc.) will eventually be taught in school and that there is no need to support early numeracy at home or in kindergarten. Nevertheless, decades of research from education and developmental psychology have strongly suggested that children who demonstrate earlier

competence in basic numeracy develop stronger academic skills (Duncan et al., 2007). Likewise, the SKIP data suggest that children may have some, but not all of the, basic numeracy skills that can support later arithmetic learning. How can teachers and parents help children develop early numeracy?

**Learning About the Development of Children's Numerical Thinking**  To help children develop early numeracy skills, it is important to learn about the foundational components of formal arithmetic (e.g., counting, informal arithmetic) and their development, so teachers and parents have appropriate expectations of their children that help guide the type of activities or questions presented to children. To this end, parents and teachers can draw on at least two sources of information in Singapore. One source of information is the "Nurturing Early Learners: A Curriculum for Kindergartens in Singapore" (NEL), a curriculum developed by the Ministry of Education in Singapore (MOE, 2013). The NEL curriculum was first published in 2003, with the goal of providing all child care providers with a framework that they can customize to balance the learning of pre-academic skills such as numeracy and literacy and nurturing children's problem-solving skills and creativity (see Tan, 2007, for details on key reforms on preschool education in Singapore). It includes clear learning objectives, key components on children's numerical thinking, and ideas for activities that teachers can engage with their students. For example, one of the aspects NEL identifies in numeracy is counting and understanding the relations between numbers, which is a key component documented in the developmental literature (Cheung & Ansari, 2020; Nunes & Bryant, 2007). NEL encourages teachers to provide opportunities for children to "count, compare, combine, and take apart numbers… learning experiences must be authentic and relevant to children during play or as they occur in the real world" (p. 8, Vol 6., MOE, 2013). The NEL curriculum is informed by basic developmental research in numeracy and provides detailed examples on strategies that allow children to reflect on and explore concepts as they encounter them in their daily experiences. Some of these strategies include using numerical and spatial language to describe things in the environment (e.g., more/less, left/right, top/bottom) and representing the same quantity in different ways (e.g., 10 objects, 10 fingers or 2 hands, 1 base-ten block).

Another important source of information is through sharing basic research in developmental psychology on numeracy. In Singapore, this can take the form of public workshops (e.g., "Education in the City" workshops organized by the Office of Education Research at NIE), the annual Early Childhood Conference, and professional development programs for early childhood teachers (e.g., courses offered by the National Institute of Early Childhood Development). Research on the development of children's numerical understanding have highlighted different components that underlie early numeracy in the preschool years. To prepare prospective and in-service teachers in distilling and fostering mathematical ideas in young children, it is important to learn about the basic research behind different aspects of numerical thinking. This includes, for example, learning about procedural and conceptual understanding of counting, units of measurement (e.g., length of 1 shoe = combined length of 3 small balls, 10 unit blocks = 1 tens block), cues for numerical

comparisons (e.g., number, area, length, volume), the development of children's spatial thinking abilities, and their ability to detect patterns.

Indeed, recent studies have provided support that professional development that involves the sharing of basic research and teachers as active participants can lead to children's improvement in spatial and mathematical thinking (Hawes et al., 2017). In this professional development model that spans over multiple weeks, the researchers shared early numeracy research with teachers and provided teachers with activities that were originally developed in laboratory settings for basic research. Then, they asked teachers to adapt and modify the activities in their classroom (e.g., "make them your own") based on their knowledge and children's needs. Toward the end of the professional development workshop, teachers were encouraged to share their adaptations and observations with the researcher and other teachers. They found evidence for improvements in children's spatial thinking and, to some extent, also their numerical reasoning. Teachers also reported being more confident and their content knowledge has increased (Hawes et al., 2017). Future professional development workshops in Singapore should consider adapting this model in the local context.

Exposing teachers (and parents) to the developmental literature of children's numerical thinking through scientific outreach or curriculum documents will help them understand what mathematical ideas emerge during the preschool years and how to provide guided instruction to further develop children's numerical thinking.

**Observations and Formative Assessments** Learning about the scientific research on early numeracy will also help teachers when they make detailed observations of children's behavior that are meaningful for teaching and learning. For example, a child may have skipped an object when counting a set of 5 objects and incorrectly counted "one, two, three, four." Research suggests that following one-to-one correspondence in counting is a procedural skill that continues to develop even after children have acquired the cardinal principle (Fuson, 1988). Thus, it may not be clear at first glance whether the child's error reflects a lack of conceptual understanding or procedural skill. How can a teacher differentiate between the two? In this scenario, the teacher can ask the child to give a puppet a large number of objects (e.g., 5, 8) as a way to test whether the child can use counting to generate a set of objects. If the child is able to use counting to give a large number of objects, this suggests that children understand the cardinal principle and the teacher can focus on fine-tuning the child's procedural skill of counting. If the child fails to use counting to generate sets of objects, the teacher can provide a more enriched counting environment, for example, counting smaller sets of objects, emphasizing the last word in counting, and providing different sets of objects (e.g., counting three pandas, three giraffes, three penguins, three balls) to develop the child's understanding of numbers. This example illustrates how developmental research on counting (e.g., procedural vs. conceptual counting, providing different exemplars to aid generalization) can be combined with observations (e.g., a child making a counting error) and formative assessment (e.g., asking children to count to generate sets of objects) to foster children's understanding of numbers.

**Teacher Attitudes Toward Early Numeracy** Teacher attitudes toward early numeracy may also influence children's learning. For example, factors such as misconceptions around early numeracy education and math anxiety should also be considered when developing teacher education programs. Lee and Ginsburg (2009) suggested that there are nine common misconceptions around preschool mathematics teaching and learning. This includes misconceptions that surround *who* should receive early math education (e.g., only the bright students, not preschool children), *what* early math education should include (e.g., shapes and simple counting), *when* should early math be introduced (e.g., only when children show interest; teachers need not take an active role), and *how* should early math education be taught (e.g., concrete objects only; technology and assessment are not needed). Sharing findings from developmental science on these topics in teacher education programs may be an important first step to counter misconceptions around early numeracy education.

**Helping Children Reduce Anxiety** A growing body of research on math and test anxiety suggests that both types of anxiety are more common than previously thought (Beilock & Willingham, 2014; Maloney & Beilock, 2012; von der Embse et al., 2013). How can teachers or parents help children reduce math and test anxiety? Researchers have identified a few strategies. For reducing math anxiety, this includes teaching basic numerical and spatial thinking skills, enhancing teacher training programs that focus on how to teach math vs. math concepts themselves, removing time pressure from assessments to give students more time to solve math problems, and providing appropriate feedback that fosters positive thinking (e.g., language that promotes a growth mindset; see Beilock & Willingham, 2014, for discussions).

For reducing children's anxiety more generally, parents and teachers can teach children simple techniques to self-regulate and alleviate the adverse effects of anxiety. For example, teaching elementary school children to simply take deep breaths before a math fluency test has been shown to significantly reduce their anxious feelings before the test and enhance their test performance, by allowing for better a state of mind (balance between adaptive and maladaptive intrusive thoughts) during the test (Khng, 2017).

**Enhancing Executive Functioning (EF)** Interventions and activities have also been proposed to improve children's executive functioning, including computerized cognitive training, mindfulness, aerobics, resistance training, games, martial arts, yoga, theater, and specific school curricula such as the Tools of the Mind (Tools; Bodrova & Leong, 2007), a curriculum for preschools and kindergartens (see Diamond & Ling, 2016). For example, a class of interventions gives children repeated practice on tasks requiring the engagement of EFs, typically based on paradigms initially designed for assessing EFs (e.g., a running-span working memory task), and computerized to be game-like and child-friendly. Examples of such direct, computerized cognitive training involve different EF components, such as sustained attention, inhibitory control and conflict resolution, and especially working memory (e.g., Ang et al., 2015; Rueda et al., 2012). Some studies have found improvements

in the target EF component – including a working memory training study for children in Singapore (Ang et al., 2015) – but evidence for whether there is a transfer to competencies not directly trained, such as mathematical performance, is weaker (e.g., Ang et al., 2015; Bergman et al., 2011; Jaeggi et al., 2011; Rueda et al., 2012). Although there is a lack of clear evidence that EF interventions lead to improvements in mathematics achievement, recent studies suggest that high-quality mathematics education may have a dual impact in improving children's mathematics performance and also some of the EF processes (see Clements et al., 2016, for discussion).

**Learning Numbers and Math Through Play**  Finally, we end with an important point for teachers and parents: Early numeracy can be embedded in play. Counting, arithmetic, and digit literacy can be enhanced through guided play that is fun and educational. A puppet counting game in which children are asked to identify counting mistakes made by a puppet can help children reflect on the counting principles (e.g., Gelman & Gallistel, 1978), and they may be more cognizant of their own counting mistakes as a result. Follow-up questions about how to correct the count (e.g., a puppet gave 5 and incorrectly counted "one, two, three, four," how can we make it 4?) will motivate children to think about number relations and simple arithmetic. A simple card game where children are asked to map a spoken numeral ("two hundred and fifty-six") with cards that have multi-digits on them (e.g., 256, 56, 65, 652) may help children understand how Arabic digits (e.g., 256) map onto spoken numerals and are read from left to right. Further questions that ask children to predict "what the number would be if you add 1" will further their number word, digit, and arithmetic understanding. Questions can also be asked in everyday situations, such as "How many are lining up to wash their hands?", "Which box has more toys?", and "How can we make the two boxes have the same number of toys?". These questions can promote math talk and thinking in young children and provide a rich informal learning experience that will support later math learning (Berkowitz et al., 2015; Casey et al., 2018; Gunderson & Levine, 2011).

## 12.6   Conclusions

In this chapter, we have reviewed the research behind the different components underlying early arithmetic skills, which include counting, informal arithmetic, and digit literacy. We have also presented descriptive analyses on data from the Singapore Kindergarten Impact Project (SKIP), a large-scale project on preschool education, and found that children in Singapore have relatively strong counting skills and strong digit literacy. However, children's informal arithmetic skills can be further developed. Developing teacher education programs on early numeracy, recognizing the role of domain-general skills, and incorporating guided play and math talk in everyday situations can help foster children's arithmetic skills.

# References

Ang, S. Y., Lee, K., Cheam, F., Poon, K., & Koh, J. (2015). Updating and working memory training: Immediate improvement, long-term maintenance, and generalisability to non-trained tasks. *Journal of Applied Research in Memory and Cognition, 4*(2), 121–128.

Barth, H., La Mont, K., Lipton, J., & Spelke, E. S. (2005). Abstract number and arithmetic in preschool children. *Proceedings of the National Academy of Sciences, 102*(39), 14116–14121.

Barth, H., La Mont, K., Lipton, J., Dehaene, S., Kanwisher, N., & Spelke, E. (2006). Non-symbolic arithmetic in adults and young children. *Cognition, 98*(3), 199–222.

Beilock, S. L., & Willingham, D. T. (2014). Math anxiety: Can teachers help students reduce it? ask the cognitive scientist. *American Educator, 38*(2), 28–32.

Benoit, L., Lehalle, H., Molina, M., Tijus, C., & Jouen, F. (2013). Young children's mapping between arrays, number words, and digits. *Cognition, 129*(1), 95–101.

Bergman, S., Nutley, S., Bryde, S., Thorell, L. B., Humphreys, K., & Klingberg, T. (2011). Gains in fluid intelligence after training non-verbal reasoning in 4-year-old children: a controlled, randomized study. *Developmental Science, 14*, 591–601.

Berkowitz, T., Schaeffer, M. M. W., Maloney, E. A. E., Peterson, L., Gregor, C., Levine, S. C., & Beilock, S. L. (2015). Math at home adds up to achievement in school. *Science, 350*(6257), 196–198.

Blakemore, S.-J., & Choudhury, S. (2006). Development of the adolescent brain: Implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry, 47*, 296–312.

Bodrova, E., & Leong, D. (2007). *Tools of the mind* (2nd ed.). Prentice–Hall.

Bull, R., & Lee, K. (2014). Executive functioning and mathematics achievement. *Child Development Perspectives, 8*(1), 36–41.

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.

Bynner, J. M. (1997). Basic skills in adolescents' occupational preparation. *The Career Development Quarterly, 45*(4), 305–321.

Casey, B. M., Lombardi, C. M., Thomson, D., Nguyen, H. N., Paz, M., Theriault, C. A., & Dearing, E. (2018). Maternal support of children's early numerical concept learning predicts preschool and first-grade math achievement. *Child Development, 89*(1), 156–173.

Cheung, P., & Ansari, D. (2020). Early understanding of number. In S. Hupp & J. Jewell (Eds.), *The encyclopedia of child and adolescent development*. Wiley.

Cheung, P., & Ansari, D. (2021). Cracking the code of place value: The relationship between place and value takes years to master. *Developmental Psychology*.

Cheung, P., & Le Corre, M. (2015). Algebraic reasoning in 3-to 5-year-olds. In D. C. Noelle, R. Dale, A. S. Warlaumont, J. Yoshimi, T. Matlock, C. D. Jennings, & P. P. Maglio (Eds.), *Proceedings of the 37th annual meeting of the cognitive science society*. Cognitive Science Society.

Clements, D. H., Sarama, J., & Germeroth, C. (2016, March 3). Learning executive function and early mathematics: Directions of causal relations. *Early Childhood Research Quarterly, 36*, 79–90.

Dehaene, S. (1997). *The number sense: How the mind creates mathematics*. Oxford.

Diamond, A., & Ling, D. S. (2016). Conclusions about interventions, programs, and approaches for improving executive functions that appear justified and those that, despite much hype, do not. *Developmental Cognitive Neuroscience, 18*, 34–48.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., … Japel, C. (2007). School readiness and later achievement. *Developmental Psychology, 43*(6), 1428–1446.

Eysenck, M. W., Derakshan, N., Santos, R., & Calvo, M. G. (2007). Anxiety and cognitive performance: Attentional control theory. *Emotion, 7*(2), 336–353.

Feigenson, L., Dehaene, S., & Spelke, E. (2004). Core systems of number. *Trends in Cognitive Sciences, 8*(7), 307–314.

Frye, D., Braisby, N., Lowe, J., Maroudas, C., & Nicholls, J. (1989). Young children's understanding of counting and cardinality. *Child Development, 60*(5), 1158–1171.

Fuson, K. C. (1988). *Children's counting and concepts of number*. Springer.

Gallistel, C. R., & Gelman, R. (1992). Preverbal counting and computation. *Cognition, 44*, 43–74.

Gallistel, C. R., & Gelman, R. (2000). Non-verbal numerical cognition: From reals to integers. *Trends in Cognitive Sciences, 4*(2), 59–65.

Gathercole, S. E., & Pickering, S. J. (2000). Working memory deficits in children with low achievements in the national curriculum at 7 years of age. *British Journal of Educational Psychology, 70*(2), 177–194.

Geary, D. C., & van Marle, K. (2016). Young children's core symbolic and nonsymbolic quantitative knowledge in the prediction of later mathematics achievement. *Developmental Psychology, 52*(12), 2130–2144.

Gelman, R., & Gallistel, C. R. (1978). *The child's understanding of number*. Harvard University Press.

Ginsburg, H. P., & Baroody, A. J. (2003). *Test of early mathematics ability* (3rd ed.). PRO-ED.

Göbel, S. M., Watson, S. E., Lervåg, A., & Hulme, C. (2014). Children's arithmetic development: It is number knowledge, not the approximate number sense, that counts. *Psychological Science, 25*, 789–798.

Gunderson, E. A., & Levine, S. C. (2011). Some types of parent number talk count more than others: Relations between parents' input and children's cardinal-number knowledge. *Developmental Science, 14*(5), 1021–1032.

Halberda, J., & Feigenson, L. (2008). Developmental change in the acuity of the "number sense": The approximate number system in 3-, 4-, 5-, and 6-year-olds and adults. *Developmental Psychology, 44*(5), 1457–1465.

Hawes, Z., Moss, J., Caswell, B., Naqvi, S., & MacKinnon, S. (2017). Enhancing children's spatial and numerical skills through a dynamic spatial approach to early geometry instruction: Effects of a 32-week intervention. *Cognition and Instruction*. https://doi.org/10.1080/07370008.2017.1323902

Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. *Journal for Research in Mathematics Education, 21*(1), 33–46.

Hughes, M. (1986). *Children and number: Difficulties in learning mathematics*. Wiley Blackwell.

Hughes, C., Ensor, R., Wilson, A., & Graham, A. (2010). Tracking executive function across the transition to school: A latent variable approach. *Developmental Neuropsychology, 35*(1), 20–36.

Hurst, M., Anderson, U., & Cordes, S. (2017). Mapping among number words, numerals, and nonsymbolic quantities in preschoolers. *Journal of Cognition and Development, 18*(1), 41–62.

Huttenlocher, J., Jordan, N. C., & Levine, S. C. (1994). A mental model for early arithmetic. *Journal of Experimental Psychology: General, 123*(3), 284–296.

Jaeggi, S. M., Buschkuehl, M., Jonides, J., & Shah, P. (2011). Short-and long-term benefits of cognitive training. *Proceedings of the National Academy of Sciences, 108*(25), 10081–10086.

Jara-Ettinger, J., Piantadosi, S., Spelke, E. S., Levy, R., & Gibson, E. (2016). Mastery of the logic of natural numbers is not the result of mastery of counting: Evidence from late counters. *Developmental Science*, 1–11.

Khng, K. H. (2017). A better state-of-mind: Deep breathing reduces state anxiety and enhances test performance through regulating test cognitions in children. *Cognition and Emotion, 31*(7), 1502–1510.

Khng, K. H., & Lee, K. (2009). Inhibiting interference from prior knowledge: Arithmetic intrusions in algebra word problem solving. *Learning and Individual Differences, 19*(2), 262–268.

Lan, X., Legare, C. H., Ponitz, C. C., Li, S., & Morrison, F. J. (2011). Investigating the links between the subcomponents of executive function and academic achievement: A cross-cultural analysis of Chinese and American preschoolers. *Journal of Experimental Child Psychology*.

Le Corre, M., Van de Walle, G., Brannon, E. M., & Carey, S. (2006). Re-visiting the competence/performance debate in the acquisition of the counting principles. *Cognitive Psychology, 52*(2), 130–169.

Lee, J. S., & Ginsburg, H. P. (2009). Early childhood teachers' misconceptions about mathematics education for young children in the United States. *Australasian Journal of Early Childhood, 34*(4), 37–45.

Lee, K., Bull, R., & Ho, R. M. H. (2013). Developmental changes in executive functioning. *Child Development, 84*(6), 1933–1953.

Levine, S. C., Jordan, N. C., & Huttenlocher, J. (1992). Development of calculation abilities in young children. *Journal of Experimental Child Psychology, 53*(1), 72–103.

Ma, X. (1999). A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. *Journal for Research in Mathematics Education, 30*(5), 520–540.

Maloney, E. A., & Beilock, S. L. (2012). Math anxiety: Who has it, why it develops, and how to guard against it. *Trends in Cognitive Sciences, 16*(8), 404–408.

McCrink, K., & Spelke, E. S. (2010). Core multiplication in childhood. *Cognition, 116*(2), 204–216.

McCrink, K., & Spelke, E. S. (2016). Non-symbolic division in childhood. *Journal of Experimental Child Psychology, 142*, 66–82.

McCrink, K., & Wynn, K. (2004). Large number addition and subtraction by 9-month-old infants. *Psychological Science, 15*(11), 776–781.

McCrink, K., & Wynn, K. (2009). Operational momentum in large-number addition and subtraction by 9-month-olds. *Journal of Experimental Child Psychology, 103*(4), 400–408.

Ministry of Education (MOE). (2013). Nurturing early learners: A curriculum for kindergartens in Singapore. Republic of Singapore. https://www.nel.moe.edu.sg/qql/slot/u143/Resources/Downloadable/pdf/kindergarten-curriculum-framework.pdf

Mix, K. S., Prather, R. W., Smith, L. B., & Stockton, J. D. (2014). Young children's interpretation of multidigit number names: From emerging competence to mastery. *Child Development, 85*(3), 1306–1319.

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology, 41*, 49–100.

Muller, U., & Kerns, K. (2015). The development of executive function. In R.M. Lerner, L.S. Liben, & U. Muller (Eds.), handbook of child psychology and developmental science (7th ed. cognitive processes) (Vol 2, pp. 571-623). Hoboken, NJ: John Wiley.

Ng, E. L., & Lee, K. (2019). The different involvement of working memory in math and test anxiety. In I. Mammarella, S. Caviola, & A. Dowker (Eds.), *Mathematics anxiety: What is known and what is still to be understood* (pp. 126–140). Routledge.

Ng, E. L., & O'Brien, B. (2020). *Project closure report – Singapore Kindergarten Impact Project*. Centre for Research in Child Development, National Institute of Education, Nanyang Technological University.

Nunes, T., & Bryant, P. (2007). *Paper 2: Understanding whole numbers*. Retrieved from www.nuffieldfoundation.org

Parsons, S., & Bynner, J. (1997). Numeracy and employment. *Education and Training, 39*(2).

Purpura, D. J., Schmitt, S. A., & Ganley, C. M. (2017). Foundations of mathematics and literacy: The role of executive functioning components. *Journal of Experimental Child Psychology, 153*, 15–34.

Ramirez, G., Gunderson, E. A., Levine, S. C., & Beilock, S. L. (2013). Math anxiety, working memory, and math achievement in early elementary school. *Journal of Cognition and Development, 14*(2), 187–202.

Rivera-Batiz, F. L. (1992). Quantitative literacy and the likelihood of employment among young adults in the United States. *Journal of Human Resources, 27*(2), 313–328.

Rueda, M. R., Checa, P., & Cómbita, L. M. (2012). Enhanced efficiency of the executive attention network after training in preschool children: Immediate changes and effects after two months. *Developmental Cognitive Neuroscience, 2S*, S192–S204.

Ryoo, J. H., Molfese, V. J., Brown, E. T., Karp, K. S., Welch, G. W., & Bovaird, J. A. (2015). Examining factor structures on the test of early mathematics ability – 3: A longitudinal approach. *Learning and Individual Differences, 41*, 21–29.

Sarnecka, B. W., & Carey, S. (2008). How counting represents number: What children must learn and when they learn it. *Cognition, 108*(3), 662–674.

Simon, T. J., Hespos, S. J., & Rochat, P. (1995). Do infants understand simple arithmetic? A replication of Wynn (1992). *Cognitive Development, 10*, 253–269.

Sophian, C. (1987). Early developments in children's use of counting to solve quantitative problems. *Cognition and Instruction, 4*(2), 61–90.

Sophian, C. (1988). Limitations on preschool children's knowledge about counting: Using counting to compare two sets. *Developmental Psychology, 24*(5), 634–640.

Tan, C. T. (2007). Policy developments in pre-school education in Singapore: A focus on the key reforms of kindergarten education. *International Journal of Child Care and Education Pol, 1*(1), 35–43.

Uller, C., Carey, S., Huntley-Fenner, G., & Kaltt, L. (1999). What representations might underlie infant numerical knowledge? *Cognitive Development, 14*, 1–36.

Von Der Embse, N., Barterian, J., & Segool, N. (2013). Test anxiety interventions for children and adolescents: A systematic review of treatment studies from 2000–2010. *Psychology in the Schools, 50*(*1*), 57–71.

