IMPACT OF EDUCATION FOR SUSTAINABILITY AT A MONTESSORI PRIMARY SCHOOL:
FROM SILOS TO SYSTEMS THINKING

ELAINE LEWIS
BA, DipEd, MEd

This thesis is presented for the degree of Doctor of Education of Murdoch University
2012
DECLARATION

I declare that this thesis is my own account of my research and contains, as its main content, work which has not previously been submitted for a degree at any tertiary education institution.

----------------------------------------
Elaine Lewis
----------------------------------------

----------------------------------------
Date
----------------------------------------
ABSTRACT

This research investigated Education for Sustainability (EfS) at an independent Montessori primary school, located in the Perth metropolitan area of Western Australia. A longitudinal case study involving analysis of data from a twenty year period was conducted to determine the effectiveness of EfS. Historical information about EfS at the school from 1990 to 2005 was examined, with the main focus of the study being on the impact of the Australian Sustainable Schools Initiative (AuSSI) between 2005 and 2009. AuSSI promotes a whole school, whole systems thinking approach to EfS.

Three school-based issues in EfS were studied. Firstly, the research aimed to determine what elements of EfS were in operation in the school prior to involvement in AuSSI. Secondly, student outcomes including engagement with whole systems thinking, attitudes and values, knowledge and understandings, and skills and behaviours related to EfS, were investigated during the first five years of participation in AuSSI. Thirdly, teacher perceptions of the EfS program, including engagement with whole systems thinking, were examined during this same time period.

A case study approach was employed to enable in-depth investigation of EfS in the life of the school prior to, during and post implementation of AuSSI. This approach facilitated revelation of participants' lived experiences, their perceptions and understandings of EfS, as well as detailed information about student outcomes in EfS. Case study methodology was also compatible with the culture and processes of the participating school and provided an opportunity for utilising a whole systems thinking approach. Data was gathered from a range of sources, through surveys, interviews, observation and document analysis over a five year period. The total participants included eleven teachers and seventy five students.

The research identified particular antecedents of EfS in the Montessori Method of education that existed in the school prior to AuSSI, including the whole child approach, together with the Montessori learning environment, curriculum and values. Following participation in AuSSI, student attitudes and values, knowledge and understandings, and skills and behaviours related to EfS were enhanced for all year levels. However, after three years when specific EfS actions and projects ceased, student EfS outcomes were
limited. Furthermore, students’ thinking and behaviour indicated a ‘silo’, rather than whole systems thinking approach to EfS. Teachers perceived the EfS program as highly effective in the initial three years after joining AuSSI. Key elements that enhanced EfS included EfS staff champions who had access to EfS networks, leadership support, and active school community involvement in all EfS processes. However, after three years of being an AuSSI school, the culmination of reduced leadership support for EfS, lack of staff training, vague designation of staff with EfS responsibilities and inadequate community involvement, resulted in cessation of the EfS program. Teacher perceptions on whole systems thinking revealed alignment between Montessori philosophy, EfS and whole system thinking was more in theory than in practice.

Through an in-depth longitudinal case study of a school this research highlighted the importance of whole school EfS professional learning, embedding EfS and whole systems thinking across the curriculum at all year levels, whole school support, and the usefulness of a sustainability continuum that recognizes the complex, dynamic interplay of issues involved in a school’s EfS journey. It is strongly recommended improvements to pre-service teacher education in EfS are implemented, and a review of the AuSSI toolkit is conducted to refine EfS evaluation processes and to target the specific EfS needs of teachers at different stages of schooling, as well as to enhance understanding and implementation of the whole systems thinking approach. Finally, EfS professional learning for all school staff in all schools is warranted to enhance depth of EfS engagement.
ACKNOWLEDGEMENTS

I wish to dedicate this thesis to my mother, Nell Johansen … for living her life with deep caring, creativity and sensitivity, while seeking wisdom, understanding, knowledge and excellence; and to my aunt, Tan, for sharing the wonders and joys of gardening with me.

I would like to express my profound gratitude to my dedicated supervisors. To Dr Catherine Baudains and Dr Caroline Mansfield I offer my deepest thanks for their expertise, support, enthusiasm and guidance in supporting me to complete this research and aspire to excellence in the production of the thesis and associated publications. I will forever treasure our inspirational meetings! To Professor Simone Volet my sincere gratitude for maintaining a close interest in the progress of my candidature, providing timely advice, support and feedback. To Associate Professor Irene Styles my thanks for support at the beginning of this amazing learning journey. Thank you all for sharing your unique gifts with me.

