

Abstract of thesis entitled

“Quality and Sustainability of Early Learning Environments: Case Studies of Award-Winning Green Preschools in Bali, Berkeley, and Hong Kong”

Submitted by

Ailin Iwan

for the degree of Doctor of Philosophy
at the University of Hong Kong
September 23, 2016

This thesis offers a juxtaposition of two disciplines (architecture and education) in looking at quality and sustainability in award-winning Green Preschools in three locations: Bali (Indonesia), Berkeley (United States of America), and Hong Kong (People’s Republic of China). It provides perspectives from multiple stakeholders including architects, principals, teachers, and parents. A divergent notions of ‘quality’ in early learning environments from the perspectives of architects and educators is the first theme in this thesis, which is explored in Study One. The growing emphasis on Education for Sustainable Development (ESD) and sporadic movements of ‘Green School’ in the form of research and practice led to the second theme about sustainability; explored in Studies Two, Three, and Four.

These four studies were conducted to: (i) compare architects’ and early childhood educators’ (represented by principals and teachers) perspectives on quality in preschool environments; (ii) discern the notion of a ‘Green School’ from the existing academic literature; (iii) gain an understanding of how principals, teachers, and parents of children from the three preschools perceive ‘Green School’ at the conceptual level and by evaluating at their preference for having their children being taught under a ‘Green Curriculum’ or inside a ‘Green Building’; and, (iv) determine the characteristics of a ‘Green School’ by observing award-winning Green Preschools in three different cultures using scales developed by both architects and early childhood educators.

Data were collected over a 10-month period and the unit of analysis was a classroom for 4- to 5-year-olds. Preschool environmental quality and sustainable practices were assessed using the following rating scales that reflected the

perspectives of either early childhood educators or architects: Early Childhood Environment Rating Scale-Revised; Children's Physical Environment Rating Scale; OMEP Environmental Rating Scale for Sustainable Development in Early Childhood; and Simplified Leadership in Energy and Environmental Design. A total of 25 stakeholders, including architects, principals, teachers, and parents, were also interviewed to assess their views of preschool quality and sustainability, with regard to the preschool in their location.

Results indicated that the preschool in Berkeley excelled in terms of quality, whereas the preschool in Bali excelled in terms of sustainable practices. Environmental quality was associated with the stringency of regulations for preschool design in the different contexts and a close collaboration among the architects and educators during the design process. The notions of 'Green School' promulgated in the existing literature and held by stakeholders were discerned. Finding suggest the notion of 'Green School' is contested and evolving in the literature and that stakeholders preferred the implementation of 'Green Curriculum' in the classroom in comparison to having children being taught inside a 'Green Building'. Three distinct characteristics of 'Green School' were found: 'Green School' Holistic in Preschool A – Bali; 'Green School' Building in Preschool B – Berkeley; 'Green School' Curriculum in Preschool C – Hong Kong. A timeline that capture the 35 years of green school movement was created and a more precise definition of a 'Green School' is proposed. The implications of the findings and future directions for study are discussed.

(497 words)

DECLARATION

I declare that this thesis and the research work thereof represents my own work, except where due acknowledgment is made, and it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma, or other qualifications.

Signed: _____

Ailin Iwan
September 23, 2016

DEDICATION

To the **Holy Trinity**
God, Holy Spirit, and Jesus Christ

I have finally found the purpose of my life
upon the completion of my thesis.
I thank You for patiently teaching me about
the physical, the mental, and the spiritual world
through sending so many wonderful people.
Now, I have fulfilled the thirst for knowledge and I am
embarking in a journey to accumulate more wisdom
in Your truth and love.

To my maternal grandmother
Ong Soat Hong – Ama

To my mother
Oey Suzy Wirawaty – Mami

Your love for and commitment to our families
are the embodiments of
“Wives of Noble Characters”
true virtue that I strive to model
every single day

To my husband
Kenneth K. Y. Poon

Your wisdom, humility, leadership,
self-sacrifice character,
create stability in our new family.
I hope the Lord will utilize both of our talents
to improve the environments and
people’s quality of lives.

To my professor
Nirmala Rao

Your professionalism, patience,
understanding, and brilliant mind motivate me
to pursuit excellence in my work.
I am blessed to be under your guidance;
a true scholar, who works not only with
intelligence and care, but also with your heart.