Vukovic, R. K., Kieffer, M. J., Bailey, S. P., & Harari, R. R. (2013). Mathematics anxiety in young children: Concurrent and longitudinal associations with mathematical performance. *Contemporary Educational Psychology, 38*(1), 1–10.

Wiebe, S. A., Espy, K. A., & Charak, D. (2008). Using confirmatory factor analysis to understand executive control in preschool children: I. Latent structure. *Developmental Psychology, 44*(2), 575–587.

Wynn, K. (1990). Children's understanding of counting. *Cognition, 36*, 155–193.

Wynn, K. (1992a). Addition and subtraction by human infants. *Nature, 358*(6389), 749–750.

Wynn, K. (1992b). Children's acquisition of the number words and the counting system. *Cognitive Psychology, 24*(2), 220–251.

Xu, F., & Spelke, E. S. (2000). Large number discrimination in 6-month-old infants. *Cognition, 74*(1), B1–B11.

Yao, S. Y., Muñez, D., Bull, R., Lee, K., Khng, K. H., & Poon, K. (2017). Rasch modeling of the test of early mathematics ability–Third edition with a sample of K1 children in Singapore. *Journal of Psychoeducational Assessment, 35*(6), 615–627.

Yuan, L., Prather, R. W., Mix, K. S., & Smith, L. B. (2019). Preschoolers and multi-digit numbers: A path to mathematics through the symbols themselves. *Cognition, 189*, 89–104.

Zur, O., & Gelman, R. (2004). Young children can add and subtract by predicting and checking. *Early Childhood Research Quarterly, 19*(1), 121–137.

# Chapter 13
# Harmonious Bilingual Development: The Concept, the Significance, and the Implications

He Sun

**Abstract** Harmonious Bilingual Development refers to "the experience of well-being in a language contact situation involving young children and their families" (De Houwer, The International Journal of Bilingualism 19(2): 169, 2015). This notion has attracted increasing attention in recent years, but the application of this concept within the Singaporean context remains unknown. The current chapter begins by introducing Harmonious Bilingual Development and stresses the significance of language and literacy exposure within the home and school settings alongside evidence of how this promotes local children's dual language acquisition and social-emotional development. Children's mother tongue language learning is crucial for their Harmonious Bilingual Development in Singapore and may influence kindergarteners' social-emotional and behavioral skills. Cost-effective teaching methods such as codeswitching and shared book reading are discussed in detail at the end of the chapter given their potential contribution to Singaporean children's Harmonious Bilingual Development. It is suggested that these approaches be implemented with the child bilinguals' characteristics in mind.

**Keywords** Harmonious Bilingual Development · Early bilingualism · Mother tongue language · Codeswitching · Shared book reading

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## 13.1  Harmonious Bilingual Development: The Concept, the Significance, and the Implications

The concept of Harmonious Bilingual Development (HBD) was introduced in 2006 by De Houwer who examined children's bilingual language experience from the perspective of subjective well-being (also see De Houwer, 2007a, 2009). More recently, De Houwer states:

> Harmonious Bilingual Development applies when families with young children in a language contact setting do not generally experience any problems because of that bilingual situation, or have a positive subjective experience with bilingualism. (De Houwer, 2020, p. 63)

De Houwer proposed that researchers should pay special attention to children's language usage, as it might influence HBD, and she also encouraged researchers to examine the relation between bilingual language development in children and their subjective well-being.

On the one hand, literature has established general links between bilingual input and usage and children's language proficiencies (De Houwer, 2007b; Sun et al., 2018b), whereas, on the other hand, several papers have examined the relationship between children's bilingual proficiency and their social-emotional well-being (Han, 2010; Winsler et al., 2014; Sun et al., 2021b). However, few researchers have considered language contact in relation to language outcomes and children's larger well-being within the same scope.

This chapter intends to explore HBD within the Singaporean context, where bilingualism is the cornerstone of the education system. Three major sections are included in the current chapter. As children's dual language proficiency is strongly influenced by their language input and use, the opening section addresses some environmental factors that substantially impact children's dual language learning and social-emotional well-being. These environmental factors comprise various language and literacy contacts that may affect language development and social-emotional skills. Factors related to the language environment at home, at school, and in the community (e.g., input quantity and quality) and literacy environment at home (e.g., literacy activities, availability of reading materials) will be reviewed and summarized. The subsequent section reviews how these factors and children's language use impact Singaporean bilingual preschooler' dual language acquisition and social-emotional skills. Children's mother tongue language (MTL) learning is one of the key means for achieving HBD in Singapore. Like other bilingual communities, MTL is difficult to maintain because of the dominance of English in business, government, school, and media, resulting in English being used primarily at home. Against such a backdrop, significant predictors of Singaporean preschoolers' MTL learning are highlighted. Following this, the last section expounds on the implications of HBD and discusses two well-established practices and pedagogies—codeswitching and shared book reading. These methods will be examined in detail alongside examples from early childhood education (ECE). All in all, this chapter

seeks to demonstrate how Singapore might benefit from implementing HBD in children's early childhood.

## 13.2 Section 1: Harmonious Bilingual Development and Language and Literacy Input and Use

Previous studies indicate that early child language development is influenced by both internal and external factors (Paradis, 2011; Sun & Ng, 2021; Sun et al., 2016, 2018a, 2021a; Unsworth, 2013). Whereas external factors are those variables of children's environment (e.g., SES and language exposure), internal factors refer to biological and cognitive characteristics that are intrinsic to the learners, such as age, gender, temperament, and nonverbal intelligence (Dixon et al., 2012; Eriksson et al., 2012; Sun et al., 2015). Children of older age were found to surpass their younger counterparts in terms of the rate of language development. This is probably because they are more cognitively matured and, thus, better able to utilize the learning mechanisms (Muñoz, 2006). Temperamental traits, such as adaptability, activity level, initial reactions, and mood, were revealed to correlate with children's variation in verbal and behavioral repetitions and responses at least at the beginning phase of their second language learning. For instance, children with a negative mood and a higher threshold of responsiveness were found to have their needs misinterpreted by their teachers more frequently; the misinterpretation resulted in children's lower motivation and lower chance of incidental learning in class (Sun et al., 2015). Cognitive factors would affect children's early language acquisition as well. Nonverbal intelligence refers to skills that do not require verbal articulation and may include cognitive abilities such as thinking or problem-solving (Kuschner, 2013). It is believed to promote children's structure imputation, pattern recognition, and input analysis (Daller & Ongun, 2017; but see Pham & Tipton, 2018). Meanwhile, working memory refers to a cognitive system with a limited capacity to temporarily hold information for cognitive processing (Baddeley, 2003). It facilitates children's memory of the novel sequences of pronunciation, articulation, and semantic information of the language (Barbosa et al., 2017).

Although children's internal factors play a prominent role in early language development, parents or communities have little control over these factors as compared to external factors such as input amount (Pearson, 2007). Therefore, in this section, the factors that support HBD, language input, and language output are introduced in greater detail, and both the home and school settings are discussed.

### 13.2.1  Language Input

In the home setting, children obtain their language input from two main sources: active communication with people around them, where input quantity is determined by an estimate of the amount of speech a child hears from these interlocutors (Unsworth, 2013; Ojima et al., 2011), and passive media consumption, which is rarely interactional (Sun & Yin, 2020a). The contribution of input quantity has been well documented (e.g., De Houwer, 2018). More notably, (bilingual) language exposure positively correlates to language proficiency; the more language input a child has at home, the higher their language proficiency is (De Houwer, 2018). Take vocabulary as an example: there is a corresponding relationship between time spent with the interlocutors in a specific language and acquired words in that target language for a bilingual child (Place & Hoff, 2011).

When children reach two-and-a-half-year-old, their sources of language input diversify, and parental input is complemented by input from ECE staff and peers (De Houwer, 2018). By taking into account the time children spent in school and the duration of language classes per day/week, it showed that the amount of language input from school had a significant and positive effect on early bilingual children's language proficiency (Sun et al., 2018a, 2020b; Unsworth et al., 2015). For instance, a Dutch study found that for 4-year-old children's English language learning, those who received English instruction for more than 1 h per week performed significantly better in receptive English vocabulary and grammar than their peers with less L2 English instruction per week (Unsworth et al., 2015).

Moreover, the quality of language input is also highly important and should not be neglected. Input quality could be broadly examined regarding the extent of native-standard input, richness (e.g., various sources of input), and intensity of the language input (Jia & Fuse, 2007). Bilingual children with mothers who are highly proficient in language (Chondrogianni & Marinis, 2011) and receive greater exposure from native speakers (Jia & Aaronsson, 2003) were found to have faster developmental rate and better attainment in L2 vocabulary and grammar. In the school context, teachers' language input quality might be influenced by their background knowledge (i.e., experience, education, and domain-specific skillsets). A study that examined 385 preschoolers' word learning in the Netherlands found that teachers' experience contributed to the increase in childre's performance (Druten-Frietman et al., 2015), while Gerde and Powell (2009) noted that teachers' educational level positively related to their teaching quality and postulated that these teachers' professional training might result in better language learning for children with diverse ethnic language backgrounds in the United States. Furthermore, a study by Unsworth et al. (2015) indicated that teachers' language proficiency might also affect children's language outcomes. Children with B-level CEFR[1] non-native

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[1] The Common European Framework of Reference for Languages (henceforth CEFR) ranks people's foreign language proficiency based on six levels, namely, the basic levels (A1 and A2), the intermediate levels (B1 and B2), and the advanced levels (C1 and C2) (Council of Europe, 2009).

English-speaking teachers scored significantly lower than those with native-speaker teachers or with C-level non-native speaking teachers. This finding suggests that a native-like proficiency is not necessarily required for children to obtain better English language skills and that children could improve in their language abilities so long as the teachers had a C-level CEFR holding.

### 13.2.2 Language Output

Language use provides children an outlet to test and reflect on their language behavior and correlates with children's bilingual and second language development (Bohman et al., 2010; Paradis, 2011). According to Swain (1995, 2000), comprehensible input is insufficient for language acquisition to take place; rather, language output is what pushes learners to deeply process the language and allow them to participate actively and responsively in their learning. Language output is assumed to have three unique functions: (1) the noticing/triggering function, (2) the hypothesis testing function, and (3) the metalinguistic function (Swain, 1995).

The noticing function refers to the scenario whereby learners realize that they do not know or remember the specific word or structure to deliver their meaning midspeech. In other words, output "forces" learners to notice their knowledge gap, serving as "an internal priming device for learners to notice the linguistic features that they lack in their interlanguage knowledge" (Russell, 2014, p. 26). This prompts the learners to seek the answers to address this knowledge gap in view of their future input. The hypothesis testing function means that learners would experiment with novel language forms and structures for communication demands. The feedback that speakers received afterward (e.g., clarification requests and confirmation checks) may facilitate their output modification later. Lastly, the metalinguistic function refers to how learners use their language skills to reflect upon the language produced by others or the self and to mediate the process of language learning. A local study (Sun et al., 2018b) on 805 Singaporean K1 children found that their language outputs were significantly associated with both their English and MTL (i.e., Mandarin, Malay, and Tamil) vocabulary sizes.

### 13.2.3 Literacy Input

Input and language use could be used to depict a general picture about language contact at home and school, while it is literacy activities and material availability that offers specific language and literacy features in these settings (Sun, 2019). Home literacy exposure refers to activities and practices that employ print and non-print texts or resources (Kahn & Kellner, 2005), and a common example of such an activity is shared book reading. Several child (bilingual) language studies have demonstrated how (shared) book reading may be particularly helpful for children's

acquisition of verb morphology (Paradis, 2011), vocabulary (Farver et al., 2013; Sun et al., 2020a), and story comprehension (Sun et al., 2019). For instance, Scheele et al. (2010) involved Moroccan-Dutch and Turkish-Dutch learning children in their study and revealed a significant relation between home literacy-related activities (e.g., storytelling) and children's L2 vocabulary acquisition.

In addition to literacy activities, access to rich literacy resources is also necessary to support children's language and literacy development. Whereas children commonly encounter common vocabulary and simple syntactic structures through daily conversations, they can access more complicated and varied semantic and morphosyntactic structures via book reading (Montag et al., 2015). Researchers (Hayes & Ahrens, 1988; Snow, 1983) calculated the number of sophisticated words in the books for preschoolers and found that children's books contain five times as many complicated words as in oral conversation. Besides the content, children may often benefit from the interaction with adults or peers during the shared reading. They may get access to cognitively challenging questions and comments, which allow children to master complex vocabulary and sentences (Hoff, 2006; Sun et al., 2020a, b, c). Besides, early book reading has a consistent contribution to children's long-term development, explaining about 8% of the variance in the future language and reading comprehension (Bus et al., 1995) and 12% of the variance of children's oral language performance (Mol & Bus, 2011).

### 13.2.4 Language and Literacy Input and Use on Children's Social-Emotional Well-Being

Increasing evidence indicates that children's early language and literacy environment might affect not only their language development but also their social-emotional and behavioral competencies. Social-emotional skills could be broadly defined as a person's social competence which enables him or her to effectively engage in a myriad of social contexts (Greene & Burleson, 2003). It consists of one's emotional well-being (e.g., being comfortable or upset), psychological well-being (e.g., being quick to recover from setbacks vs. vulnerable), and social well-being (e.g., having good relations with others) (National Institute of Clinical Excellence, 2013). Better social-emotional skills facilitate children's social competence—which includes peer relationships and the ability to adapt to different settings (National Institute of Clinical Excellence, 2013). This, in turn, helps them to get accustomed to new environments and cope with challenges at home and school. Conversely, without sound social-emotional skills, children may face personal and academic challenges (Eisenberg, 2006).

Han (2010) suggested that dual language exposure may influence a child's development of social-emotional skills. Examining Spanish-English bilinguals' language use at home (survey data) and English competence (children's school entry performance), Han (2010) divided the sample of 14,853 American children into 5 groups:

English monolinguals, heritage language monolinguals, English-dominant bilinguals, heritage language dominant bilinguals, and English and heritage language balanced bilinguals. The children in the balanced bilingual group (with balanced and frequent use of both languages) demonstrated better social-emotional skills (e.g., interpersonal skills) than their counterparts, and the author attributed the advantage of social-emotional skills to balanced bilinguals' enhanced communication and relationships with various stakeholders (e.g., friends, teachers, and loved ones).

Similar to the language environment, literacy environment was also revealed to significantly correlate to children's social-emotional skills (Aram et al., 2017; Farver et al., 2006). For example, Farver et al. (2006) involved children from low-socioeconomic families and found that parent-child shared book reading sessions had a direct link with children's social skills, and parent literacy habits, after controlling the age of children, highest academic qualification of parents, family size, and parental literacy habits. Such an association was shown to be moderated by children's own literacy interest. Why does literacy matter? One explanation could be that children's books usually contain rich social-emotional content and accompanying adult readers could naturally strike up a conversation to introduce prosocial skills such as sharing and collaboration, thereby facilitating children's understanding of these basic concepts. Besides, the interaction during shared book reading could also help children to practice turn-taking and self-regulation (Farver et al., 2006; Ng & Sun, 2021).

## 13.3  Section 2: Harmonious Bilingual Development and Its Relevance to the Singaporean Context

The importance of language and literacy factors on children's language development and social-emotional skills has been verified with studies on Singaporean kindergarteners (Dixon et al., 2012; Sun et al., 2018b, 2021a, b; Sun, 2019). For instance, Sun and colleagues used the data of a large-scale longitudinal study that investigated early childhood development in Singapore (SKIP; Singapore Kindergarten Impact Project) to investigate the influence of language and literacy factors on preschoolers' language development. The SKIP participants were in kindergarten 1 (K1) at the time of recruitment and were engaged from various types of preschools comprising 24 public, 10 government-run, 18 not-for-profit, and 2 commercial education providers. Sun et al. (2018b) noted that among the 805 K1 children (i.e., 551 Mandarin-English-speaking bilinguals, 105 Malay-English-speaking children, and 149 Tamil-English-speaking children; 4–5 years old), language output and the amount of books at home were positively associated with children's dual vocabulary development. Children's weekly media exposure was also significantly associated with children's MTL vocabulary, while weekly language exposure within the home setting was significantly related to the English vocabulary

development of English-Mandarin-speaking children. Such findings stress the crucial role of language exposure for Singaporean children's bilingual language development and are in line with the literature (Bohman et al., 2010; Paradis, 2011; Scheele et al., 2010; Dixon et al., 2012). It is worth noting that in an environment where children have limited language exposure from their surroundings (e.g., the MTL in the Singaporean context), media plays a unique role for children to obtain additional input.

With the same 805 bilingual children, Sun et al. (2021b) further analyzed the influences of input and output factors that promoted children's social-emotional and behavioral skills. The analysis has shown that both bilingual children with high receptive vocabulary abilities and those who have been using both languages for long periods had strong social-emotional and behavioral competencies, after taking gender, nonverbal intelligence, SES, and emotional recognition into consideration. Larger vocabulary might support children's understanding of conversation and enable them to deliver their meaning in a more precise and appropriate manner (Collins et al., 2011). Longer experience in dual language production may facilitate children to manage their behaviors with language and to build positive relations with others (Lantolf & Thorne, 2007). As illustrated in the previous section, output has specific linguistic and social functions to promote children's early language development. Children could use language output to invite more input from their interlocutors, and such a collaborative process promotes children to raise inquiries and strive for the optimal answers in the communication.

### 13.3.1 Imbalanced Bilingual Language Proficiency in Singapore

Evidence from the study mentioned above (i.e., Sun et al., 2018b) revealed that the majority of the 805 kindergarteners were exposed to English language dominant settings. Children's English and MTL language environments have been compared, and the results demonstrated that the children's home environment was heavily English focused. Whereas children had more media input, a greater amount of books, and more weekly input and output within the home setting, in English (see Table 1 in Sun et al., 2018a), their domestic MTL setting paled in comparison. Among these, media input in English and MTLs had the largest gap. The discrepancy between English and MTL environments revealed that many of the children were brought up in an English input-rich setting and a relatively input-poor MTL setting.

Singapore is not unique for such "one language dominant" bilingualism (Benmamoun et al., 2013). The situation is similar to the immigrant populations in the United States (Carnevale, 2009) and in Australia (Cavallaro, 2010), where the "first-generation" (seniors) are mainly dominant in MTLs, the "second-generation" (the middle-aged) are mainly bilinguals (proficient in both societal and

MTLs), and the younger "third-generation" are mainly English-dominant (Carnevale, 2009; Cavallaro, 2010). As Cavallaro and Ng (2014) depicted, "English is increasingly becoming the mother tongue for more and more Singaporeans, and their ethnic languages are technically more like second languages" (p. 36). The predominant status of English worldwide is considered a crucial reason for the shift away from MTL usage. In Singapore, English has functioned as the lingua franca since the launch of the bilingual policy and has continued to flourish with more social power as a result of the nation's multi-racial climate. Consequently, English has replaced various functions of MTLs in the local communities, such as being used for daily communication (Ng, 2014). Besides, as a global hub for finance, trade, and transport, Singapore requires its citizens to have a good command of English. It is probable that this prestige and pragmatism afforded to English within schools and the workplace, in turn, motivates parents to deliberately use more English with their children at home (Ng, 2014; Sun et al., 2018b). As seen in the report from the Ministry of Education in 2009, 59% of the children from primary 1 were from English-dominant home settings (Oon & Kor, 2009). This number is speculated to increase over the years as the younger generation of parents were educated in English and are used to speaking English in their workplaces.

### 13.3.2 MTL Input and Use, Children's MTL Proficiency, and Social-Emotional Well-Being

But what if parents change their MTL behaviors? Would their children's MTL learning and social-emotional skills be simultaneously affected? A recent study that followed 202 English-Mandarin-speaking K1 children suggested a positive answer (Sun, 2019). The participants' domestic Mandarin language-literacy environment was assessed with a parental questionnaire, and their receptive Mandarin language competence was examined with standard vocabulary and grammar tests. Children's social-emotional skills were assessed with the Strengths and Difficulties Questionnaire (Goodman, 1997). The results indicated that there was a relation between Mandarin language and literacy environment and children's receptive language outcomes. The results also showed that Mandarin literacy environment likely positively contributed to children's prosocial behavior and was negatively related to their total difficulty level (e.g., conduct problems). It is important to note that sufficient parental support in MTL learning, with adequate literacy scaffolding in particular, may positively influence children's MTL development and social-emotional skills at the same time. As the parents in the study only read MTL books with their children twice a week and possessed approximately 10–30 Mandarin books at home in general, the finding implies that a sound MTL literacy environment is affordable in most of the households, even for those families with tight schedules and low incomes.

The ways in which a good literacy environment positively influences children's language development have been extensively discussed in the "Literacy Environment" section. Therefore, the current paragraph only extends the discussion to cover aspects concerning the book's content and the process of the communication during the reading (Aram & Shapira, 2012; Aram et al., 2017). Content-wise, children's books usually illustrate the feelings or emotions of the character(s), thus offering the listeners ample exemplars to appreciate, recognize, and understand the feelings or opinions of others (Zeece, 2004). Conversation-wise, the discussion during the shared book reading allows children to analyze the intentions, motivation, and emotions of the protagonists based on their actions (Bruner, 1986). Frequent exposure to social-emotional conversation would facilitate children's comprehension, expression, and regulation of their behaviors and emotions.

## 13.4   Section 3: Principles and Approaches of Having Language-Literacy Input and Use

The third section of the chapter stresses the importance of children's MTL maintenance in achieving HBD in the Singaporean context. The findings of Sun (2019) suggest that Singaporean parents should be alerted to their vital role in their children's early childhood development. Parents with a good command of MTL are encouraged to speak with their children in the language more frequently. The MTL-oriented home language policy works to change both their preconceived thoughts and habits, as children's language development requires frequent and patient intellectual commitment (Bornstein et al., 1998). This is not just the case for the home environment. Schools (e.g., kindergartens) have shown a great contribution to children's early MTL development as well, and children's cumulative experience at school has been shown to significantly relate to their MTL vocabulary development (Sun, et al., 2019). Compared to the home setting, children would be exposed to academic language at school via meaning-focused activities and would establish concepts via discussions with their teachers and peers (Connor et al., 2006; Mashburn et al., 2008).

### 13.4.1   Principles of Having Language-Literacy Input and Use

As language-literacy exposure is critical to both children's language and social-emotional development, the following section introduces two approaches that teachers and parents could employ in early childhood education—codeswitching (CS; language-oriented) and shared book reading (SBR; literacy-oriented). To successfully implement these approaches, parents and teachers need to act according to the characteristics of young bilingual language learners. Some major pedagogical

principles have been synthesized as follows (Sun & Yin, 2020b). Firstly, teachers of bilingual children should not emphasize the characteristics of the language when teaching, but, rather, prioritize the child's development of conceptual knowledge (Hindman & Wasik, 2015). Secondly, parents and teachers should consider scaffolding strategies that are suited for the children's chronological age. When children begin attending preschools, parents and teachers should not view English-dominant bilinguals as blank slates when they formally start to learn MTL. Infant-directed speech (e.g., with heavily modified word pronunciation and repetition) might not be appropriate for the preschoolers any longer. Instead, parents and teachers should take advantage of children's more established first language and help them to map the phonological representation to word meaning in their L2 (Nicolay & Poncelet, 2013). For instance, children might have acquired the basic concepts, such as dog and happy, in their dominant language (i.e., Tier 1 words, which convey basic concepts and are commonly used in the home setting; Beck et al., 2002), so when they start their preschool, they may only lack the specific words for these concepts in their L2 (Lin & Johnson, 2016). Teachers might consider using children's L1 to promote their L2 learning in this case.