I would like to acknowledge the support of my family in this endeavour. I wish to thank my beloved husband, Chris, and children, Andrew and Karen, for their support, patience and encouragement to pursue my goals. To Pegah, my daughter-in-law, thank you for your thoughtfulness and caring.

Finally, I wish to sincerely thank the students and teachers who shared their experiences, understandings and knowledge with me. I also acknowledge the assistance of the various Principals and Management Boards at the school during the extended period of study, for permitting me to conduct the research. Without their cooperation, this research would not have been possible. Thank you.
# TABLE OF CONTENTS

DECLARATION iii

ABSTRACT v

ACKNOWLEDGEMENTS vii

TABLE OF CONTENTS ix

LIST OF TABLES xv

LIST OF FIGURES xxi

PUBLICATIONS xxv

CHAPTER 1 INTRODUCTION 1

1.1 Context of the Study 2

1.2 Purpose of the Study 2

1.2.1 Influences Impacting on AuSSI-WA 3

1.2.2 EfS Pre 2005 3

1.2.3 EfS and AuSSI-WA Post 2005 3

1.3 Research Questions 4

1.4 Significance of the Study 4

1.5 Definition of Terms 6

1.6 Overview of the Thesis 7

CHAPTER 2 REVIEW OF LITERATURE 9

2.1 Education for Sustainability 9

2.1.1 Defining EfS 9

2.1.2 Attitudes and Values in EfS 13

2.1.3 Knowledge and Understandings 19

2.1.4 Skills and Behaviours 27

2.1.5 Whole Systems Thinking 23

2.2 Whole School Approaches to Sustainability 27

2.2.1 International Perspectives 31

2.2.2 National Perspective 34

2.2.3 State Perspective 39

2.3 Montessori Educational Context 45

2.3.1 Brief History and Philosophy 45

2.3.2 Values 45

2.3.3 Curriculum 46
Appendix 7: Work Samples from Observation Lessons 443
Appendix 8: Other Work Samples 447
Appendix 9: Teacher Workshop Handouts 465
Appendix 10: Extracts from School Newsletters 473
Appendix 11: Other Evidence 481
Appendix 12: Application of Eagle Eye Model at the Case Study School 491
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Changing conceptions of EE and EfS in Australia</td>
<td>11</td>
</tr>
<tr>
<td>2.2</td>
<td>International Contributions to the Development of EfS Understandings</td>
<td>32</td>
</tr>
<tr>
<td>2.3</td>
<td>National Contributions to the Development of EfS Understandings</td>
<td>35</td>
</tr>
<tr>
<td>2.4</td>
<td>AuSSI goals</td>
<td>37</td>
</tr>
<tr>
<td>2.5</td>
<td>AuSSI principles</td>
<td>37</td>
</tr>
<tr>
<td>2.6</td>
<td>Contributions to and developments in EfS in Western Australia</td>
<td>40</td>
</tr>
<tr>
<td>2.7</td>
<td>AuSSI-WA Key Elements Rubric</td>
<td>44</td>
</tr>
<tr>
<td>3.1</td>
<td>School and Participant Populations</td>
<td>84</td>
</tr>
<tr>
<td>3.2</td>
<td>Timeline for Data Collection</td>
<td>86</td>
</tr>
<tr>
<td>3.3</td>
<td>Audit Trail of Data Collection</td>
<td>92</td>
</tr>
<tr>
<td>3.4</td>
<td>Final Coding Categories</td>
<td>95</td>
</tr>
<tr>
<td>3.5</td>
<td>Limitations of the Research Techniques Employed</td>
<td>99</td>
</tr>
<tr>
<td>4.1</td>
<td>Teachers’ SWOT Analysis of Understandings of EfS (1990-2004)</td>
<td>106</td>
</tr>
<tr>
<td>4.2</td>
<td>Elements Identified in Teachers’ SWOT Analysis (1990-2004)</td>
<td>107</td>
</tr>
<tr>
<td>4.4</td>
<td>Teacher Perspectives: EfS Programs (1990-2004)</td>
<td>110</td>
</tr>
<tr>
<td>4.5</td>
<td>Teacher Perspectives: Interests Ignored by Approach to EfS (1990-2004)</td>
<td>111</td>
</tr>
<tr>
<td>4.6</td>
<td>Teachers’ Final Comments: Facilitators to EfS (1990-2004)</td>
<td>112</td>
</tr>
<tr>
<td>4.7</td>
<td>Student Perspectives: Impact of the Montessori philosophy on EfS (1990-2004)</td>
<td>116</td>
</tr>
<tr>
<td>4.8</td>
<td>Student Perspectives: EfS Lessons (1990-2004)</td>
<td>117</td>
</tr>
<tr>
<td>4.9</td>
<td>Student Perspectives: Interests Ignored by Approach to EfS (1990-2004)</td>
<td>118</td>
</tr>
<tr>
<td>4.10</td>
<td>Students’ Final Comments: Facilitators and Barriers to EfS (1990-2004)</td>
<td>120</td>
</tr>
<tr>
<td>4.11</td>
<td>Teachers’ SWOT Analysis of Understandings of EfS at the school (2007)</td>