To **Planet Earth & Humanity at large**

This thesis has taught me how to be more conscious
about the environment.
Now, God has put a desire in my heart
to protect the beauty of His Earthly Garden
through raising awareness about sustainable living.
I shall start with the children.

ACKNOWLEDGMENT

“Scholars are those unique individuals with curious minds who seek for knowledge and truth, loving hearts for the humanity, and whose inks and words are often sharper than the sharpest swords to dissect right from wrong.”

Ailin Iwan

The completion of this thesis has been a labor of love and a testament to my passion for the two disciplines I have enjoyed since my childhood: architecture and education. I am forever indebted to the Holy Trinity: God, the Holy Spirit, and Jesus Christ, for it is through the direction of the Heavens that I have come this far in a scholarship journey that I had ever even dared to dream before. My heartfelt thanks to my parents, Mr. Susanto Iwan and Mrs. Oey Suzy Wirawaty, who have always loved me unconditionally, no matter whether I would be considered successful or fail in the societies' eyes. Their emotional care and financial support enable me to satisfy my thirst for knowledge and search for new discoveries; I thank them for giving me wings to fly and nest to catch me when I fall down. I thank my belated grandfathers: Mr. Sulaiman Iwan and Mr. Pius Oeij Tjin Goan, who both cherished me, a grand-daughter, and treated me as equal as their other grand-sons. Their open-mindedness and supports for female's education in our families planted the seeds to break through the patriarchal traditional Chinese belief that high education, position in society, and respect are only for males. I have been privileged to learn from two aunties who live successful and balance lives - not only they took care their own families well - but they also contributes their time and energy to help other family members: Aunt Jenny Iwan, a proficient female entrepreneur who assisted her husband, Tony Leong, to build up their company, Safeco Electric Supply, Inc. in San Francisco; and Aunt Sylvie Wirawaty, an accomplished architect and an Associate Dean in a real estate department at the University of Tarumanegara in Jakarta. Both are loving wives and mothers to their children. I thank my uncle, Kusnadi Wirawan, for being a good testimony in living a successful life while never forgetting to care for the others; his wisdom, timely advice, and grace in handling difficult situations are good quality that I try to model.

My doctoral studies journey would never have been completed without my partner in life, soul-mate, and a beloved husband, Mr. Kenneth K.Y. Poon. It is through his love, patience, understanding, intellect, and unconditional support for my thesis that I have finally been able to complete an interdisciplinary work that I

sincerely hope will benefit humanity. Kenneth has been instrumental in this journey, as he helped me to fine tune my research questions, accompanied me to a difficult research site in Bali, edited several thesis drafts, and also patiently discussed certain difficult parts to bounce back ideas during the critical data analysis period. I humbly acknowledge that my PhD is a co-laboring effort with my husband, who is an extremely talented architect with his own accomplishments.

The conceptualization, development, and maturation of this thesis, from idea to completion, would not have been possible without my amazing primary supervisor, Prof. Nirmala Rao, for whom I have great respect and deep admiration. It was Prof. Rao who inspired me to combine the two disciplines of architecture and education when I visited her office, in 2010, confused about how to find an appropriate research topic to cover two different disciplines. I thank Prof. Rao for her open-mindedness, for taking me on as her student despite my limited exposure to academic research, and her confidence in my ability to develop a new research study through a process of exploration that often carried a great risk of failure. Working with a great scholar at the caliber of Prof. Nirmala Rao has been such an honor for someone like me, who was initially oblivious of what a scholarship would mean. I also would like to express my gratitude to my co-supervisor, Dr. Li Hui, whose advice, guidance, care, and friendship have been such a great source of supports for my wellbeing at the University of Hong Kong (HKU). I will always fondly remember Dr. Li Hui as a caring co-supervisor. I also thank Mr. Stephen Lau, my previous co-supervisor for his guidance in the first part of my thesis.