Moreover, teaching should ideally be tailored to the individual children's needs, and this is especially important in the school context. In her study, Lindholm-Leary (2014) found a huge variance in Spanish proficiency among her participants ("Spanish-English child bilinguals" in the United States). The so-called Spanish-English child bilinguals have substantially varied Spanish proficiency in the United States. At the entry of preschool, only 25% of the participants are Spanish-proficient children, less than half are considered to have limited Spanish proficiency, and one-third of them have minimum Spanish proficiency. This calls to attention the implications of neglecting the differences between individuals and sub-groups. For a multilingual society such as Singapore, this forewarns the implications of considering children from the same ethnic group or similar SES as a homogeneous group and implores teachers to consider these differences while preparing their classes.

### 13.4.2   Approaches of Having Language-Literacy Input and Use

**The Codeswitching Approach**[2] CS can be broadly defined as an alternation between languages, either within or between utterances (Myers-Scotton, 2011). Language educators and curriculum specialists have mixed perceptions about its value to language instruction and development. Some researchers perceive CS as a

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[2] In the school context, a related approach "translanguaging" has received substantial amount of attention (see Vijayakumar et al., 2020). Translanguaging refers to "a process by which students and teachers engage in complex discursive practices that include all the language practices of all students in a class in order to develop new language practices and sustain old ones, communicate and appropriate knowledge, and give voice to new sociopolitical realities by interrogating linguis-

sign of confusion or weak language skills, and a common belief was that CS affects language proficiencies negatively, resulting in subtractive bilingualism whereby a learner acquires the second language at the cost of their first language especially when the first language is a minority language (Aitchison, 1991). Under the umbrella of the Unitary Language System Hypothesis, researchers argue that CS leads to confusion because a bilingual child first learns the lexicons and grammars as one system, before gradually separating into two different language systems via language differentiation (Genesee, 1989). With such a negative perception, these researchers advocate only using the target language in class, to reduce cross-language interference and to prevent the stronger language from superseding the weaker one entirely, thereby ensuring the complete assimilation of the target language (Howatt, 1984) with sufficient output (Ellis, 1988).

However, recent years witnessed increasing support for the use of CS. Firstly, the Unitary Language System Hypothesis was not proven to be true by further studies. Instead, the results suggested that young bilinguals could distinguish the two language systems and their CS practices were systematic and grammatical (Yow et al., 2017). Moreover, children who used CS might command higher-order language competency given the heavier cognitive load of switching between two language systems while maintaining grammatical and syntactic accuracy (Yow et al., 2017). Furthermore, there have been studies suggested that CS facilitates students' language acquisition, enhancing their comprehension, eliciting more oral responses, and creating a more positive learning climate (Zhu & Vanek, 2017). This is especially true for beginner learners of the target language. Moreover, the recent discussion about translanguaging extends from CS and proposed that teachers and learners should be encouraged to use the full linguistics repertoire to communicate (Creese & Blackledge, 2015). The implementation of translanguaging is believed to support students' development of language awareness and multilingual and intercultural competence (García & Wei, 2014).

Different reasons have also been listed to support CS in a language class. Firstly, CS has a repetitive function in teaching instruction and proved to promote children's comprehension in a weaker language through repetition in their stronger language (Madriñan, 2014). Teachers tended to codeswitch to the learners' stronger language to convey their meaning clearly (Sert, 2005). Secondly, CS may increase the associations between words in their weaker language and stronger language. Learners could tap on their knowledge of the grammatical and lexical systems of their stronger languages, to facilitate their understanding of the target language and to make the learning environment more conducive (Madriñan, 2014; Parama et al., 2017). Thirdly, CS makes teacher's instruction more naturalistic in a multilingual classroom. As bilingual learners have dual language resources in their minds, teachers should actively use their stronger language to aid in the target language instruction without any reservations. However, there needs to be a purposeful and appropriate

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tic inequality" (Garcia & Kano, 2014, p. 261). It involves a codeswitching process to make sense and meaning.

use of the stronger language to enhance teaching and learners' target language development (Cahyani et al., 2016; Yussof & Sun, 2020).

What about the application of the CS approach in Singapore? A recent study examined the relation between teachers' use of CS and bilingual children's language and cognitive development in MTL class (Sun et al., 2020c). The study transcribed teachers' and children's utterances in 20 K1 MTL classrooms (10 Mandarin, 6 Malay, and 4 Tamil), to investigate the frequency and types (i.e., inter-sentential and intra-sentential switches) of CS adopted in teacher-child interaction. Children's MTL receptive vocabulary and cognitive switching ability were measured at K1 and K2. The study demonstrated that teachers' use of CS matches children's use of intra-sentential CS in terms of frequency. However, the teacher's CS behavior did not significantly correlate to children's MTL vocabulary development. This is probably due to the teachers' primary use of CS being out of habit rather than for instructional purposes. Besides, teacher's CS tended to influence children's growth in cognitive flexibility. The study keeps in line with the view of the literature that teachers' CS should not be sporadic or casually used; rather, it should be invoked with instructional intention. To better engage children in MTL classes, teachers need to use CS for pedagogical reasons (e.g., ensuring comprehension, providing affective support); otherwise, the positive impact of CS on children's MTL learning might be minimal.

**Shared Book Reading**  Shared book reading (SBR) has long been considered as an effective approach to help preschoolers build vocabulary and reading comprehension (De Temple & Snow, 2003; Chow et al., 2008). SBR involves an adult and a child (at home) or a group of children (in class) reading a book. During SBR, the adult will scaffold the comprehension with questions, comments, and other interactive techniques to help children to devote more attention to the story. Contextualized and decontextualized questions and comments could help enhance children's novel words acquisition and reading comprehension during SBR. Distancing Hypothesis (Sigel, 1986, 2002) describes that adults' questions and comments could be divided into three levels depending on the imposed cognitive demand. High-level strategies (e.g., inference) require children to infer word meanings using lexical and syntactic cues for story comprehension. Medium-level strategies (e.g., explanation) invite children to discover new text and connect the story to their own lives. Low-level strategies (e.g., demonstration) allow children to rely on textual cues of the book (e.g., illustration) to grasp the meaning and the plot (Sigel, 1986). Studies based in the Singaporean context suggest that the medium-level strategies could work better for K1 children's English learning (Sun et al., 2020a), while low-level strategies may facilitate children's Mandarin vocabulary learning (Sun et al., forthcoming). The findings imply that whether certain type of strategies is beneficial depends on children's current language proficiency. As many of the participants in the study were English-dominant children, they might gain more knowledge from the higher level of cognitive loading strategies.

SBR could be used independently to teach young bilinguals novel vocabulary, but if it is used with other strategies (e.g., multimodal strategies and culturally

relevant content) in an integrative manner, the reading activities may demonstrate greater effectiveness in early language development (Silverman, 2007). For instance, teachers might employ various modalities, such as singing and drama, to present the target word in different settings to help younger students understand a novel word association through the use of additional semantic cues (Silverman et al., 2013). Besides, the same story should be read repeatedly (five to six times; Collins, 2010), as children need to experience the same word multiple times to reinforce their memories (Gutiérrez-Clellen et al., 2013). To successfully employ multiple strategies in early vocabulary instruction, different strategies need to be strategically integrated; this relies on "thoughtful sequencing of tasks to intentionally combine new information with what the learner already knows" (Pollard-Durodola et al., 2018, p. 4).

It is worth noting that not all children could benefit similarly from SBR (Sun & Verspoor, 2020). SBR might not be effective for children with limited language knowledge, due to the lack of narration processing skills. These children may struggle with understanding novel words meaning or grammar, and as a result, they may have difficulty following the story plots (Verhallen & Bus, 2010). Electronic storybooks (eBooks) with well-designed features can be beneficial to emerging language skills of these children, as features of the eBooks (e.g., images, camera movement, background sound, and music) could promote children's story comprehension with different senses (Verhallen et al., 2006). A study on Singaporean kindergarteners' Mandarin language learning indeed supported the potential of animated eBooks on children's early MTL learning (Sun et al., 2019). One hundred two Singaporean preschoolers aged 4–5 joined in one of the four reading conditions: (a) enhanced eBooks (with motion and sound effects), (b) static eBooks I (without motion but with sound effects), (c) static eBooks II (without either motion or sound effects), and (d) math game (the control condition). Children read three books for four times within 2 weeks. During the session, an eye tracker was employed to capture children's attention. Children who read the enhanced eBooks were found to outperform their counterparts in attention, word production, and the capacity to retell a complicated story. The findings indicate the potential of using animated eBooks in enhancing children's early MTL learning.

## 13.5   Conclusion

The chapter starts with a recently proposed concept of HBD and discusses the factors (i.e., language and literacy input and use) that promote children's HBD in early childhood. Children's language and literacy exposure and use have been illustrated to demonstrate their impact on young learners' bilingual language development and social-emotional well-being. The recent findings on how these factors affect Singaporean kindergarteners are summarized. Even though bilingualism is the cornerstone of the Singaporean educational system, many children are English-dominant speakers. Therefore, the key to achieving HBD in the local context lies in children's sound development of their MTL through an enriched language and

literacy environment at school and home. Parents and early childhood educators might consider adopting CS and SBR approaches to help children better develop their dual language competencies. The application of these approaches has been discussed at the end of the chapter.

# References

Aitchison, J. (1991). *Language change: Progress or decay?* Cambridge University Press.

Aram, D., & Shapira, R. (2012). Parent-child shared book reading and children's language, literacy, and empathy development. *Rivista Italiana di Educazione Familiare, 2*, 55–65.

Aram, D., Deitcher, D. B., Shoshan, T. S., & Ziv, M. (2017). Shared book reading interactions within families from low socioeconomic backgrounds and children's social understanding and prosocial behavior. *Journal of Cognitive Education and Psychology, 16*(2), 157–177. https://doi.org/10.1891/1945-8959.16.2.157

Baddeley, A. (2003). Working memory: Looking back and looking forward. *Nature Reviews Neuroscience, 4*(10), 829–839. https://doi.org/10.1038/nrn1201

Barbosa, P. G., Jiang, Z., & Nicoladis, E. (2017). The role of working and short-term memory in predicting receptive vocabulary in monolingual and sequential bilingual children. *International Journal of Bilingual Education and Bilingualism*. https://doi.org/10.1080/13670050.2017.1314445

Beck, I. L., McKeown, M. G., & Kucan, L. (2002). *Bringing words to life: Robust vocabulary instruction*. The Guilford Press.

Benmamoun, E., Montrul, S., & Polinsky, M. (2013). Keynote article. Heritage languages and their speakers: Opportunities and challenges for linguistics. *Theoretical Linguistics, 39*, 129–181.

Bohman, T., Bedore, L. M., Peña, E. D., Mendez-Perez, A., & Gillam, R. B. (2010). What you hear and what you say: Language performance in Spanish English bilinguals. *International Journal of Bilingual Education and Bilingualism, 13*(3), 325–344. https://doi.org/10.1080/13670050903342019

Bornstein, M. H., Haynes, O. M., & Painter, K. M. (1998). Sources of child vocabulary competence: A multivariate model. *Journal of Child Language, 25*, 367–394.

Bruner, J. S. (1986). *Actual minds, possible worlds*. Harvard University Press.

Bus, A. G., van IJzendoorn, M. H., & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research, 65*, 1–21.

Cahyani, H., de Courcy, M., & Barnett, J. (2016). Teachers' CS in bilingual classrooms: Exploring pedagogical and sociocultural functions. *International Journal of Bilingual Education and Bilingualism, 21*(4), 465–479. https://doi.org/10.1080/13670050.2016.1189509

Carnevale, N. C. A. (2009). *New language: A new world: Italian immigrants in the United States, 1890-1945*. University of Illinois Press.

Cavallaro, F. (2010). *Transgenerational language shift: From Sicilian and Italian to Australian English*. The Italian Australian Institute.

Cavallaro, F., & Ng, B. C. (2014). Language in Singapore: From multilingualism to English plus. In J. Hajek & Y. Slaughter (Eds.), *Challenging the monolingual mindset* (pp. 33–48). Multilingual Matters.

Chondrogianni, V., & Marinis, T. (2011). Differential effects of internal and external factors on the development of vocabulary, tense morphology and Morpho-Syntax in successive bilingual children. *Linguistic Approaches to Bilingualism, 1*(3), 318–345.

Chow, B. W. Y., McBride, C., Cheuk, C., & Cheung, H. (2008). Dialogic reading and morphology training in Chinese children: Effects on Language and literacy. *Developmental Psychology, 44*(1), 233–244.

Collins, M. (2010). ELL preschoolers' English vocabulary acquisition from storybook reading. *Early Childhood Research Quarterly, 25*, 84–97.

Collins, B. A., Toppelberg, C. O., Suárez-Orozco, C., O'Connor, E., & Nieto-Castañon, A. (2011). Cross-sectional associations of Spanish and English competence and well-being in Latino children of immigrants in kindergarten. *International Journal of the Sociology of Language, 208*, 5–23.

Connor, C. M., Morrison, F. J., & Slominski, L. (2006). Preschool instruction and children's emergent literacy growth. *Journal of Educational Psychology, 98*(4), 665–689.

Council of Europe. (2009). *Common European framework of reference for languages: Learning, teaching, assessment (10th print.)*. Cambridge University Press.

Creese, A., & Blackledge, A. (2015). Translanguaging and identity in educational settings. *Annual Review of Applied Linguistics, 35*, 20–35. https://doi.org/10.1017/S0267190514000233

Daller, M., & Ongun, Z. (2017). The threshold hypothesis revisited: Bilingual lexical knowledge and nonverbal IQ development. *International Journal of Bilingualism.* https://doi.org/10.1177/1367006917690835

De Houwer, A. (2006). Le développement harmonieux ou non harmonieux du bilinguisme de l'enfant au sein de la famille. *Langage et Société, 116*, 29–49.

De Houwer, A. (2007a). Reflections on child family bilingualism: Time to focus on factors promoting harmonious bilingual development. In J. De Schryver & A. Vlasselaers (Eds.), *Naar Panama: opstellen voor Fred Van Besien* [To Panama: Essays for Fred Van Besien] (pp. 111–129). VLEKHO.

De Houwer, A. (2007b). Parental language input patterns and children's bilingual use. *Applied Psycholinguistics, 283*, 411–424.

De Houwer, A. (2009). *Bilingual first language acquisition.* Multilingual Matters, xvii + 412 pp.

De Houwer, A. (2015). Harmonious bilingual development: Young families' well-being in language contact situations. *The International Journal of Bilingualism, 19*(2), 169–184.

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: The State of the science across its subfields* (pp. 127–154). John Benjamins.

De Houwer, A. (2020). Harmonious bilingualism: Well-being for families in bilingual settings. In S. Eisenchlas & A. Schalley (Eds.), *Handbook of home language maintenance and development* (pp. 63–83). Mouton de Gruyter.

Dixon, L. Q., Zhao, J., Quiroz, B. G., & Shin, J. Y. (2012). Home and community factors influencing bilingual children's MTL vocabulary development. *International Journal of Bilingualism, 16*(4), 541–565.

Druten-Frietman, L. V., Denessen, E., Gijsel, M., & Verhoeven, L. (2015). Child, home and institutional predictors of preschool vocabulary growth. *Learning and Individual Differences, 43*, 92–99.

Eisenberg, N. (2006). Prosocial behavior. In G. G. Bear & K. M. Minke (Eds.), *Children's needs III: Development, prevention, and intervention* (pp. 313–324). National Association of School Psychologists.

Ellis, R. (1988). *Classroom second language development*. Pergamon.

Eriksson, M., Marschik, P. B., Tulviste, T., Almgren, M., Perez Pereira, M., Wehberg, S., et al. (2012). Differences between girls and boys in emerging language skills: Evidence from 10 language communities. *British Journal of Developmental Psychology, 30*(2), 326–343. https://doi.org/10.1111/j.2044-835X.2011.02042.x

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.

Farver, J. A. M., Xu, Y. Y., Lonigan, C. J., & Eppe, S. (2013). The home literacy environment and Latino head start children's emergent literacy skills. *Developmental Psychology, 4*, 775. https://doi.org/10.1037/a0028766

García, O., & Kano, N. (2014). Translanguaging as process and pedagogy: Developing the English writing of Japanese students in the U.S. In J. Conteh & G. Meier (Eds.), *The multilingual turn in languages education: Benefits for individuals and societies* (pp. 258–277). Multilingual Matters.

García, O., & Wei, L. (2014). *Translanguaging: language, bilingualism and education*. Basingstoke: Palgrave Macmillan.

Genesee, F. (1989). Early bilingual development: one language or two? *Journal of Child Language, 16*, 161–179. https://doi.org/10.1017/S0305000900013490

Gerde, H. K., & Powell, D. R. (2009). Teacher education, book-reading practices, and children's language growth across one year of Head Start. *Early Education and Development, 20*, 211–237.

Goodman, R. (1997). The strengths and difficulties questionnaire: A research note. *Journal of Child Psychology and Psychiatry, 38*, 581–586. https://doi.org/10.1111/j.1469-610.1997.tb01545.x

Greene, J. O., & Burleson, B. R. (2003). *Handbook of communication and social interaction skills*. Routledge.

Gutiérrez-Clellen, V., Simon-Cereijido, G., & Restrepo, M. (2013). *Improving the vocabulary and oral language skills of bilingual Latino preschoolers: An intervention for speech-language pathologists*. Plural.

Han, W. J. (2010). Bilingualism and socioemotional well-being. *Children and Youth Services Review, 32*, 720–731. https://doi.org/10.1016/j.childyouth.2010.01.009

Hayes, D. P., & Ahrens, M. (1988). Vocabulary simplification for children: A special case of "motherese". *Child Language, 15*(2), 135–169.

Hindman, A. H., & Wasik, B. A. (2015). Building vocabulary in two languages: An examination of Spanish-speaking Dual Language Learners in Head Start. *Early Childhood Research Quarterly, 31*, 19–33. https://doi.org/10.1016/j.ecresq.2014.12.006

Hoff, E. (2006). How social contexts support and shape language development. *Developmental Review, 26*(1), 55–88. https://doi.org/10.1016/j.dr.2005.11.002

Howatt, A. (1984). *A history of English language teaching*. Oxford University Press.

Jia, G., & Aaronson, D. (2003). A longitudinal study of Chinese children and adolescents learning English in the United States. *Applied Psycholinguistics, 24*(1), 131–161.

Jia, G., & Fuse, A. (2007). Acquisition of English grammatical morphology by native mandarin-speaking children and adolescents: Age-related differences. *Journal of Speech, Language, and Hearing Research, 50*, 1280–1299.

Kahn, R., & Kellner, D. (2005). Reconstructing Technoliteracy: A multiple literacies approach. *E-Learning and Digital Media, 2*(3), 238–251. https://doi.org/10.2304/elea.2005.2.3.4

Kuschner, E. S. (2013). Nonverbal intelligence. In F. R. Volkmar (Ed.), *Encyclopedia of autism spectrum disorders*. Springer.

Lantolf, J., & Thorne, S. L. (2007). Sociocultural theory and second language learning. In B. van Patten & J. Williams (Eds.), *Theories in second language acquisition* (pp. 201–224). Lawrence Erlbaum.

Lin, L. C., & Johnson, C. J. (2016). Mandarin-English bilingual vocabulary development in an English-immersion preschool: How does it compare with monolingual development? *International Journal of Bilingualism, 20*(2), 173–189. https://doi-org.libproxy.nie.edu.sg/10.1177/1367006914547662

Lindholm-Leary, K. (2014). Bilingual and biliteracy skills in young Spanish-speaking low-SES children: Impact of instructional language and primary language proficiency. *International Journal of Bilingual Education and Bilingualism, 17*(2), 144–159. https://doi.org/10.1080/13670050.2013.86662

Madriñan, S. M. (2014). The use of first language in the second-language classroom: A support for second language acquisition. *GiST Education and Learning Research Journal, 9*, 50–66. https://doi.org/10.26817/16925777.143

Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O., Bryant, D., et al. (2008). Measures of classroom quality in prekindergarten and children's development of academic, language, and social skills. *Child Development, 79*, 732–749.

Mol, S. E., & Bus, A. G. (2011). To read or not to read: A meta-analysis of print exposure from infancy to early adulthood. *Psychological Bulletin, 137*(2), 267–296.

Montag, J. L., Jones, M. N., & Smith, L. B. (2015). The words children hear: Picture books and the statistics for language learning. *Psychological Science, 26*(9), 1489–1496.

Muñoz, C. (2006). The effects of age on foreign language learning: The BAF Project. In C. Munoz (Ed.), *Age and the rate of foreign language learning* (pp. 1–40). Multilingual Matters.

Myers-Scotton, C. (2011). Codeswitching. In P. Hogan (Ed.), *The Cambridge encyclopedia of the language sciences* (pp. 159–160). Cambridge University Press.

National Institute of Clinical Excellence. (2013). *Social and emotional well-being for children and young people*. Retrieved from https://www.nice.org.uk/advice/lgb12/chapter/Introduction

Ng, C. L. P. (2014). Mother tongue education in Singapore: concerns, issues and controversies. *Current Issues in Language Planning, 15*(4), 361–375. https://doi.org/10.1080/14664208.2014.927093

Ng, S. C., & Sun, H. (2021). Promoting Social Emotional Learning through Shared Book Reading in Kindergarten Classrooms. Early Education and Development. https://doi.org/10.1080/10409289.2021.1974232

Nicolay, A. C., & Poncelet, M. (2013). Cognitive abilities underlying second-language vocabulary acquisition in an early second-language immersion education context: A longitudinal study. *Journal of Experimental Child Psychology, 115*, 655–671. https://doi.org/10.1016/j.jecp.2013.04.002

Ojima, S., Matsuba-Kurita, H., Nakamura, N., Hoshino, T., & Hagiwara, H. (2011). Age and amount of exposure to a foreign language during childhood: Behavioral and ERP data on the semantic comprehension of spoken English by Japanese children. *Neuroscience Research, 70*(2), 197–205. https://doi.org/10.1016/j.neures.2011.01.018

Oon, C, & Kor, K. K. (2009, November 29). Was Chinese wrongly taught for thirty years? *The Straits Times*. Retrieved from http://www.news.asiaone.com/News/

Paradis, J. (2011). Individual differences in child English second language acquisition: Comparing child-internal and child-external factors. *Linguistic Approaches to Bilingualism, 1*, 213–237.

Parama, K. S., Kreiner, D. S., Strak, K. S., & Schuetz, S. A. (2017). Monolingual and bilingual perceptions of code- switching: A difference in cognition but not competence. *North American Journal of Psychology, 19*(1), 87–102.

Pearson, B. Z. (2007). Social factors in childhood bilingualism in the United States. *Applied Psycholinguistics, 28*(3), 399–410.

Pham, G., & Tipton, T. (2018). Internal and external factors that support children's minority first language and English. *Language, Speech, & Hearing Services in Schools, 3*, 595. https://doi.org/10.1044/2018

Place, S., & Hoff, E. (2011). Properties of dual language exposure that influence 2-year-olds' bilingual proficiency. *Child Development, 82*(6), 1834–1849.