<td>129</td>
</tr>
<tr>
<td>4.12</td>
<td>Elements Identified in Teachers’ SWOT Analysis (2007)</td>
<td>130</td>
</tr>
</tbody>
</table>
Table 4.13  Teacher Perspectives: Impact of the Montessori philosophy on EfS (2007) 131
Table 4.14  Teacher Perspectives: Impact of AuSSI-WA (2007) 131
Table 4.15  Teacher Perspectives: Impact of the Strategic Plan (2007) 132
Table 4.16  Teacher Perspectives: Impact of the Sustainability Model (2007) 132
Table 4.17  Teacher Perspectives: Impact of the Sustainability Policy (2007) 133
Table 4.18  Teacher Perspectives: Impact of Sustainability Focus Each Term on Students (2007) 134
Table 4.19  Teacher Perspectives: Impact of Sustainability Focus Each Term on Teachers (2007) 134
Table 4.20  Teacher Perspectives: EfS Programs (2007) 135
Table 4.21  Teacher Perspectives: Interests Ignored by Approach to EfS (2007) 136
Table 4.22 Teachers’ Final Comments: Facilitators and Barriers to EfS (2007) 136
Table 4.23  Typical Student Responses categorized by Action Learning Areas (2007) 138
Table 4.24  Children’s House Student Drawings by Action Learning Area (2007) 140
Table 4.25  Lower Primary Student Mind Maps by Action Learning Area (2007) 143
Table 4.26  Lower Primary Students’ Favourite EfS Lessons by Action Learning Area (2007) 143
Table 4.27  Lower Primary Students’ Least Favourite EfS Lessons by Action Learning Area (2007) 144
Table 4.28  Lower Primary Students’ Suggestions to Enhance EfS Lessons by Action Learning Area (2007) 145
Table 4.29  Upper Primary Student Mind Maps by Action Learning Area (2007) 149
Table 4.30  Upper Primary Student Descriptions of Good EfS Programs (2007) 150
Table 4.31  Upper Primary Student Perspectives on Interests Ignored by EfS Approach (2007) 151
Table 4.32  Upper Primary Students’ Favourite EfS Lessons by Action Learning Area (2007) 152
Table 4.33  Upper Primary Students’ Least Favourite EfS Lessons by Action Learning Area (2007) 152
Table 4.34  Upper Primary Students’ Suggestions to Enhance Enjoyment of EfS Lessons by Action Learning Area (2007) 153
Table 4.35  Upper Primary Students’ Suggestions to Improve EfS Lessons by Action Learning Area (2007)  
Table 4.36  Student Engagement in Learning Behaviours for Water Quality Lessons (2007)  
Table 4.37  Knowledge, Attitudes and Behavioural Intentions of Typical Student involved in Water Quality Lessons (2007)  
Table 4.38  Student Engagement in Learning Behaviours for Water Quality and Gardening Lessons (2007)  
Table 4.39  Knowledge, Attitudes and Behavioural Intentions of Typical Student involved in Water Quality Lesson (2007)  
Table 4.40  Knowledge, Attitudes and Behavioural Intentions of Typical Student involved in Garden Lesson (2007)  
Table 4.41  Student Engagement in Learning Behaviours for Turtle Research Lessons (2007)  
Table 4.42  Knowledge, Attitudes and Behavioural Intentions of Typical Student involved in Turtle Research Lesson (2007)  
Table 4.43  Teachers’ SWOT Analysis of Understandings of EfS at the school (2008)  
Table 4.44  Elements Identified in Teachers’ SWOT Analysis (2008)  
Table 4.45  Teacher Perspectives on the Impact of the Montessori philosophy on EfS (2008)  
Table 4.46  Teacher Perspectives on the Impact of AuSSI-WA (2008)  
Table 4.47  Teacher Perspectives on the Impact of the Strategic Plan (2008)  
Table 4.48  Teacher Perspectives on the Impact of the Sustainability Model (2008)  
Table 4.49  Teacher Perspectives on the Impact of the Sustainability Policy (2008)  
Table 4.50  Teacher Perspectives: Impact of Sustainability Focus Each Term on Students (2008)  
Table 4.51  Teacher Perspectives: Impact of Sustainability Focus Each Term on Teachers (2008)  
Table 4.52  Teacher Perspectives on EfS Programs (2008)  
Table 4.53  Teacher Action on EfS Priority (2008)  
Table 4.54  Teacher Perspectives: Interests Ignored by Approach to EfS (2008)  
Table 4.55  Teachers’ Final Comments: Barriers to EfS (2008)  
Table 4.56  Children’s House Student Drawings by Action Learning Area (2008)  