I thank my Christian mentors: Fiona Lee (who has been tired-less-ly praying for my thesis), Donna Sun (who always opens her house during my tough time in Hong Kong), Caroline Huang Lee (who cheers me up whenever I feel down), Kenneth Lee (who gives me words of wisdoms when I became too negative about life). I thank my spiritual leaders – Pastor Paul Chou and Shimu; belated Pastor Dan Williams and Anita Williams; and Pastor James Pounder and Elaine Pounder – whose prayers, kind words of encouragement, and emotional support have always strengthened me and shown me that there is so much more to life than just thesis. I thank Prof. Mark Bray for his insightful discussions about comparative study; Prof. Wing-Wah Law, Prof. Samson Tse, and Dr. Eugenie Leung for their helpful advices about solving life's problems. I thank my office friends: Dr. Diana Lee, Dr. Iris Lin Feng, Dr. Fiona Lue Fang, Dr. Ava Miao Yang, Dr. Sailor Cai, Dr.

Carrie Lau, Daniel Li Bing, Lily, and Wong Chin Mei for sharing our academic journey through strengthening each other. I thank many friends at the Graduate House, particularly Vera Matarese, who co-labor with me in leading the Spirit Shines Fellowship and whom I have considered as my own dear sister. I thank those who are involved in the Faith and Global Engagement Initiative, particularly my thanks goes to its founder and director, Prof. Daniel Chua. These two organizations have provided platforms for my spiritual growth at the University of Hong Kong.

Lastly, I would like to thank all of the participants (principals, teachers, parents, and architects) involved in this thesis from the three preschools in Bali, Berkeley, and Hong Kong. They have kindly opened up their centers and offices to allow me to expand my knowledge and deepen my understanding about award-winning green schools. It has been my honor to encounter such passionate educators and architects, who take their work so seriously.

People often say that a PhD is a lonely and boring journey. On the contrary, my PhD life has been enriched by so many eventful occasions. Through facing academic frustration together and sharing our work-family-life balance struggles, I have formed meaningful and deep friendships with other students. Over nearly 4 years of study, I have witnessed the births of 7 babies to my academic brothers and sisters and 8 weddings of friends and family members (including Kenneth and my wedding). It has not been an easy ride, yet it is a great privilege to be surrounded with brilliant minds, caring hearts, and friendly faces at the University of Hong Kong. Finally, I cannot be more proud than to graduate from the same university where Dr. Sun Yat Sen, the founding father of modern China, graduated as a medical doctor, many years ago. This cross-national study has enabled me to find back my cultural root as a Chinese Daughter at the same time it deepen my conviction about the need to acquire a ‘Global Citizenship’ view to perceive the 21st Century as a period to pursuit a universal value that benefit humanity as a whole. For all these people whom I have mentioned above, I would like to present this poem to end my acknowledgement.

Blossoming as a Scholar

The attribute of a scholarship
In the academic pursuit
Truly a long and a difficult one

The process of reading, writing, thinking, and analyzing
It is somehow much more challenging than I ever could imagine
What is the meaning of a scholarship that it worth such sacrifice?

In the process of struggling of finding research questions
In the process of reading endless literature reviews
In the process of collecting data
In the process of writing academic papers
Finally, in the process of wrapping up the thesis
I struggled, cried, felt stupid, frustrated, and
worked really hard to motivate myself every single day

Pile after pile of documents at my office table
Countless journal articles have been printed and read
Countless of my own writing and revision papers
Countless of hours spending to produce a quality thesis
Further, countless of people asking me: When will you graduate?

In these painful and seemingly endless process of being trained
Learning the baby step of how to write with precision
Not bringing in any speculation
Writing with evidence and not simply voicing a mere opinion

The confidence, smile, encouragement, timely feedback and
support from my supervisor, Prof. Nirmala Rao,
is truly worth more than any gold and silver
The patience, understanding, and love from my
caring husband, Kenneth KY Poon, is truly worth more than the most expensive diamond

What is the worth of a PhD degree? I often asked myself
Is it only another label for a mere societal praise?
Never shall be the case!!!
Now that I have experience that: a PhD is a training to be a scholar
Whose words shall be count trustworthy
Whose actions shall follow with integrity
Whose work shall benefit the society

A four-year well-spent journey
I have been transformed in becoming a scholar
From egg, larva, pupa, into a butterfly
In this scholarship journey.