Pollard-Durodola, S. D., Gonzalez, J. E., Saenz, L., Resendez, N., Kwok, O., Zhu, L., & Davis, H. (2018). The effects of content-enriched shared book reading versus vocabulary-only discussions on the vocabulary outcomes of preschool dual language learners. *Early Education and Development, 29*(2), 245–265.

Russell, V. (2014). A closer look at the output hypothesis: The effect of pushed output on noticing and inductive learning of the Spanish future tense. *Foreign Language Annals, 47*(1), 25–47.

Scheele, A. F., Leseman, P. M., & Mayo, A. Y. (2010). The home language environment of monolingual and bilingual children and their language proficiency. *Applied Psycholinguistics, 31*(1), 117–140.

Sert, O. (2005). The functions of code switching in ELT classrooms. *The Internet TESL Journal, 11*, 1–6.

Sigel, I. E. (1986). Early social experience and the development of representational competence. In W. Fowler (Ed.), *Early experience and the development of competence. New directions for child development* (pp. 49–65). Jossey-Bass.

Sigel, I. E. (2002). The psychological distancing model: A study of the socialization of cognition. *Culture & Psychology, 8*(2), 189–214.

Silverman, R. D. (2007). Vocabulary development of English-language and English-only learners in kindergarten. *The Elementary School Journal, 107*(4), 365–383.

Silverman, R. D., DiBara Crandell, J., & Carlis, L. (2013). Read Alouds and beyond: The effects of read aloud extension activities on vocabulary in Head Start classrooms. *Early Education and Development, 24*, 98–122. https://doi.org/10.1080/10409289.2011.649679

Snow, C. (1983). Literacy and language: Relationships during the preschool years. *Harvard Educational Review, 53*(2), 165–189.

Sun, H. (2019). Home environment, bilingual preschooler's receptive mother tongue language outcomes, and social-emotional and behavioral skills: One stone for two birds? *Frontier in Psychology., 10*, 1640. https://doi.org/10.3389/fpsyg.2019.01640

Sun, H., & Ng, E. (2021). Home and School Factors in Early English Language Education. Asian Pacific Journal of Education. https://doi.org/10.1080/02188791.2021.1932742

Sun, H., & Verspoor, M. (2020). Mandarin vocabulary growth, teacher qualification and teacher talk in bilingual kindergartners. *International Journal of Bilingual Education and Bilingualism.* https://doi.org/10.1080/13670050.2020.1835813

Sun, H., & Yin, B. (2020a). Multimedia input and bilingual children's language learning. *Frontiers in Psychology, 1*(2023), 1–11. https://doi.org/10.3389/fpsyg.2020.02023

Sun, H., & Yin, B. (2020b). Vocabulary development in early language education. In M. Schwartz (Ed.), *International handbook on early language education* (pp. 1–26). Springer. https://doi.org/10.1007/978-3-030-47073-9_3-1

Sun, H., de Bot, K., & Steinkrauss, R. (2015). A multiple case study on the effects of temperamental traits in Chinese preschoolers learning English. *The International Journal of Bilingualism, 19*(6), 703–725. https://doi.org/10.1177/1367006914534332

Sun, H., Steinkrauss, R., Tendeiro, J., & de Bot, K. (2016). Individual differences in very young children's English acquisition in China: Internal and external factors. *Bilingualism: Language and Cognition, 19*(3), 550–566. https://doi.org/10.1017/S1366728915000243

Sun, H., Steinkrauss, R., Wieling, M., & de Bot, K. (2018a). Individual differences in very young Chinese children's English vocabulary breadth and semantic depth: Internal and external factors. *International Journal of Bilingual Education and Bilingualism, 21*(4), 405–425. https://doi.org/10.1080/13670050.2016.1178706

Sun, H., Yin, B., Amsah, F., & O'Brien, B. A. (2018b). Differential effects of internal and external factors in early bilingual vocabulary learning: The case of Singapore. *Applied Psycholinguistics, 39*(2), 383–411. https://doi.org/10.1017/S014271641700039X

Sun, H., Loh, J. Y., & Charles, A. C. (2019). Motion and sound in animated storybooks for preschooler's total fixation time and mandarin language learning: An eye-tracking study with Singaporean bilingual children. *AERA Open, 5*(2), 1–19. https://doi.org/10.1177/2332858419848431

Sun, H., Toh, W. M., & Steinkrauss, R. (2020a). Instructional strategies and linguistic features of kindergarten teachers' shared book reading: The case of Singapore. *Applied Psycholinguistics, 41*(2), 427–456. https://doi.org/10.1017/S0142716420000053

Sun, H., Ng, S. C., O'Brien, B. A., & Fritzsche, T. (2020b). Child, family, and school factors in bilingual preschoolers' vocabulary development in heritage languages. *Journal of Child Language, 47*(4), 817–843. https://doi.org/10.1017/S0305000919000904

Sun, H., Yussof, N., Vijayakumar, P., Lai, G., O'Brien, B. A., & Ong, Q. H. (2020c). Teacher's code-switching and bilingual children's heritage language learning and cognitive switching flexibility. *Journal of Child Language, 47*(2), 309–336. https://doi.org/10.1017/S030500091900059X

Sun, H., Bornstein, M. H., & Esposito, G. (2021a). The specificity principle in young dual language learners' English development. *Child Development.* https://doi.org/10.1111/cdev.13558

Sun, H., Yussof, N., Mohamed, M., Rahim, A., Bull, R., Cheung, W. L., & Cheong, S. A. (2021b). Bilingual language experience and social-emotional well-being: A cross-sectional study of Singapore pre-schoolers. *International Journal of Bilingual Education and Bilingualism, 24*(3), 324–339. https://doi.org/10.1080/13670050.2018.1461802

Sun, H., Cheong, S.A., Toh, W. M., Dickinson, D., & Verspoor, M. (forthcoming). *Teacher-child interaction and kindergarten children's acquisition of Mandarin vocabulary.*

Swain, M. (1995). Three functions of output in second language learning. In G. Cook & B. Seidlhofer (Eds.), *Principle and practice in applied linguistics: Studies in honour of H.G. Widdowson* (pp. 125–144). Oxford University Press.

Swain, M. (2000). The output hypothesis and beyond: Mediating acquisition through collaborative dialogue. In J. P. Lantolf (Ed.), *Sociocultural theory and second language learning* (pp. 97–114). Oxford University Press.

Temple, J., & Snow, C. E. (2003). Learning words from books. In A. van Kleeck & S. A. Stahl (Eds.), *On reading books to children: Parents and teachers*. Erlbaum.

Unsworth, S. (2013). Assessing the role of current and cumulative exposure in simultaneous bilingual acquisition: The case of Dutch gender. *Bilingualism: Language and Cognition, 16*, 86–110.

Unsworth, S., Persson, L., Prins, T., & de Bot., K. (2015). An investigation of factors affecting early foreign language learning in the Netherlands. *Applied Linguistics, 35*(5), 527–548.

Verhallen, M. J. A. J., & Bus, A. G. (2010). Low-income immigrant pupils learning vocabulary through digital picture storybooks. *Journal of Educational Psychology, 102*, 54–61.

Verhallen, M. J. A. J., Bus, A. G., & De Jong, M. T. (2006). The promise of multimedia stories for kindergarten children at risk. *Journal of Educational Psychology, 98*, 410–419.

Vijayakumar, P., Steinkrauss, R., & Sun, H. (2020). Entering into the weak version of translanguaging: Teachers' English use in children's Tamil language classes in Singapore. *Journal of Multilingual and Multicultural Development*. https://doi.org/10.1080/01434632.2020.1808003

Winsler, A., Kim, Y. K., & Richard, E. R. (2014). Socio-emotional skills, behavior problems, and Spanish competence predict the acquisition of English among English language learners in poverty. *Developmental Psychology, 50*(9), 2242–2254.

Yow, W. Q., Tan, J. S., & Flynn, S. (2017). CS as a marker of linguistic competence in bilingual children. *Bilingualism: Language and Cognition*, 1–16. https://doi.org/10.1017/S1366728917000335

Yussof, N. T., & Sun, H. (2020). Mismatches between teacher beliefs, practices and reasons for English use in preschool Malay language classrooms. *Journal of Language and Education, 34*(4), 363–382. https://doi.org/10.1080/09500782.2020.1720230

Zeece, P. D. (2004). Promoting empathy and developing caring readers. *Early Childhood Education Journal, 31*(3), 193–199. https://doiorg.libproxy.nie.edu.sg/10.1023/B:ECEJ.0000012314.00539.12

Zhu, X., & Vanek, N. (2017). Facilitative effects of learner-directed CS: Evidence from Chinese learners of English. *International Journal of Bilingual Education and Bilingualism, 20*(7), 773–787. https://doi.org/10.1080/13670050.2015.10879

# Chapter 14
# Does Early Language Development Contribute to Socio-emotional Functioning in Pre-school and Beyond?

**Shaun Goh**

**Abstract** Although multiple studies across the world have shown that low language ability associates with three major clusters of low socio-emotional functioning in childhood- behavioural, emotional and ADHD type, little is known about how these relationships come to develop, while even less is known among children who grow up learning two or more languages.

This is of global concern, as a substantial number of individuals who speak two languages exist around the world and even form the majority in some countries such as Singapore. Moreover, both low language and low socio-emotional functioning is closely associated with multiple negative costs in later life to community and state resources. In this chapter, I first focus on the pre-school period and provide a framework for understanding the early development of language. Next, recent systematic reviews regarding the contribution of language to socio-emotional functioning are synthesised. In brief, both cross-sectional and longitudinal reviews report linkages between language and socio-emotional functioning. Such linkage can be variable, with age, level of language proficiency and type of socio-emotional functioning postulated as explanations for such variability. Finally, as Singapore is a country with a substantial number of children who grow up learning two or more languages, findings regarding the estimates and nature of the relationship between language and socio-emotional functioning in multi-lingual environments are discussed.

**Keywords** Language proficiency · Dual language learners · Bilingual · Socio-emotional functioning · Behavioural problems · Emotional problems · ADHD

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## 14.1    Why Consider Language?

Simply put, to ignore language is to let a vast pool of potential go to waste.

Language casts a surprisingly long shadow, with evidence of linkages to various meaningful outcomes many years later into adulthood. In the longest running study to date, Beitchman et al. (1986) identified children with very low language ability in the absence of obvious causes in early life at age 5. At 19 years old (Young et al., 2002), rates of learning difficulties in areas of reading, spelling and math are three to four times higher. At 25 years old (Johnson et al., 2010), they were more likely to be in a job of lower occupational prestige and not complete higher education. Thus, early language, especially low levels of it, can be demonstrated to contribute to outcomes which contribute to a country's 'bottom line'.

A striking number of children are at risk of these multiple poor outcomes, as they present with low levels of verbal language from early life for no obvious reason. International estimates suggest that very low levels of language proficiency affect 7–8% of children. Tomblin et al. (1997) estimate that 7.4% of a sample of 7218 American kindergarten children, which is approximately 2 children per classroom (i.e. 7.4% of an average class size of 30 children = 2.2 children), performed in the bottom tenth percentile on these tests of language. More recently, from the UK, Norbury et al. (2016) found that 7.6% of a sample of 7267 kindergarten children between 4 and 5 of age also performed in the bottom 8th percentile across multiple tests of language. These estimates of two per classroom cannot be attributed to the presence of other conditions known to cause poor language. Children for which low language was found in the presence of intellectual disability, hearing impairment, head injuries and autism spectrum disorder were not counted in these estimates.

Early language in pre-school is important to consider, both in Singapore and around the world, especially the many children with very low levels of language. Singapore has a paucity of natural resources, leaving its people as a key resource. It follows that having each individual reach his or her potential is accordingly magnified. In a study of 324 children, Bornstein et al. (2014) estimated that oral language at 4 years old strongly predicted oral and written language at 10 years (standardised beta = 0.78; variance explained = 60.8%, p < 0.001). This is remarkable given that it is arguably routine to find predictors to be small or moderate in size in social sciences. Thus, pre-school language is not just an important predictor of language ability in primary school; its demonstrated linkage to academic achievement and occupational outcomes many years later into adolescence and adulthood highlights its importance towards maximising human capital in Singapore and around the world.

## 14.2  Early Language Development: An Introduction

By the end of pre-school, it can be observed that children regularly use words to express themselves. This may range from simple one-word answers (e.g. 'Yes' to the question 'Do you want French fries?), longer sentences (e.g. 'I want French fry[ies] not vegetable[s]!') and a collection of sentences to form an oral narrative (e.g. 'I just finish[ed] playing soccer…I am hungry!!… I want French fry[ies] not vegetable[s]'). By definition, narratives are structured as a collection of words which form sentences, which are further structured to form paragraphs. Although these examples are in English, the use of words, sentences and narratives can also be seen for the three mother tongues in Singapore: Mandarin, Malay and Tamil. How do children get to this point in language development?

The ability to understand or use spoken words does not suddenly appear out of thin air. The answer surely involves understanding what goes on in the many years spent acquiring language prior to Primary 1. I provide a framework for understanding language acquisition in childhood, starting with a basic description of language.

'C' in 'cat' is an example of a *phoneme*, a unit of sound in a language that makes 'cat' different from 'at'. 'C' itself has no inherent meaning and cannot be further subdivided. Phonemes as a unit of sound enable one to explain how the same letter can sound the same, for example, 'c' in 'cat' and 'k' in 'kick' are pronounced the same, denoted by the phoneme /k/. Pinyin is notable as an emic system developed from within Mandarin to denote differences in sounds in Mandarin (see https://en.wikipedia.org/wiki/Help:IPA/Mandarin for an example of phoneme -pinyin correspondence). Although 'cat' is counted as 3 phonemes of /k/, /ae/ and /t/, it is considered as 1 *morpheme* – a unit of meaning in a language that cannot be further subdivided. Table 14.1 illustrates that words are composed of combinations of phonemes and morphemes across languages.

**Table 14.1**  Illustration of the building blocks of language across official language in Singapore

|  | English | Malay | Tamil | Mandarin |
|---|---|---|---|---|
| Word | 'Cat' | 'Kucing' | 'பூனை' | '猫' |
| Morphemes | 1 | 1 | 1 | 1 |
| Phonemes | 3 | 5 | 5 | 2 |
|  | /k/,/ae/,/t/ | /k/, /u/, / /ʧ/ /ɪ/ /ŋ/ | /p/, / ū/, / n̪/, /a/, /i/ | /m/, /au/[b] |
| Sentence | 'I like cats' | 'Saya suka kucing' | 'எனக்கு பூனைகள் பிடிக்கும்' | '我喜欢猫' |
| Grammatical feature | SVO | SVO | SOV | SVO |
| Morphosyntactic feature | 'cats' plural of 'cat' | No plural marking here[a] | 'பூனைகள்' plural of 'பூனை' | No plural marking here |

[a]Repeating 'cat' such as in 'kucing-kucing' is grammatically appropriate to communicate a more specific interest across different types of cats
[b]Mao1 in pingyin

*Syntax* refers to the rules or principles which govern the structure of language. For example, 'I cats like' is a sentence in English that does not sound as grammatically correct as 'I like cats'. This illustrates the ordering of subject-verb-object (SVO; I-like-cats). Also, '-s' in 'cats' is another syntactical feature, recognised as a plural in English. Table 14.1 illustrates that sentences are composed of combinations of phonemes, morphemes and syntactical rules across languages. In Malay, 'Saya suka kucing' communicates a liking of cats in general. Nonetheless, plural marking is also possible, 'Saya suka kucing-kucing', to communicate a liking of different types of cats.

Classically influential are nativist positions (Chomsky, 1980) which posit that the largest factor driving the ability to learn language is innate to the child. Here, it is argued that children ordinarily become competent in their use of grammar, despite the arguably impossible task of inferring grammatical rules from everyday speech. Consider the following sentences adapted from Laurence and Margolis (2001):

1. Bishan is in Singapore.
2. Is Bishan in Singapore?
3. Shaun is feeling better now that his visit to the doctor is over.
4. Is Shaun feeling better now that his visit to the doctor is over?

The most natural interpretation in explaining the patterns in sentences (1) to (4) would be the rule of moving the first 'is' to the front of the sentence. However, the application of this rule can be quickly shown to be problematic if generalised.

5. That uncle who *is* cooking fried rice is Jane's neighbour.
6. *Is* that uncle who cooking fried rice is Jane's neighbour?

As can be seen, moving the first 'is' results in an ungrammatical sentence. Instead, the second 'is' needs to be moved as shown in (7).

7. Is that uncle who is cooking fried rice Jane's neighbour?

It is thus unclear how a child can infer even this single basic grammatical rule from the sentences he or she hears. This is part of an argument known as the poverty of stimuli argument (Chomsky, 1980), which proposes that it is simply not possible for a child to learn grammar from the environment. Instead, grammar is considered innate/internal.

By contrast are empiricist positions which argue that language can be learnt and so can be influenced by the environment. One example is statistical learning, the ability of children to infer regularities from presented stimuli. In a recent study, Kidd (2012) administered 100 pre-school children aged 4–6 a test of statistical learning. Children were asked to observe a screen where a cartoon character would appear in one of the four spatial positions and respond by pressing a button on a keypad. Unknown to the children, the cartoon character followed an implicit pattern, for example, first appearing in position 1, then 4, then 3, then 3 and so on. Children were considered to have learnt the pattern, even though they were not explicitly told to, if a change was detected in how long the children took to respond on the keypad when the cartoon character followed a different pattern at the end of

the task. In this study, better performance on this task of learning from repeated presentations of a pattern predicted the ability to successfully use a relatively rare grammatical rule they had just heard in this study.

Demonstrating the role of the environment are the large bodies of work linking socio-economic status and language. Influential is the study by Hart and Risley (2003), which documents a '30 million word gap' among children from backgrounds of low socio-economic status. The authors recorded the verbal interactions between parents and children across 42 families ranked as low, middle or high socio-economic status. Analyses indicated that the number of words spoken and known by children from low-income families was approximately 50% smaller than those from high-income families. The authors suggest that this is due to a word gap, where children from low-income families were found to hear approximately 30 million lesser words by age 3 than in high-income families. Likewise, the role of the environment has been documented in studies on language development among children learning two languages. In the largest local study to date, Sun, Yin, Amsah and O'Brien (2018) examined the vocabulary of 805 Kindergarten 1 children recruited from 50 pre-schools in English and mother tongue. A higher number of books and media in the home environment predicted higher scores of mother tongue vocabulary. English vocabulary was predicted by the number of books and amount of English heard, though only among families of Chinese ethnicity.

## 14.3   Early Language Development: Part Internal and Part Environment?

As important as the aforementioned works are on language development, studies have also found that language is neither 100% due to an 'innate/internal factor' nor 100% due to the 'environment'. Twin studies are one type of research which simultaneously examines the influence of the innate/internal and environment on language development (see Evans & Martin, 2000, for further details). In one of the larger twin studies to date, Kovas et al. (2005) tested 1574 identical and non-identical twins on a battery of language tests at 4.5 years. Language tests were comprehensive and covered the use and understanding of meanings of words (semantics), grammatical rules (syntax) and speech sound (phonology). The genetic contribution was estimated as moderate, explaining between 29 and 53% of the variance depending on the aspect of language measured. The smallest contribution was to a measure of grammar, while the largest was to semantics.

In brief, twin studies leverage on naturally occurring differences between different types of twins. Monozygotic twins, who by definition share 100% of their genes, are colloquially known as 'identical twins'. By contrast, dizygotic twins, also known as 'non-identical twins', share 50% of their genes. It thus appears that, if language is entirely affected by genes, identical twins would have the same language ability, while non-identical twins would only have 50% similarity in language ability. Any

excessive similarity between monozygotic twins above that of dizygotic twins is considered to reflect the genetic contribution to language.

Further studies utilising this methodology of twin studies find that genes and the environment both have moderate influences on language ability across childhood. For example, Hayiou-Thomas et al. (2012) in a follow-up to the aforementioned Kovas et al. (2005) report that language ability as assessed by parent report has a genetic contribution of 24% across ages 2 to 4. This increased to 57% at ages 7 to 10 when children are in primary school.

A similar figure was reported in a recent study by Rice et al. (2018). This study examined 1255 Australian twins aged 4 to 6. Language was assessed with tests across multiple domains including vocabulary and semantics, grammar (syntax), speech sounds and a composite measure of language which measures the average number of words to express a concept. Factors that possibly clouded results, such as age from targeted recruitment age, sex and maternal education, were statistically adjusted for. Results indicated that the genetic contribution of 20–73%, depending on the type of measure, at age 4. The smallest contribution was the measure of vocabulary, while the largest was a composite measure of average number of words to express a concept. Similar to Hayiou-Thomas et al. (2012), the genetic contribution was observed to increase at the end of pre-school/start of primary school, age 6. Here, the genetic contribution was estimated to be 54–92%.

What does it mean for language to be influenced to some extent by genes? It would be a misunderstanding to conclude that language is 'set in stone' from birth. For example, a child with genes that predispose him or her to grow very tall simply cannot do so without food eaten from the environment. Similarly, a child with strong genetic capacity for athletics, or playing a musical instrument, does not become highly proficient without years of practice (see Dale et al., 2015, for details). In the same way, a child with genes for language proficiency cannot do so in the absence of any environmental input. It is difficult to see how a child endowed with genes to be proficient, for example, in Mandarin, will ever be proficient in this language in Singapore if he or she grew up in a home or school where Mandarin is not regularly practiced.

It is immediately apparent that the linguistic environment of Singapore differs from 'just English'. In Singapore, English is utilised as the language of instruction in formal education. Lessons in another language, also known as a mother tongue, are regularly conducted in Malay, Tamil and Mandarin. Moreover, with the Compulsory Education Act (2000), virtually 100% of Singaporean children attend primary school. Thus, I here utilise the term dual language learners to characterise Singaporean children as they are expected to learn not only one but two languages.

Although twin studies provide a basis for considering the genetic-environmental contribution to early language development, they were conducted on children who as a group are English speaking and monolingual. At the time of writing, the genetic-environmental contribution to language has yet to be directly evaluated in Singapore, where children learn a mother tongue in addition to English. Despite the strong dominance of English in dual language profiles among pre-school children in Singapore (see the last section in this chapter for details), the claim that genetic

factors influence language in Singapore remains unverified. At this stage, it is only a possibility that there is a genetic influence on language development among pre-schoolers in Singapore. I next consider recent studies which highlight two robust environmental influences in studies of language learning among bilingual dual language learners.

*Language Exposure*  Multiple studies report that a child who is exposed to a relatively higher amount of language at home and likely school is more proficient in it. Thordardottir (2011) had parents of 84 pre-school children aged 4.5 years indicate how many hours per week their children were exposed to English and French through a detailed questionnaire. Exposure included not only influences from home but also estimates of time and languages used in pre-school centres. A moderate to strong relationship ($r = 0.48$ to $0.73$) was found, where relative exposure was related to language proficiency. For example, higher relative exposure to English was related to higher English language proficiencies but lower French proficiencies. Likewise, higher relative exposure to French was related to higher French language proficiencies, but lower English proficiencies. Here, language was tested by measures which indexed the ability to verbally use and understand vocabulary.

Similar findings on the influence of exposure were reported in a recent larger sample of 177 Spanish-English pre-school language learners (Maier et al., 2016). Here, a higher relative amount of exposure to English from the home was associated with higher levels of English vocabulary and correspondingly smaller levels of Spanish vocabulary. In this study, home-level exposure overpowered the effects of exposure from school. Neither the percentage of English nor Spanish used by the teacher in the class was associated with children's Spanish or English vocabulary.