xvii
Table 4.76  Knowledge, Attitudes and Behavioural Intentions of Typical Student involved in Early Man (Model) Lesson (2008) 211
Table 4.77  Assessment of the school’s approach to sustainability using the AuSSI-WA rubric 216
Table 4.78  Elements of EfS Emerging from Research Findings 219
Table 4.79  Facilitators and Barriers to EfS in an AuSSI-WA Context 220
Table 6.1  Critical success factors for whole school sustainability programs 274
Table A5.1  Fundamental Values for Sustainability 412
Table A5.2  Key Understandings for Effective EfS 415
Table A5.3  Skills for Effective EfS 416
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Cyclic model of environmental education</td>
<td>20</td>
</tr>
<tr>
<td>2.2</td>
<td>Model of SRL as pertaining to environmental education</td>
<td>21</td>
</tr>
<tr>
<td>2.3</td>
<td>EfS adaptation of bioecological systems model</td>
<td>25</td>
</tr>
<tr>
<td>2.4</td>
<td>Nested systems model</td>
<td>25</td>
</tr>
<tr>
<td>2.5</td>
<td>UNESCO’s model of the dimensions of sustainability</td>
<td>33</td>
</tr>
<tr>
<td>2.6</td>
<td>National model for environmental EfS</td>
<td>36</td>
</tr>
<tr>
<td>2.7</td>
<td>AuSSI-WA Ecological Footprint</td>
<td>43</td>
</tr>
<tr>
<td>2.8</td>
<td>AuSSI-WA Social Handprint</td>
<td>43</td>
</tr>
<tr>
<td>2.9</td>
<td>Influences impacting on AuSSI-WA at the Montessori school</td>
<td>60</td>
</tr>
<tr>
<td>2.10</td>
<td>EfS research themes influencing the study</td>
<td>61</td>
</tr>
<tr>
<td>2.11</td>
<td>Curriculum influences in the study</td>
<td>64</td>
</tr>
<tr>
<td>2.12</td>
<td>School setting influences in the study</td>
<td>65</td>
</tr>
<tr>
<td>2.13</td>
<td>Conceptual framework: Aspects impacting on EfS in schools</td>
<td>67</td>
</tr>
<tr>
<td>2.14</td>
<td>Dynamic interrelated nature of key aspects in EfS</td>
<td>71</td>
</tr>
<tr>
<td>2.15</td>
<td>Dynamic interrelated nature of key aspects and overarching issues in EfS</td>
<td>72</td>
</tr>
<tr>
<td>3.1</td>
<td>Research scenario showing relationships between the case study context and EfS outcomes</td>
<td>80</td>
</tr>
<tr>
<td>3.2</td>
<td>Design framework showing the relationship between data collection methods and 12 elements of EfS at the school</td>
<td>81</td>
</tr>
<tr>
<td>4.1</td>
<td>School sustainability Timeline 1990-2004</td>
<td>121</td>
</tr>
<tr>
<td>4.2</td>
<td>Children’s House Student Drawing: “Sweeping up rubbish” (2007)</td>
<td>139</td>
</tr>
<tr>
<td>4.3</td>
<td>Children’s House Student Drawing:</td>
<td>139</td>
</tr>
<tr>
<td>4.4</td>
<td>Lower Primary Student (Year 1) Mind Map: Everything I know about sustainability (2007)</td>
<td>141</td>
</tr>
<tr>
<td>4.5</td>
<td>Lower Primary Student (Year 2) Mind Map: Everything I know about sustainability (2007)</td>
<td>142</td>
</tr>
<tr>
<td>4.6</td>
<td>Lower Primary Student (Year 3) Mind Map: Everything I know about sustainability (2007)</td>
<td>142</td>
</tr>
<tr>
<td>4.7</td>
<td>Upper Primary Student (Year 4) Mind Map: Everything I know about sustainability (2007)</td>
<td>146</td>
</tr>
</tbody>
</table>