*Praise be to the Holy Trinity
for such an amazing
'Scholarship Journey':
It is PRECIOUS*

Ailin Iwan Poon

Poem was written in
March 5, 2016

TABLE OF CONTENTS

ABSTRACT.....	i
DECLARATION.....	iii
DEDICATION.....	iv
ACKNOWLEDGEMENTS.....	v
TABLE OF CONTENTS.....	ix
LIST OF TABLES.....	xiv
LIST OF FIGURES.....	xv
PROLOGUE.....	1
Overview Thesis in a Poster Format.....	2
CHAPTER 1: INTRODUCTION.....	3
1.1. The Criticality of Learning Environment in the Early Years.....	3
1.2. Educators' and Architects' Perspectives of Preschool Quality.....	6
1.2.1. Preschool Quality from Educators' Perspectives.....	7
1.2.1.1. Varying Perspectives.....	8
1.2.1.2. Teacher Quality.....	8
1.2.1.3. Pedagogical Quality.....	9
1.2.1.4. Curriculum.....	10
1.2.2. Preschool Quality from Architects' Perspectives.....	11
1.2.2.1. Ideal Preschool Design.....	11
1.2.2.2. Classroom Density.....	13
1.2.2.3. Center and Building Size.....	13
1.2.2.4. Indoor and Outdoor Spaces.....	13
1.2.2.5. Playgrounds.....	14
1.2.2.6. Preschool Location.....	15
1.2.2.7. Air quality.....	15
1.2.2.8. The Function of Colors.....	16
1.2.2.9. Acoustic.....	16
1.2.2.10. Differentiated Ceiling Height.....	17
1.2.2.11. Activity Zones.....	17
1.3. Education for Sustainable Development and the Green School.....	18
1.3.1. International Institutions that Focus on ESD.....	18
1.3.2. The Evolution of the Green School.....	20
1.3.2.1. The Green School Concept.....	22
1.3.2.2. The Green Curriculum.....	22
1.3.2.3. The Green Buildings.....	24
1.3.2.4. The Green Environment.....	25
1.3.2.5. The Green School: Infrastructure and Curriculum.....	25
1.4. Research Questions.....	26
1.5. Research Design.....	28
1.5.1 Multiple Case Study.....	29
1.5.2. Research Sites.....	30
1.5.3. Author/Researcher as an Instrument.....	30
1.6. Research Framework.....	32

1.6.1. Conceptual Framework.....	33
1.6.2. Operational Framework.....	34
1.6.3. Theoretical Framework.....	35
1.7. Significance of the Thesis.....	36
1.8. Organization of the Thesis.....	37
References.....	39
<i>Preface to Chapter 2</i>	48
“Early Childhood Educators’ and Architects’ Notions of the Quality of Preschool Environments: Case Studies in Bali, Berkeley, and Hong Kong”	
CHAPTER 2: STUDY ONE	49
Abstract.....	49
2.1. Introduction.....	50
2.1.1. Structural and Process Quality.....	51
2.1.2. Importance of the Physical Environment.....	51
2.2. Diverging Perspectives on Preschool Quality.....	52
2.2.1. Early Childhood Educators’ Views on Preschool Quality.....	53
2.2.2. Architects’ Views on Preschool Quality.....	53
2.3. Learning Environments and Preschool Design.....	54
2.3.1. The Role of the Environment in Children’s Development.....	55
2.3.2. Characteristics of Ideal Preschool Design.....	56
2.4. Research Gaps and Research Questions.....	57
2.5. Method.....	57
2.5.1. Preschool Participants.....	58
2.5.1.1. Selection Process.....	58
2.5.1.2. Preschool Settings.....	58
2.5.1.3. Stakeholder Participants.....	60
2.5.3. Measures.....	61
2.5.3.1. Observation Scales.....	61
2.5.3.2. Interviews.....	62
2.5.3.3. Field notes.....	63
2.5.3.4. Visual Data.....	63
2.5.3.5. Documentary Analysis.....	63
2.5.4. Procedure.....	63
2.4.5. Inter-rater Reliability.....	65
2.6. Results.....	65
2.6.1. ECERS-R and CPERS.....	66
2.6.2. Interviews.....	68
2.7. Discussion.....	79
2.7.1. Municipalities Regulations Matter.....	79
2.7.2. Architects’ and Educators’ Close Collaboration Enhanced Design Quality.....	80
2.7.3. Architectural Design Supports Educational Curriculum.....	81
2.7.4. The Indoor and Outdoor Environments: Stakeholders’ Ratings.....	82
2.7.5. The Impact of Preschool Design on Students’ Behaviors.....	82
2.7.6. Cultural Influences on Design.....	84
2.7.6.1 ECERS-R and CPERS in Cultural Contexts.....	84