Locally, the role of exposure has also been reported in a study on pre-schooler's mother tongue vocabulary proficiency (Dixon et al., 2012). Pre-schoolers aged between 5 years 6 months and 6 years 7 months were recruited from 28 kindergartens in Singapore. A total of 282 pre-schoolers were recruited, with considerable variability in socio-economic status and language used at home. Consistent with the aforementioned studies, parental use of mother tongue at home correlated with higher mother tongue vocabulary ($r = 0.35$, $p < 0.000$). Not using mother tongue was correlated with lower mother tongue vocabulary ($r = -0.26$, $p < 0.000$).

Teacher's speech as a form of exposure was found to be a predictor in an earlier study. Bowers and Vasilyeva (2011) utilised more precise measures and showed a moderate contribution of teacher's speech to pre-school children's vocabulary outcomes. This study recruited a sample of 29 pre-schoolers aged 4.5 years who were dual language dominant in a non-English language. Recordings of teacher's verbal language use in class were recorded and coded for number of words, number of different words used and length of utterances. Results revealed that (i) a higher number of words and (ii) a shorter number of words to 'get the meaning across' (i.e. mean length of utterance) associated with higher English vocabulary scores.

*Age of Acquisition*  It is readily apparent that individuals who pick up a second language from a young age are harder to distinguish from native speakers. In fact,

so important is this factor that children with a very early age of acquisition, such as the hearing of both languages from birth, can be thought of as a distinct group of bilinguals – bilingual first language acquisition (BFLA; De Houwer, 2009). This is in contrast to children who acquire an additional language later on, perhaps in pre-school or primary school, termed early second language acquisition (ESLA; De Houwer, 2009).

For example, Thordardottir (2019) reported moderate to large effects of age of acquisition in a sample of 6- to 8-year-olds. Children who were first exposed to a second language (French) from birth had higher French vocabulary scores were compared to children who were first exposed to French at 4 years old. Vocabulary scores were higher for those exposed to French from birth, only when tested in the receptive rather than expressive modality, and were moderate to large in effect size (eta sq. = 0.115 to 0.296). Likewise, in a recent large study of low to moderate socio-economic status of 585 Primary 1 Spanish-English children, Bedore et al. (2016) report a moderate to large effect. Children on average first heard English (their second language) at age 2, with the majority ranging from 0 to 4 years. The age that children were first exposed to English (their second language) explained approximately a third of the variability in both English and Spanish (29.4% for English, 37.7% for Spanish).

Finally, in a recent large local study, Sun et al. (2018a) recruited 805 pre-schoolers across 50 pre-schools. Children were in Kindergarten 1 aged 4 years 1 month to 5 years 8 month and had sizeable number of children across all English-mother tongue profiles (551 Mandarin-English; 105 Malay-English; 149 Tamil-English). Children's vocabulary were assessed in English, Malay, Tamil and Mandarin on a locally developed test of vocabulary (Rickard Liow et al., 2013). The length of time that the child has actively used a language was found to be a robust predictor. It moderately associated with all four languages, even in the presence of 'other multiple factors' (B = 0.15 to 0.22).

These 'other multiple factors' consist of both environmental and internal factors. For English vocabulary, internal cognitive factors such as nonverbal intelligence, working memory and phonological awareness were also generally predictive of vocabulary (B = 0.19 to 0.37), with variation across different ethnicities. For mother tongue, similar patterns were found. The cognitive factor of nonverbal intelligence along with environmental factors such as exposure to a higher amount of mother tongue media or the length of time of active mother tongue use was predictive of Chinese and Tamil vocabulary.

In sum, these studies suggest that the development of language ability in pre-school is complex. Existing twin studies suggest that genes have a part to play, though their extension beyond English language monolingual development remains unclear at this time. Moreover, existing studies of dual language learners in Singapore and across the world report the influence of both internal/innate and environmental factors. This is in contrast to 'single' factor explanations which the author has anecdotally heard – such as 'this child just has to study harder to excel in language'. Individual effort is most certainly important and should be encouraged.

Nonetheless, it is also important to consider the range of internal and environmental factors that could explain the child's language ability. It thus follows that practitioners and policy guard against overly simplistic explanations and remain open to the multiplicity of factors involved in early language development.

## 14.4   Why Consider Socio-emotional Functioning?

This chapter focuses on one outcome – socio-emotional functioning. Low levels of socio-emotional functioning, like low language ability, impinge upon the development of human capital to its full potential, which is of importance to Singapore. For example, low socio-emotional functioning is associated with poorer academic performance among children. This is especially the case at the problematic level, where poorer functioning in school or at home is required before socio-emotional functioning can be considered at the problematic disordered level, as described by the manual used by medical professionals in Singapore, the *Diagnostic and Statistical Manual of Mental Disorders* (Association, 2013).

There appears to be a growing appreciation of the importance of low problematic socio-emotional functioning in Singapore, with a growing number of local studies (e.g. Goh et al., 2020) and public interest in this matter, such as when it presents among adults. For example, President of Singapore Halimah Yacob (Wong, 2018) in a speech expressed her hope that more emphasis be placed in raising awareness and supporting individuals with mental health issues. Illustrative of this was her along with Member of Parliament Fatimah Lateef removing a black cloth with the word 'stigma' on it.

Current models which focus on low problematic socio-emotional functioning generally agree on the existence of at least three related but separate clusters (Achenbach & Edelbrock, 1983; Association, 2013; Goodman et al., 2010). This includes problems that are (i) 'external' which are readily seen in a child's behaviour and at a clinical disorder level are known as oppositional defiance disorder or conduct disorder, (ii) 'internal' such as anxiety or depression and (iii) in attention, impulsivity and hyperactivity which at a clinical disordered level are known as attention deficit hyperactivity disorder.

## 14.5   Language and Socio-emotional Functioning: Are They Linked?

A meta-analysis is a type of research study conducted to provide a 'summary-of-studies'. It does so by first systematically searching scientific databases for relevant studies, followed by the use of quantitative statistics to synthesise study findings into an overall summary estimate. For example, a meta-analysis may identify six

**Table 14.2** Summary table of meta-analyses on language and socio-emotional functioning reviewed in this section

| Meta-analyses | Sample | Inclusion criteria of relevance to this chapter | Age | Language significantly associates with socio-emotional functioning? | Language significantly contributes to later socio-emotional functioning? |
|---|---|---|---|---|---|
| Hollo et al. (2014) | 1171 at-risk children from 14 studies | Studies had to select children with emotional and/or behavioural problems | 5 to 13 years old | Yes 1 in 2 co-occurrence | |
| Chow and Wehby (2016) | 22,927 children from 19 studies | Studies did not require children to have low levels of language or socio-emotional functioning | 4 to 12 years old | Yes Small effect sizes | Yes Small effect sizes |
| Curtis et al. (2018) | 63,153 children from 47 studies | Studies needed to identify children as either low language or not | 1 to 12 years old | Yes Moderate effect sizes | |
| Yew and O'Kearney (2013) | 2086 children from 8 prospective studies | Studies needed to identify children as low language or not | 3.3 to 8 years old at identification | | Yes Moderate effect sizes |

relevant studies, of which three have findings that are statistically significant and three that are not. Following which, the results of these six studies are weighted by the computer to produce one summary statistic. The ability of meta-analyses to quantitatively synthesise findings across multiple studies is a key strength, such that they are typically highly ranked as a source of evidence (Murad et al., 2016). As shown in Table 14.2, I draw upon this high-quality source of evidence across recently conducted meta-analysis to consider the relationship between language and socio-emotional functioning.

In a meta-analysis of at-risk children conducted by Hollo et al. (2014), data was pooled across 14 different studies around the world, across 838 children identified with emotional and behavioural problems at a disordered level. Low verbal language was associated with low levels of socio-emotional functioning. In fact, estimates from this study suggested that approximately one in two children with low problematic levels of emotional and behavioural problems also present with low levels of language ability (46.5% [95% CI 36%, 57%]).

In another meta-analysis, this time including both typical and at-risk children, Chow and Wehby (2016) conducted a recent systematic review where terms such as 'language' and 'problem behaviour' were keyed into eight scientific databases. An initial 1625 reports were found to be relevant. Further screening of these reports, and subsequent statistical analysis, indicated a correlation between language ability and socio-emotional functioning. Data was pooled across 9 eligible studies with a combined sample size of 22,927. Language associated with behaviour type problems (z = −0.15[95% CI-0.23, −0.08], p < 0.000), as well as emotional type problems (z = −0.11 [95% CI −0.16, −0.05], p < 0.000). In other words, a one-unit increase in a child's ability to express or understand verbal words was related with a small decrease on measures of childhood socio-emotional functioning.

By contrast, a medium-sized relation between language and socio-emotional functioning has also been reported. In another recent meta-analysis, Curtis et al. (2018) systematically searched and reviewed three scientific databases. Pooled statistical analyses were carried out on 47 studies with a combined sample size of 63,153 children. Children identified with low language ability scored lower on socio-emotional measures when collapsed across emotional and behavioural types (estimate = 0.43 SD [95% CI 0.34, 0.53], p < 0.001).

Taken together, these two meta-analyses form a reliable base as they pool together data from many different studies across tens of thousands of children. A very conservative estimate, which assumes 100% of the studies are double counted (i.e. 47 – 19; see Table 14.2), still yields 28 unique studies. As signified by p-values of <0.05, both meta-analyses are consistent in reporting the presence of a relation between language and socio-emotional functioning. Still, results from Curtis et al. (2018), which report the largest effects of 0.43 SD, appear to support a larger relative importance of language to socio-emotional functioning than the estimated 0.11 to 0.15 by Chow and Wehby (2016). Understanding the factors behind these differences is not only of academic but also of practical concern. For example, if relations between language and socio-emotional functioning are stronger among older children, then low language ability would be of greater concern for children in Kindergarten 2 than Nursery 1. Below, three possibilities are considered.

## 14.6 Language and Socio-emotional Functioning: Can Different Findings Be Explained?

*Age* may be one possibility for the different effect sizes across meta-analyses. Younger children were in the meta-analysis which reported a larger effect size (Curtis et al., 2018). Here, samples ranged from ages 1 to 12, while children in studies in Chow and Wehby's (2016) meta-analysis were older with average ages ranging from 4 to 12. It thus appears that the relation of language with socio-emotional functioning is larger among younger children.

However, the opposite was found when the effect of age was statistically tested. Curtis et al. (2018) conducted a further analysis of this by pooling data from 41 of the 47 studies with relevant data. They examined if the strength of the relationship of language and socio-emotional functioning was modified by age. It was estimated that language associated with socio-emotional functioning even when children were at the very first years of life (age = 1.5 years; unstandardised coefficient = 0.19 [95% CI 0.07, 0.31], p = 0.004). However, the strength of language and socio-emotional functioning was found to be larger among older children (unstandardised coefficient = 0.07; [95% CI 0.03, 0.11] p = 0.001).

*Type* of socio-emotional functioning could also be a factor. Although interrelated, internalising emotional type, externalising behavioural type and ADHD type socio-emotional difficulties have been shown to be differentiable. For example, in the widely utilised child behavioural checklist, externalising behavioural problems, internalising emotional problems and attention difficulties are three separate factors. Yet, these factors also relate to each other (Achenbach & Edelbrock, 1983). Likewise, there is qualitative difference in conceptualisations of each cluster. For example, physiological reactions such as an increased heart rate and sweaty palms feature in emotional problems of anxiety but not others (Association, 2013). Thus, it is possible that language contributes differently to each type of socio-emotional functioning.

Still, statistical analyses in both meta-analyses show otherwise. Chow and Wehby (2016) note that their estimates of language to externalising behavioural problems (z = −0.15 [95% CI-0.23, −0.08]) and internalising emotional problems (z = −0.11 [95% CI -0.16,-0.05]) are both small and similar, as shown by the non-overlapping 95% confidence intervals in square parentheses. This is consistent with the moderator analysis performed by Curtis et al. (2018). When socio-emotional type was entered as a moderator, results were not statistically significant (p = 0.50). Hence, language appears to have a similar relation across different types of socio-emotional functioning problems.

*Children with low levels of language ability* could also be a possibility. Studies in Curtis et al. (2018) 'selected' children into two groups: (i) those with low language ability and (ii) those of typical language ability free of the presence of low language ability. By contrast, Chow and Wehby (2016) examined samples where children were 'unselected' – children across a range of language ability were analysed as a single group. For example, the largest study in Chow and Wehby's (2016) meta-analysis consisted of 11,506 children in America (Petersen et al., 2013). Children were not grouped into, for example, groups of low language versus typical language, but instead analysed as a single group of children. Thus, it appears that language has a stronger relation with socio-emotional functioning in samples which explicitly sample children with low language ability.

As important as these findings are in amassing a large evidence base establishing a connection between language and socio-emotional functioning, these studies are not designed to estimate the contribution of language to socio-emotional functioning. That is, these data are consistent with two 'opposite' possibilities: (i) language contributes to socio-emotional functioning (L→SEF), as well as the possibility that

(ii) socio-emotional functioning contributes to language (SEF→L). After all, poor socio-emotional functioning can impinge upon a child's ability to be engaged in language acquisition activities such as communicating with parents or playing with peers. Thus, we next turn to studies which are designed to estimate the contribution of language to socio-emotional functioning (L→SEF).

## 14.7 Language and Socio-emotional Functioning: Connecting the Past with the Future

The future cannot affect the past. This critical fact is incorporated into the design of a certain type of research study – prospective studies. Unlike the previous section where data was collected at the same point in time, prospective studies have two or more time points. Thus, they provide an estimate of how past language contributes to future socio-emotional functioning.

For example, in one of the largest studies to date, St Clair et al. (2019) identified 884 children at age 5 who were at risk of poor language. This included scoring (i) in the bottom 7th percentile on a short standardised measure of word vocabulary and (ii) endorsement of questions to do with language difficulties by caregivers. Compared to children who were not at risk of poor language, those at risk were found to have approximately two times the prevalence of internalising emotional problems years later, when these children were aged 7 and 11. At age 7, 13.8% of those at risk of poor language met cut-offs for levels of concern for emotional problems (13.8% vs 6.9% not at risk, b = 0.58, p < 0.000). Likewise at age 11, 18.5% of those at risk of poor language met cut-offs for levels of concern for emotional problems (18.5% vs 10.9% not at risk, b = 0.50, p < 0.000).

Ten studies which were prospective in nature were identified and reported in the aforementioned meta-analysis by Chow and Wehby (2016). Pooling across these studies, verbal language was found to make a contribution to future problem behaviour that included either emotional internalising or behavioural externalising (z = −0.17; 95% CI = [−0.21, −0.13]). In other words, a one-unit increase on a measure of verbal language was associated with a small decrease in ratings of socio-emotional functioning later on.

Consistent with the aforementioned stronger findings in studies which concentrate on children with low language proficiency, medium-sized associations have also been reported among those most at risk. Yew and O'Kearney (2013) conducted a systematic search of seven scientific databases for prospective type studies. To be included, verbal language had to be measured at a point in time before the measure of socio-emotional functioning. Moreover, studies needed to formally assess and identify children as having a low proficiency in language not attributable to other obvious causes. Pooling across prospective studies which first measured language at pre-school as well as primary school (3 to 8.8 years old), low language proficiency children were found to be at approximately two times the risk of reaching clinical

levels across all three major clusters of socio-emotional functioning. This includes (i) behavioural externalising type (relative risk = 2.26, p < 0.001, pooled n = 1654), (ii) emotional internalising type (relative risk = 1.84, p < 0.05, pooled n = 1011) and (iii) ADHD type (relative risk = 1.78, p < 0.01, pooled n = 736).

Taken together, these meta-analyses by Yew and O'Kearney (2013) and Chow and Wehby (2016) provide empirical support for the notion that early language does contribute to socio-emotional functioning across childhood. Both suggest the need to be aware that language in general, and in particular among those with low language proficiency, can be a risk factor across multiple clusters of socio-emotional functioning.

## 14.8   Language and Socio-emotional Functioning: What About Singapore?

*Exposure to multiple languages from a young age* is one language feature which distinguishes Singapore compared to existing studies in the meta-analyses reported in Table 14.2. For example, Sun et al. (2018b) sampled 805 Singaporean children and their parents in Kindergarten 1. Children as a group were estimated to have begun speaking two languages approximately 2 years prior to kindergarten (mean = 23.31 months; range = 0–57 months). Similar estimates of greater variability are reported in another recent large-scale study among very young Singaporean children. Goh et al. (2017) report that approximately half of the 2-year-olds were exposed to two or more languages even prior to the pre-school period. Caregivers of 313 Singaporean toddlers were asked to estimate the percentages of each language that their child had been exposed to. Out of 313 2-year-old toddlers, 169 (54.0%) were considered 'bilingually exposed' as they were exposed to a second language at least >20% of the time.

This feature of early exposure or use of two languages has been found to associate with a known correlate relevant to the ADHD cluster in low socio-emotional functioning, executive functions. For example, Carlson and Meltzoff (2008) reported that 6-year-old children exposed to two languages from birth showed better performance on a known correlate of ADHD, executive functions. Here, children were shown cards which differed along two dimensions (e.g. a 'Red-Boat' card which differs from a 'Blue-Car' card by both shape and colour). They were then tasked to sort these bidimensional cards first according to one dimension and then the other. It is presumed that to successfully sort these bidimensional cards, children will have to engage in executive functioning – to mentally suppress the first dimension while selecting the second dimension.

Greater executive function performance has been argued to be expectable among bilinguals as they are proposed to engage in similar mental activity in order to correctly sort audio-visual speech stimuli into the different mental representations of distinct language systems from a young age (Bialystok, 2015). Still, this is an area

of dispute, as studies have also shown the absence of the aforementioned 'boost' to executive functioning. For example, Gathercole et al. (2014) administered a similar bidimensional card sorting task to 331 children from ages 2 to primary school. Welsh-English children's performance on this measure of executive function was not found to be better than that by monolingual English children across this age group.

The role of early exposure to multiple languages, and its contribution to executive functioning and ADHD 2.5 years later, was recently examined in a local study (Goh et al., 2020). The study drew upon 408 2-year-old children who were assessed for the presence of low language ability on a standardised test of language. Examiners had the option to administer items a second time in the child's non-dominant language if they judged the child might not have understood the item in his/her dominant language. Examiners also accepted equivalent responses in a dominant language, in a mix or entirely in a non-dominant language (e.g. give ball, bagi ball and bagi bola).

Exposure to two languages was here observed to buffer against the expectable relation of low language and the socio-emotional cluster of ADHD. Toddlers in the bottom 10th percentile of this test of language were found to have a higher probability of ADHD 2.5 years later when they were in pre-school. However, this was only the case for toddlers who were predominantly exposed to a single language. Toddlers with similarly low levels of language, but came from backgrounds where they were predominantly exposed to two languages, were not at a higher probability of ADHD 2.5 years later. As promising as this finding is on the possible benefits of early exposure to two languages, it is entirely observation and thus is only a first step to further researching showing the causal connections between language and ADHD.

However, exposure to two languages was worryingly found to amplify the relation of ADHD for the majority of children with typical language proficiency, those above the 10th percentile. This is consistent with recent work among adults with ADHD. Among adults with ADHD, Bialystok et al. (2017) reported that monolinguals outperformed bilinguals on another measures of executive functions, a stop signal task. This task requires the participant to inhibit their previous response pattern to press a button on the keyboard upon hearing 'stop'. Like other tasks, here is a task of executive function which associates with ADHD.

Still, these findings could not be explained by a 'bilingual advantage' in executive functions. Children were administered tasks of executive functioning, such as the Dimensional Card Change Sort, which required them to sort bidimensional cards as explained in the aforementioned card sort tests. Higher exposure to two languages was not associated with better performance on these tasks. Moreover, further analysis indicated that the aforementioned buffering effect was not statistically mediated by executive functioning tests.

Instead, the authors propose that such findings could arise from a greater role of social interaction among bilingual children. Parents may be exposed to beliefs that bilingual exposed children take longer to develop language skills to be on par with their monolingual counterparts. Therefore, parents may be more *accommodating* of language delay among bilinguals (Gupta & Chandler, 1993). A more

accommodating parental perception among bilingual children with low language ability may allow them to interact and socialise with peers and adults free from the negative label of a language delay. Such normative interaction may in turn assist in the development of self-regulatory and attentional abilities (Moriguchi, 2014), reducing the risk of ADHD as compared to monolingual children with language delay.

*A dual language profile which is on average English dominant and can be expected to be present in pre-school* is a second striking feature of the language among Singaporean pre-schoolers. A more prevalent use of English at home is reported in a study of pre-schoolers (Dixon et al., 2012) where 71% of parents reported using English alone or English in addition to a mother tongue at home. Similarly, Sun et al. (2018a, b) report pre-schoolers are characterised as using English 'often' at home (mean = 3.34; range = 0 to 4; 0 = never, 1 = rarely, 2 = sometimes, 3 = often, 4 = primary). The authors suggest this correspondingly entails lesser use of a mother tongue at home. Also as a group, pre-schoolers appeared to be dominant in English as they had a higher vocabulary of English compared to their mother tongue (mean English vocabulary score = 35.46; mean mother tongue score = 29.02).

This feature of dual language English dominance is interesting as a source of both similarity and difference in the nature of language and socio-emotional functioning in Singapore as compared to existing international work. Given the dominance of English in Singapore, it is expectable that the link between language and socio-emotional functioning as found among English-speaking children is also present in Singapore. Another source of information critical towards expecting this relation between language and socio-emotional functioning to be present in Singapore would be findings among studies of bilingual dual language children. Although little is known internationally regarding the relation of language and socio-emotional functioning among bilingual dual language children, and even less known locally, I next review this growing body of work.

In the only systematic review to date on the socio-emotional functioning of dual language learners, Halle et al. (2014) keyed in search terms such as 'bilingual', 'dual language learners', 'early childhood' and 'socio-emotional development' across five scientific databases. Studies had to be recently conducted from 2000 to 2011. They located three studies relevant to language and socio-emotional competencies among dual language learners, which were interpreted as consistently showing that low language in English associated with the poorest socio-emotional outcomes. Although it is interesting to speculate on the drivers of this association, such as English as the main language of instruction in America where these studies were conducted, little is known regarding the causes and mechanisms behind language and socio-emotional outcomes, as detailed below.

In the first of these studies, Han (2010) examined language and socio-emotional outcomes of 14,853 Latino/Latina and White children attending kindergarten in America. Approximately one in five children (16.2%) was identified as having exposure or use in two languages English and another language. For these dual language learners, it appears that higher proficiency in either language was

associated with lower emotional and behavioural problems years later when they were in the fifth grade aged 10 to 11. Bilingual children proficient in English had either the lowest or second lowest levels of emotional and behavioural problems in the fifth grade. Although no test of language ability in the non-English language was administered, children who were dominant and perhaps proficient in Spanish also had either the lowest or second lowest levels of emotional and behavioural problems in the fifth grade.

The same pattern of results was found in the second of these studies. Han and Huang (2010) utilised a similar analytical strategy as in Han (2010), with the exception that children of Asian children were now examined in place of Latino/Latina children. Approximately 1 in 10 children (8.9%) of 12,580 children was identified as having exposure or use in two languages of English and a non-English language. Similar to Han (2010), bilingual children either fluent in English or who were dominant in their non-English language showed the lowest levels of emotional and behavioural problems in the fifth grade.