Figure 4.8 Upper Primary Student (Year 5) Mind Map: Everything I know about sustainability (2007) 147
Figure 4.9 Upper Primary Student (Year 6) Mind Map: Everything I know about sustainability (2007) 148
Figure 4.10 Upper Primary Student (Year 7) Mind Map: Everything I know about sustainability (2007) 148
Figure 4.11 School Sustainabiliblity Timeline 1990 - 2007 163
Figure 4.12 Ecological Footprint 2007 164
Figure 4.13 Social Handprint 2007 165
Figure 4.14 Children’s House Student Drawing “I am caring for my house and ...” (2008) 185
Figure 4.15 Children’s House Student Drawing: “Boy outside placing fish bones ...” (2008) 185
Figure 4.16 Lower Primary Student (Year 1) Mind Map: Everything I know about sustainability (2008) 188
Figure 4.17 Lower Primary Student (Year 2) Mind Map: Everything I know about sustainability (2008) 188
Figure 4.18 Lower Primary Student (Year 3) Mind Map 1: Everything I know about sustainability (2008) 189
Figure 4.19 Lower Primary Student (Year 3) Mind Map 2: Everything I know about sustainability (2008) 189
Figure 4.20 Upper Primary Student (Year 4) Mind Map: Everything I know about sustainability (2008) 194
Figure 4.21 Upper Primary Student (Year 5) Mind Map 1: Everything I know about sustainability (2008) 194
Figure 4.22 Upper Primary Student (Year 5) Mind Map 2: Everything I know about sustainability (2008) 195
Figure 4.23 Upper Primary Student (Year 5) Mind Map 3: Everything I know about sustainability (2008) 195
Figure 4.24 Upper Primary Student (Year 6) Mind Map: Everything I know about sustainability (2008) 196
Figure 4.25 Upper Primary Student (Year 7) Mind Map: Everything I know about sustainability (2008) 196
Figure 4.26 School Sustainability Timeline 1990 - 2009 214
Figure 5.1  Influences impacting on AuSSI-WA at the case study school  224
Figure 5.2  Alignment and Constraints of Montessori and Other Influences Impacting on AuSSI-WA Pre 2005  230
Figure 5.3  Confounding Influences Impacting on Student Outcomes Following Participation in AuSSI-WA Post 2005  253
Figure 6.1  Silo approach to teaching EfS  278
Figure 6.2  Exploring the Eagle Eye Model for teaching EfS from a whole systems thinking perspective  279
Figure 6.4: Generic Eagle Eye Model for teaching EfS from a whole systems thinking perspective  281
Figure 6.5  Revised understandings: Influences impacting on AuSSI-WA at the case study school  284
Figure 6.6  Conceptual framework: Illustration of EfS outcomes during 2005-2007 period  287
Figure 6.7  Conceptual framework: Illustration of EfS outcomes during 2008-2009 period  288
Figure 6.8  Perceptions of EfS: Self-assessed and independent reality  289
Figure 6.9  Sustainability circle: Pre- and post-AuSSI-WA circles  291
Figure 6.10  Silos, systems and circles at the case study school  292
Figure A5.1  Triple bottom line conception of sustainability  423
Figure A5.2  Pyramid model of sustainability  427
Figure A5.3  Western Australia’s Sustainability Strategy  428
PUBLICATIONS

Aspects of this thesis have been previously published or presented as follows:

Papers


**Conference Posters**


**Conference Presentations**


**Website Conference Presentations**