2.8. Limitations.....	85
2.9. Conclusion.....	86
References.....	88
<i>Preface to Chapter Three</i>	94
.	
“Negotiating The Meaning of The ‘Green School’”	
CHAPTER 3: STUDY TWO	95
Abstract.....	95
3.1. Introduction.....	96
3.2. Overlapping Interpretation.....	96
3.2.1. The Interpretation of the ‘Green School’ as Green Building.....	96
3.2.2. The Interpretation of the ‘Green School’ as Green Education.....	99
3.3. Organizations Supporting ‘Green School’ – Educational Scheme.....	102
3.4. Benefits of the ‘Green School’: Green Building and Green Education.....	102
3.5. Conclusion.....	103
References.....	105
<i>Preface to Chapter Four</i>	107
“The Green School Concept: Perspectives of the Stakeholders from Award-Winning Green Preschools in Bali, Berkeley, and Hong Kong”	
CHAPTER 4: STUDY THREE	108
Abstract.....	108
4.1. Introduction.....	109
4.2. The Historical Root of the Green School Concept.....	109
4.3. The Conceptualization of the Green School.....	110
4.3.1. The Green School: Education.....	111
4.3.2. The Green School: Building.....	112
4.4. Research Questions.....	113
4.5. Method.....	113
4.5.1. Settings.....	113
4.5.2. Participants.....	114
4.5.3. Procedure.....	115
4.5.4. Data management.....	115
4.5.5. Reliability and Validity.....	115
4.6. Results.....	115
4.6.1. The Green School Concept.....	116
4.6.1.1. The Green School Concept in Preschool A.....	117
4.6.1.2. The Green School Concept in Preschool B.....	117
4.6.1.3. The Green School Concept in Preschool C.....	117
4.6.2. The Green Education Concept.....	118
4.6.2.1. The Green Education Concept in Preschool A.....	118
4.6.2.2. The Green Education Concept in Preschool B.....	119
4.6.2.3. The Green Education Concept in Preschool C.....	119
4.6.3. The Green Building Concept.....	120

4.6.3.1. The Green Building Concept in Preschool A.....	120
4.6.3.2. The Green Building Concept in Preschool B.....	121
4.6.3.3. The Green Building Concept in Preschool C.....	121
4.6.4. The Green Building versus the Green Curriculum	121
4.7. Discussion.....	122
4.7.1. The Parallel Movement of the Green School: In Theory and Practice.....	122
4.7.2. The Green School Manifestation: The Stakeholders' Perceptions.....	124
4.7.3. The Stakeholders' Preference for the Green Curriculum over the Green Building.....	126
4.8. Limitations.....	127
4.9. Conclusion.....	127
References.....	129

<i>Preface to Chapter Five</i>	132
--------------------------------------	-----

**Characteristics of Green Schools: Observations of Award-Winning
Green Preschools in Bali, Berkeley, and Hong Kong**

CHAPTER 5: STUDY FOUR	133
------------------------------------	-----

Abstract.....	133
5.1. Introduction.....	134
5.2. The Green School Movement: Global.....	134
5.3 The Green School Movement: The United States, China, and Indonesia.....	135
5.4. Research Questions.....	136
5.5. Method.....	136
5.5.1. Settings.....	136
5.5.2. Measures.....	137
5.5.2.1. OMEP ERS-SDEC.....	137
5.5.2.2. Simplified LEED	138
5.5.3. Procedure.....	138
5.5.4. Inter-rater Reliability.....	138
5.5.5. Research Framework: Bronfenbrenner Ecological Theory.....	139
5.6. Results.....	139
5.6.1. OMEP ERS-SDEC.....	139
5.6.1.1. Social and Cultural Responsibility.....	140
5.6.1.2. Economic Sustainability.....	140
5.6.1.3. Environmental Sustainability.....	140
5.6.2. Simplified LEED	142
5.6.2.1. Sustainable Site.....	143
5.6.2.2. Water Efficiency.....	143
5.6.2.3. Energy and Atmosphere.....	144
5.6.2.4. Material and Resources.....	145
5.6.2.5. Indoor Environmental Quality.....	146
5.6.2.6. Innovation in Design.....	147
5.7. Discussion.....	147
5.7.1. Analyzing the Green Schools in Three Cultures with the Bronfenbrenner.....	147