In the third of these studies, Dawson and Williams (2008) examined language and socio-emotional outcomes of 2628 children attending kindergarten, all of Hispanic ethnicity. The authors hypothesised that low English proficiency is a source of difficulty in socialising with peers and society at large. Still, low proficiency in English language among dual language Hispanics in kindergarten did *not* systematically relate to either behavioural or emotional type socio-emotional functioning across the next 4 years as they progressed to primary school. These negative results are consistent with findings from the monolingual English literature, where results vary across studies and can be found to be non-significant (e.g. Yew & O'Kearney, 2013).

Although the aforementioned studies provide much needed information on the link between language and socio-emotional functioning among dual language learners, they are limited in so far as they only measure the proficiency of one of two languages utilised by these dual language bilingual children – English. Toppelberg et al. (2006) conducted an in-depth study of 29 Latino children aged 5 to 16. Children were tested on ten standardised tests in both English and Spanish language proficiency. Correlational analyses indicated that each language generally contributed a moderate amount to cluster of behavioural (r = −0.26 to −0.37), emotional (r = −0.13 to −0.24) and attentional (r = −0.35 to −0.49) socio-emotional functioning. Further partial correlational analyses suggest that when considered together, the contribution of language appeared to be specific to rather than shared across both languages.

Finally, at the time of writing, some local data is available regarding the link between language and socio-emotional functioning, with findings generally consistent with international findings. Goh et al. (2017) in a sizeable sample of 514 2-year-old Singaporean toddlers report no significant relation between low language ability and emotional and behavioural type socio-emotional functioning. This is expectable given findings from the aforementioned meta-analysis conducted by Curtis et al. (2018), where relations between language delay and socio-emotional functioning are smaller at a younger age. Indeed, in a follow-up study of these children, Goh

et al. (2019) report that the presence of low language delay associated with inattention-hyperactive type ADHD 2 years later, albeit only for children who by and large have only been exposed to a single language from birth.

Sun et al. (2018a, b) in a sizeable sample of 805 Singaporean Kindergarten 1 children report small-sized associations between English and mother tongue languages with socio-emotional functioning. Here, knowing approximately 9 more words on a measure of vocabulary in English was associated with approximately 0.9th of a point on a 20-item scale of socio-emotional problem behaviour (r = −0.17; SD of English vocabulary = 8.70; SD of problem behaviour = 5.26). Similarly, knowing approximately 9 more words on a measure of vocabulary in mother tongue was associated with approximately 0.7th of a point on the same 20-item scale of socio-emotional problem behaviour (r = −0.14; SD of mother tongue vocabulary = 7.92; SD of problem behaviour = 5.26).

## 14.9   Summary

Figure 14.1 provides a visual summary of the content discussed in this chapter regarding the link between language and socio-emotional functioning. Language in early childhood is both straightforward and infinitely complex. It can simply be defined as the use and understanding of verbal words, sentences and paragraphs. Yet its development is multi-factorial, where (i) innate/internal factors of cognitive variables and possibly genes act alongside (ii) environmental factors, such as absolute and relative amount of exposure and language usage, to predict language
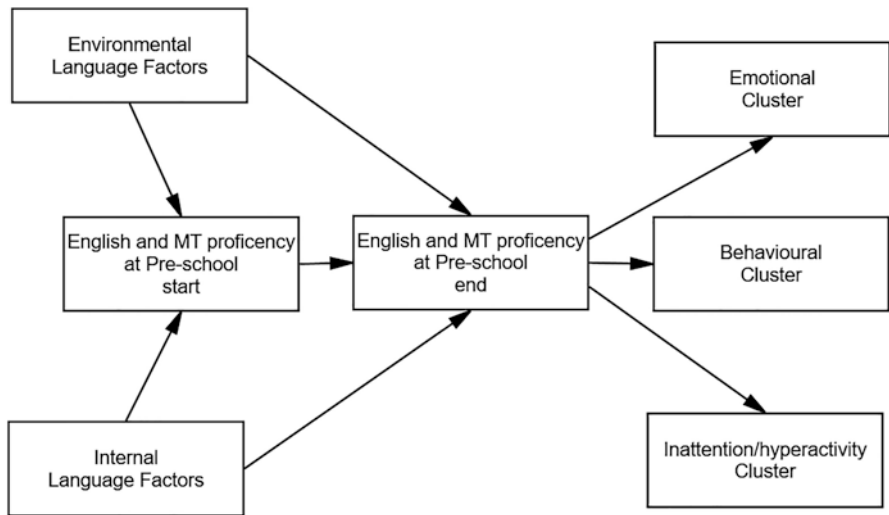


**Fig. 14.1** The development of English and mother tongue verbal proficiencies and its contribution to socio-emotional functioning across pre-school

proficiency. Moreover, it remains unclear if these same factors exert an equal importance across monolinguals and bilinguals or among different languages of English, Mandarin, Tamil and Malay.

Nonetheless, there is accumulating evidence from studies conducted both internationally and locally that there is a link between language and socio-emotional functioning in early childhood. Consistent across works from both monolingual English and dual language children is the general finding of a small- to moderate-sized contribution of early language to multiple clusters of behavioural, emotional and ADHD type socio-emotional functioning later on in life. These relations are complex and appear to increase or decrease in size according to age (larger among older children), level of language proficiency (larger among children with low language proficiency) and type of language (relationships possibly similar in size and appears to be language bound among bilingual dual language learners).

It follows from these findings that policy makers and practitioners remain vigilant to the following:

Language proficiency has been found to be the result of a complex interplay between multiple innate/internal and environmental factors. We should guard against overly simplistic explanations, such as concluding that a child with low language proficiency is 'simply not working hard enough' or 'it's because he or she was not taught well by their parents'.

Although internal/innate factors are important, so too are environmental factors to do with increasing the amount of exposure to each language. In this sense, (i) usual recommendations of increasing accessibility to books/literacy and opportunities for peer interaction to foster increased use of language in conversations and (ii) preliminary findings discussed in this chapter of clear and short sentences in language instruction should be considered in fostering language ability of pre-school children.

An eye should be kept on older children who appear to have 'language problems' or score low on tests of language proficiency. This is especially the case if these scores are low across both English and mother tongue and if such language problems are present among children in Kindergarten 2. This can be a starting point of a conversation with the caregivers of the child to seek further professional assistance in matters of language and/or socio-emotional functioning.

Parents may request additional information from practitioners regarding language and socio-emotional functioning. At the time of writing, online resources for this include:

(i) The Ministry of Social and Family Development parenting resources for language, communication and emotions (https://babybonus.msf.gov.sg/parentingresources/web/Young-Children).

(ii) Singapore's professional association for speech and language therapists which contains articles on language and has a directory of local speech language therapists (https://salts.org.sg).

(iii) A locally developed promising brief checklist for pre-school teachers indicative of low language proficiencies (Pua et al., 2017).
(iv) An overview of local SG-enabled services for concerns of low language or low socio-emotionalfunctioning(https://www.sgenable.sg/pages/content.aspx?path=/for-children/).
 (v) UK-based platform founded with university professors to raise awareness of children with very low language proficiency around the world (https://radld.org/).

# References

Achenbach, T. M., & Edelbrock, C. S. (1983). *Manual for the child behavior checklist and revised child behavior profile*. University of Vermont, Department of Psychiatry.

Association, A. A. P. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Pub.

Bedore, L. M., Pena, E. D., Griffin, Z. M., & Hixon, J. G. (2016). Effects of age of English exposure, current input/output, and grade on bilingual language performance. *Journal of Child Language, 43*(3), 687–706.

Beitchman, J. H., Nair, R., Clegg, M., Ferguson, B., & Patel, P. (1986). Prevalence of psychiatric disorders in children with speech and language disorders. *Journal of the American Academy of Child Psychiatry, 25*(4), 528–535.

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

Bialystok, E., Hawrylewicz, K., Wiseheart, M., & Toplak, M. (2017). Interaction of bilingualism and attention-deficit/hyperactivity disorder in young adults. *Bilingualism: Language and Cognition, 20*(3), 588–601.

Bornstein, M. H., Hahn, C. S., Putnick, D. L., & Suwalsky, J. T. (2014). Stability of core language skill from early childhood to adolescence: A latent variable approach. *Child Development, 85*(4), 1346–1356. https://doi.org/10.1111/cdev.12192

Bowers, E. P., & Vasilyeva, M. (2011). The relation between teacher input and lexical growth of preschoolers. *Applied PsychoLinguistics, 32*(1), 221–241. https://doi.org/10.1017/S0142716410000354

Carlson, S. M., & Meltzoff, A. N. (2008). Bilingual experience and executive functioning in young children. *Developmental Science, 11*(2), 282–298.

Chomsky, N. (1980). Rules and representations. *Behavioral and Brain Sciences, 3*(1), 1–15.

Chow, J., & Wehby, J. (2016). Associations between language and problem behavior: A systematic review and correlational meta-analysis. *Educational Psychology Review*. https://doi.org/10.1007/s10648-016-9385-z

Compulsory Education Act. (2000). 27, Singapore Statues Online (Singapore Statues Online PLUS 2000)

Curtis, P. R., Frey, J. R., Watson, C. D., Hampton, L. H., & Roberts, M. Y. (2018). Language disorders and problem behaviors: A meta-analysis. *Pediatrics, 142*(2), e20173551.

Dale, P. S., Tosto, M. G., Hayiou-Thomas, M. E., & Plomin, R. (2015). Why does parental language input style predict child language development? A twin study of gene–environment correlation. *Journal of Communication Disorders, 57*, 106–117.

Dawson, B. A., & Williams, S. A. (2008). The impact of language status as an acculturative stressor on internalizing and externalizing behaviors among Latino/a children: A longitudinal analysis from school entry through third grade. *Journal of Youth and Adolescence, 37*(4), 399–411.

De Houwer, A. (2009). *Bilingual first language acquisition*. Multilingual Matters.

Dixon, L. Q., Zhao, J., Quiroz, B. G., & Shin, J.-Y. (2012). Home and community factors influencing bilingual children's ethnic language vocabulary development. *International Journal of Bilingualism, 16*(4), 541–565.

Evans, D. M., & Martin, N. G. (2000). The validity of twin studies. *Genescreen, 1*(2), 77–79. https://doi.org/10.1046/j.1466-9218.2000.00027.x

Gathercole, V. C. M., Thomas, E. M., Kennedy, I., Prys, C., Young, N., Viñas Guasch, N., … Jones, L. (2014). Does language dominance affect cognitive performance in bilinguals? Lifespan evidence from preschoolers through older adults on card sorting, Simon, and metalinguistic tasks. *Frontiers in Psychology, 5*, 11–11. https://doi.org/10.3389/fpsyg.2014.00011

Goh, S. K., Tham, E. K., Magiati, I., Sim, L., Sanmugam, S., Qiu, A., … Rifkin-Graboi, A. (2017). Analysis of item-level bias in the Bayley-III language subscales: The validity and utility of standardized language assessment in a multilingual setting. *Journal of Speech, Language, and Hearing Research, 60*(9), 2663–2671.

Goh, S. K. Y., Yang, H., Tsotsi, S., Qiu, A., Chong, Y.-S., Tan, K. H., … Rifkin-Graboi, A. (2020). Mitigation of a prospective association between early language delay at toddlerhood and ADHD among bilingual preschoolers: Evidence from the GUSTO cohort. *Journal of Abnormal Child Psychology*. https://doi.org/10.1007/s10802-019-00607-5

Goodman, A., Lamping, D. L., & Ploubidis, G. B. (2010). When to use broader internalising and externalising subscales instead of the hypothesised five subscales on the strengths and difficulties questionnaire (SDQ): Data from British parents, teachers and children. *Journal of Abnormal Child Psychology, 38*(8), 1179–1191.

Gupta, A. F., & Chandler, H. (1993). Paediatric speech and language therapy referral in Singapore: Implications for multilingual language disability. *European Journal of Disorders of Communication, 28*(3), 311–317.

Halle, T. G., Whittaker, J. V., Zepeda, M., Rothenberg, L., Anderson, R., Daneri, P., … Buysse, V. (2014). The social–emotional development of dual language learners: Looking back at existing research and moving forward with purpose. *Early Childhood Research Quarterly, 29*(4), 734–749.

Han, W.-J. (2010). Bilingualism and socioemotional well-being. *Children and Youth Services Review, 32*(5), 720–731.

Han, W.-J., & Huang, C.-C. (2010). The forgotten treasure: Bilingualism and Asian children's emotional and behavioral health. *American Journal of Public Health, 100*(5), 831–838.

Hart, B., & Risley, T. R. (2003). The early catastrophe: The 30 million word gap by age 3. *American Educator, 27*(1), 4–9.

Hayiou-Thomas, M. E., Dale, P. S., & Plomin, R. (2012). The etiology of variation in language skills changes with development: A longitudinal twin study of language from 2 to 12 years. *Developmental Science, 15*(2), 233–249.

Hollo, A., Wehby, J. H., & Oliver, R. M. (2014). Unidentified language deficits in children with emotional and behavioral disorders: A meta-analysis. *Exceptional Children, 80*(2), 169–186. https://doi.org/10.1177/001440291408000203

Johnson, C. J., Beitchman, J. H., & Brownlie, E. B. (2010). Twenty-year follow-up of children with and without speech-language impairments: Family, educational, occupational, and quality of life outcomes. *American Journal of Speech-Language Pathology, 19*, 51–65.

Kidd, E. (2012). Implicit statistical learning is directly associated with the acquisition of syntax. *Developmental Psychology, 48*(1), 171.

Kovas, Y., Hayiou-Thomas, M. E., Oliver, B., Dale, P. S., Bishop, D. V., & Plomin, R. (2005). Genetic influences in different aspects of language development: The etiology of language skills in 4.5-year-old twins. *Child Development, 76*(3), 632–651.

Laurence, S., & Margolis, E. (2001). The poverty of the stimulus argument. *The British Journal for the Philosophy of Science, 52*(2), 217–276.

Maier, M. F., Bohlmann, N. L., & Palacios, N. A. (2016). Cross-language associations in the development of preschoolers' receptive and expressive vocabulary. *Early Childhood Research Quarterly, 36*, 49–63. https://doi.org/10.1016/j.ecresq.2015.11.006

Moriguchi, Y. (2014). The early development of executive function and its relation to social interaction: A brief review. *Frontiers in Psychology, 5*, 388.

Murad, M. H., Asi, N., Alsawas, M., & Alahdab, F. (2016). New evidence pyramid. *Evidence Based Medicine, 21*(4), 125–127. https://doi.org/10.1136/ebmed-2016-110401

Norbury, C. F., Gooch, D., Wray, C., Baird, G., Charman, T., Simonoff, E., … Pickles, A. (2016). The impact of nonverbal ability on prevalence and clinical presentation of language disorder: Evidence from a population study. *Journal of Child Psychology and Psychiatry, 57*(11), 1247–1257. https://doi.org/10.1111/jcpp.12573

Pua, E. P. K., Lee, M. L. C., & Rickard Liow, S. J. (2017). Screening bilingual preschoolers for language difficulties: Utility of teacher and parent reports. *Journal of Speech Language and Hearing Research, 60*(4), 950. https://doi.org/10.1044/2016_jslhr-l-16-0122

Rice, M. L., Zubrick, S. R., Taylor, C. L., Hoffman, L., & Gayán, J. (2018). Longitudinal study of language and speech of twins at 4 and 6 years: Twinning effects decrease, Zygosity effects disappear, and heritability increases. *Journal of Speech, Language, and Hearing Research: JSLHR, 61*(1), 79–93. https://doi.org/10.1044/2017_JSLHR-L-16-0366

Rickard Liow, S., Sze, W., & Lee, L. (2013). *Bilingual Language Assessment Battery (BLAB) manual*. Unpublished Measure. National University of Singapore, Department of Psychology and Division of Graduate Medical Studies.

St Clair, M. C., Forrest, C. L., Yew, S. G. K., & Gibson, J. L. (2019). Early risk factors and emotional difficulties in children at risk of developmental language disorder: A population cohort study. *Journal of Speech, Language, and Hearing Research, 62*(8), 2750–2771.

Sun, H., Yin, B. I. N., Amsah, N. F. B. B., & O'Brien, B. A. (2018a). Differential effects of internal and external factors in early bilingual vocabulary learning: The case of Singapore. *Applied PsychoLinguistics, 39*(2), 383–411. https://doi.org/10.1017/S014271641700039X

Sun, H., Yussof, N. T. B., Habib Mohamed, M. B. B., Rahim, A. B., Bull, R., Cheung, M. W. L., & Cheong, S. A. (2018b). 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*, 1–16. https://doi.org/10.1080/13670050.2018.1461802

Thordardottir, E. (2011). The relationship between bilingual exposure and vocabulary development. *International Journal of Bilingualism, 15*(4), 426–445. https://doi.org/10.1177/1367006911403202

Thordardottir, E. (2019). Amount trumps timing in bilingual vocabulary acquisition: Effects of input in simultaneous and sequential school-age bilinguals. *International Journal of Bilingualism, 23*(1), 236–255. https://doi.org/10.1177/1367006917722418

Tomblin, J. B., Records, N. L., Buckwalter, P., Zhang, X., Smith, E., & O'Brien, M. (1997). Prevalence of specific language impairment in kindergarten children. *Journal of speech, Language, and Hearing Research: JSLHR, 40*(6), 1245–1260. https://doi.org/10.1044/jslhr.4006.1245

Toppelberg, C. O., Nieto-Castañon, A., & Hauser, S. T. (2006). Bilingual children: Cross-sectional relations of psychiatric syndrome severity and dual language proficiency. *Harvard Review of Psychiatry, 14*(1), 15–29.

Wong, D. (2018). President's challenge 2019 to focus on mental health, says President Halimah. *The Straits Times*. Retrieved from https://www.straitstimes.com/singapore/presidents-challenge-2019-to-focus-on-mental-health-says-president-halimah-at-conference

Yew, S. G. K., & O'Kearney, R. (2013). Emotional and behavioural outcomes later in childhood and adolescence for children with specific language impairments: Meta-analyses of controlled prospective studies. *Journal of Child Psychology and Psychiatry, 54*(5), 516–524.

Young, A. R., Beitchman, J. H., Johnson, C., Douglas, L., Atkinson, L., Escobar, M., & Wilson, B. (2002). Young adult academic outcomes in a longitudinal sample of early identified language impaired and control children. *Journal of Child Psychology and Psychiatry, 43*(5), 635–645. https://doi.org/10.1111/1469-7610.00052

# Chapter 15
# Preschool Teachers' Experiences of Work-Related Stress: A Pilot Study of Singapore Teachers

**EeLynn Ng and Emily Meow**

**Abstract** Research has shown that early childhood teachers play a crucial role in supporting children's development via the provision of socially and emotionally supportive learning environments. However, teachers' abilities to provide such high-quality learning environments may be hindered by work-related stress. Prolonged exposure to stress is also associated with several undesirable outcomes, including lower job satisfaction and increased motivation to leave the teaching profession. Although research on teacher stress is actively conducted in many countries, very little has been done in Singapore. Yet, considering recent concerns about the high turnover rates of preschool teachers in Singapore and the scarcity of local studies on teacher stress, more research is needed to understand whether and how work-related stress affects preschool teachers in Singapore. This chapter is a first attempt at bridging the knowledge gap between international findings and local evidence. In the first section, we provide a review of the theory and empirical findings on work-related stress in teachers. In the second section, we report findings from a pilot study involving one-to-one interviews with preschool teachers to understand their experiences of stress at the workplace. We highlight common themes as well

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as unique perspectives that emerged from the interviews. We conclude with a discussion of the implications of our findings and directions for future research.

Research has shown that early childhood teachers play a crucial role in supporting children's development via the provision of socially and emotionally supportive learning environments (Jennings, 2015). For example, Mashburn et al. (2008) showed that effective instructional support (e.g. supporting the development of thinking skills and providing high-quality feedback) was associated with larger improvements in language and math skills in preschool. Through the provision of high-quality classroom interactions, teachers also foster the development of effective self-regulation skills in children (Blair & Raver, 2015).

However, teachers' abilities to provide such high-quality learning environments may be hindered by work-related stress (Downer et al., 2012). Several studies have reported a negative association between teacher stress and quality of classroom interactions (Friedman-Krauss et al., 2014; Zinsser et al., 2013). Moreover, prolonged exposure to stress is associated with several undesirable outcomes, including lower job satisfaction, burnout and increased motivation to leave the teaching profession (Johnson et al., 2005; Skaalvik & Skaalvik, 2016; Zhai et al., 2011). In light of recent concerns about the high turnover rates of preschool teachers in Singapore (Ang, 2012) and the scarcity of local studies on teacher stress, it is clear that more research is needed to understand whether and how work-related stress affects preschool teachers in Singapore.

Although research on teacher stress is actively conducted in many countries, very little has been done in Singapore. This chapter is a first attempt at bridging this knowledge gap. In the first section, we provide a review of the literature on work-related stress in teachers. In the second section, we report findings from a pilot study involving one-to-one interviews with preschool teachers to understand their experiences of stress at the workplace. We highlight common themes as well as unique perspectives that emerged from the interviews. We conclude with a discussion of the implications of our findings and directions for future research.

## 15.1 Teaching Is Stressful

Research has shown that teaching is a stressful occupation. Teacher stress is generally defined as the experience by teachers of negative or unpleasant emotions resulting from aspects of their work (Kyriacou, 1987). Importantly, stress involves the

contribution of personal and external factors, the individual's perception of these and the individual's resulting negative response or reaction (Kelly & Berthelsen, 1995). In studies of high school and secondary school teachers (e.g. Skaalvik & Skaalvik, 2016), commonly reported sources of work-related stress include time pressure, heavy workloads, lack of support from colleagues and supervisors, low student motivation and management of difficult student behaviours. Similar stressors have also been reported by early childhood educators (e.g. Hall-Kenyon et al., 2014; McGrath & Huntington, 2007). However, early childhood educators also reported experiencing other stressors, including increased frequency of illness and health symptoms (e.g. backaches, general fatigue and muscle strain), dealing with administrative paperwork and other non-teaching tasks, maintaining early childhood philosophy and practice, meeting personal needs and handling issues with children's parents as well as others' perceptions about early childhood programmes (Hall-Kenyon et al., 2014).

## 15.2 Effects of Work-Related Stress on Teachers and Children

Prolonged exposure to job stress has been linked to a variety of undesirable outcomes on teachers' well-being and motivation, including lower job satisfaction (Chan et al., 2000) and poorer psychological and physical well-being (Johnson et al., 2005; Tsai et al., 2006). Chan et al. (2000) reported that teachers, alongside nurses, were the least satisfied among six professional groups (including lawyers, general practitioners, life insurance personnel and engineers) involved in the study. For teachers, performance pressure was found to be the most stressful aspect of work and was also most strongly linked to job satisfaction and mental health (Chan et al., 2000). In a comparison among 26 occupations, Johnson et al. (2005) found that teachers were ranked the second least physically and psychologically healthy. Together, these findings imply that teachers are highly susceptible to poor physical and mental health, as well as dissatisfaction at work. Moreover, teacher stress leads to exhaustion, which in turn leads to an increased motivation to leave the profession (Skaalvik & Skaalvik, 2016).

Teacher stress also has significant consequences for children's learning and development. Work-related stress hampers teachers' abilities to provide a high-quality learning environment, which is crucial for supporting children's cognitive, language and socio-emotional development (Blair & Raver, 2015; Jennings, 2015; Whitebook et al., 2014). Several studies have reported a negative relationship between teacher stress and the quality of emotional support that they provide in the classroom (Friedman-Krauss et al., 2014; Zinsser et al., 2013). According to Jennings and Greenberg (2009), highly stressed teachers are susceptible to having conflictual interactions with their students and are less likely to establish supportive relationships with them, which could negatively influence the classroom's

emotional climate. More recently, Jennings (2015) found that preschool teachers who reported higher levels of emotional exhaustion were less able to provide quality instructional support (e.g. provide scaffolding to promote deeper engagement and understanding in learning activities) in the classroom.

Teacher stress has also been associated with various child outcomes, including poorer social skills (Siekkinen et al., 2013) and poorer socio-emotional functioning (Zinsser et al., 2013). For example, children in classrooms with more stressed teachers tended to display less productive involvement, emotional regulation and prosocial behaviours compared to their peers with less stressed teachers (Zinsser et al., 2013). From the perspective of stress-contagion theory (Milkie & Warner, 2011), stressful experiences can spill over from one stressed individual to another within a classroom. In a recent study involving elementary school teachers, higher levels of teacher burnout predicted higher levels of morning cortisol (indicative of higher stress) in students (Oberle & Schonert-Reichl, 2016). This finding provides support for the notion that higher levels of occupational stress in teachers could transfer to their students. Another study found that elementary school children who were part of stressful classroom environments exhibited more behavioural and adjustment problems (Milkie & Warner, 2011).

To summarise, teacher stress has serious consequences for both teachers and children, as well as the quality of classroom interactions. Because teachers play a crucial role in supporting preschoolers' cognitive and socio-emotional development, it is important to understand the impact of teacher stress on teaching and learning in preschool and to identify ways to alleviate teacher stress. Although research on these issues is currently ongoing in many countries, very little has been done in Singapore.

## 15.3   Prior Research on Teacher Stress in Singapore

To our knowledge, only two studies have investigated the phenomenon of teacher stress in Singapore. In a survey conducted with 316 secondary and junior college teachers, Ko et al. (2000) presented a list of 49 items pertaining to work-related situations and asked respondents to indicate whether or not they had experienced those situations and the level of stress experienced on a 5-point scale (0 = not a source of stress; 4 = extreme stress). Of the 49 items, teachers rated 35 items as stressful (i.e. average rating was larger than 0). Ko et al. (2000) grouped these items under seven categories of teacher stress, of which the most commonly experienced source of stress were "work overload", "work interfering with personal and family life" and "unfulfilled job responsibilities and self-expectations". Less commonly experienced stressors were "unnecessary tasks and red tape", "insufficient support from colleagues", "low evaluation of teachers from society" and "conflicting or insufficient support from superiors". In another study, Chan et al. (2000) found that teachers reported the most stress compared to general practitioners, lawyers, engineers, nurses and life insurance personnel. Similar to Ko et al.'s (2000) results, teacher

stress was attributed mainly to performance pressure and work-family conflicts. It is important to note that both studies did not involve preschool teachers. In addition, there are as yet no local studies examining how stress impacts on teaching and learning in the classroom.

In a study commissioned by the Lien Foundation (a Singapore-based philanthropic organisation), Ang (2012) examined leading professionals' perspectives on improving the preschool sector in Singapore. The study participants comprised key stakeholders from the early childhood sector, including teachers, principals and training providers. A key finding that emerged from this study is "…an overwhelming concern over the turnover of qualified and experienced preschool teachers" (p. 51). The study also revealed that high turnover rates were mainly due to teachers either moving from one setting to another or leaving the profession altogether. Some media reports have also documented the substantial amount of stress that preschool teachers face on a daily basis (e.g. Foo, 2013).

Given that scant research has been done to understand the stressors faced by preschool teachers in Singapore, we still know very little about the extent to which work-related stress is a salient problem for our preschool teachers. As most 5- to 6-year-old children in Singapore spend a substantial portion of their time in preschool ("Childcare enrolment surges as more mums go back to work", 2016), it is essential to address this knowledge gap. Prior research indicates that an appropriate starting point would be to identify preschool teachers' job-related demands and resources, as these factors influence their well-being.

## 15.4   The Job Demands-Resources Model

Within the broader context of the occupational health literature, empirical studies have shown that job characteristics (comprising job demands and job resources) are predictive of employee well-being. The job demands-resources (JD-R) model (Bakker & Demerouti, 2007) provides an overarching theoretical framework of the associations between job demands and resources, employee well-being (strain and motivation) and organisational outcomes. The JD-R model assumes that there are specific psychological, physical, organisational and social aspects of any particular job. These can have either positive or negative influences on occupational outcomes. The JD-R model makes a distinction between job resources and job demands. The former refers to aspects of the job that either facilitate the attaining of work goals, minimise job demands and its related psychological and physiological costs or encourage personal growth, development and learning. Job demands refer to aspects of the job that require prolonged psychological and/or physical effort and are thus associated with specific psychological and/or physiological costs.

According to the JD-R model, job demands and resources influence organisational outcomes via different pathways (see Fig. 15.1). First, job demands are associated with negative individual and organisational outcomes via increased physical and/or psychological strain. For example, chronic job demands (e.g. work overload,
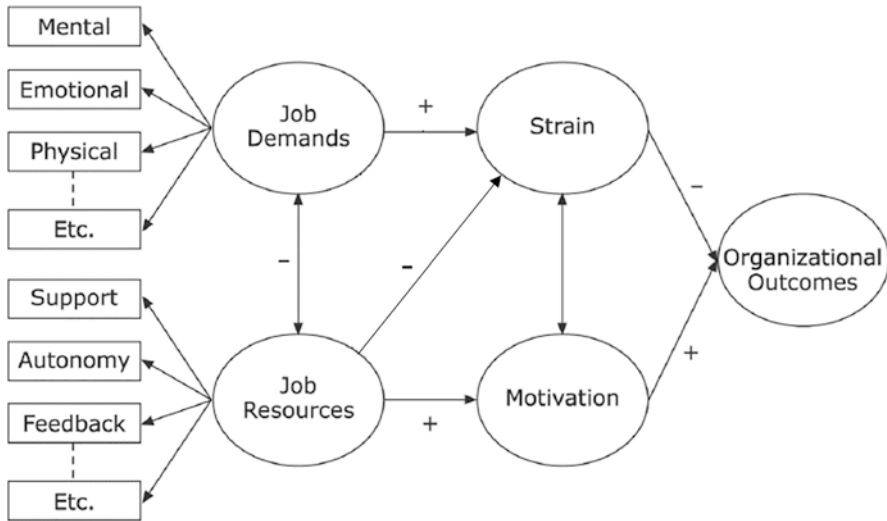
**Fig. 15.1** The job demands-resources model. (Adapted from Bakker & Demerouti, 2007)

emotional demands) or poorly designed jobs exhaust employees' physical and mental resources, which may lead to health concerns and a state of exhaustion. Second, job resources are linked to positive organisational outcomes via increased motivation and work engagement. Either job resources may play an *intrinsic* motivational role by fostering employees' growth and learning, or they may play an *extrinsic* motivational role because they are contributing to achieving work goals (Bakker & Demerouti, 2007). In the former, appropriate feedback from one's supervisor fosters learning, thereby increasing job competence. In the latter, having supportive colleagues increases the likelihood of successfully achieving one's work goals. In both cases, the presence of job resources (i.e. proper feedback and social support from colleagues) leads to increased motivation (Bakker & Demerouti, 2007). Conversely, a lack of job resources may have negative effects on teachers' well-being, i.e. increase levels of strain and burnout. In addition, recent findings suggest that job resources can buffer the adverse of job demands on strain (Bakker & Demerouti, 2017). In other words, employees with more job resources available are better able to cope with their job demands.

### 15.4.1  *Job Demands and Resources of Teachers*

The JD-R model has been used to investigate the associations between job demands, resources and well-being in teachers. We provide a brief review of these findings from studies conducted in the United States and Europe to demonstrate how various job demands and resources are linked to different indicators of well-being (e.g. burnout, ill health, motivation and work engagement).

**Job Demands**   *Work overload* is one of the major sources of psychological strain among teachers (Hakanen et al., 2006). Teachers may have too many work demands and too few resources or have to perform complex tasks that are not in line with their experience and skills (Leiter & Maslach, 2003). Work overload may also refer to having to work quickly under time pressure (Ilies et al., 2015; Van der Doef & Maes, 1999) and being burdened with non-teaching-related tasks, such as meetings and administrative paperwork (Van Droogenbroeck et al., 2014). In particular, non-teaching-related tasks may be viewed as a burden, which distracts teachers from their core job of teaching (Van Droogenbroeck et al., 2014). Work overload has been linked to undesirable outcomes, including lower job satisfaction and general psychological well-being (e.g. Kusma et al., 2012), increased work-family conflict (Ilies et al., 2015) and burnout (Van Droogenbroeck et al., 2014). Another major reason for teachers' strain pertains to the *social-psychological aspects of teaching*, such as managing teacher-student relationships, student behaviour (Baumgartner et al., 2009; Dicke et al., 2018) and parent-teacher relationships (Faulkner et al., 2014). Teachers' perceptions of student misbehaviours in the classroom were linked to increased emotional exhaustion and reduced work enthusiasm (Aldrup et al., 2018). Poor parent-teacher relationships contributed to poorer teacher-student relationships and increased stress in childcare teachers (Faulkner et al., 2014). *Lack of rewards*, which refers to whether professionals feel properly recognised for their work, in either financial or social terms or both (Maslach et al., 2001), is another major stressor for teachers. For example, Blöchliger and Bauer (2018) found that lower satisfaction with one's pay was negatively associated with burnout in preschool teachers.

**Job Resources**   *Autonomy* refers to the extent to which individuals have control and influence over their jobs according to their own ideas and wishes (Kusma et al., 2012; Leiter & Maslach, 2003). Empirical studies have shown that autonomy is an important resource for teachers. Autonomy is positively correlated with psychological well-being, work engagement and job satisfaction (Bakker & Bal, 2010; Kusma et al., 2012; Royer & Moreau, 2016) and negatively associated with burnout (Blöchliger & Bauer, 2018). Another important resource for teachers is *interpersonal relationships at work*, which reflects the extent to which one feels socially connected and supported at work by either their supervisors or co-workers (Leiter & Maslach, 2003). As teaching is a people-oriented job and involves a significant amount of interaction with others, having a positive social climate is crucial in facilitating teachers' work. In a study involving childcare teachers, Kusma et al. (2012) found that job resources associated with interpersonal relationships at work (i.e. sense of community and quality of leadership) were most strongly predictive of job satisfaction compared to other resources (e.g. opportunities for development, autonomy and meaning of work). Similarly, other studies have shown that social support from colleagues and supervisors is associated with increased engagement and lower levels of burnout and emotional exhaustion (e.g. Hakanen et al., 2006; Løvgren, 2016; Skaalvik & Skaalvik, 2011).

In summary, our review has shown that teachers are exposed to many different job demands, which in turn leads to an increase in job strain, burnout and exhaustion. However, there is also evidence to show that teachers with access to job resources are more likely to report an increase in motivation and engagement at work, as well as increased job satisfaction. In light of these findings, what do we know about the job demands and resources of preschool teachers in Singapore?

## 15.4.2 Job Demands and Resources of Preschool Teachers in Singapore: A Pilot Study

We conducted a pilot study to gain some initial insights about the job demands and resources of preschool teachers in Singapore. One-on-one interviews were conducted with three preschool teachers, L, A and F (all pseudonyms), to gather information about their work experiences. The interviews were conducted in a semi-structured format, guided by a set of questions around the topics of teachers' job demands and resources. Table 15.1 provides a summary of the job demands and resources reported by the teachers during the interviews. It should be noted that each teacher had a different story to tell. Teacher L reported having multiple job resources but very few job demands. In comparison, Teacher A and Teacher F both reported multiple sources of job demands, but Teacher A had significantly more job resources than Teacher F. The following excerpts from the teachers' interviews provide more detailed descriptions about each teacher's experience.

**Table 15.1** Job demands and resources reported by three preschool teachers

|                                                | Teacher L | Teacher A | Teacher F |
|------------------------------------------------|-----------|-----------|-----------|
| Job demands                                    |           |           |           |
| 1. Managing children with different needs      | •         | •         | •         |
| 2. Demands and expectations from parents       |           |           | •         |
| 3. High workload and time pressure             |           | •         | •         |
| Job resources                                  |           |           |           |
| 1. Opportunities for professional development  | •         | •         |           |
| 2. Positively valued by society                | •         |           |           |
| 3. Job security                                | •         | •         | •         |
| 4. Support from supervisors                    | •         | •         |           |
| 5. Support from colleagues                     | •         | •         | •         |
| 6. Support from family and friends             | •         | •         | •         |
| 7. Autonomy at work                            | •         | •         |           |

### 15.4.2.1   Teacher L (Low Job Demands; High Job Resources)

Teacher L is 55 years old and has 10 years of experience as a preschool teacher. She is currently teaching a K2 class. Teacher L's teaching career began at Sunday school in church. She was later inspired to become a preschool teacher after seeing how her Sunday school mentor made a difference in the children's lives. Teacher L is very interested in children's development and views teaching as a meaningful job as it prepares children for a lifelong journey of learning:

> Especially when you see the lights in the children's eyes. And you see the joy. Especially [when] they discover something they can do. Of course, children … tend to say "I can't do" … but once you see them actually doing it, and they see they can do it, it brings joy to them…. I am so especially privileged to be working here… it brings me much joy.

For Teacher L, it is a challenge to manage children with different developmental needs and issues within the same classroom:

> There will be some [children] who have difficulty adjusting socially, emotionally… Or sometimes when the child comes to K2, they may not have had the grounding in K1. Or this might be their first experience to school life. So that means I have to start from the basics with each child... And so you have different children at different stages of their development. Some children may have come to the school from N1 so they are familiar to the culture, familiar with the ways but for some children [they may only come] in term 2. So I have to ensure that the child has all the basic foundation.

Teacher L does not have many issues with excessive demands and expectations from parents. While she acknowledged that parents are more demanding now due to their concerns about their child's readiness for primary school, she feels that "they have been very supportive". Similarly, Teacher L finds her workload to be manageable although there are occasions where she would be "under time pressure", especially when handling several projects simultaneously. Compared to when she first started as a preschool teacher, Teacher L has more work-life balance now as she has time to attend to personal matters and to rest during the weekends.

Teacher L has multiple resources at work. She has some degree of autonomy in implementing her lesson plans and enjoys a good relationship with her supervisors and colleagues. Her family and friends also provide an additional source of social support:

> I like my colleagues and the environment. Where we all come in to help. For example, [for] the kids' graduation, we have the other teachers coming to help in doing the props. It really helps a lot. And also if you're not sure of something, we can always go and ask… I also have sources outside work and it really helps as well... family, friends, [and] children. Just lately, they have been calling me Teacher L … to [affirm] that [I am] a teacher.

Teacher L also thought that society's impression of preschool teachers has changed for the better over the years, "There is such a tremendous change that is something I am grateful for, especially now when they see the significance of preschool education…". Although there are opportunities for job advancement, she was not interested because she preferred to work directly with children and to witness their development:

> Yes, we are encouraged to go for courses and classes. It equips us with more…. But I don't really go for job advancement at the moment [because] I am interested in seeing the children develop. That's my key. To see them be able to do something they cannot do. That brings great joy.

Overall, Teacher L's experience as a preschool teacher has been largely positive. She works in a supportive and happy environment and receives strong social support from her family and friends. Although she has to handle a few demands at work, she appears to be coping well. Her passion to make a positive difference in children's lives also plays a significant motivating factor.

### 15.4.2.2   Teacher A (High Job Demands; High Job Resources)

Teacher A is 47 years old and has 18 years of experience as a preschool teacher. She is currently teaching Mother Tongue in K1 and K2, with classes in the morning and afternoon sessions. She also helps her colleagues to facilitate learning centre time and outdoor play. Teacher A joined the teaching profession because she has a passion for children and she felt that her personality was a good fit for the job.

Teacher A experiences mental, physical as well as emotional stress at work. She finds it particularly difficult to juggle her attention between children with different learning needs:

> Some children need more attention than others, especially those with learning need[s] … they find difficulty understanding the language, especially … mother tongue. These are the children who need more attention as we need to paraphrase each time if they don't understand. And also, children with learning needs … they are not able to sit and focus within a long time frame. So, I guess my attention to them depends on their learning needs. Some children need more, some children can just leave them with an instruction.

Similar to Teacher L, Teacher A does not have problems with excessive demands from parents, except for a handful of parents who make demands due to their concerns about their child's progress (e.g. "why can't my [K2] child read a book?"). Generally, Teacher A feels that she does not have an excessive workload and is able to strike a good work-life balance. However, during specific peak periods of the school year, she does struggle to manage her teaching and administrative duties:

> But during this peak period whereby you need to prepare for portfolio and prepare write up for documentation and you have events at school, which is concurrently happening at the same time, this is where the challenge comes in. That is why I have to bring work home to do. Then over the weekend, I will also do my work at home. If not, I will not manage to complete all my tasks on time… there are days where my stress level is really to the max.

Teacher A has adequate autonomy and flexibility to plan her own lessons and projects according to the children's profiles and needs. She also described her relationship with her supervisors and colleagues in a very positive light and noted that there is a strong culture based on teamwork and mutual support. In addition, Teacher A's family is proud of her, and her nieces view her as their role model:

> My centre head has been very supportive …. The teamwork here is excellent … very caring colleagues, they know when to render help and are more open. I guess [it's] the culture here that is developed. You are not on your own. Everything we do, even if it's ad-hoc events, we kind of help each other…. My family [is] proud of me. And I'm proud to say 3 of my nieces actually follow my footsteps…. They mention that, "Auntie, you are my mentor!"… So I'm proud to say that I am their role model.

While Teacher A acknowledged the support received from her colleagues and family, she also highlighted the importance of prioritising her tasks and to practice good time management in order to handle multiple responsibilities effectively:

> So, it all depends on how you manage your time and how you actually lay out the priority…. That's why I reflect on the way I did things…, okay which one is priority…. And of course sometimes ... the deadlines [are] very close to one another, and there [are] lots of things to do, so I need to prioritise….

Teacher A has had many opportunities to develop new skills by attending professional development courses as well as managing and running events (e.g. parent workshops). She feels that she is "growing year after year … and [the new skills] help with my daily practices". Her supervisors have also implemented a system that encourages her to reflect on the impact and meaningfulness of her work:

> So, what is the impact of your actions on the children or the parents or school as a whole? It … make[s] you reflect [on] what you have done and the impact of it. By understanding the impact you have created, it's more meaningful to you. Oh, I've done this and I can see the impact is such, I can see they are more interested in learning mother tongue and they can converse in mother tongue….

Although Teacher A highlighted many positive aspects associated with her job, she lamented the fact that society did not value her profession and viewed it as an easy job:

> They still have that mindset that kindergarten teacher, play play only … because they [do not have the] understanding that our preschool is adopting this holistic learning of the child. It's not just playing and don't learn anything…. We are no less than the … primary and secondary school teachers…. Regardless whether children, adolescents or growing up children, we [still] need to tackle the issue[s]. It's the ways that are different. But stress level still the same….

Teacher A faces several demands at work, but she also has multiple sources of support and opportunities for personal growth and reflection. At the same time, she is aware of the need to prioritise in order to manage her workload effectively. Teacher A genuinely loves her job and finds great joy in teaching.

### 15.4.2.3  Teacher F (High Job Demands; Low Job Resources)

Teacher F is 29 years old and has 10 years of experience as a preschool teacher. Ten years ago, she enrolled in a sponsored preschool diploma programme as teaching was "... something like a dream that I've always wanted". Although the realities of a teacher's job differed from her expectations, she remained in the profession

because she wanted to learn more and to see how the industry can grow. Currently, Teacher F works full-time as a K1 English teacher while pursuing a degree at a local university. She gave birth to a baby boy just over a year ago. Since she started working at her current preschool 9 months ago, she has faced numerous demands in her job while juggling additional demands at home. Her greatest challenges are taking care of children with special needs (e.g. children diagnosed with developmental disabilities) and managing the increasing demands from parents:

> Having to handle children with special needs [is] also something that can put a pressure on a teacher…. We're only trained for that few hours … just a touch-and-go kind of module. So when you have to handle a child with special needs, it's really very difficult … for us, it's 20 children to 1 teacher, so if you have 1 or 2 [children with special needs] inside the classroom … it's really very taxing on yourself as well.
>
> Some parents are … very demanding…. They'll [say], "in primary school they are doing this, why are we not doing this as well?" So, in a way, they feel we are very much similar but actually we are catering [to] the 5 and 6 year-olds, which for them, the milestones are different. But parents don't understand this…..

The high workload and increased time pressure also pose a challenge for Teacher F. This becomes an additional source of frustration as she feels that some tasks do not bring direct benefits to children:

> You know all the other paper work that need[s] to be done, it's just not enough time… especially when you're rushing for your portfolio …. Because at the end of the day, when you ask us to do certain things…, we have to still take a look at whether it benefits the children. If it doesn't, and it's something that's so rushed because you expect certain things to be up because of certain events…, then I guess it's just not beneficial….. Especially when you need to complete a lot of things, it's really a time pressure.

While Teacher F lamented that "there is no such thing as work-life balance", she also acknowledged that it was up to the individual to decide which was more important:

> It's you who determine the work-life balance. If you feel that you [want to] have that work-life balance right, then … you have to … do certain things to make sure that you have that.

An additional challenge for Teacher F is juggling between her work and family responsibilities, including taking time off to deal with personal matters (e.g. taking care of her sick child):

> … when I want to seek that permission [to use my childcare leave] …, sometimes I'm hesitant knowing that sometimes the centre is in need of teachers ….. Most of the time … I would force my husband to take his childcare leave... it's really very hard … they say it's best for you to tell us beforehand when you [want to] take your childcare leave. But sometimes your child just fall sick just that night or the next [morning]... but because of my work commitment, I just got to … find other alternatives …. I'm a family person, so when I just have to put aside family just for work right, it annoys me a lot.

Teacher F also appears to be struggling to adapt to the working culture at her preschool. She feels that the centre is not run effectively as her supervisor is inflexible and does not give teachers the autonomy to make their own decisions:

> Lessons plans [are] … already something given, so I guess freedom, I would say … no ….
> When we plan for certain events, we plan it in a way that we feel and believe [is] beneficial
> for the children, but then … there is always people micro-managing. So sometimes when I
> do plan for event, I'll just come with a blank paper. Yeah, because regardless of what I plan,
> it's being micro-managed so I do not have much say. But I do not know, maybe because …
> I just came to the centre, so having to learn a centre's culture will take that one year also.

In addition to these challenges at work, Teacher F expressed disappointment at the lack of recognition and appreciation for the work that preschool teachers do:

> Ten years being in the industry, every year, they say, "Okay, there's a pay raise." No, it
> doesn't work that way… the appreciation for us is just still—just not there.... Some people
> still think that we are [a] nanny, you know…. It's kind of sad lah. Ten years down the road,
> [it is] still the same… parents' misconception [is] always like, "oh, preschool teachers are
> nothing"… there should really [be] a line drawn already, so that parents can start seeing us
> as professional[s].