5.7.2. Three Distinct Green School Characteristics.....	151
5.7.2.1. The Green School – Holistic: Preschool A in Bali.....	151
5.7.2.2. The Green School – Building: Preschool B in Berkeley.....	151
5.7.2.3. The Green School - Curriculum: Preschool C in Hong Kong.....	152
5.7.3. Factors Influencing Implementation of the Green Concept.....	152
5.7.3.1. Visions of the Schools’ Leaders.....	152
5.7.3.2. Cultures and City Regulations.....	153
5.7.3. The Green Institutions.....	154
5.8. Limitations.....	154
5.9. Conclusion.....	155
References.....	156
CHAPTER 6: CONCLUSION.....	159
6.1. Thesis Overview.....	159
6.1.1. Review of Thesis Goals and Research Questions.....	159
6.1.2. Review of Framework.....	162
6.1.2.1. Operational (Cube Inspired by Bray and Thomas).....	162
6.1.2.2. Theoretical (Bronfenbrenner Ecological Theory).....	162
6.2. Major Findings.....	163
6.2.1. The Quality of Preschool Environments.....	163
6.2.2. Sustainability in Preschool Environments.....	164
6.3. Contributions.....	166
6.3.1. Preschool Environmental Quality.....	166
6.3.2. Green School Field.....	169
6.4. Implications.....	169
6.4.1. Research on Early Learning Environments.....	169
6.4.2. Green School Research.....	170
6.4.3. For Educators.....	170
6.4.4. For Architects.....	171
6.5. Limitations.....	172
6.6. Future Directions.....	173
6.7. Conclusion.....	174
6.8. Chapter Summary.....	174
References.....	176
EPILOGUE.....	179
APPENDICES.....	180

LIST OF TABLES

Table 1.1 Parallel Learning Environment Images in Education and Architecture..	7
Table 1.2. The Evolution of People’s Understanding of the Green School.....	21
Table 1.3. OMEP’s Three Pillars of ESD and 7Rs.....	24
Table 2.1: ECERS-R and CPERS Comparative Data from Preschools in Bali, Berkeley, and Hong Kong.....	66
Table 2.2.1. Architects’ Perspectives on Design Goals.....	69
Table 2.2.2. Architects’ Perspectives on Design Processes.....	70
Table 2.2.3. Architects’ Perspective on Design Challenges.....	71
Table 2.2.4. Architects’ Perspective on Design Features.....	72
Table 2.3.1. Principal’s Perspective on Preschool Environment.....	73
Table 2.3.2. Principal’s Perspective on Curriculum and Activities.....	74
Table 2.4. Principal of Preschool B’s Sister School who sat at the Design Committee of Preschool B.....	75
Table 2.5.1. Teachers’ Perspective on the Preschool Physical Environment.....	76
Table 2.5.2. Teachers’ Perspective on the Curriculum and Activities.....	77
Table 2.6. Principals and Teachers’ Rating of Their Own Preschool’s Indoor-Outdoor Facility.....	78
Table 4.1. Interview Participants.....	114
Table 4.2. Comments Displaying Stakeholders’ Understanding of the Green School.....	116
Table 4.3. Comments Displaying Stakeholders’ Understanding of the Green Education.....	118
Table 4.4. Comments Displaying Stakeholders’ Understanding of the Green Building.....	120
Table 5.1. OMEP ERS-SDEC Comparative Data from Preschools in Bali, Berkeley, and Hong Kong.....	139
Table 5.2. Simplified LEED Comparative Data from Preschools in Bali, Berkeley, and Hong Kong.....	142

LIST OF FIGURES

Figure 1.1. Modified Cresswell Multiple Case Study Approach.....	29
Figure 1.2. Research Conceptual Framework Diagram.....	33
Figure 1.3. Operational Framework:	
Cube inspired by Bray and Thomas (1995).....	35
Figure 4.1 The Historical Roots of the Green School and Its Parallel Movements.....	124
Figure 5.1. Bronfenbrenner Diagram to analyze the Award-Winning Preschools in Bali, Berkeley, and Hong Kong.....	150