Teacher F's family provides a strong pillar of support, especially her mother and her husband:

> I'm very thankful because I have very helpful family members. After I fetch my son, my
> mum will … just take care of him while I go and settle my own things…. [My husband] is
> very supportive…. When I feel stressed, like that time when I cried very badly …, he said
> that, well, this is the work life but it's my choice of how I want to see it. He will always
> remind me, work is work… It should not be my top priority because at the end of the day,
> my top priority should be my family….

Compared to Teacher L and Teacher A, Teacher F struggles with many different work demands, including adapting to a new work environment and balancing her roles as teacher, mother, wife and student. Nonetheless, Teacher F believes that she has a choice in maintaining some form of balance between work and family. Perhaps her family's support provides an important resource for her to continue in this profession.

## 15.5   Future Directions for Research and Policy

Researchers are increasingly recognising the relationship between preschool teachers' well-being and their capacity for providing high-quality education and care (Cumming, 2017). As a result, there has been a surge in research interest in educators' well-being over the past 10 years (Cumming, 2017; Hall-Kenyon et al., 2014). Concurrent developments in theory, particularly the emergence of the JD-R model, have provided a useful framework for understanding how teachers' job characteristics (i.e. job resources and job demands) influence their well-being and broader organisational outcomes. Against this backdrop, we have presented real-world examples of a variety of ways in which job demands and resources interact to affect job satisfaction and well-being of preschool teachers in Singapore.

Consistent with findings from the international literature, our participants spoke about the challenges of handling an excessive workload (Hakanen et al., 2006),

managing children with different needs (Baumgartner et al., 2009) and struggling with a lack of autonomy in decision-making and lesson-planning (Kusma et al., 2012). One participant also struggled with the challenge of managing parents' demands and expectations. On a more positive note, our participants also spoke about different resources that aided in their work, such as having supportive supervisors, colleagues, family and friends, as well as opportunities for personal development and growth. A key takeaway of our pilot study is the varied experiences of each teacher, despite the fact that all of them reported similar sources of job demands. Specifically, their lived experiences differed depending on the amount of job resources, their working environment and their personal circumstances. Despite the preliminary nature of our results, findings from our case studies provide a good starting point to think about some considerations for policy and research.

### 15.5.1   Teacher Well-Being as an Important Component of the Quality of Early Childhood Education

First, we posit that both practitioners and policymakers must acknowledge that preschool teachers' well-being is an important component of good-quality early childhood education. Much research links teacher stress to poorer physical, mental and emotional well-being in teachers (Johnson et al., 2005; Skaalvik & Skaalvik, 2016), as well as poorer quality of care and support for their students (e.g. Friedman-Krauss et al., 2014; Jennings, 2015). In other words, teacher well-being has significant impacts on the quality of their practice, which could lead to detrimental effects on children's socio-emotional and cognitive development. A decrease in teacher well-being is also associated with an increase in turnover rates, which is worrisome due to the threat that it poses to the stability of teacher-child attachment relationships and instructional methods (Royer & Moreau, 2016). Therefore, we argue that more systematic research is needed to better understand the factors that contribute to teacher well-being within the early childhood educational context in Singapore.

### 15.5.2   Systematic Research on Preschool Teachers' Job Demands and Resources

A logical next step would be to mount larger-scale studies to identify the job demands and resources pertinent to preschool teachers in Singapore. Certainly, the demands and resources described by our case study participants are not exhaustive, as the data was obtained from a very small sample of teachers who have been in the profession for a relatively long period of time (i.e. at least 10 years). Thus, it is plausible that their experiences differ from student teachers (i.e. prospective teachers) and their counterparts who have had fewer years of teaching experience. It is

also important to gather information about teachers' job demands and resources from external sources, such as spousal reports (Ilies et al., 2015). Other variables to consider are teachers' age, classes taught (i.e. English versus mother tongue), age profiles of children in the classroom (e.g. same age versus mixed age groups, prenursery- versus kindergarten-age children), number of children with special needs and overall class size. Our pilot findings also highlight the importance of considering the influence of personal and situational factors on teachers' well-being in future studies.

A subsequent line of research might focus on evaluating the impact of job demands and resources on teachers' well-being and organisational outcomes, as well as children's learning and development. Which aspects of preschool teachers' job demands are predictive of strain and burnout? Which aspects of preschool teachers' job resources are predictive of work engagement and motivation? To what extent do job resources buffer the adverse effect of job demands on strain and burnout? How does preschool teachers' well-being impact on children's socio-emotional, language and cognitive development? Findings could be leveraged to identify strategies that may be implemented to support teachers in their work, reducing job demands and increasing their resources, thus leading to more positive outcomes for teachers and the children in their classroom.

## 15.6    Conclusions

In this chapter, we have reviewed the literature on the impact of work-related stress on teachers and children and highlighted the importance of investigating the phenomenon of work-related stress in preschool teachers internationally and within Singapore. We briefly introduced the job demands-resources model, a well-known theoretical framework linking job demands and resources to teacher well-being, and discussed some of the demands and resources reported by teachers in previous studies. Findings from a recently completed pilot study illustrate some of the job demands and resources of three preschool teachers in Singapore. Based on these findings and the extant literature, we argue that it is important to consider teacher well-being as a key component of quality early childhood education and provide some directions for future research.

## References

Aldrup, K., Klusmann, U., Lüdtke, O., Göllner, R., & Trautwein, U. (2018). Student misbehavior and teacher well-being: Testing the mediating role of the teacher-student relationship. *Learning and Instruction, 58*, 126–136. https://doi.org/10.1016/j.learninstruc.2018.05.006

Ang, L. (2012). *Vital voices for vital years: A study of leaders' perspectives on improving the early childhood sector in Singapore*. Lien Foundation.

Bakker, A. B., & Bal, M. P. (2010). Weekly work engagement and performance: A study among starting teachers. *Journal of Occupational and Organizational Psychology, 83*(1), 189–206. https://doi.org/10.1348/096317909X402596

Bakker, A. B., & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of Managerial Psychology, 22*(3), 309–328. https://doi.org/10.1108/02683940710733115

Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology, 22*(*3*), 273–285. https://doi.org/10.1037/ocp0000056

Baumgartner, J. J., Carson, R. L., Apavaloaie, L., & Tsouloupas, C. (2009). Uncovering common stressful factors and coping strategies among childcare providers. *Child & Youth Care Forum, 38*(5), 239–251. https://doi.org/10.1007/s10566-009-9079-5

Blair, C., & Raver, C. C. (2015). School readiness and self-regulation: A developmental psycho-biological approach. *Annual Review of Psychology, 66*, 711–731. https://doi.org/10.1146/annurev-psych-010814-015221

Blöchliger, O. R., & Bauer, G. F. (2018). Correlates of burnout symptoms among child care teachers. A multilevel modeling approach. *European Early Childhood Education Research Journal, 26*(1), 7–25. https://doi.org/10.1080/1350293X.2018.1412012

Chan, K.-B., Lai, G., Ko, Y.-C., & Boey, K.-W. (2000). Work stress among six professional groups: the Singapore experience. *Social Science and Medicine, 50*(10), 1415–1432. https://doi.org/10.1016/S0277-9536(99)00397-4

Childcare enrolment surges as more mums go back to work. (2016, 28 February). *The Straits Times*, Singapore.

Cumming, T. (2017). Early childhood educators' well-being: An updated review of the literature. *Early Childhood Education Journal, 45*(5), 583–593. https://doi.org/10.1007/s10643-016-0818-6

Dicke, T., Stebner, F., Linninger, C., Kunter, M., & Leutner, D. (2018). A longitudinal study of teachers' occupational well-being: Applying the job demands-resources model. *Journal of Occupational Health Psychology, 23*(2), 262–277. https://doi.org/10.1037/ocp0000070

Downer, J. T., Jamil, F., & Maier, M. (2012). Implications of information processing theory for professional development of early educators. In C. Howes, B. K. Hamre, & R. Pianta (Eds.), *Effective early childhood professional development: Improving teacher practice and child outcomes* (pp. 131–155). Brookes.

Faulkner, M., Gerstenblatt, P., Lee, A., Vallejo, V., & Travis, D. (2014). Childcare providers: Work stress and personal well-being. *Journal of Early Childhood Research, 14*(3), 280–293. https://doi.org/10.1177/1476718X14552871

Foo, J. Y. (2013, 14 July). Ex-childcare centre teacher says: Hours were long and pay was peanuts. *The New Paper*, Singapore.

Friedman-Krauss, A. H., Raver, C. C., Morris, P. A., & Jones, S. M. (2014). The role of classroom-level child behavior problems in predicting preschool teacher stress and classroom emotional climate. *Early Education and Development, 25*(4), 530–552. https://doi.org/10.1080/10409289.2013.817030

Hakanen, J. J., Bakker, A. B., & Schaufeli, W. B. (2006). Burnout and work engagement among teachers. *Journal of School Psychology, 43*(6), 495–513. https://doi.org/10.1016/j.jsp.2005.11.001

Hall-Kenyon, K. M., Bullough, R. V., MacKay, K. L., & Marshall, E. E. (2014). Preschool teacher well-being: A review of the literature. *Early Childhood Education Journal, 42*(3), 153–162. https://doi.org/10.1007/s10643-013-0595-4

Ilies, R., Huth, M., Ryan, A. M., & Dimotakis, N. (2015). Explaining the links between workload, distress, and work–family conflict among school employees: Physical, cognitive, and emotional fatigue. *Journal of Educational Psychology, 107*(4), 1136–1149. https://doi.org/10.1037/edu0000029

Jennings, P. A. (2015). Early childhood teachers' well-being, mindfulness, and self-compassion in relation to classroom quality and attitudes towards challenging students. *Mindfulness, 6*(4), 732–743. https://doi.org/10.1007/s12671-014-0312-4

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

Johnson, S., Cooper, C. L., Cartwright, S., Donald, I., Taylor, P., & Millet, C. (2005). The experience of work-related stress across occupations. *Journal of Managerial Psychology, 20*(2), 178–187. https://doi.org/10.1108/02683940510579803

Kelly, A. L., & Berthelsen, D. C. (1995). Preschool teachers' experiences of stress. *Teaching & Teacher Education, 11*(4), 345–357. https://doi.org/10.1016/0742-051X(94)00038-8

Ko, Y.-C., Chan, K.-B., Lai, G., & Boey, K.-W. (2000). Stress and coping of Singapore teachers: A quantitative and qualitative analysis. *Journal of Developing Societies, 16*(2), 181–200. https://doi.org/10.1163/156852200512049

Kusma, B., Groneberg, D. A., Nienhaus, A., & Mache, S. (2012). Determinants of day care teachers' job satisfaction. *Central European Journal of Public Health, 20*(3), 191–198.

Kyriacou, C. (1987). Teacher stress and burnout: An international review. *Educational Research, 29*, 146–152. https://doi.org/10.1080/0013188870290207

Leiter, M. P., & Maslach, C. (2003). Areas of worklife: A structured approach to organizational predictors of job burnout. In P. Perrewe & D. Ganster (Eds.), *Emotional and physiological processes and positive intervention strategies (Research in occupational stress and well being)* (Vol. 3, pp. 91–134). Emerald Group Publishing.

Løvgren, M. (2016). Emotional exhaustion in day-care workers. *European Early Childhood Education Research Journal, 24*(1), 157–167. https://doi.org/10.1080/1350293X.2015.1120525

Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O. A., Bryant, D., … 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

Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job burnout. *Annual Review of Psychology, 52*(1), 397–422. https://doi.org/10.1146/annurev.psych.52.1.397

McGrath, B. J., & Huntington, A. D. (2007). The health and wellbeing of adults working in early childhood education. *Australasian Journal of Early Childhood, 32*(3), 33–38. https://doi.org/10.1177/183693910703200306

Milkie, M. A., & Warner, C. H. (2011). Classroom learning environments and the mental health of first grade children. *Journal of Health and Social Behavior, 52*(1), 4–22. https://doi.org/10.1177/0022146510394952

Oberle, E., & Schonert-Reichl, K. A. (2016). Stress contagion in the classroom? The link between classroom teacher burnout and morning cortisol in elementary school students. *Social Science and Medicine, 159*, 30–37. https://doi.org/10.1016/j.socscimed.2016.04.031

Royer, N., & Moreau, C. (2016). A survey of Canadian early childhood educators' psychological wellbeing at work. *Early Childhood Education Journal, 44*(2), 135–146. https://doi.org/10.1007/s10643-015-0696-3

Siekkinen, M., Pakarinen, E., Lerkkanen, M.-K., Poikkeus, A.-M., Salminen, J., Poskiparta, E., & Nurmi, J.-E. (2013). Social competence among 6-year-old children and classroom instructional support and teacher stress. *Early Education and Development, 24*, 877–897. https://doi.org/10.1080/10409289.2013.745183

Skaalvik, E. M., & Skaalvik, S. (2011). Teacher job satisfaction and motivation to leave the teaching profession: Relations with school context, feeling of belonging, and emotional exhaustion. *Teaching and Teacher Education, 27*(6), 1029–1038. https://doi.org/10.1016/j.tate.2011.04.001

Skaalvik, E. M., & Skaalvik, S. (2016). Teacher stress and teacher self-efficacy as predictors of engagement, emotional exhaustion, and motivation to leave the teaching profession. *Creative Education, 7*, 1785–1799. https://doi.org/10.4236/ce.2016.713182

Tsai, E., Fung, L., & Chow, L. (2006). Sources and manifestations of stress in female kindergarten teachers. *International Education Journal, 7*(3), 364–370.

Van der Doef, M., & Maes, S. (1999). The job demand-control (-support) model and psychological well-being: A review of 20 years of empirical research. *Work & Stress: An International Journal of Work, Health & Organisations, 13*(2), 87–114. https://doi.org/10.1080/026783799296084

Van Droogenbroeck, F., Spruyt, B., & Vanroelen, C. (2014). Burnout among senior teachers: Investigating the role of workload and interpersonal relationships at work. *Teaching and Teacher Education, 43*, 99–109. https://doi.org/10.1016/j.tate.2014.07.005

Whitebook, M., Phillips, D., & Howes, C. (2014). *Worthy work, Still unlivable wages: The early childhood workforce 25 years after the National Child Care Staffing Study*. Center for the Study of Child Care Employment, University of California, Berkeley.

Zhai, F., Raver, C. C., & Li-Grining, C. (2011). Classroom-based interventions and teachers' perceived job stressors and confidence: Evidence from a randomized trial in Head Start settings. *Early Childhood Research Quarterly, 26*, 442–452. https://doi.org/10.1016/j.ecresq.2011.03.003

Zinsser, K. M., Bailey, C. S., Curby, T. W., Denham, S. A., & Bassett, H. H. (2013). Exploring the predictable classroom: Preschool teacher stress, emotional supportiveness, and students' social-emotional behavior in private and Head Start classrooms. *Dialog, 16*(2), 90–108.

# Epilogue: Moving Forward in Research and Practice in the Early Childhood Sector

"It takes a village to raise a child" is an adage that speaks to the ecological layering of societal, community, and family contexts that affect an individual child's developmental trajectory and long-term well-being. With this framework in mind, this book examines early childhood development within these layered contexts of Singapore. It provides a comprehensive overview of Singapore's early childhood sector by exploring the interconnected aspects of children's experience and knowledge. It emphasizes the importance of viewing young children from a holistic lens, with the interplay between the child and his/her environments in mind.

The chapters collected in this edited book begin with the understanding that children's larger context matters. They show that Singapore's early education system has experienced significant changes in recent years, including a revised curriculum, enhanced training for preschool educators, and increased government support for early childcare accessibility. Future research must understand the effects of such changes on ECE teaching practices and their consequences for children's development and future learning.

As discussed in this book, recent research has begun to outline aspects of child development as related to ECE and how changes in teacher (and parent) practices may benefit children moving forward. Some of this earlier research is based on the first large-scale investigation of the impact of classroom quality on child development in Singapore – the Singapore Kindergarten Impact Project (SKIP). This kindergarten cohort study, conducted at the National Institute of Education (NIE) and funded by the Ministry of Education (MOE), followed 1,537 children from 80 preschools and covered their development from Kindergarten 1 to Primary 1 levels. The study has shown that limited aspects of early childhood education environments predict child outcomes. However, a recently concluded Local Evidence Synthesis on Early Childhood Education (ECE) by NIE recommends further examination of classroom quality in future research. This includes extending studies of

ECE's effects upon child outcomes to capture a wider range of preschool environ-ments and classroom practices and expanding on effects beyond the preschool years. Some progress already has been made in these directions. At NIE, a recently conducted study ("Transitioning from Kindergarten to Primary School – Exploring the links between children's self-regulation skills, socioemotional competence, and academic outcomes"), involving a subsample of SKIP cohort children, investigated the influence of self-regulation difficulties at Primary 1 on children's academic and socioemotional outcomes at Primary 3. Such studies contribute to an improved understanding of the longer-term developmental outcomes of children who enter primary school with poor self-regulation skills. Similarly, an ongoing follow-up study of the SKIP cohort as they approach the end of primary school collects addi-tional data from participating SKIP children during their Primary 5 and 6 school years. Questions that the study seeks to address include the longer-term impact of early childhood home and school factors on children's physical, academic, and socioemotional development and the identification of factors that may moderate these developmental trajectories.

Additional chapters of this book focused on issues related to the home and class-room and reveal the importance of caregiver and teacher well-being in creating the types of positive early environments that are most conducive for children's growth in socioemotional and pre-academic competence. Previous research at NIE (as indi-cated in the Local Evidence Synthesis on ECE) shows that factors beyond the pre-school environment are predictive of child development. This can be because of their influence on child development resources, stress, parental behavior, and even prenatal stress. However, the exact mechanisms need further study. The next step in this direction is to further understand how good-quality home environments support children's learning and development by closely examining early caregiving environ-ments. It will also be important to research how home life may interact with school experience to predict early child outcomes. A step in this direction is the recently launched "BE POSITIVE" study by NIE and SingHealth researchers (described in Chapter 8). It will examine multiple aspects of home life including caregiving and childcare arrangements, parental stress, anxiety, and feelings about status, the qual-ity of the home learning environment, and naturally occurring language use in the home. This understanding will help families to recognize the best ways to facilitate preschool readiness and well-being in their children. Moreover, BE POSITIVE hopes to collect data from children's preschool teachers, about their own education and credentials, teaching practices, feelings of stress and anxiety, and expectations of students and their parents. As BE POSTIIVE also hopes to collect information from parents about their own expectations for children and their teachers, BE POSITIVE may be positioned to examine the extent to which it is important for parents and teachers to have consistent expectations regarding child development and caregiving/pedagogical practices. If consistency across home and school con-texts is found to be impactful on child outcomes, the importance of better parent-teacher communication will be highlighted.

Moreover, because of the Covid-19 pandemic, ongoing efforts to support chil-dren from financially disadvantaged families may need to be expanded beyond the

current levels if the gap between these children and their peers is to be reduced. The pandemic has clearly shown that children's well-being and achievement depend on more than just what goes on in school. Therefore, we need to look holistically at the children's lives in totality to help lift children from disadvantaged homes. Programs such as KidStart and the Child Support Model (CSM) for children from low-income families take this enlarged approach with the aim of supporting children to have a better start in life. They aim to strengthen parental education and support for children from disadvantaged homes, which will be important to level the playing field. Research must examine whether such levelling-up programs currently result in caregivers using more child-centered engagement techniques and if these in turn encourage positive child development. An ongoing joint study between NTUC First Campus and the NIE is researching the effects of the CSM. To better understand the long-term benefits and build a strong evidence base, it will be helpful to conduct follow-ups of these programs.

Another area highlighted in this book is the need to examine the experiences of preschool children with special developmental needs, as well as those of their teachers, and to identify ways to support these children in preschool environments. Based on a small but increasing number of studies conducted in Singapore, it appears that additional research can shed light on issues of identification and assessment, child profile and needs, inclusive education models/programs, support practices and support needs, and family-centered service provision. An ongoing longitudinal study, the Tran-SEN study (The Transition and Adjustment of Children with Special Educational Needs in Primary or Special Schools: A Study of Three-Year Outcomes and Their Determinants), understands the transition and adjustment of preschool children with special educational needs (SEN) into mainstream primary or special education schools. It is expected that this study will yield insights into the profile and needs of children with SEN accessing both primary and special education in Singapore, leading to more accurate educational support.

The final chapters emphasized the detailed conditions, antecedents, and culturally specific issues related to the early development of emotional, mathematical, and language skills. As effective bilingualism is a central policy of Singapore's education system, understanding home, school, and child factors in the early years will provide guidance on best practices for preparing students to demonstrate the required bilingual proficiency by the end of primary school. Given the multilingual context of Singapore and the bilingual education practice of English plus one "mother tongue" (either Mandarin Chinese or Bahasa Melayu or Tamil language), this research is complicated by the fact that three different types of bilinguals are under consideration. According to SKIP findings, factors contributing to the successful development of English and mother tongue language and literacy skills include to a large part the amount of exposure a child has to his/her mother tongue language in the home. Language development is the result of a complex interplay between multiple inherent and environmental factors, and the study's children showed that while their competence in English depends more on inherent skills such as memory, their mother tongue competence depended on environmental input. Following up on the SKIP substudy on bilingualism, the upcoming project "Growth

in Bilingual & Biliteracy Proficiency: Environmental, Individual & Experiential Factors (GiBBER)" will track the developmental trajectories of Singaporean children's bilingual proficiency over a wider age range (kindergarten to middle primary) with a more representative sample across the three bilingual language groups and a deeper focus on different language and literacy domains while profiling struggling learners. Additional studies in the project aim to trial effective interventions to support Singaporean children's bilingual development.

The first editor of this volume once visited the Royal Swedish Academy of Sciences (RSAS) where he had the privilege of visiting the *Hall of Decision* where deliberations on Nobel Prize winners are made each year. What impressed him most were not just the photos of Nobel Laureates down through the centuries but also the emblem of the RSAS with the statement "för efterkommande" which means "for the next generation." Research in early childhood is for the next generation. The "inputs," "throughputs," and "outputs" of research are all important when we are researching about the development of the child and trying to understand how experiences and environment interact with biology to shape a child and even a generation. In the context of Singapore, investment in early childhood research is especially critical when taking a future-oriented approach in optimizing human development and potential. Even at the input stages where larger-scale research proposals are being conceptualized, opportunities are created for voices and visions about the issues that matter to researchers, practitioners, the community, and stakeholders. Without research, such conversations often lack the science, rigor, and bigger picture of things. Partnerships between researchers and the community will be an integral part of the "throughputs" when researchers collect data and share with participants the reasons for their research. Conversations of "why" and "how" are important as we seek to understand interventions in the home as well as school environment. Outputs for the Centre for Research in Child Development (CRCD) at NIE will be not just about advancing scholarship in the field of early childhood but also will be about how we can impact the development of children through the practices of parents, teachers, and the community.

Finally, the pandemic and home-based learning experience have shown us that in the context of new learning environments, we have much to do in lifting vulnerable groups of children up to have equal access to learning opportunities. Singapore is particularly invested in building a fairer and more equal society. The Singapore Ministry of Education highlighted three "resets" we must adopt in post-pandemic Singapore, one of which strongly emphasizes early childhood education. This includes the provision of more resources to schools with a larger proportion of students from lower-income families or disadvantaged backgrounds and intervening as early as possible to uplift children from birth and early childhood as key policy movements. We hope that our research will further support and inform such policy movements.